EDITED BY

DONALD WATERS
AND STEPHEN RINSLER

GLOBAL LOGISTICS

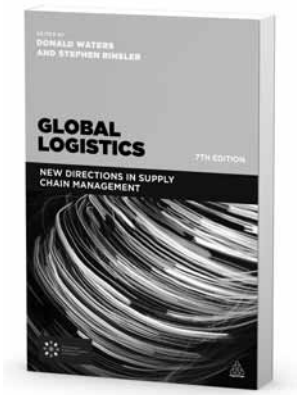
7TH EDITION

NEW DIRECTIONS IN SUPPLY CHAIN MANAGEMENT

The Chartered Institute of Logistics and Transport

Kogan Page

SEVENTH EDITION



Global Logistics

New directions in supply chain management

Edited by Donald Waters and Stephen Rinsler

The Chartered Institute of Logistics and Transport

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CONTENTS

CONTRIBUTORS

Julian Allen is a Senior Research Fellow in the Planning and Transport Department at the University of Westminster. His major research interests are urban freight transport, the impact of manufacturing and retailing techniques on logistics and transportation systems, the relationship between policy measures and freight transport operations, and the market structure of the freight transport industry. He has carried out many projects in these areas and has published research results in various journal papers, book chapters and reports.

Grzegorz M Augustyniak was a faculty member of the Department of Logistics and Department of Management Theory at the Warsaw School of Economics (SGH) and held visiting positions at Carleton University, University of Calgary, University of Minnesota and the University of British Columbia. He is also a graduate of International Faculty Development Programme at IESE. He is now a deputy head of SGH International Centre, Programme Manager of CEMS MIM Programme (joint degree of top 29 business schools and over 60 global corporate partners in the world), and lecturer in logistics and quality management at SGH executive programmes. He has been a consultant to many companies in manufacturing and distribution, and is currently working on improving productivity and quality in Poland.

Adrian Beesley is the Head of Product Development for DHL Exel Supply Chain within its Consumer Sector. Before this he was Director of the Academy of Logistics and Director of Client Operations at BAX Global covering EMEA solutions and business development. He has been a Senior Research Fellow with the University of Warwick's Manufacturing group where he worked on a number of projects for leading companies in the area of time compression. During this time he developed Time Based Process Mapping for supply chain re-engineering. Adrian started his career as a management trainee for Unilever, and his other experiences include Director of DLR Consulting in the Far East, Senior Consultant at PriceWaterhouse and Company Logistics Manager for B&Q.

Alan Braithwaite is the Chairman of LCP Consulting, which he founded in 1985. In more than 20 years the company has become a leading independent consultancy in supply chain management, working internationally and receiving worldwide recognition.

Alan has worked with the LCP team to develop innovative new analytical and design tools including Cost-to-Serve®, Time-to-Serve® and Carbon-to-Serve®. In his career he has consulted for more than 300 clients across every industry sector, applying key principles of supply chain management

to manufacturing, purchasing, retailing, logistics and customer satisfaction. Alan is a visiting professor at Cranfield University and holds an MSc in Business Administration from the London Business School and a BSc in Chemical Engineering from Birmingham University. He is a Fellow of The Chartered Institute of Logistics and Transport, a regular speaker at conferences, and the author of many papers and articles. Web: **www.lcpconsulting.com**; e-mail: **alan.braithwaite@lcpconsulting.com**

Michael Browne is Professor of Transport and Logistics at the University of Westminster. He is a visiting professor at the University of Gothenburg and Chalmers University of Technology. He serves as Associate Editor of *Transport Reviews* and Regional Editor of *Logistique et Management*. His research focuses on issues of sustainable distribution and logistics at both the urban and regional scale. Recent projects include: best practice in urban freight initiatives in European cities; potential energy savings from city logistics strategies; mapping energy use in global supply chains; forecasting future trends in freight transport and distribution; benefits from improved city logistics strategies; how partnerships can be used to promote improved urban freight operations and the impact on freight transport of the 2012 Olympic Games in London. He represents the University of Westminster on many external committees and boards and chairs the Central London Freight Quality Partnership. He is a Fellow of The Chartered Institute of Logistics and Transport and Chair of the Logistics Research Network.

Simon Chan is a research member of the Logistics Management Research Centre, Hong Kong Baptist University. He earned his bachelor degree in business administration (information systems management) from the same university, and is currently a PhD candidate at the Department of Finance and Decision Sciences. His research interests are enterprise resource planning systems, information systems and technologies application, logistics and supply chain management. He has presented research papers at international conferences and published in journals and book chapters, and is active in several academic and professional bodies.

Martin Christopher was Professor of Marketing and Logistics at Cranfield School of Management and chaired the Centre for Logistics and Transportation, where his work in supply chain management gained international recognition. He is now Emeritus Professor at Cranfield University. He has published widely, with recent books including *Logistics and Supply Chain Management* and *Marketing Logistics*. Martin is also co-editor of the *International Journal of Logistics Management* and is a regular contributor to conferences and workshops around the world. Martin is Emeritus Fellow of The Chartered Institute of Logistics and Transport and was awarded the 1988 Sir Robert Lawrence Gold Medal for his contribution to logistics education. He continues to do research and teach with colleagues at a number of universities around the world.

Robert Duncan is a Director of B & C Business Services Limited, a specialist supply chain consulting firm. His global supply chain management experience

of over 40 years, as both an executive and a consultant, embraces many industry sectors and geographies. Robert has gained particular expertise in the area of outsourced supply chain resources, helping clients select and improve the performance of their chosen partners. His recent work has continued in the area of outsourced supply chain resources and the processes related to fulfilling e-commerce orders. Robert has contributed to a number of publications and conferences relating to supply chain management.

Christian F Durach is a research associate in the field of supply chain management at the Kühne Foundation Center for International Logistics Networks at the Chair of Logistics, Institute of Technology and Management, Technische Universität Berlin. Christian received multiple Masters of Science from the Worcester Polytechnic Institute and the Technische Universität Berlin. His current research interests are supply chain risk and complexity management. He frequently speaks at conferences and has published in academic journals. Christian has worked on projects in the United States and Germany. He is a member of the Beta Gamma Sigma International Honor Society, European Operations Management Association (EurOMA), the Council of Supply Chain Management Professionals (CSCMP) and the German Logistics Association (BVL).

John Fernie (MA, MBA, PhD) is Emeritus Professor of Retail Marketing at Heriot-Watt University, Scotland. He has written and contributed to numerous textbooks and papers on retail management, especially in the field of retail logistics and the internationalization of retail formats. In 2005 he created the George Davies Centre for Retail Excellence with generous financial support from the retail entrepreneur of the same name. Subsequently much of his research has focused upon the fashion sector with work on offshore sourcing, on shelf availability and luxury branding. He was the editor of the *International Journal of Retail & Distribution Management* from 1989 to 2009 and is on the editorial board of numerous marketing and logistics journals. He is a Fellow of The Chartered Institute of Logistics and Transport and a member of the Logistics Directors Forum. He holds an Honorary Professorship at St Andrews University and several visiting positions at European universities.

John Gattorna is Executive Chairman of Sydney-based Gattorna Alignment, a specialist supply chain research and advisory firm, emphasizing 'thought leadership' in the supply chain subject-matter area. He also holds Adjunct Professorial positions at universities in Australia, Singapore, the UK and France, including the University of Technology, Sydney (UTS) and SP Jain Business School (Singapore). John is a prolific writer on the topic of logistics and supply chains, and his most recent book, *Dynamic Supply Chains* (2nd edn, FT Prentice Hall, Harlow, 2010) is highly acclaimed. He is currently working on the third edition, due for publication in early 2015. John is a highly innovative and insightful global supply chain 'thought-leader' and is much sought after as a speaker at international conferences. He also conducts numerous workshops and seminars for corporate teams.

Apart from a busy teaching and research schedule, he advises several multinational companies in Asia Pacific, the Middle East, Europe and South America. His website is very informative: **www.johngattorna.com**

David B Grant is Professor of Logistics and Associate Dean (Business Engagement) at Hull University Business School. David's doctoral thesis investigated customer service, satisfaction and service quality in UK food processing logistics and received the James Cooper Memorial Cup PhD Award from The Chartered Institute of Logistics and Transport (UK). His research interests include customer service and satisfaction; services marketing and service quality; retail logistics; reverse, closed-loop and sustainable logistics; logistics and supply chain relationships; logistics in SMEs; and integration of logistics and marketing. David's business experience includes retail, corporate banking, technical design, seminar facilitation and consulting. His recent applied research has investigated on-shelf availability and out-of-stocks, total loss and waste in food retailing, forecasting and obsolete inventory, service quality of internet retailers, and consumer logistics and shopping convenience in both grocery and non-grocery contexts, and he has directed two reports for the Hull and Humber region on its economic activity and future capability. David has over 135 publications in various refereed journals, books and conference proceedings and is on the editorial board of eight international academic journals. He is a member of the Council of Supply Chain Management Professionals (CSCMP), the UK Logistics Research Network (LRN), and the British Retail Consortium's Storage and Distribution Technical Advisory Committee.

Markus Hesse graduated in geography from the University of Münster, received his PhD in regional planning from the University of Dortmund (Faculty of Spatial Planning), and completed a post-doctoral degree in human geography from the Faculty of Earth Sciences of the Freie Universität Berlin. Since 2008, he has been Professor of Urban Studies at the University of Luxembourg, Geography and Spatial Planning research centre. His research is concentrated on principles of urban and regional development, European urban policy, globalization and the flows of materials – especially the impact of global logistics on Western Europe and North America. E-mail: **markus.hesse@uni.lu**

Heikki Holma is a senior lecturer at Seinäjoki University of Applied Sciences. Before this, he worked as a researcher and project manager in the Department of Marketing in the University of Oulu, and then as a special researcher in the Department of Logistics. He has over 25 years of experience in business-to-business marketing, and his main research interests are focused on industrial marketing, networks and business relationships in supply chains. Heikki is also a specialist in the forest industry, starting research with the Finnish Forest Research Institute in the early 1980s and consequently completing a dissertation on moderating business cycles in the Finnish sawmill industry. E-mail: **Heikki.Holma@seamk.fi**

Jacques Leonardi is Senior Research Fellow in the Department of Planning and Transport, University of Westminster. His research focuses on freight transport, energy efficiency and carbon footprint. Recent tasks have included survey methods and impact evaluation of new technologies. He has worked on the following projects within which he has conducted a range of analytical studies: urban freight best practices for BESTFACT (**www.bestfact.net**), electric vehicles for SMARTFUSION (**www.smarfusion.eu**), and policy transfer for SUGAR (**www.sugarlogistics.eu**). He has published widely and also teaches at the University of Westminster.

Chris Lonsdale taught at the University of Hull and in 1993 moved to the University of Birmingham, Department of Political Science and International Studies and the Institute for Local Government Studies. The following year he moved to the Business School, from where he was awarded a PhD. He is now a senior lecturer in the Centre for Business Strategy and Procurement, the School's supply chain management group, and was Programme Director of the MBA (Strategy and Procurement Management). In 2000, he was awarded honorary membership of the Chartered Institute of Purchasing and Supply.

Heimo Losbichler is Professor of Finance and Control and Chair of the Department of Accounting, Control and Financial Management at the University of Applied Sciences Upper Austria in Steyr. He was the elected Dean at the School of Management for the last three years and is an elected member of the board of the International Controller Association. Heimo's research and teaching interests include value-based management, financial performance analysis, and financial performance measurement within the supply chain. He has published his research widely in academic and professional journals. He also has extensive experience in industry, serving as the CEO of Baudatentechnik GMBH (an Austrian IT company) and consulting for leading Austrian companies. E-mail: **heimo.Losbichler@fh-steyr.at**

Farzad Mahmoodi is Joel Goldschein '57 Endowed Chair Professor in Supply Chain Management and the Director of Clarkson University's nationally ranked Global Supply Chain Management Program. He has been actively involved in executive education and has served as a consultant for several Fortune 500 and mid-size companies. His research interests focus on design and control of manufacturing and logistics systems. He has published more than 50 articles in a variety of edited books and leading journals, such as *Decision Sciences*, *Journal of Operations Management*, *European Journal of Operational Research*, and the *International Journal of Production Research*. He has been the recipient of several awards, including the Professor of the Year Award (MBA Program), the Commendable Leadership Award, the Distinguished Teaching Award, and the John W Graham, Jr Faculty Research Award. He serves on the editorial boards of the *International Journal of Industrial Engineering* and the *International Journal of Integrated Supply Management*. E-mail: **mahmoodi@clarkson.edu**

Kirstie McIntyre is director for Hewlett-Packard's social and environmental responsibilities in Europe, Middle East and Africa. Her remit covers all product-related environmental laws and market access agreements on energy efficiency, chemical and material restrictions and end-of-life considerations. Her team supports HP sales teams and customers across the region on environmental topics. She liaises with government, industry partners and peers, supply chain members as well as business customers and consumers on environmental regulations, recycling and other environmental aspects of HP's products. Kirstie has worked for a number of years in the strategic development of end-of-life programmes for various companies in the electronics sector. She has an engineering doctorate in environmental technology and has published widely on sustainability and supply chain issues.

Alan McKinnon is Professor and Head of Logistics at Kühne Logistics University, Hamburg. He was formerly Director of the Logistics Research Centre at Heriot-Watt University in Edinburgh. A graduate of the universities of Aberdeen, British Columbia and London, he has been researching and teaching in freight transport and logistics for 35 years and has published extensively in journals and books. Alan has undertaken research and consultancy studies for numerous public and private sector organizations in the UK and overseas and been an adviser to several UK government departments and parliamentary committees, the European Commission, the International Transport Forum, International Energy Agency and OECD. Between 2010 and 2012 he was Chairman of the World Economic Forum's Logistics and Supply Chain Industry Council. In 2012 he was appointed to the EU High Level Group on Logistics set up to advise the EC Transport Commissioner. Alan is also a lead author of the transport chapter of the 5th Assessment Report of the Inter-governmental Panel on Climate Change, which published in 2014. Much of his research in recent years has focused on the environmental sustainability of logistics and in particular the links between logistics and climate change. He is a Fellow of The Chartered Institute of Logistics and Transport and, in 2003, received its Sir Robert Lawrence Award for his long track record of research and education in logistics.

Hildegunn Kyvik Nordås is a senior trade policy analyst at the OECD Trade and Agriculture Directorate where she is currently managing a project on measuring trade restrictiveness in services. Before joining the OECD she was a researcher in the WTO secretariat, a senior research fellow and research director at Chr Michelsen Institute in Norway and an associate professor at the University of Bergen. She has held visiting positions at Stanford University, University of Durban Westville and the University of Western Cape. She has published articles, book chapters and reports on international trade, trade and growth, trade and investment and macroeconomic management, and has served on the board of several programmes for the Norwegian Research Council.

Stephen Rinsler has extensive industrial experience including senior positions in Unilever (SVP UK and European procurement and supply chains), Exel (now DHL) Europe (Services Director with a brief that included procurement, risk, health and safety), Volt Europe (SVP Operations), and Interim Procurement Director and Supply Chain strategist for Storehouse (BHS and Mothercare). He is currently Director of Bisham Consulting, Trustee and Honorary Secretary of The Chartered Institute of Logistics and Transport, a past chair of the CILT (UK) Board and the Supply Chain Faculty. He is commissioned as a Colonel in the Engineer and Logistics Staff Corps RE(V) and is an honorary Professor of Logistics and Engineering at the University of Nanjing, PR China. His consultancy work specializes in demand management, forecasting and inventory control, cost to serve models and strategic supply chain and procurement reviews. Educated at Bristol University, he attended Wharton Business School, Pennsylvania and is currently studying Mathematics at the Open University. E-mail: **steverinsler@bishamconsulting.com**

Jean-Paul Rodrigue received a PhD in transport geography from the Université de Montreal in 1994 and is now Professor in the Department of Global Studies and Geography at Hofstra University, New York. His research interests cover issues related to freight transportation, transport terminals, logistics and globalization, particularly focusing on the integration of maritime and inland freight distribution and the impact of intermodal transport on freight distribution. His website – The Geography of Transport Systems – has been adopted internationally as a tool for education and research on transport issues. He serves on the international editorial board of the *Journal of Transport Geography*, is a member of University Transportation Research Center, Region II of the City University of New York and is a lead member of the PortEconomics.eu initiative. He regularly performs advisory and consulting assignments for international organizations and corporations. He is a member of the World Economic Forum's Global Agenda Council on Advanced Manufacturing (2011–13) and a board member of the Canadian Transportation Research Forum. In 2013, the US Secretary of Transportation appointed him to sit on the advisory board of the US Merchant Marine Academy. E-mail: **Jean-paul.Rodrigue@Hofstra.edu**

Krzysztof Rutkowski is Professor and Chair of the Department of Logistics, Warsaw School of Economics, Lecturer at the Community of European Management Schools, and Adjunct Professor of International Studies at the Carlson School of Management, University of Minnesota. He studied at Warsaw University, the Warsaw School of Economics, Rayerson Polytechnic University in Toronto and Scuola Superiore Enrico Mattei, Milan.

He has worked in logistics for many years with a professional career that began in Plastics Kanada in Toronto and continued in IPEX, Pomaton EMI, UPS, and PEKAES Group. His current research interests are in development trends in supply chain management, demand-driven supply networks, global logistics and best practices in supply chain management. He has published widely in these areas.

Krzysztof was Vice Rector of the Warsaw School of Economics and has been an adviser and expert to governments, international organizations and international companies. He is currently President of the Association of Polish Logistics Managers.

Jari Salo is Professor of Marketing at the University of Oulu. He is also Adjunct Professor of Marketing at the School of Business at the Aalto University. His research interests include digital marketing, branding, innovation and mobile marketing. Salo has more than 130 publications. His research has been published in journals such as *Computers in Human Behavior*, *Online Information Review*, *Industrial Marketing Management* and *International Journal of Information Management*. Jari has worked as a consultant and organized research projects in many companies, and has raised funding from companies such as Nokia, Rautaruukki, Outotec, Metso Paper, Kemira and Outokumpu.

Joe Sanderson is a senior lecturer at the Centre for Business Strategy and Procurement at the University of Birmingham. He is currently working on a project to map the structural characteristics of supply and value chains in a range of service and industrial sectors. He has a BA in politics from the University of Hull and is writing his doctoral thesis on the regulatory and organizational drivers of procurement efficiency in the UK utilities after privatization. His principle research interests are in international business and supply management, power in supply chains, and the impact of national, regional and international regulation on procurement practices.

Xinping Shi is the Director of the Logistics Management Research Centre, and Associate Professor in the Department of Finance and Decision Sciences, Hong Kong Baptist University. Xinping has taught widely on business management subjects, and has supervised many research projects and published widely in information system and supply chain management. His research interests include logistics and supply chain management, decision making in organizations, enterprise resource planning, knowledge management, and international business negotiations. He is a visiting professor of Logistics Management at the College of Logistics, Beijing Normal University, and is an independent director of logistics firms in Hong Kong and China.

Lars Stemmler is Head of International Projects with Bremenports GmbH & Co KG, the infrastructure manager of the ports of Bremen/Bremerhaven. Prior to joining bremenports he was Deputy Head of Structuring/Analysis Transportation Finance Europe of HSH Nordbank AG and he worked for BLG Consult GmbH (the consultancy branch of the BLG Logistics Group), Deutsche Schiffsbank AG (a leading ship and financial company). In these jobs he has been involved in several international projects concerned with port finance and logistics.

Frank Straube is Director of the Institute of Technology and Management and holds the Chair of Logistics at the Technische Universität Berlin. He

is active as an international teacher at the CDHK of Tongji University, Shanghai, University of St Gallen, Switzerland and University of Paris II (Pantheon-Assas), France. Frank is a member of the advisory board of the German Logistics Association (BVL), European Logistics Association (ELA), Bremer Logistics Group (BLG) and Deutsche Bahn AG. He is the founder of the International Transfer Center for Logistics (ITCL), which implements innovative planning and professional development operations for companies.

Rolando Tomasini is Programme Manager for the Humanitarian Research Group at the INSEAD Social Innovation Center. His work focuses on public–private partnerships between humanitarian organizations and corporate multinationals. Through numerous secondments to various UN agencies and NGOs he has acquired an extensive knowledge of emergency relief operations and corporate social responsibility. He is the author of several case studies at INSEAD, academic articles, and books on humanitarian logistics. He has a Master of International Business degree from Florida International University and is working on his PhD at Hanken School of Economics.

Remko van Hoek is Global Procurement Director at PwC, based in the Netherlands. Previously he was a supply chain improvement director for Nike, CPO at Nuon (a major Dutch utility company) and Chief Procurement Officer at Cofely (part of GDF SUEZ). Remko is also a visiting professor of supply chain management at the Cranfield School of Management, having previously been a professor of supply chain management. He has also taught at the Rotterdam School of Management and the University of Ghent/Vlerick School of Management. He is on the board of directors of CSCMP, and serves on editorial boards of several international academic journals. He is a frequent speaker in boardrooms and executive events, and his work is widely published. He is co-author of the best-selling textbook *Logistics Management and Strategy*, translated into eight languages and now in its fifth edition; he has won 10 awards for academic work in the supply chain domain and three industry awards.

James Jixian Wang is Associate Professor in the Department of Geography, University of Hong Kong. He has a Bachelor in Economics from the People's University of China, MPhil from the University of Hong Kong, and PhD from the University of Toronto. Currently he is a council member of the Hong Kong Society for Transport Studies, and a Fellow of The Chartered Institute of Logistics and Transport. His research area is Transport Geography, particularly port development and port-city relations. He has published widely in many international journals and is on the editorial boards of the *Journal of Transport Geography* and *Transportmatrica*. As a port-city specialist, James has participated in planning projects and strategic studies for more than 25 cities in China and the rest of Asia.

Luk Van Wassenhove holds the Henry Ford Chair of Manufacturing at INSEAD and is also Academic Director of the INSEAD Social Innovation Centre. Before joining INSEAD he was on the faculty at Erasmus University

Rotterdam and Katholieke Universiteit Leuven. Luk's research and teaching are concerned with operational excellence, supply chain management, quality, continual improvement and learning. His recent research focus is on closed-loop supply chains (product take-back and end-of-life issues) and on disaster management (humanitarian logistics). He is senior editor for *Manufacturing & Service Operations Management* and departmental editor for *Production and Operations Management*, and publishes regularly in academic journals. He is the author of several award-winning teaching cases and regularly consults for major international corporations. In 2006 he won the EURO Gold Medal for outstanding academic achievement.

Glyn Watson obtained a PhD from the University of Birmingham Business School in 1996 and is now a senior lecturer at the Centre for Business Strategy and Procurement. He was Programme Director of the MBA in Strategy and Procurement Management and recently became Director of Education for the Business School. He has done research in the broad area of integration and on European business issues, and his current interests include supply chain, supply chain typologies and supply chain management.

Andreas Wieland heads the Kühne Foundation Center for International Logistics Networks at the Institute of Technology and Management, Technische Universität Berlin. He is a researcher in the field of supply chain management. In 2012, Andreas received his PhD in Economics from the Technische Universität Berlin (summa cum laude). He studied at the Clausthal University of Technology, the KTH Royal Institute of Technology in Stockholm, and the University of Münster, where he received a master's degree in Information Systems. He has published several articles in academic journals. He currently teaches classes in logistics management. Andreas is a member of the German Academic Association for Business Research (VHB), the German Logistics Association (BVL), and the European Operations Management Association (EurOMA). He is also the editor of the blog scmresearch.org.

Allan Woodburn is Principal Lecturer in Freight and Logistics in the Department of Planning and Transport, University of Westminster. He is Course Leader of MSc Logistics and Supply Chain Management and has 20 years' research experience in freight transport planning and policy, focusing primarily on freight mode choice, rail/intermodal freight trends and issues relating to rail freight efficiency and sustainability. He is the joint editor of the *International Journal of Logistics*.

PREFACE

The first edition of *Global Logistics and Distribution Planning: Strategies for Management* appeared in 1988. Since then the whole field of logistics has changed. There is now a real global recognition of the importance of logistics and the supply chain: corporate, humanitarian, defence, food, etc. There is agreement about the basic principle of a supply chain as 'the series of activities and organizations that materials – both tangible and intangible – move through on their journeys from initial suppliers to final customers' (Waters, 2009). Then logistics – or supply chain management – becomes the function that 'plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements' (CSCMP, 2006).

What has changed is the speed and richness of data that is available through the supply chain and the challenge that brings in order to make information out of it. Arthur C Clarke (2001) said: 'The Information Age offers much to mankind, and I would like to think that we will rise to the challenges it presents. But it is vital to remember that information – in the sense of raw data – is not knowledge, that knowledge is not wisdom, and that wisdom is not foresight. But information is the first essential step to all of these.' I would go further and say that data is not even information unless one has collected it, formatted it and assembled it in such a manner that on analysis the information provides 'knowledge'. Data is available faster and in more depth and there is an increasing need to share this information up and down the supply chain.

What has also changed is the structure of the channels to market. For the first 20 years of my career aggregation was the route to lower costs: longer production runs on bigger machines, larger orders, bigger lorries, etc. In the last 10–15 years disaggregation has become necessary: retailers want smaller orders but more frequently; this permits smaller production runs on smaller cheaper machines, permitting lower stocks and more flexibility. The consumer now drives the supply chain, ordering one unit from the internet for delivery immediately and wanting to know where it is, even at 3 am in the morning. This has necessitated a fundamental change in the way that managers control the movement and storage of materials and services.

In response to these pressures for change, logistics/supply chain managers initially formed a single integrated function that brought together the responsibility for all aspects of material movement and storage from the central warehouse through to final retail customers. However, ensuring flexibility has required recognizing the necessity to integrate from the initial suppliers through to the final customer. Within this function the emphasis has been on

balancing reducing costs, globalization, e-business, improving communications, lean and agile strategies, environmental concern, risk management and customer satisfaction, etc. Some of the management of these aspects are in their infancy: risk management in supply chains, for example, but the threats to the supply chain that arose from the tsunamis of 2004 and 2011 – and their effects on continual supply – were real, and efforts to mitigate the risks are certainly gaining in importance.

Logistics, the supply chain, is now taken seriously, its strategic role is clear, but also its independent, facilitating role within an organization. It may not have the largest budget: manufacturing or product buyers have that; it is not the creative heart of the company: marketing plays that role; but it is the glue that binds the organization. Without logistics and the supply chain organization, businesses are recognizing that they cannot succeed. The management and output of the supply chain must be improved. Market competition is fierce. Without the speed to market, without high levels of customer service, all at a competitive cost, companies will not thrive or survive.

This book discusses the latest developments in this dynamic business function. This seventh edition builds on the success of earlier editions and follows the same general format. Do not think it is an encyclopaedia of logistics techniques that will answer all your questions around this very broad subject. Treat it as a forum of challenging ideas that address a number of key issues in a thought-provoking manner. The book focuses on areas that are of particular current interest, and emphasizes changes that have occurred in recent years.

The contributors are acknowledged experts in their fields with a wealth of experience and knowledge. Each gives an authoritative view of current thinking. Of course, this does not mean that they present the only view, and we hope that the material will encourage informed discussion.

This edition has been rewritten with new examples to support its theses. The focus is contemporary, data has been refreshed and some of the previous chapters have been replaced. The book continues to evolve, maintaining its focus on current issues that are relevant to an international readership.

The book will appeal to everyone with an interest in logistics and the supply chain: academics and students doing a variety of courses that have some logistics content, logistics professionals, consultants and managers from different backgrounds, all of whom want an appreciation of current thinking about the supply chain. It is important for all managers to realize the importance of logistics, the way that it crosses organizational and disciplinary boundaries – and the way that it fundamentally affects the way that an organization works. The success of every organization depends on its ability to deliver products to customers – and this is precisely the role of logistics.

Previous editors, James Cooper and Donald Walters, summarized the pleasures of editing the book: I echo their words, 'One of the greatest pleasures of being editor is to be the first to enjoy the riches of the chapters as they are written. I now leave it to new readers to explore the chapters that follow,

in the anticipation that they too will benefit, both professionally and personally, from the wealth of knowledge and expertise that they contain.'

And what of the future? Forecasting is so important in the supply chain. I suspect we will be exploring the further disruptive technologies of disaggregation of which 3D printing is but one?

Do enjoy reading this book.

Stephen Rinsler
(with grateful acknowledgement to
Professor Donald Waters for
using his still pertinent words in several places)

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New directions in logistics

01

MARTIN CHRISTOPHER
Cranfield School of Management

In recent years there has been a growing recognition that the *processes* whereby we satisfy customer demands are of critical importance to any organization. These processes are the means by which products are developed, manufactured and delivered to customers and through which the continuing service needs of those customers are met. The logistics concept is the thread that connects these crucial processes and provides the basis for the design of systems that will cost-effectively deliver value to customers.

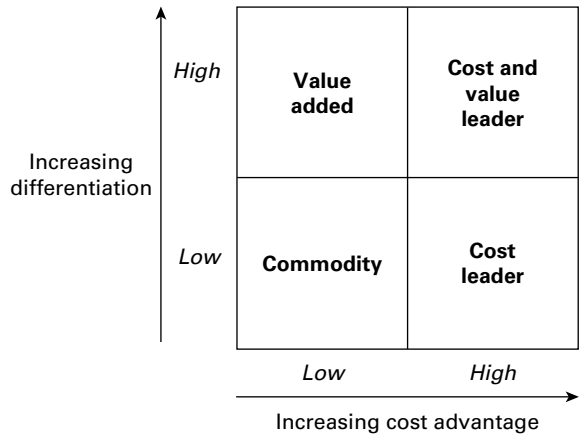
Accompanying this recognition of the importance of process has been a fundamental shift in the focus of the business towards the marketplace and away from the more inwardly oriented production and sales mentality that previously dominated most industries. This change in orientation has necessitated a review of the means by which customer demand is satisfied – hence the dramatic upsurge of interest in logistics as a core business activity.

The emergence of the value-conscious customer

Recession in many markets, combined with new sources of competition, has raised the consciousness of customers towards value. 'Value' in today's context does not just mean value for money – although that is certainly a critical determinant of the purchase decision for many buyers – but it also means perceived benefits. Customers increasingly are demanding products with added value, but at lower cost, and hence the new competitive imperative is to seek out ways to achieve precisely that.

Michael Porter (1980, 1985) was one of the first commentators to highlight the need for organizations to understand that competitive success could only come through cost leadership or through offering clearly differentiated products or services. The basic model is illustrated in Figure 1.1. Porter's argument was that a company with higher costs and no differential advantage

FIGURE 1.1 The competitive options



in the eyes of the customer was in effect a commodity supplier with little hope of long-term success unless it could find a way out of the box. His prescription was that the organization should seek to become either a *low-cost producer* or a *differentiated supplier*.

However, in reality it is not sufficient to compete only on the basis of being the lowest-cost supplier. The implication of this is that a competitor in the bottom right-hand corner has to compete on price – if a company is only a cost leader, how else can it compete? Competing solely in terms of price will merely reinforce the customer's view that the product is a commodity – the very thing the company wishes to avoid. On the other hand, a strategy based upon differentiation will make it possible to compete on grounds other than price. While value for money will always be an issue, the aim is to increase customers' perception of the value they are receiving and hence their willingness to pay a higher price.

Organizations create value for their customers either by increasing the level of 'benefit' they deliver or by reducing the customers' costs. In fact customer value can be defined as follows:

$$\text{Customer value} = \frac{\text{Perceived benefits}}{\text{Total cost of ownership}}$$

Perceived benefits include the tangible, product-related aspects as well as the less tangible, service-related elements of the relationship.

The key point to note is that these benefits are essentially perceptual and that they will differ by customer. The 'total cost of ownership' reflects all the costs associated with the relationship, not just the price of the product. Hence the customer's cost of carrying inventory, ordering costs and other transactions costs all form part of this total cost concept.

Because logistics management, perhaps uniquely, can impact upon both the numerator and the denominator of the customer value equation, it can provide a powerful means of enhancing customer value.

An argument that is being heard more frequently is that logistics is a *core capability* that enables the firm to gain and maintain competitive advantage. More and more the view is expressed (Stalk, Evans and Shulman, 1992) that it is through capabilities that organizations compete. These capabilities include such processes as new product development, order fulfilment, marketing planning and information systems. There can be little doubt that companies that in the past were able to rely upon product superiority to attain market leadership can no longer do so, as competitive pressure brings increasing technological convergence. Instead these companies must seek to develop systems that enable them to respond more rapidly to customer requirements at ever lower costs.

Logistics and supply chain management

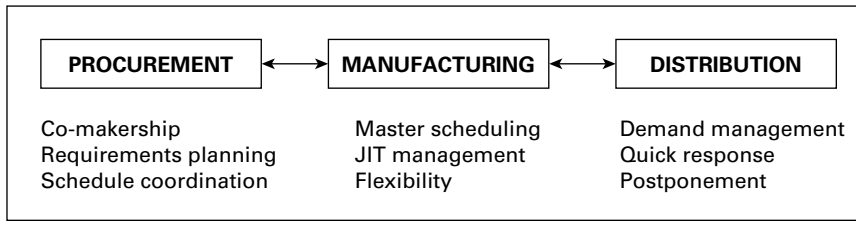
Logistics management is essentially an integrative process that seeks to optimize the flows of materials and supplies through the organization and its operations to the customer. It is essentially a planning process and an information-based activity. Requirements from the marketplace are translated into production requirements and then into materials requirements through this planning process.

It is now being recognized that, for the real benefits of the logistics concept to be realized, there is a need to extend the logic of logistics upstream to suppliers and downstream to final customers. This is the concept of *supply chain management*.

Supply chain management is a fundamentally different philosophy of business organization and is based upon the idea of partnership in the marketing channel and a high degree of linkage between entities in that channel. Traditional models of business organization were based upon the notion that the interests of individual firms are best served by maximizing their revenues and minimizing their costs. If these goals were achieved by disadvantaging another entity in the channel, then that was the way it was. Under the supply chain management model the goal is to maximize profit through enhanced competitiveness in the final market – a competitiveness that is achieved by a lower cost to serve, achieved in the shortest time-frame possible. Such goals are only attainable if the supply chain as a whole is closely coordinated in order that total channel inventory is minimized, bottlenecks are eliminated, time-frames compressed and quality problems eliminated.

This new model of competition suggests that individual companies compete not as company against company, but rather as supply chain against supply chain. Thus the successful companies will be those whose supply chains are more cost-effective than those of their competitors.

FIGURE 1.2 Critical linkages in the supply chain



What are the basic requirements for successful supply chain management? Figure 1.2 outlines the critical linkages that connect the marketplace to the supply chain.

The key linkages are between procurement and manufacturing, and between manufacturing and distribution. Each of these three activities, while part of a continuous process, has a number of critical elements.

Procurement

Typically in the past, supply management has been paid scant attention in many companies. Even though the costs of purchases for most businesses are the largest single cost, procurement has not been seen as a strategic task. That view is now changing, as the realization grows that not only are costs dramatically impacted by procurement decisions and procedures but also that innovation and response-to-market capability are profoundly affected by supplier relationships.

The philosophy of *co-makership* is based upon the idea of a mutually beneficial relationship between supplier and buyer, instead of the more traditional adversarial stance that is so often encountered. With this partnership approach, companies will identify opportunities for taking costs out of the supply chain instead of simply pushing them upstream or downstream. Paperwork can be eliminated, problems jointly solved, quality improved and information shared. By its very nature, co-makership will often involve longer-term relationships, but with fewer suppliers.

A fundamental feature of this integrated approach to supply chain management is the adoption of some form of alignment and synchronization of the customer's and the supplier's processes.

The aim should be to view your suppliers' operations as merely an extension of your own. Companies like Nissan, in their UK manufacturing facility, have developed closely linked systems with all of their suppliers so that those suppliers have full visibility not only of the production schedule at Nissan's Washington plant, but also of the real-time sequence in which cars are moving down the assembly line. By the use of electronic data interchange (EDI) and open communications, Nissan has been able to reduce

lead times, eliminate inventories and take costs out of the supply chain. Other companies may have introduced similar just-in-time (JIT) systems, but often, in so doing, have added to their suppliers' costs, not reduced them.

Manufacturing

There has been much talk of 'lean' manufacturing in recent years (led by Womack, Jones and Roos, 1990). The idea of leanness in this sense is that wasteful activities are reduced or eliminated and that value-creating processes are performed more quickly. However, just as important as leanness is agility. Agility is a wider supply chain concept that is more concerned with how the firm responds to changes in marketplace requirements – particularly requirements for volume and variety. Leanness is undoubtedly a desirable feature of a supply chain unless it leads to a misplaced emphasis on manufacturing costs. It may be preferable, for example, to incur a cost penalty in the unit cost of manufacture if it enables the company to achieve higher levels of customer responsiveness at less overall cost to the supply chain.

The key word in manufacturing in today's environment is *flexibility* – flexibility in terms of the ability to produce any variant in any quantity, without significant cost penalty, has to be the goal of all manufacturing strategies. In the past, and even still today, much of the thinking in manufacturing was dominated by the search for economies of scale. This type of thinking led to large mega-plants, capable of producing vast quantities of a standardized product at incredibly low unit costs of production. It also has led many companies to go for so-called 'focused factories', which produce a limited range of products for global consumption.

The downside of this is in effect the possibility of hitting the 'diseconomies' of scale: in other words, the build-up of large inventories of finished product ahead of demand, the inability to respond rapidly to changed customer requirements and the limited variety that can be offered to the customer. Instead of economies of scale, the search is now on for strategies that will reduce total supply chain costs, not just manufacturing costs, and that will offer maximum flexibility against customer requirements. The goal must be 'the economic batch quantity of one', meaning that in the ideal world we would make things one at a time against known customer demands.

One of the lessons that the Japanese have taught us is that the route to flexibility in manufacturing does not necessarily lie through new technology, eg robotics, although that can help. A lot can be achieved instead through focusing upon the time it takes to plan, to schedule, to set up, to change over and to document. These are the classic barriers to flexibility and if they can be removed then manufacturing can respond far more rapidly to customer requirements. In a factory with zero lead times, total flexibility is achieved

with no forecasts and no inventory! While zero lead times are clearly an impossibility, the Japanese have shown that impressive reductions in such lead times can be achieved by questioning everything we do and the way in which we do it.

Distribution

The role of distribution in the supply chain management model has extended considerably from the conventional view of the activity as being concerned solely with transport and warehousing. The critical task that underlies successful distribution today is *demand management*.

Demand management is the process of anticipating and fulfilling orders against defined customer service goals. Information is the key to demand management: information from the marketplace in the form of medium-term forecasts; information from customers, preferably based upon actual usage and consumption; information on production schedules and inventory status; and information on marketing activities such as promotions that may cause demand to fluctuate away from the norm.

Clearly, while forecasting accuracy has always to be sought, it must be recognized that it will only rarely be achieved. Instead the aim should be to reduce our dependence upon the forecast by improved information on demand and by creating systems capable of more rapid response to that demand. This is the principle that underlies the idea of *quick response* logistics.

Quick response logistics has become the aim for many organizations, enabling them to achieve the twin strategic goals of cost reduction and service enhancement. In essence, the idea of quick response is based upon a replenishment-driven model of demand management. In other words, as items are consumed or purchased, this information is transmitted to the supplier and this immediately triggers a response. Often more rapid, smaller consignment quantity deliveries will be made, the trade-off being that any higher transport costs will be more than covered by reduced inventory in the pipeline and at either end of it, yet with improved service in terms of responsiveness. Clearly information technology has been a major enabling factor in quick response logistics, linking the point of sale or consumption with the point of supply.

A further trend that is visible in distribution is the search for *postponement* opportunities. The principle of postponement is that the final configuration or form of the product should be delayed until the last possible moment. In this way maximum flexibility is maintained, but inventory minimized. The distribution function takes on a wider role as the provider of the final added value. For example, at Xerox the aim is not to hold any inventory as finished product but only as semi-finished, modular work in progress, awaiting final configuration once orders are received. Similarly, at

Hewlett-Packard, products are now designed with 'localization' in mind. In other words, products will be designed for modular manufacture but with local assembly and customization to meet the needs of specific markets. In this way economies of scale in manufacturing can be achieved by producing generic products for global markets while enabling local needs to be met through postponed configuration.

What is apparent is that distribution in the integrated supply chain has now become an information-based, value-added activity, providing a critical link between the marketplace and the factory.

The new competitive framework: the four Rs

We began this chapter with a brief review of how today's customer is increasingly seeking added value and how logistics management can provide that value. In the past, the primary means of achieving competitive advantage were often summarized as the 'four Ps' – product, price, promotion and place. These should now be augmented with the 'four Rs' – reliability, responsiveness, resilience and relationships – and logistics strategies need to be formulated with these as the objectives. Let us briefly examine each in turn.

Reliability

In most markets and commercial environments today, customers are seeking to reduce their inventory holdings. Just-in-time practices can be found in industries as diverse as car assembly and retailing. In such situations it is essential that suppliers can guarantee complete order-fill delivered at agreed times. Hence a prime objective of any logistics strategy must be reliability.

Making logistics systems more reliable means that greater emphasis must be placed upon process design and process control. The processes that are particularly germane to logistics are those to do with order fulfilment and supply chain management. Because traditionally these processes have been managed on a fragmented, functional basis they tend to have a higher susceptibility to variability. These processes are typified by multiple 'hand-offs' from one area of functional responsibility to another and by bottlenecks at the interfaces between stages in the chain. One of the benefits of taking a process view of the business is that it often reveals opportunities for simplification and the elimination of non-value-adding activities so that reliability inevitably improves.

One of the main causes of unreliability in supply chain processes is performance variability. Recently, the use of so-called 'Six Sigma' methodologies has been adopted to reduce that variability. Six Sigma is the umbrella term applied to a range of tools that are designed to identify the sources of variability in processes and to reduce and control that variability.

Responsiveness

Very closely linked to the customers' demands for reliability is the need for responsiveness. Essentially this means the ability to respond in ever-shorter lead times with the greatest possible flexibility. Quick response, as we have seen, is a concept and a technology that is spreading rapidly across industries. For the foreseeable future, speed will be a prime competitive variable in most markets. The emphasis in logistics strategy will be upon developing the means to ship smaller quantities, more rapidly, direct to the point of use or consumption.

The key to time compression in the logistics pipeline is through the elimination or reduction of time spent on non-value-adding activities. Hence, contrary to a common misconception, time compression is not about performing activities faster, but rather performing fewer of them. The old cliché 'Work smarter, not harder' is particularly relevant in this context.

As Hammer and Champy (Hammer, 1990; Hammer and Champy, 1993) have pointed out, many of the processes used in our organizations were designed for a different era. They tend to be paper-based, with many – often redundant – manual stages. They are sequential and batch-oriented rather than parallel and capable of changing quickly from one task to another. Even though eliminating or reducing such activities may increase cost, the end result will often be more cost-effective. For example, shipping direct from factories to end customers may be more expensive in terms of the unit cost of transport compared to shipping via a regional distribution centre, but time spent in the distribution centre is usually non-value-adding time.

Resilience

Today's supply chains are more complex and vulnerable to disruption than ever before. In many cases, as a result of outsourcing and the increasingly global nature of supply chains, the likelihood of interruption to product and information flows has increased significantly.

Identifying, mitigating and managing supply chain risk is now a critical requirement to ensure business continuity. The idea of resilience in the context of supply chain management is that supply chains need to be able to absorb shocks and to continue to function even in the face of unexpected disruption.

The paradox is that in many cases, because companies have adopted 'lean' strategies and reduced inventories and, often, capacity, there is little 'slack' left in their systems. Resilient supply chains will typically incorporate strategic buffers at the critical nodes and links in their networks. These buffers could be in the form of inventory or capacity, possibly shared with competitors.

As uncertainty in the business environment continues to increase, organizations need to adopt a more systematic and structured approach to supply chain risk management. One way in which this can be achieved is

by creating a supply chain continuity team whose job is to audit risk across the supply chain and to develop and implement strategies for the mitigation of any identified risk.

Relationships

The trend towards customers seeking to reduce their supplier base has already been commented upon. The concept of 'strategic sourcing' is now receiving widespread support. Strategic sourcing is based on the careful selection of suppliers whom the customer wishes to partner. The benefits of such an approach include improved quality, innovation sharing, reduced costs and the integrated scheduling of production and deliveries. Underlying all of this is the idea that buyer–supplier relationships should be based upon partnership. More and more companies are discovering the advantages that can be gained by seeking out mutually beneficial, long-term relationships with suppliers. From the suppliers' point of view, such partnerships can prove formidable barriers to entry to competitors. Once again, companies are finding that logistics provides a powerful route to the creation of partnerships in the marketing channel. Logistics management should be viewed as the thread that connects the inbound and outbound flows of channel partners.

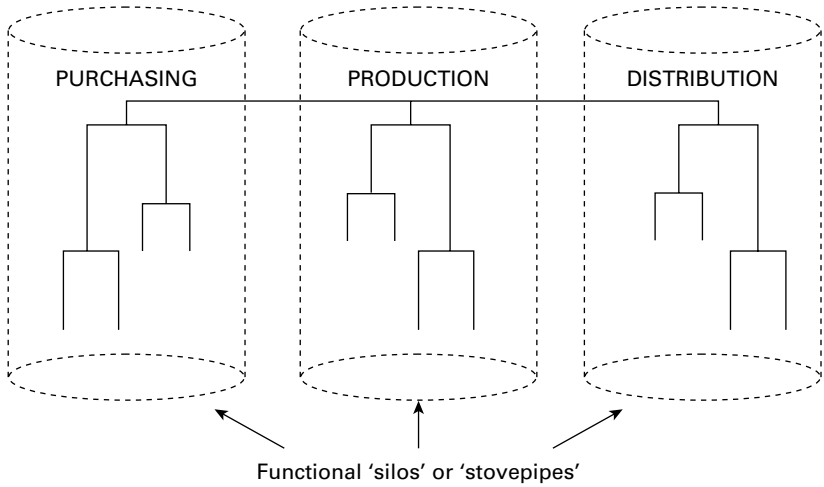
A good example of logistics partnership is the growing use of 'vendor-managed inventory' (VMI). The underlying principle of VMI is that the supplier rather than the customer assumes responsibility for the flow of product into the customer's operations. Thus instead of the customer placing orders on the vendor – often at short notice – the vendor can directly access information relating to the rate of usage or sale of the product by the customer. With this information the supplier can better plan the replenishment of the product with less need to carry safety stock. In effect, VMI enables the substitution of information for inventory in the supply chain.

The challenge to marketing and strategic planning in any business is to construct a corporate strategy that specifically builds upon logistics as a means to achieving competitive advantage through a much stronger focus on the four Rs. It is still the case that many organizations have not fully understood the strategic importance of logistics and hence have not explicitly tailored logistics into their corporate strategies and their marketing plans.

The organizational challenge

One of the most significant changes in recent years has been the way in which we think of organization structures. Conventionally, organizations have been 'vertical' in their design. In other words, businesses have organized around functions such as production, marketing, sales and distribution.

FIGURE 1.3 The vertical/functional organization



Each function has had clearly identified tasks and within these functional 'silos' or 'stovepipes' (as they have been called) there is a recognized hierarchy up which employees might hope to progress. Figure 1.3 illustrates this functionally oriented business.

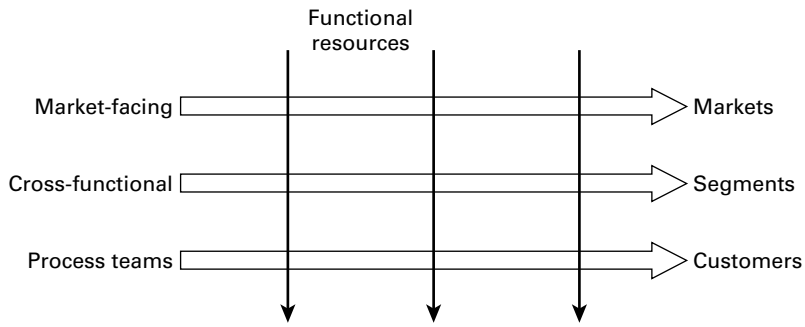
The problem with this approach is that it is inwardly focused and concentrates primarily on the use of resources rather than upon the creation of outputs. The outputs of any business can only be measured in terms of customer satisfaction achieved at a profit. Paradoxically, these outputs can only be realized through coordination and cooperation *horizontally* across the organization. These horizontal linkages mirror the materials and information flows that link the customer with the business and its suppliers. They are in fact the *core processes* of the business. Figure 1.4 highlights the fundamental essence of the horizontal organization.

In the horizontal organization, the emphasis is upon the management of processes. These processes, by definition, are cross-functional and include new product development, order fulfilment, information management, profitability analysis and marketing planning.

The justification for this radically different view of the business is that these processes are in effect 'capabilities' and, as we have observed, it is through capabilities that the organization competes. In other words, the effectiveness of the new product development process, the order fulfilment process and so on determine the extent to which the business will succeed in the marketplace.

How does a conventionally organized business transform itself into a market-facing, process-oriented organization? One of the major driving forces for change is the revolution that has taken place in information technology and

FIGURE 1.4 The horizontal/process organization



systems, enabling the supply chain linkage to become a reality. More and more, the business will find itself organizing around the information system. In other words, the processes for capturing information from the marketplace (forecasts, anticipated requirements, customer schedules and orders) will be linked to the processes for meeting that demand.

It is no coincidence that companies that have installed the new generation of 'enterprise resource planning' (ERP) systems have also been at the forefront of the change from vertical to horizontal organizational structures. These systems enable entire supply chains to become truly demand-driven through the use of shared information. They open up new and exciting opportunities to create true end-to-end pipeline management and the achievement of the ultimate business goal of high service to customers at less cost.

Summary

- Businesses in all types of industries are placing far greater emphasis on the design and management of logistics processes and the integration of those processes upstream and downstream with those of suppliers and customers.
- The business of the future will undoubtedly be market-driven, with logistics processes providing a critical means for achieving corporate goals.
- It will be a highly coordinated network of outsourced flows of materials and supplies, integrated through an information system that reaches from the ultimate consumer to the far end of the supply chain.
- The era of logistics and supply chain management, which many have predicted for some time, seems finally to have arrived.

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02

Best practices in logistics and supply chain management: the case of Central and Eastern Europe

KRZYSZTOF RUTKOWSKI
Warsaw School of Economics

The essence of the phenomenon of best practices in business

All talk about logistics and supply chain management practices – the best, the good, the bad, and the worst – seems to pervade logistics and supply chain managers (at least temporarily) on both sides of the Atlantic. The visibility of the widely publicized successes of companies such as Toyota, Wal-Mart, Dell, Apple, IBM, P&G or IKEA has encouraged supply chain managers from many other industries to benchmark their supply chains against those successful ones and try to apply some of the practices in their own organizations. [*Good business practices can take some time to digest and become acknowledged as best practice. This chapter is an important retrospective and asks the key questions of what is best practice and how good is it for optimizing the situation in the future state? Editor*]

In management, are there practices which can contribute to the achievement of established business goals in the best possible way? The answer to this question has probably always been on the minds of management theoreticians and practitioners. The very notion of best business practices also seems to be nothing new. The best practice phenomenon has been widely

regarded as a 'corporate miracle' and became popular among practitioners of various disciplines in the 1980s and 90s.[1] In the current global economy of the 21st century, where companies more than ever are being forced to optimize their operations as a matter of survival, the term (or buzzwords) 'best practice' gains more relevance for, and more interest from, key management personnel every year. Everyone wants to know how their operations compare with those of their competitors, and best practice metrics are seen as one way of doing this.[2] More and more companies see value in copying such practices if they are shown to be more efficient or more effective than current methods. The ability to translate the successful experience of one organization for the benefit of another represents a core element of the operating philosophies of many leading companies from all continents, which integrate best practices into their operating philosophies.[3]

The term 'best practice' is widely, albeit unreflectively, used within any type of business, including logistics and supply chain management. Best practices come in many shapes and sizes. There are best practices around policy, concept, model, process, activity, initiative, information, organization, people and technology. Taken together, best practices provide a comprehensive framework for designing, implementing and operating at the optimal level of performance.[4] There is a plethora of 'best practice examples' everywhere, especially if they concern the presentation of a company, its business offer, its successes and its achievements. A closer analysis of these practices indicates, however, that the term is rarely precisely defined and in most cases it is not uniformly understood, while the cited examples rarely reflect those business achievements which deserve publicity and the notion of 'the best'. Looking at the posts and comments on websites, it appears that the term is either 'overused' or misunderstood. Unfortunately, companies often confuse the latest or trendiest with the best, and the best practices of one era are soon superseded by the ever more ludicrous fads of the next.[5]

Best practices might be concepts, processes, activities or procedures with demonstrated ability to achieve superior results, which have been shown in practice to be the most effective and are considered leading edge, or exceptional models for others to follow. The best practice cannot be an acceptance of mediocrity; it must be supported by an achievement of unique success, ensuring the company's competitive advantage and its ability to achieve better results than the competition. Only then can such practices become the basis for achieving success, the consequence of which is a practice worthy of imitation by others. Using proven patterns as a base saves us from running into problems that others have already experienced, and also prevents us from reinventing the wheel and wasting effort. It pays to work smart by leveraging and building on existing information or proven patterns to fit our need. So irrespective of the name we'd like to give them, we do need 'things' of the nature of best practices and patterns to help us do our job better.

To some extent it doesn't matter if the 'best practices' are really best or not. 'Best practices' is only the name we choose to call them. Maybe it's a bad name but the important thing is that they teach us something, even if we don't agree with them. Unfortunately, this entire discussion is based on

a misunderstanding of the word 'best' in the context of the phrase 'best practice'. It does *not* mean 'better than all other practices in *all* contexts'.[6]

Transferring best practices – one solution fits all?

Can best practices be moved across sectors? Is it possible to transfer successful solutions from a small company to a large organization and vice versa? Are there any generic solutions that can be used regardless of the context in which they are applied? What are the problems facing companies when they transfer practices and learn from each other? The mythology about best practices is that they universally improve every organization. The truth is more likely that firms are so idiosyncratic that any practice born elsewhere probably needs tailoring before it can be imported.[7]

Some of the best practices are universal by nature and may be applied in all organizations and regions of the world (therefore are easily transferable); some, however, are specific to given sectors, regions or firms, which may significantly differ from each other and which may require a completely different approach to achieve success. The Six Sigma concept could be applied to control of the manufacturing process in practically all areas of business, whereas the Quick Response concept in its original form was restricted to the textile industry. The concept of distribution structures based on fully automated distribution centres works well in countries and regions characterized by high land and labour costs but fails to do so where the cost of these resources is low.

According to C. Ashton, 'best' is always contextual, or situation specific. No practice is good or bad in itself.[8] A 'best practice' is best only in the precise, specific context in which it exists. Even if moved from one situation to another very similar one, the chances of the transfer being made with practice intact might be nil. A specific development history, evolution path, competition strategy, key competences, size, accessible resources, organizational structure, products, management style, company culture, condition of the market, competition, regulatory environment, governmental assistance/impediments, executive leadership, state of international trade, acts of God, technology life cycle, partnerships/alliances, trendiness/hipness, inertia, effects of corruption or even luck may be decisive in ensuring that transferring best practices between firms as well as business lines and countries is not a simple task. One can learn from the practices of others, but copying them by rote without analysing the conditions within which they were developed and implemented and then comparing them to one's own particular situation and making requisite adjustments would lead to mistakes being made. The best practices should therefore be perceived more as models to be imitated than ready models to be copied by other companies. One size doesn't fit all! The Supply Chain 2020 research project provides an excellent example of this type of approach to best practices.

MIT Supply Chain 2020

What exactly is an excellent supply chain? The Center for Transportation & Logistics at the Massachusetts Institute of Technology (MIT) is striving to answer that question. In 2005, the Center undertook a long-term research effort, called Supply Chain 2020 (SC2020), with the aim of finding out what the characteristics of so-called perfect supply chains should be in future. It will also map out the process innovations that will underpin successful supply chains as far into the future as 2020.

'Beyond best practices' is one of the unifying themes behind the research to be conducted on identifying supply chain principles. It is predicated on the fact that a practice may be best for the supply chain of a specific company trying to achieve competitive advantage, but it may not be best for another company in another industry, nor even in its own. It is not MIT researchers' intent to dismiss the value of best practice benchmarking in the right context. But it concerns them that managers continue to search fruitlessly for the 'silver bullet' that they expect will transform their organization into the next Toyota or Dell.

The successes of global business leaders such as Toyota, Wal-Mart or Dell, which have been described in a transparent and convincing way, have inspired theoreticians and the managers of supply chains from many sectors to attempt to compare themselves with these leaders and to transfer the best practices of these businesses to their own organizations. In practice, however, such attempts at transferring outside solutions have rarely succeeded. The best practices of Toyota, Dell or Wal-Mart vary significantly as a result of their completely different approaches to the configuration and management of their supply chains.

According to SC2020, the companies with the best supply chains are those with a clear business strategy supported by a supply chain strategy and a complementary operational model, which enables the perfect realization of strategy. Their activities are driven by a limited number of 'tailor-made' supply chain practices.

A critical element determining the success of the supply chain is the 'operational goals' of the firm, which define the main aim of their supply chain. This supports the firm's competition strategy and measurement system, which it uses to assess the effects of managing its supply chain. The operational goals can be divided into three groups: customer responsiveness, typical for firms active in those sectors with high profit margins and short product life cycles (eg fashion apparel, pharmaceuticals,

cosmetics, toys, computers); efficiency, required in companies active in those sectors with low profit margins (eg the food and beverage industry, basic-goods retail, industrial supplies); and asset utilization, typical for those branches characterized by high capital intensiveness (eg the automotive and petrochemical industries, semiconductor fabricators).

Some supply chains, such as those of Wal-Mart or Dell, must be extremely efficient in order to maintain low costs and remain price-competitive. Others are designed in such a way as to focus more on reactive capacity, less so on costs. IBM is a good example of a company which has to focus on its ability to react quickly to signals coming from its customers, for only such an approach can guarantee its long-term success in the sale of its high-profit-margin products and services (although certainly at the cost of maintaining greater stocks and higher operational costs).

In light of these assumptions, a perfect supply chain is characterized by a focus on a limited number of consistent and cross-optimized business practices, which mutually reinforce each other and are strictly tied to the operational goals of the company. Perfect supply chains avoid, according to SC2020, the trap of trying to do everything well, for as a rule this results in nothing being done properly. In order to be perfect, the supply chain must focus more of its resources on the most important tasks, and less on others which are not as important from the perspective of the company's strategy and operational model. Therefore, according to SC2020, perfect supply chain practices deserve such credit only when the entire package of practices strengthens the realization of the firm's competitive strategy and its operating model. This means that the term 'best' may only apply when the whole system of tailored practices is greater than the sum of the parts.

SOURCE: www.sc2020.net; L Lapide, MIT's SC2020 Project: the essence of excellence, *Supply Chain Management Review*, 1 April 2006; *Proceedings of the Supply Chain 2020 Project's European Advisory Council's Fall 2005 Meeting*, Frankfurt, 18 October 2005; T Speh, *Key Criteria for Supply Chain Excellence: US experience*, BestLog Meeting, Paris, 16 May 2007.

The best practice of one company will not automatically become best practice in another unless it is adapted, successfully implemented and brings the expected results.[9] Yesterday's core capabilities embedded in best practices could become tomorrow's core rigidities. Institutionalization of 'best practices' by embedding them in information repositories may facilitate efficient handling of routine, 'linear' and predictable situations during stable or

incrementally changing environments. However, when change is radical and discontinuous, there is a persistent need for continual renewal of the basic premises underlying best practices. Organizations in such environments need imaginative suggestions and inspiration more than they do best practices.[10]

The best practices – between the hammer of economic demands and the anvil of corporate social responsibility

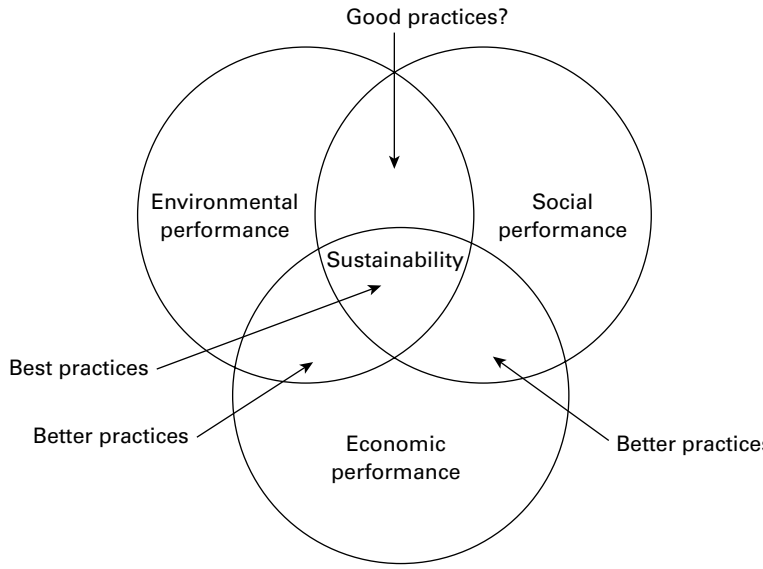
In business, the principle of achieving various goals (understood to be economic, most frequently financial) is dominant. This is generally the basic and sometimes only criterion of best practice assessment. Undoubtedly, many such business goals can be found, but the basic role is played by various financial targets (eg costs, revenues, profit, profitability). A US research, consulting and publishing firm that is a world leader in the field of best practice benchmarking, Best Practices, LLC, defines them as verified tactics which maximize revenues and profits, increase productivity and optimize costs.[11] When aiming for specific mastery of business activities, can non-business targets be completely overlooked?

First of all, this means facing balanced development postulates, which involve not only ensuring the financial success of a business in the long run, but also simultaneous involvement on the part of economic and social development, environmental protection, protection of social stability and assisting clients and suppliers in the fulfilment of the same targets. A balanced development has three, intrinsically linked, dimensions: economic, ecological and social.

A given practice may potentially lead to business success, but fail to find success for political, social or ecological reasons. Examples of such unacceptable practices are: building lasting business relationships with raw material suppliers from a country that is politically unstable; enforcing advanced technology in production or distribution that eliminates the need for a larger workforce in countries and regions with a high unemployment rate; and building distribution systems based on frequent road transport supplies in regions affected by heavy traffic congestion and/or in ecological danger. For non-business targets one must undoubtedly include various aims, such as meeting the challenges of social responsibility and/or balanced development.

Such a perspective refers to the guru of green business, J Elkington, who claimed that the success of a company influences its achievement in three respects: economic, ecological and social. He proposed a simultaneous consideration and balancing of three key dimensions (the Triple Bottom Line) observed from a micro perspective.[12] From the perspective of the organization, sustainable development is not only a question of good corporate

FIGURE 2.1 The best practices in light of the Triple Bottom Line concept



SOURCE: devised on the basis of Carter and Rogers, 2008

citizenship based on collecting bonus points by reducing harmful emissions from its factory or ensuring healthcare for its workers, but becomes a fundamental principle for intelligent management. This concept emphasizes that combining social, ecological and economic activities not only has a positive influence on the natural and social environment, but also has its expression in economic benefits and the building of a competitive edge in the long term. In light of this concept, the exclusive realization of economic (financial) objectives is not the best of practices, but it is difficult to acknowledge that such practices realize ecological and social objectives but without any success in the economic sphere. Undoubtedly, good practices have the object of achieving economic and ecological, or economic and social, objectives, while the best practices focus on realizing economic, ecological and social objectives at the same time (see Figure 2.1).

It is believed that orientation towards sustainable development helps today's companies increase their market share, build customer loyalty, positively distinguish their brand, improve employees' morale and loyalty, and increase the effectiveness and productivity of their activities. Attention is also paid to the fact that such an orientation lessens risk by way of avoiding negative social opinions, taking a proactive approach towards new regulation and avoiding future safety threats of the supply chain. The BestLog project, described below, illustrates how logistics and supply chain management might combine economic, ecological and social dimensions in best practice assessment.

BestLog Project

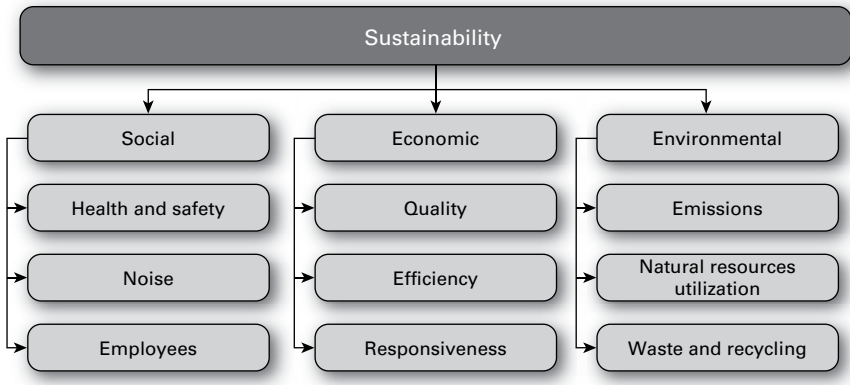
The European BestLog research project is an ambitious attempt to undertake ecological and social topics with reference to logistics and supply chain management. A particular aim of the project principal, the Directorate-General for Energy and Transport (DG TREN), is an elaboration of the concept that will meet the challenge of sustainable land transport. From a long-term perspective, within the scope of the BestLog project is an attempt to overcome many of Europe's problems in the areas of transport, logistics and supply chain management, such as: a 30 per cent increase in transportation volume in the past decade, which has not been accompanied by suitable development of the transport infrastructure; underutilized intermodal transport; road congestion and environmental pollution; shortage of qualified supply chain management personnel; unsatisfactory exchange of supply chain management knowledge and practice; a gap in strategies for harmonizing efficiency and sustainability; and stakeholders' increasing sensitivity with regard to social responsibility. Failure to tackle these problems may mean that economic growth and effective development of the continent are threatened. The project is part of the EU policy context and the DG TREN transport policy context.

The first context draws particular attention to: the 'Transport White Paper' subordinating transport to economic interests as well as those of European citizens (transport at the service of European industry and citizens); Lisbon strategy assumptions leading to the creation of jobs by making Europe the most competitive and knowledge-based region of the world; sustainable development goals establishing the harmonization of economic growth and transport (decoupling economic growth and transport growth); and EU enlargement – continual integration of new Member States.

The DG TREN political transport context aims to pay particular attention to the following: intermodal transport needs 'door-to-door' logistics solutions to be successful and compete in real terms; co-modality, with the assumption of improvement of efficiency of all modes separately and together in intermodal chains; and shippers, who should take all modes of transport (not just road transport) into consideration.

Although the BestLog project concentrates on the promotion of 'green' transport solutions in logistics and supply chain management, it is closer in its assumptions to J Elkington's concept (a parallel consideration of three key microeconomic goals), which is illustrated in Figure 2.2.

FIGURE 2.2 The scope of best practice assessment in the BestLog project – with benefits analysed in social, economic and ecological categories



SOURCE: http://www.bestlog.org/; Department of Logistics at WSE, 2009

Where do Central and Eastern Europe countries come from? From the world of worst practices!

Accepting the existence of best practices brings with it the necessity of accepting the thesis that their opposites also exist, namely – worst practices. 'Worst practice' is the synergistic combination of many elements of bad practice. Having just one or two elements of bad practice does not lead to worst practice status, but a range of bad practices that can 'support' and 'multiply' each other does. The economic and business environment of Central and East European countries before 1990 was a breeding ground for the emergence of worst practices in various business activities, including logistics.

With the end of the Second World War in 1945, Europe found itself divided into two spheres of power. Decades of separation during the Cold War resulted in different logistics systems and management attitudes in Western and Eastern Europe.[13] There is an obvious danger in generalizing about Central and Eastern Europe (CEE) as if it had been one place. CEE countries were not homogeneous either in political or economic dimensions. Typically, however, under the centrally planned system, control over the entire economic system resided with state-owned enterprises (SOEs), which had dominance over raw material supplies, manufacturing, wholesaling and retailing, as well as warehousing. Government control of the economy

meant that industry structures and management practices were not focused on efficiency. A persistent imbalance between demand and supply caused constant shortages.[14] Production was based on available raw materials, instead of customer orders. Because of shortages, managers' purchasing behaviour was inconsistent with the basic rules of logistics. Customer service was an unknown field. In fact, centrally planned economies did not need logistics. Therefore, logistics as a function was immaterial under the old system because whatever and whenever goods were available, they were sold.[15] Achieving legendary worst practice business and logistics practices in CEE must have exceeded expectation in a number of areas!

Logistics, if any, was oriented towards purchasing, not towards selling, and its characteristics were:

- no or poor customer focus;
- no or poor sales forecasting/order processing (customers went 'shopping' in production);
- lack of information systems;
- no or poor management of finished goods;
- no or poor material flow structures (internal and external);
- no or poor quality focus on warehouses and transportation;
- no third party available (either own truck fleet, or customers' trucks);
- very high stocks of raw materials (… if available, buy as much as you can);
- very high stocks of packaging materials;
- very long lead times, with loading times up to 12 hours;
- scarce palletization of products, leading to double and triple handling;
- people not familiar with Western logistics management tools, but with very good technical preparation.

Centrally planned economies generally put little emphasis on the retail sector. The communist government in Poland, for example, worked with an 'economy of shortages', where demand for most goods was greater than supply and there was no incentive to develop an efficient distribution system.[16] Furthermore, physical distribution of goods was primarily the responsibility of a government-run railroad and over-the-road carriers. Where more efficient private enterprises existed, they were very limited in both their operations and their influence on the overall system. Because of the overwhelming role of SOEs, this was a major hindrance not only for domestic firms, but also for most foreign companies wishing to develop business opportunities in Poland.[17]

Where are CEE countries going? The case of Poland

The fall of the Berlin Wall in 1989 served as both a literal and a symbolic catalyst for communism's decline in Europe and the emergence of social and economic freedom throughout Eastern bloc countries. The sudden collapse of the centrally planned institutions initiated the transition of Central and Eastern Europe into a market economy. New market forces transformed logistics structures and created a competitive environment for distribution services. Government regulations on developing sales and distribution networks did not exist beyond those needed to establish a business. Poland's new retail sector played a major role in bringing the country through a period of transition and into the subsequent period of growth. During this period the retail sector changed from having no power at all, simply following central government plans, to becoming a major force in the economy with increasing control of supply chains. Though the logistics revolution in Poland began in the retail industry, its relevance to other businesses has become ever more apparent. The appearance in Poland of global businesses with long supply chains has created new logistics challenges. As multinationals started expanding in the region, so did the global logistics firms. They were hoping to pick up business from the grocery, automotive, electronics, pharmaceutical and furniture sectors, now playing an important role in Poland. Global competition also poses a big challenge to Polish firms. If they are to find a place in the new pan-European supply chains that have begun to straddle Central and Eastern Europe, they will need to bring their logistical organization and technology up to the standards of multinationals. And, more generally, they will only stay competitive if they can keep pace with the state-of-the-art concepts and techniques now revolutionizing logistics and supply chain management in the West.[18]

The results of this transformation and privatization in Poland created a rapid expansion of logistics business opportunities. In the 1990s logistics was barely considered in the long-term plans of even major companies: now its strategic role is recognized in almost every organization. In the past decade, logistics in Poland has undergone a Cinderella-like transformation. This is hardly surprising. Recent years have seen a growth in international trade, strategic alliances, e-commerce and increased outsourcing of non-core activities. Add to this the increased emphasis on customer satisfaction, flexible operations, time compression and concern for the environment, and it becomes clear why organizations are concentrating on getting their logistics and supply chain management right. They are fast becoming a real focal point, as companies come to see them as a key battleground for gaining competitive advantage.[19] Meanwhile, logistics and supply chain management have become a fully fledged 'science', complete with their own vocational schools, university departments, research institutes, consulting firms, journals and newspapers.

Poland is the largest of the CEE countries. It has the largest landmass, the largest population and the largest economy. Poland's integration with the global economy has been highly dependent on foreign capital. Since the beginning of the 1990s there has been a huge increase in foreign direct investment in Central and Eastern Europe, with Poland topping the list of investment destinations.[20] This should be no surprise bearing in mind Poland's geographical location and the shift of production to this part of the world. According to the latest European Attractiveness Survey prepared by Ernst & Young, in 2007, Poland ranked as the most attractive destination for new foreign investment in Europe.[21]

Direct foreign investment in Poland involved not only the transfer of capital, but also machines, devices and technology, as well as modern systems of management and technological, marketing and organizational knowledge. These spread through the economy and were also incorporated by native companies with Polish capital. This contributed to the increase of competitiveness and innovation of all Polish enterprises, which at the same time improved their organizational culture and business ethics. The worst business practices were replaced by good and acceptable ones. This allowed Polish firms to enter European and global markets. Their practices became not just good, but the best, unique on a global scale, and worthy of being copied abroad.

The research projects carried out by the Department of Logistics at Warsaw School of Economics (WSE) have covered many of the latest examples of leading-edge companies and practices. In the authors' view, the content of the cases developed within these projects perfectly reflects the spirit of the smart opinion of D Blanchard on best practices' essence: '"Best practices" don't just happen by throwing a lot of money at your supply chain problems. … It takes money, but it also takes time, talent, energy, focus, commitment from senior management, and a lot of guts to pull off a supply chain transformation. Those are the qualities that the best-run companies in the world share, and it's why they're on top.'[22] The knowledge and abilities of huge global corporations, together with entrepreneurship, imagination and an innovative approach to the business practices of corporations on the part of Polish managers and employees, led to an unexpected effect – the best practices 'Made in Poland'.

The benefits that Poland has gained from being a late entrant have enabled it to skip many interim best practices that were implemented by companies before the collapse of communism in the region. This quantum leap has allowed Polish logistics and supply chain managers to develop their own best practices. Moreover, no longer is Poland an importer of best practice. It is now an exporter, with its examples holding their own and available to the rest of the world.[23] The Polish small car producer Fiat Tychy provides an excellent example of how Polish best practices can influence automakers of other countries and continents.

Chrysler comes to Poland to learn the secrets of small-car production

American car companies never knew how to build a good small car. After a decade in which Detroit automobile companies depended on sales of big sport utility vehicles and pickup trucks for their profits, high gasoline prices are sending consumers flocking to small cars. Therefore, Detroit companies are rushing small cars into development and making deals with foreign companies to supply them.

Fiat, one of Europe's oldest and largest car companies, effectively took over Chrysler in 2009. Instead of buying the equity with cash, it planned to put up capital to retool part of Chrysler's production capacity to build smaller cars. The deal is the latest manoeuvre by Fiat's chief, Sergio Marchionne, who has pulled the Italian company back from the brink of collapse since taking over in 2004. The partnership will provide each company with economies of scale and geographical reach at a time when both are struggling to compete with larger and more global rivals like Toyota Motor Corp., Volkswagen AG and the alliance of Renault SA and Nissan Motor Co.

For many years, carmakers searching for the secret to small-car success would travel to Japan's Toyota City. Today, the destination is Poland's Tychy. Ever since the car manufacturer Fiat took over, Chrysler engineers from Detroit have been voyaging all the way to this Polish town, up until now more famous for its beer, to discover a car factory employing workers and managing to make a tidy profit! Fiat's plant in Tychy has hit a new production record. As of the end of October 2009 the facility rolled out 500,000 cars – up from the 492,000 produced in all of 2008. The plant exceeded 600,000 units in 2012. At plants like Tychy, standards have been raised and the art of building smaller, fuel-efficient cars has been mastered. Chrysler has high hopes and believes that Fiat can do the same since assuming control.

At Tychy, the latest robotic technology is balanced by workers who can quickly shift models to match given demand. Today, the factory is running six full days a week. By contrast, most other car plants in Europe and the United States are running at a fraction of capacity. Fiat executives have several goals: to produce subcompact European models at Chrysler's North American plants and to teach Chrysler managers how to introduce smaller cars in the United States that Americans will want to buy, while increasing efficiency the way Fiat has done at its Tychy plant.

Mr Zdzislaw Arlet, the Tychy plant director, is always on the lookout for time- and money-saving improvements, adding that he himself looks to Toyota's famous Kaizen system for inspiration. For example, instead of filling up cars at different production points with brake fluid, petrol, water and other liquids, one machine on each of Tychy's three lines fills each vehicle. A car comes off the assembly line in less than a minute, half of what it took about 10 years ago. A new focus on quality has also been developed. About three years ago, workers were assigned an individual identification number that is stamped on whatever sections of the car they assemble so any problems at the end of the line can be traced to the source. '*At the moment, Tychy is the best of Fiat as far as quality is concerned*', said Giuseppe Volpato, a professor of economics at the University of Venice who has long studied the company. '*I think Poland is becoming the reference point for the whole organization, even in Italy.*'

SOURCE: ND Schwartz (2009) To shrink a US car, Chrysler goes to Poland, *The New York Times*, 14 July; Auto profits in Tychy, *Warsaw Business Journal*, 9 November 2009; Small cars, *The New York Times*, 22 November 2009; Fiat: Facts, Discussion Forum, and Encyclopedia Article, **http://www.absoluteastronomy.com/topics/Fiat** [accessed 22 November 2009].

The best practices – the Holy Grail of contemporary business?

Does the search for best practices place too much hope on discovering something new, something extraordinary, which does not exist? Many theoreticians and practitioners of management formulated and attempted to implement the 'Zero Inventory' or the 'Zero Defects' theory. From the beginning they were all too aware that they were striving to realize an unachievable goal, but this aim brought them closer to achieving better results than others. They failed to reach the absolute goal, perfection, but did become role models for others. The same goes for best practices. The comparison of the quest for best practices to the quest for the Holy Grail might also be a useful one. Striving to discover best practices is similar to the legendary search for the Holy Grail. To this day, nobody knows what the Holy Grail actually was or whether it actually existed. Despite long-term searches it has never been found. The same goes for the best practices.

Nevertheless, in the search for unique company success, business leaders allow themselves to discover all those things that lead to their achievement, which gives the company or institution an edge over the competition and proves its ability to achieve better results. Why, therefore, should one not aim to discover the basis for all these successes and make further attempts

to transfer such experiences to the company? Such a shift may bring great benefits.

One can imagine a Sir Lancelot of the logistics and supply chain industry seeking the ultimate best practice without knowing what it is and whether it actually exists!

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03

Trends and strategies in global logistics and supply chain management

CHRISTIAN F DURACH, FRANK STRAUBE AND ANDREAS WIELAND

Technische Universität Berlin

Introduction

Global companies that are truly successful have identified the importance of logistics as a management function. Public awareness of logistics has increased significantly, and its influence on strategic corporate decisions is strong. However, many companies are still in the process of defining the specific scope of responsibility of the logistics function and gearing their service networks towards the needs of their customers.[1] Reduced delivery times and adherence of defined delivery dates, as well as completeness and accuracy of delivery, are important criteria for an increasing customer satisfaction through logistics services.

At the same time, worldwide megatrends such as growing and increasingly fragmented global sales channels, talent shortages and cost pressure are challenges for logistics managers and lead to new and changing requirements on the network competences of companies. More than ever before, today's logistics managers are confronted with dynamic trends in corporate development, and dynamic trends are difficult to forecast.

As markets have changed over the past 20 years in both the business to business (B2B) markets and the business to consumer (B2C) markets so major

changes have been required of logistics. This trend will continue; we have the increasing influence of the internet and the rapid transmission and analysis of data. The area of logistics is getting more and more important, as more tasks will be fulfilled by logistics in the future. To be best prepared, future developments have to be forecasted. As a result, companies are in need of properly identifying such trends in order to build effective logistics coping strategies. The study at hand helps practitioners to identify key trends and lists strategies to cope with such trends. It is based on the interviews with 62 senior logistics and supply chain executives from global organizations in Brazil, China, France, Germany, India, the Netherlands, the United Kingdom and the United States. The results were analysed, and combined with analysis of 1,757 responses to an international survey.[2]

This chapter is organized into three sections: the first outlines the research design; the second lists the major trends and strategies identified in the study; the third interprets and discusses the findings with respect to the strategic attribute of delivery reliability.

Research design and research sample

This research project was financed by the German Logistics Association (BVL), in their 20-year effort to support research on logistics trends, and their impact on the global logistics environment. The research design followed a three-step methodological approach. A comprehensive content analysis of over 200 consulting reports helped to lay the groundwork for executive interviews. This step was supported by 62 interviews with executives from India, Germany, the United Kingdom, France, the United States, China, Brazil and Russia. A subsequent large-scale survey helped to regionally confirm or reject key trends and strategies identified in the executive interviews. A group of international partners collaborated on interviews and survey data collection to support the research team from Germany and the United States. In the following, a more detailed explanation of each methodological step will be outlined:

1. The consulting and research reports reviewed were organized and key issues analysed and extracted. In compiling this information, a content analyser tool was applied to identify the frequency of major trends and strategies. The tool allowed the scanning of thousands of research articles online to identify relevant articles and publications based on the number of search hits. This tool allowed further validation of the importance of the topics and resulted in a focal set of keywords and themes for further analysis by the team.

2 A number of important Chinese, English and German databases were searched. For example, Bloomberg supply chain analysis terminal, Business Source Premier, Ibis, Lexis-Nexus, and other databases. The research team then consolidated and finalized the list of trends and strategies that were relevant in the literature.

3 Based upon the results of the literature review, the research team developed a preliminary list of logistics trends and strategies. Based on these elements, a set of interview questions and a protocol for discussions with key industry executives were developed. The interviews were conducted with 62 international supply chain executives at the director level or higher from logistics services, retailing and various manufacturing industries. Subsequently, interviews were transcribed and coded into major trends and strategies.

4 The research team jointly discussed the findings from interviews and revised the list of trends and strategies derived. From this discussion, a survey of key items to include was developed. The survey was launched in November 2012, following the International Supply Chain Conference in Berlin. The survey was provided in English, German, Portuguese, Chinese and Russian, and posted to an online survey tool (see Figure 3.1).

FIGURE 3.1 Countries represented in the survey

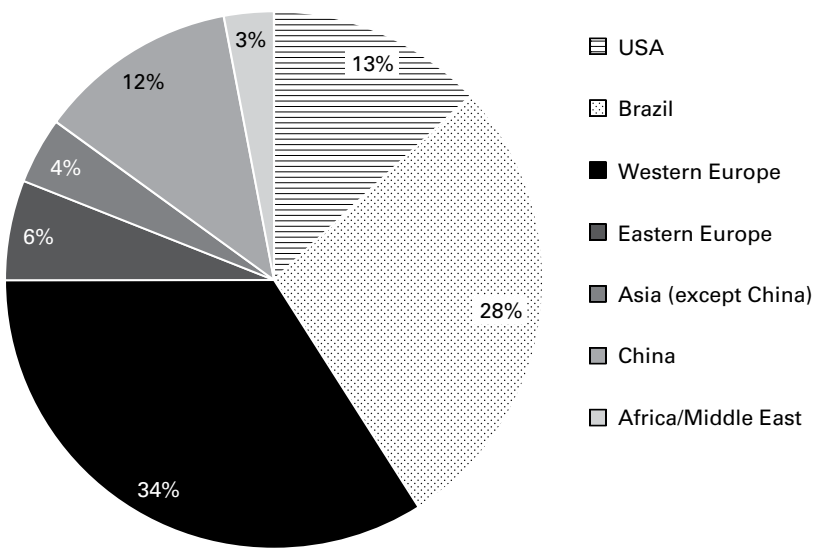
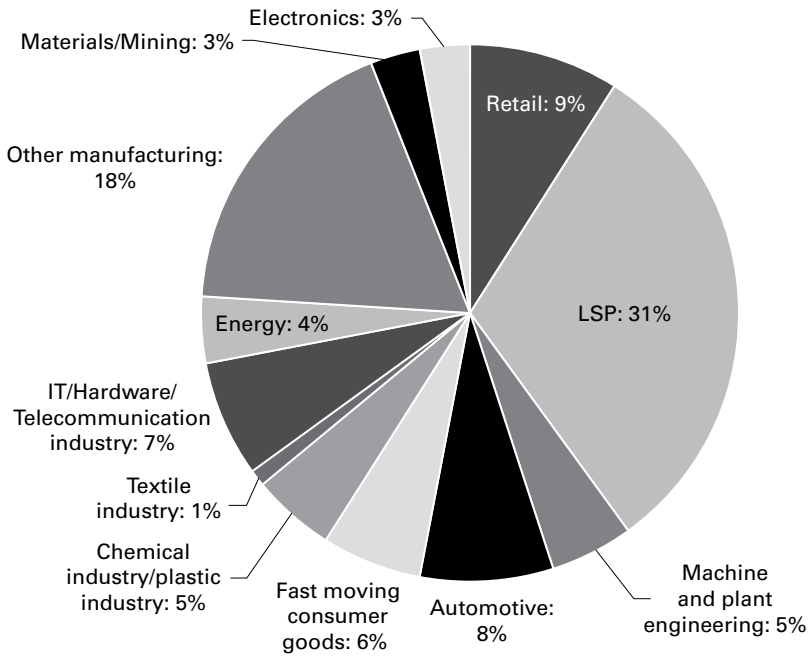


FIGURE 3.2 Industries represented



5 The online survey targeted global companies across major global regions, in an effort to obtain a truly global sample of organizations. As shown in Figure 3.1, the research team obtained a wide diversity of responses from the United States, Brazil, Western Europe, Eastern Europe, Asia, China, Africa and the Middle East. A total of 1,757 responses from various industries were retrieved, of which 645 completed all questions (see Figure 3.2). The number of responses per question varied, based on the structure and response rate of the survey.

6 The research sample included about 39 per cent of organizations with more than $500 million in annual global sales, with the majority (41 per cent) between $10 million and $500 million, and a strong representation of smaller organizations (20 per cent less than $10 million). Almost two-thirds (61 per cent) of respondents were from manufacturing industries, with 30 per cent LSPs and 9 per cent retailers (see Figures 3.3 and 3.4).

The remainder of this chapter will outline some of the insights derived from the executive interviews, backed by the survey results. It describes the major global logistics trends identified in the analysis and discusses the importance of delivery reliability.

FIGURE 3.3 Company size (employees)

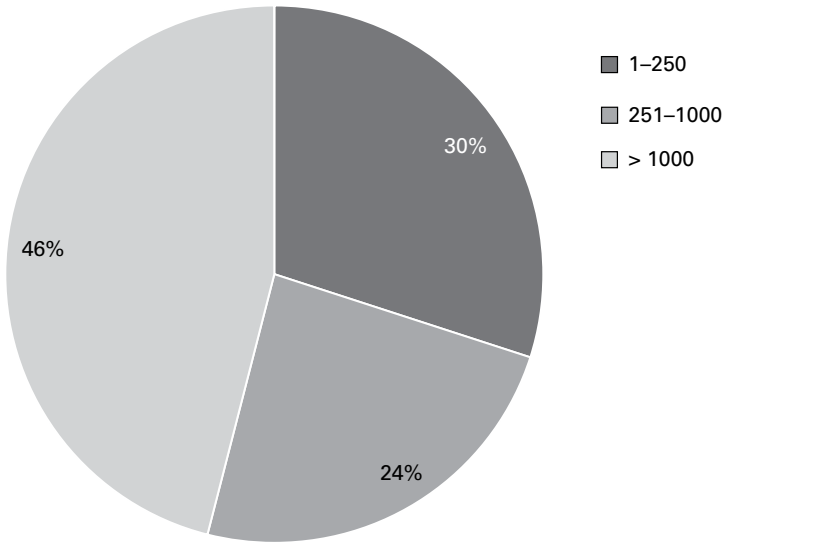
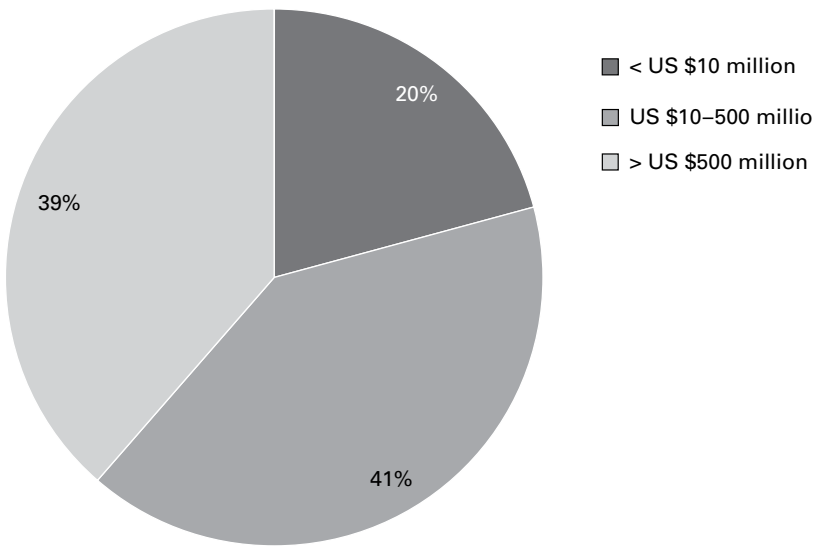


FIGURE 3.4 Company size (revenue)



Key trends and strategies

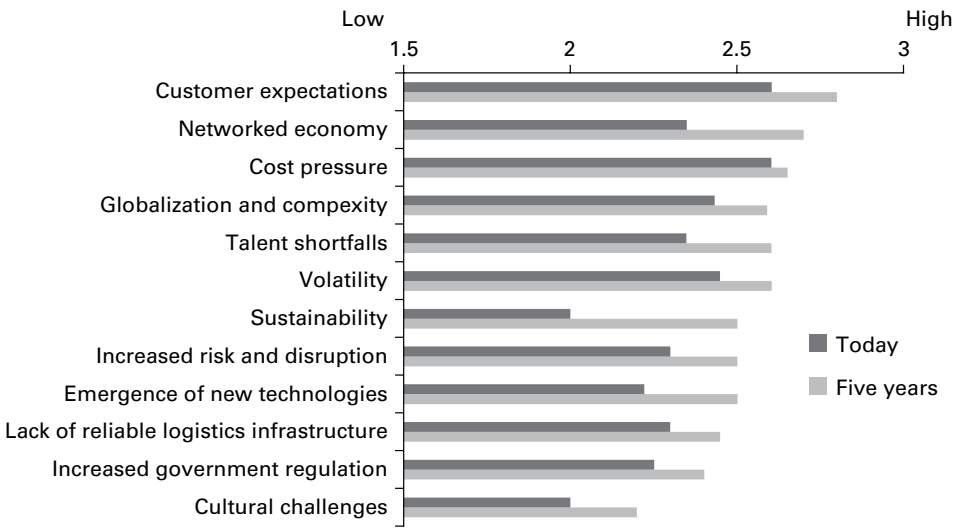
Trends

The purpose of this section is to summarize the key trends and strategies identified by the executives surveyed. Today's global logistics environment is characterized by increasing complexity and a number of important parameters shaping the global environment. The speed of change of these parameters is breathtaking and is driving increasing complexity in the logistics ecosystem. Such changes were labelled as 'trends', in that they continue to reshape the logistics landscape, and provide a shifting set of environmental risks and limitations that either constrain decisions, or alternatively present opportunities that agile enterprises are able to exploit quickly.

Figure 3.5 shows the importance of identified top trends, as well as their relative importance in the period 2012 to 2017.

The trends reflect executives' perceptions. In the following, the top six trends are grouped into two sets of related forces – network and external forces – and briefly discussed.

FIGURE 3.5 Perceived importance of logistics trends



Network forces

Network forces refer to vertical and horizontal interorganizational forces of the network. This includes customers, suppliers and logistics service providers (LSPs) that operate across the supply system. The three major network forces are as follows.

1. Increased customer expectation

As organizations grow, new global customers present a lucrative target but there is a steep cost to servicing these customers. A global customer base creates a new set of challenges for organizations that are used to providing standard logistics solutions to a homogeneous regional customer base. Customers are not only demanding perfect order and high delivery reliability, but are also requiring more customized and complex solutions.

Managers' top priorities identified are 'meeting customer expectations', followed by 'on-time delivery' and 'green logistics' (these were ranked the number one priority by 22 per cent, 17 per cent and 13 per cent of respondents respectively). The majority of respondents note that customers can change delivery orders based on 10 days or less. A majority (over 50 per cent) indicated that this window can be even one day or less. Therefore, reliability within the supply chain is essential both for meeting consumer demands and allowing flexibility in the customer order process.

2. Networked economy

The second most important trend requires organizations to recognize that their destiny is intertwined with others in the network. There has been an explosion of new channels to customers that are not well developed and that are interlinked with other channels.

In a networked economy, enterprises are expected to have extreme levels of flexibility. Manufacturers need to be able to adapt to new product requirements or suppliers. LSPs need to offer flexible services. Retailers must grapple with how to fulfil different types of orders, and how to handle inventory behind the purchases, as customers are offered an array of different delivery mechanisms (ship to home, pick up at store, etc). E-commerce orders that are typified by higher volume but smaller picked orders delivered to homes are more common.

Many of the companies interviewed recognize that they cannot operate independently but need to become experts at managing global relationships. This is particularly true in regions where sales are only starting out and, in many cases, companies need to figure out what it means to operate regionally. To do so, partnerships are key, particularly for importing into regions. Some companies are seeking to outsource more technology design, inventory management, working capital investments, and planning execution to other partners in the supply chain. Experts have warned that driving too much responsibility up the supply chain can result in significant risk and loss of control. Companies risk losing control of the channel if suppliers decide to integrate downstream towards customers.[3]

The most important reasons identified by almost 80 per cent of executives for collaboration in the supply chain is to achieve improved coordination and increasing trust, as well as to improve synergies and increase innovation. In the words of one executive: 'Collaborate or die!' It is clear that organizations are seeking to develop new forms of logistics value and innovation, and an open and trusting dialogue where all parties can openly exchange

ideas for improvement is an imperative for survival. Therefore, reliable partners have to be identified.

3. Cost pressure

The third most important trend is cost pressure. Customers expect high service level, high and fast logistics capabilities, and innovative products at a low price. The pressure of the last five years has driven many companies to capture the cost savings, and additional savings require more sophisticated approaches. The era of moving supply to emerging countries to exploit low-cost labour is coming to an end, as the savings are not as easy to find as they were five to eight years ago. Organizations are finding that they must begin to truly adopt analytical tools to design their logistics networks that capture multiple cost drivers.

More than one-third of respondents noted that logistics costs had increased in 2012, while another one-third stated it had stayed constant. No standardized methods exist in research or in business practice to measure the logistics costs as a percentage of overall costs/revenue of a company. This is due to several factors. First, standards defining what elements of transportation, purchasing, materials handling, quality inspection and other costs belong in the category of logistics often vary between divisions in the same company. A baseline definition of what is included in logistics costs also varies between companies in the same industry. Despite this limitation, the study shows logistics costs as a percent of overall revenue as estimated by respondents. Logistics costs exceed 8 per cent of revenues in industries such as retail, fast-moving consumer goods, chemicals, textiles, energy and mining/materials. These industries, not surprisingly, have a strong interest in optimizing their logistics network. Logistics costs are higher for stationary retailers than for mail-order retailers. Clearly, the pressure to reduce costs and working capital is part of the global landscape that is likely to stay. Organizations must therefore find innovative ways to provide new solutions to complex customer requirements, without increasing costs.

External forces

External forces represent changes outside of the interorganizational network over which organizations have little to no control. The three major external forces are set out below.

1. Globalization of logistics networks

Organizations in multiple sectors are continuing to pursue global growth strategies that focus on expansion into new regions. In particular, the BRIC countries (Brazil, Russia, India and China) represent major targets for expansion. The research results suggest that Eastern Europe and Russia are the regions that 20 per cent of respondents identified as a growth region. Another 15 to 20 per cent of organizations are expanding into Africa, Central America, India and the Middle East. The growth into China is at

a much lower rate than in the past. Organizations are finding that the value proposition for many firms in China is disappearing as the competitive cost advantage is beginning to erode relative to other countries. Simultaneously, Africa is seen as a region for global expansion. Along Africa's Atlantic coast, garment factories are giving up African couture to assemble scrubs, aprons and lab coats. The switch comes as global suppliers seek out Africa's low-cost, English-speaking labour and ports that are 10 days closer than Asia's garment factories to the US eastern seaboard.[4]

However, with globalization comes a host of new problems that enterprises have little experience in dealing with. As companies continue to expand their global footprint, global networks are fraught with challenges due to government regulatory forces, channel fragmentation and poor logistics infrastructure. An increasing risk of supply chain disruption from any number of possible nodes along the supply chain further complicates the logistics environment.

Organizations will need to continue to find networked solutions in response to the continued growth of their global footprint, which surely will continue due to the appeal of large mass markets in BRIC countries and beyond.

2. Talent shortage

Each of the executives mentioned the lack of talent as a critical barrier to driving logistics progress and improvement. Talent shortage is one of the most critical concerns on the horizon for global organizations in all of the regions surveyed. This will occur not just in manual processes (truck drivers, warehouse workers, material handling, expediting), but also in managerial capability (buyers, planners, analysts, schedulers, warehouse supervisors and distribution managers). Supply chains cannot operate without people, yet organizations are recognizing that they face critical shortfalls in the number of unfilled job requirements and the shortage is growing every day.

The study shows that the talent gap is most apparent in the areas of skilled labour and supply chain planning. Both areas are critically short, despite a growing unemployment rate in many regions of the world (60 per cent of firms see major shortages). The perception is that this shortage in skilled workers and planners will continue to escalate. The biggest growth in terms of shortages will be for certain types of skilled labour, ie for warehouse workers – as the number of experienced workers begin to retire, there will not be enough replacements to cover the growing logistical requirements and complexities in the global environment.

The root cause of this problem is not simple. Managers from Western European countries noted that young people do not view logistics as an exciting career. Instead, students and graduates often have greater interest in finance and marketing careers. In Brazil, China and India, the shortage of logistics talent was a very challenging issue, as many universities in these countries do not have logistics training on their curriculum.

3. Volatility

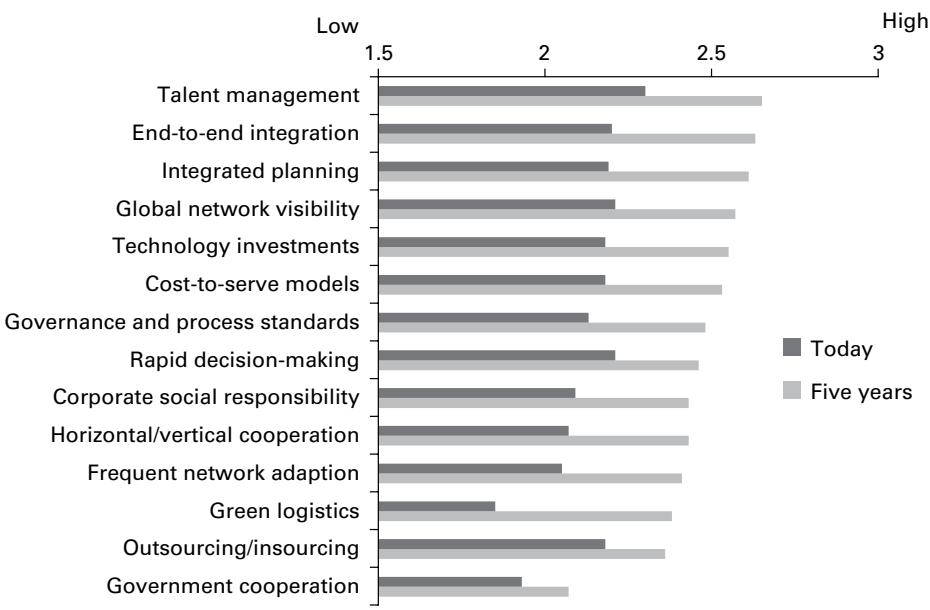
As in previous studies,[5] volatility is perceived as increasingly significant in the logistics environment. It refers to major shifts in customer demand volume, product or service mix, government regulations, new competitors, substitute products, short product life cycles, and requirements for rapid network nodal changes and redesign.

Many executives noted that, as their organization's global footprint expands, there is increasing complexity of government regulations, especially in the area of logistics regulations, protectionist policies, product regulations, compliance to customs, trade, local content issues and security requirements. As the private sector seeks to expand its growth in emerging countries, there is increasing pressure economically in these countries to levy import codes and product restrictions to drive revenue and protect local industries. The barrier of regulatory issues is a shifting target that is continually changing, yet the fines and penalties for non-compliance are on the rise. These regulations render it more difficult to meet increasing customer requirements for reliable product delivery, and make it challenging to be able to plan using normal lead times, inventory requirements and scheduling.

Strategies

It is the purpose of this subsection to show how top-performing companies prepare themselves to deal with emerging trends (see Figure 3.6). Some of

FIGURE 3.6 Importance of logistics strategies



them manage to exploit these elements for advantage. The strategies will be clustered into four different categories: people, process, technology and network. Some key insights will be listed based on what these top-performing companies from different sectors are doing differently.

People

People build the foundation for a company's success. The management of people involves both the development of a talent management strategy that prepares the company for anticipated future gaps, and the creation of an organizational culture that supports fast decision-making processes. The deployment of the following people strategies correlates with the occurrence of several trends (global complexity, increased risk, cost pressure, emerging technologies and talent shortages etc).

Talent management

While talents enter the company, some of them might stay for an extended period of time while others may leave quickly. In order to address anticipated talent shortfall, the organization needs to deploy a long-term strategy for talent management that first identifies and extrapolates talent shortfall and then develops countermeasures in collaboration with human resources.

In this regard, the principle of supply chain management can be transferred to people, and hence people can be seen as a product. As described by Peter Cappelli in his book *Talent on Demand*,[6] the organization has the choice between '*make*', which means internal development, and '*buy*', which stands for external hires. This view includes an evaluation of the respective costs.

While training intends to retain good people and is being offered by 90 per cent of the surveyed companies, engagement with universities aims to connect students with the company and eventually cover future talent needs. Because of the fact that many young people are into social media, building a talent network on this platform is a valid strategy for reaching out to young people. Partnering with universities is a vital strategy as well, since they function as a 'supplier' of graduates and partners for industry projects, which can be beneficial for the organization.

Quick decision making

To provide individuals with the authority and ability for quick decision making is the second component of talent management. Because of the quickly changing environment and demanding challenges in complex global networks, organizations must establish a solid basis for optimal decision making in order to promote decentralized decision making. Organizations need to rely on the capabilities of their managers in various locations. They must be able to independently make quick decisions under the consideration of the best available data and corporate guidelines. In this regard, the organizational culture must allow managers to make mistakes as part of their individual development process.

Process

With the movement towards globalization it is of vital importance for the organization to create the right mix of global governance, process standardization and alignment. Global process standards and integrated planning schemes between different actors in the supply chain are a strong basis for the organizational culture; however, it also embraces the ability to adapt to regional or cultural needs, logistics and delivery requirements, and diverse transportation infrastructure. A combination of global process standards and governance format that evaluates if individuals are meeting the standards – an integrated planning culture to make sure that every individual in remote places and different positions within the supply chain are planning based on the same results and an ability to adapt the network to different existing local requirements – is seen as the ideal approach to create a new type of agile logistics structure. The strategies correlate with trends such as new technologies, networked economy, increased risk and disruption, volatility, poor logistics infrastructure, talent shortfalls and globalization.

Logistics governance and process standards

A process culture is based on an organization's capability to deploy a high level of governance over global logistics processes. While there has always been a need for policies and procedures determining standards of performance, it remains a challenging task to develop a flexible form of governance that allows adaptions to local requirements. Helpful tools to achieve these are so-called 'maturity models'. These can be used to measure outcome and results.

Regional logistics requirements drive regional logistics design. A centralized Logistics & Management Council manages regional divisions and establishes overall guidelines and structures. Three components typically build the foundation for developed standards: process, policy and playbook. First, processes that must be in place are defined by standards (eg transportation planning). Second, standards come with policies that must be followed (eg scheduling). Third, playbooks that can be seen as a form of user guide help to understand and go through processes.

In the event of conflicts between regional requirements, organizations have established global sales and operations planning requirements. It turns out, however, that regional divisions understand, interpret and act differently on these requirements. It is obvious that global process standardization is neither feasible nor expedient. Therefore, a clearly defined and structured organization is required. Defined, precise roles and responsibilities have to be assigned to people in order to ensure a common understanding of processes. This also enhances communication by providing people with the same toolboxes, comparable metrics and plans.

Integrated planning and cost analytics

The movement towards a global supply planning system drives the need for a single planning function together with teams of global brand/business planners. Teams are responsible for market forecasts, inventory management

plans, production plans for designated facilities and distribution models, as well as the development of supply plans. A major goal is to reduce inventory, improve customer experience and enhance efficiency.

This is an entirely new approach for companies since planning was mostly conducted on a regional or local level, including finished good buffers to handle demand and supply deviation in the supply chain to the warehouse. Global supply and demand planning asks for a structured process in order to build, update and revise the plan. For the implementation and realization of this process certain organizational and personal prerequisites must be met: roles and responsibilities as well as positions within the company for regional market planners must be defined clearly. Because of the inequality with respect to the quality of planning processes among the regions, development through training is necessary. Regional planners need to understand their new roles and responsibilities for global planning as well as the necessity of common sharing and communication of market forecast development of contingencies, consensus building, capacity planning, supply scheduling and execution of the plan that comes with their new role.

Network adaptation, working capital time frames and logistics network design

Due to increasing complexity and a new view of total cost of ownership, many organizations are restructuring their global expansion footprint by reallocating elements of their supply chain to local regions. Increased requirements for reliable and resilient supply chains, together with volatility, are reason for some organizations to re-evaluate global low-cost country sourcing.

One reason is that executives realize that effective, localized decision making is becoming more and more important. In addition, more capital investment is forced down onto the suppliers by customers protecting their working capital. The tough economy has turned many companies financially conservative and this is expected to remain the overriding culture for some years. While capital decisions could have a long-term horizon in the past, nowadays organizations are focusing on shorter planning horizons.

Technology

While technology is a great enabler and helps with automation of processes and data exchange, its competitive advantage for the company is rather short-lived. Top performers use technology to enhance decision-making processes by providing the right individuals with correct information and therefore driving quicker decision making. Hence top performers exploit technology, aiming to enhance future 'what-if' planning and the development of different scenarios, as well as the capability to 'act before others do'.

Aligned technology investments

Technology also enables local sourcing strategies. While in the past low-cost country sourcing was necessary, new advancements in hardware (flexible robotics) and software (communication and information) make formerly

cost-intensive locations financially appealing. This may have a major influence on the future of global logistics by disproving the paradigm of offshoring to low-cost countries in order to remain competitive.

The most important trends that drive investments in technology are cost pressure, new mobile and 'big data' technologies, sustainability, the lack of infrastructure in BRIC countries, an increased risk of disruption, government regulations, poor infrastructure and increasing global demand complexity.

Technologies help with the control of complexity and the linked challenges. IT-oriented core technologies are most prevalent and build the foundation for integrated technological solutions. IT cyber security technology, enterprise resource planning systems, warehouse management systems and 2D (bar code) scanning systems are elements of core technologies. The connection of these technologies enables a global material and delivery visibility as well as a business intelligence that ensures correct data capturing as well as data accessibility by all designated individuals. The purpose of such systems is a faster response to global complexity, an effective integrated planning and the provision of a reliable basis for key performance indicators (KPIs) and data. Business analytics can be built on this solid quantitative platform. Organizations that drive technological integration must plan their investments with a defined technology roadmap. This roadmap is the basis for future strategic investments in emerging technology that is based upon the existing core technology. In this way, solutions for customers can be tailor-made and technological developments will be elaborated in cooperation with partners in order to obtain better outcomes and reduce time-to-market.

Network visibility

To empower individuals the organization needs to provide real-time data about events, customer requirements, capacity information and other types of data. Therefore, they invest in various forms of technology that not only accumulate and spread current data to increase network visibility but also provide network modelling tools. Individuals then can make statements about projected impacts of certain actions on the networks status.

Collaborating with partners within the supply chain is crucial to a company's success. Network optimization technologies provide a collaboration platform for sharing information and scenario analysis that can be used to model the outcome of possible decisions. To work effectively, this technology has to gather data from multiple members of the supply chain, requiring commitment and trust from supply chain partners. Real-time visibility improves the foundation for tactical decision making and enables companies to react quickly to disruptions within the network.

Cost to serve analytics

Customer cost to serve analytics is an interesting application of the so-called 'big data' in order to capture the total costs over the entire supply chain that goes along with the fulfilment of customer demand. This data and information provides executives with the ability to reduce costs, optimize

profitability and increase market share. This is a new and unexploited field that offers the opportunity to gain a competitive advantage. Also, companies are about to learn how to use social media data and customer feedback in real-time and turn it into tactical advantages.

Network

Companies are just small units within a comprehensive network. This network requires that single organizations do not only strive for their own interests and benefits but also respect and enable the economic success of their network partners. That implies that optimization projects are scaled to network size. Network strategies cope with new technologies, cultural diversity, talent shortfall and volatility.

End-to-end supply chain integration

Besides an integration across processes such as inventory management, warehousing, transportation and customer service, companies aspire to expand their integration activities back into manufacturing production scheduling, supplier planning and product development processes. Since product and system design highly influences the end-to-end supply chain, companies start projects to try and drive total cost analytics, market intelligence and performance. While information exchange among supply chain partners has been a valid strategy in logistics for the last 30 years, end-to-end integration differentiates itself from simple information sharing by its information diversity and depth, its intensity of exchange and the number of applications.

Outsourcing

Outsourcing is a strategy that organizations have been deploying for many years. In the early 21st century the lure of low wage costs, particularly in China and India, drove a surge in outsourcing. These extended supply chains bring complexity, rising logistics costs (eg in line with fuel prices) as well as higher demands towards supply chain reliability and resilience. These risks force companies to reconsider their outsourcing strategy. Local sourcing offers the benefits of shorter reaction time and decreased transportation costs for the customer. However, in contrast to manufacturing outsourcing, if one has global expansion then outsourcing the logistics is increasingly likely, as local control and local culture empathy is key to success. In order to fight the risk of loss of control, organizations outsource non-core competences such as transportation or warehousing.

Horizontal and vertical cooperation

A strategic component of network strategy is cooperation. Horizontal cooperation describes the collaboration of two companies that both compete in the same industry sector. Vertical cooperation is the extension of cooperative processes upstream or downstream of the vertical supply chain and therefore enables end-to-end integration. Components of the supply chain need to be integrated and included as partners, if global logistics

design is going to be successful. The form of collaboration may vary, however, it must be planned carefully since mistakes can not only be costly but can harm the company's reputation for future collaboration with other organizations.

Horizontal collaborations with others in the industry are also a powerful tool to influence governmental regulations, investment guidance or increase customer satisfaction. During times of disruption, competitors can, for example, assist each other for mutual benefit. That is, a troubled company can pay a competitor to help serve current customers while the company recovers, in order to ensure long-term customer satisfaction.[7]

The strategic attribute of delivery reliability

As mentioned earlier, overall it was found that logistics performance as measured by delivery reliability has deteriorated since the study undertaken in 2008. Qualitative data suggests that current deterioration is due to developments downstream as well as upstream from the focal company. It is the purpose of this section to outline the importance of the strategic attribute of delivery reliability as a major driver for trends and as a setting lever for coping strategies.

In 2008, the BVL research team found that delivery reliability was the most important goal of logistics for all categories of firms (manufacturing, LSPs and retail). In 2012 it was found that downstream from a focal company, increased customer expectations are being driven by consumers or marketing experts down to retailers, who are passing on these requirements to manufacturers. This suggests that it is not necessarily the delivery capability of the firms that has deteriorated, but rather that they cannot keep up with increasing expectations of the customers. As a fast-moving consumer goods (FMCG) executive stated: 'The biggest challenge we see by far is the increased expectation of reliability our major customers are placing on us.' The interviewee also indicated that one of the main reasons for this development is the lack of adequate logistics infrastructure. Two out of three respondents stated that their company's logistics capability is negatively influenced by poor transportation infrastructure, which is a problem, particularly in emerging markets.

In due course of this development, logistics service providers are being pressured to provide more and more customer-specific delivery solutions to meet a variety of new demands. E-commerce is also driving fragmentation of supply chain networks and further complicating the job of logistics providers to meet customer needs. Customers are expected to be more willing to switch brands and suppliers on short notice if they find someone better meeting their needs in terms of delivery reliability. On top of this, companies must have high-quality, low-cost and sustainable low-carbon solutions to keep customers satisfied.

To give an example of an effective coping strategy to ensure enhanced delivery reliability: Symrise, a Germany-based global supplier of fragrances, flavours, active ingredients and aroma chemicals has built a partnership with local vanilla farmers in Madagascar. Symrise is one of the largest buyers of this spice in Madagascar and closely collaborates with over 1,000 vanilla farmers. Through partnering with non-government organizations (NGOs), development organizations and farmers' associations the company creates a sustainable partnership. It benefits from receiving high-quality vanilla beans from a reliable source.[8]

The development of increased customer expectations is not expected to shift any time soon. As mentioned earlier, volatility is the 'new normal'. This endangers logistic systems, as delivery times can be threatened by such external network forces. For companies it is necessary to create partnerships through networks in order to increase the reliability. As pointed out by a global chemical executive: there is a 'need to have outstanding processes and reliable systems'. It seems as if enterprise transformation is now a continuous event, as organizations are continuously adapting and reinventing their operating model in the face of continuous global change. The speed and scale of this change is unparalleled in the last decades.

As discussed, upstream from a focal company, organizations are finding themselves increasingly a part of a networked economy. Delivery reliability of suppliers is a must in such cooperative networks. Product manufacturing and service delivery are no longer stand-alone capabilities, but are increasingly bundled into a single set of capabilities demanded by customers. As companies cannot offer all services and products, they must find new ways of working with not just customers and suppliers but, in some cases, other competitors as well.

The given facts are not new. In the 2008 and 2012 studies, German survey participants were asked to estimate the value of delivery reliability in terms of percentage of goods that are delivered on time. A comparison between responses from 2008 to 2012 for five selected industries provides a number of important insights. In Table 3.1, a 2008/2012 comparison of delivery reliability is depicted for five German industry sectors. The respondents were grouped into quintiles ranging from 'best in class' (BIC) companies to 'latecomers'. The median values for the four indicators remained almost the same, indicating a high degree of industry standardization around delivery reliability. In many countries and industries logistics delivery reliability measures have not improved. Conversely, the gap between best in class and latecomers has increased since 2008. Compared to the top performers, the latecomers throughout the industries lost 3–10 per cent of their delivery reliability. It seems that more companies cannot keep pace with the ever increasing calls for higher delivery reliability. Such companies run into danger of losing their customers, as these are, as stated earlier, increasingly willing to switch brands. Executives therefore have to set themselves the task of making logistics a key value-adding service of their company, rather than focusing on saving on the costs of logistics.

TABLE 3.1 Comparison of delivery reliability

Delivery reliability (%)							
	Year	Latecomer	Catch up	Typical	Advanced	BIC	Median
German Automotive Industry							
	2012	< 90	≥ 90 – < 97	≥ 97 – < 98	≥ 98 – < 100	≥ 100	98
	2008	< 93	≥ 93 – < 97.2	≥ 97.2 – < 98	≥ 98 – < 99.4	≥ 99.4	98
German Chemical and Plastics Industry							
	2012	< 80	≥ 80 – < 95	≥ 95 – 98	≥ 98 – < 99	≥ 99	95
	2008	< 90	≥ 90 – < 94.4	≥ 94.4 – < 95.3	≥ 95.3 – < 98	≥ 98	95
German Electronic Industry							
	2012	< 81	≥ 81 – < 95	≥ 95 – < 98	≥ 98 – < 98	≥ 98	96
	2008	< 90	≥ 90 – < 95	≥ 95 – < 95	≥ 95 – < 98	≥ 98	95
German Machine and Plant Engineering Industry							
	2012	< 85	≥ 85 – < 95	≥ 95 – < 96	≥ 96 – < 98	≥ 98	95
	2008	< 94	≥ 94 – < 95	≥ 95 – < 96.2	≥ 96.2 – < 98	≥ 98	95
Retail							
Stationery	2012	< 81	≥ 81 – < 90	≥ 90 – < 95	≥ 95 – < 98	≥ 98	95
Mail order	2012	< 90	≥ 90 – < 95	≥ 95 – < 95	≥ 95 – < 98	≥ 98	95

A final point of note is that in terms of absolute importance, delivery reliability and lead time were evaluated significantly higher by logistics managers surveyed in countries characterized by poor infrastructure and uncertainty due to government regulations. This was most apparent in the ratings of managers from China and Brazil.

Conclusion and outlook

Persisting long-term trends create challenges for logistics managers and result in increasing demands on the delivery reliability of today's companies – due to trends such as increasing customer requirements, greater volatility and problems with infrastructure. The study reveals that the gap between companies that can provide high delivery reliability and latecomers has increased since 2008. At present, many companies in the manufacturing and retail industry still focus their efforts on internal processes and operational goals. But the picture varies in different companies and also differs from sector to sector. Without doubt, these findings have important implications for practitioners from companies that run the risk of missing their connection with the best in class. Executives have to strengthen the perception of logistics as a key value-adding service for their company, rather than increasing pressure on saving costs in logistics.

In future, success in an increasingly networked economy will depend on how successful companies are at collaborating with horizontal and vertical partners in order to meet the customer's needs. The successful companies strategically integrate their logistics activities in the overall business system. They have recognized the advantages of logistics and can measure these benefits. This means they are able to create a higher end-to-end scope of responsibility and to successfully complete strategic projects.

Notes

1 cf. Straube and Pfohl (2008)
2 cf. Handfield *et al* (2013)
3 cf. Choi and Linton (2011)
4 A version of this article appeared 1 December 2012 on page B1 in the US edition of the *Wall Street Journal*, with the headline 'Fast-Growing Label: Made in Ghana'
5 cf. Christopher and Holweg (2011)
6 cf. Cappelli (2008)
7 cf. Zeng *et al* (2012)
8 http://www.symrise.com/newsroom/article/outstanding-excellence-symrise-wins-fi-europe-excellence-awards/

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Incentives and the strategic management of suppliers

04

GLYN WATSON, CHRIS LONSDALE AND JOE SANDERSON

University of Birmingham

As far as the modern discipline of microeconomics is concerned, incentives play a central role in supplier management. Indeed, arguably they play the central role. It is incentives (in the form of gains from trade) that bring buyers and suppliers together in the first place, and it is incentives that govern the nature of that relationship thereafter. Incentives determine the decision to outsource, the choice of trading partner and the depth of trading relationship, as well as the terms of trade. Without incentives there would be no suppliers and there would be no supply management.

This is hardly a controversial assertion; today's microeconomics rests upon it. However, when surveying the existing literature on the subject it becomes clear that literature is not so much wrong as incomplete. This is because the preponderance of what has been written treats the firm as though it were a black box. Profit optimization is assumed to be axiomatic, with both parties striving to maximize the returns to their respective shareholders. Because this is the case, activities within the firm are held to be of second-order importance.

However, such a belief sits uncomfortably with the everyday experience of supply managers. A supply manager is acutely aware that his or her choices are not made in a vacuum. They are highly political in that they have an impact, not only on the supplier, but on other actors within the firm. Some choices leave supply managers pushing at an open door, in that they find a receptive audience among internal stakeholders. Other choices are more controversial, though. They unsettle a status quo to which a stakeholder has become accustomed, or finds profitable. Where such is the case,

supply managers can count on finding themselves opposed. Where such a stakeholder is powerful, he or she is able to exercise a veto over what is being proposed.

This chapter seeks to describe the role played by incentives in supply management. Using mainstream analysis, it covers the traditional literature on interorganizational relationships. However, it also examines the politics of supply management, and particularly the potential influence of powerful internal actors on the supply management process.

Collaboration vs competition and the role of incentives in the exchange process

All exchange involves elements of both cooperation and competition. Assuming that the parties concerned have voluntarily agreed to the deal, the very act of signing a contract is a cooperative activity. The vendor (or seller) is getting something that it wants – cash – while the buyer is getting something it wants – the products and services supplied by the vendor. However, the cooperative aspects of an exchange can (and frequently do) go beyond this. Buyers and sellers can actively work together to streamline the contracting process and/or adapt/develop the vendor's products and services so that they more closely match the requirements of the buyer. The creation of such value-adding relationships has today become a staple of supply chain management.

Buyers and sellers are also in competition, however. While both sides gain from a trade (else why trade in the first instance), it is not necessary for both sides to gain equally for a trade to take place. For the buyer, the aim is to get value for money from a deal. If it is a rational agent, this means maximum value for money. Every time it is able to negotiate the contract price down a notch, the value for money that is obtained increases. Of course, for the vendor, passing value to its customers means smaller profits. Economists refer to the contested ground that exists between the two parties to a trade as the surplus value. Surplus value is the difference between the value that the customer places on the vendor's products (ie the customer's utility function) and the supplier's costs of production. That portion of the contested ground that passes to the customer is said to be the consumer surplus, while that which is retained by the vendor is the producer surplus. This competitive element is represented in Figure 4.1, where the potential returns (or surplus value) are assumed to be fixed (B1–S1). However, the proportion of the returns that falls to the buyer increases the closer the contract price moves towards the *x*-axis. Conversely, the returns to the buyer increase the closer the contract price moves towards the *y*-axis. Where the contract price falls equidistant between B1 and S1, the gains from trade are shared equally (point P). Typically this is referred to in the literature as a win–win. Figure 4.2 depicts the value-adding nature of some relationships. Here, the surplus value is not fixed, but as a result of cooperation it increases from B1–S1 to B2–S2.

FIGURE 4.1 Conflict and the exchange process

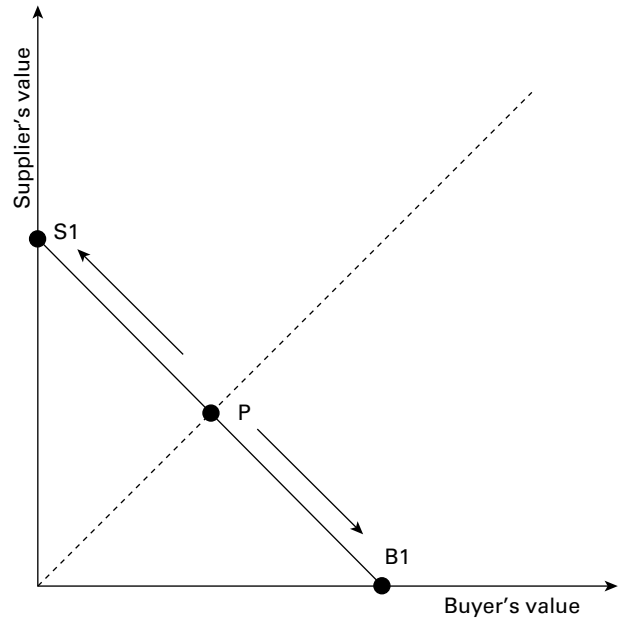
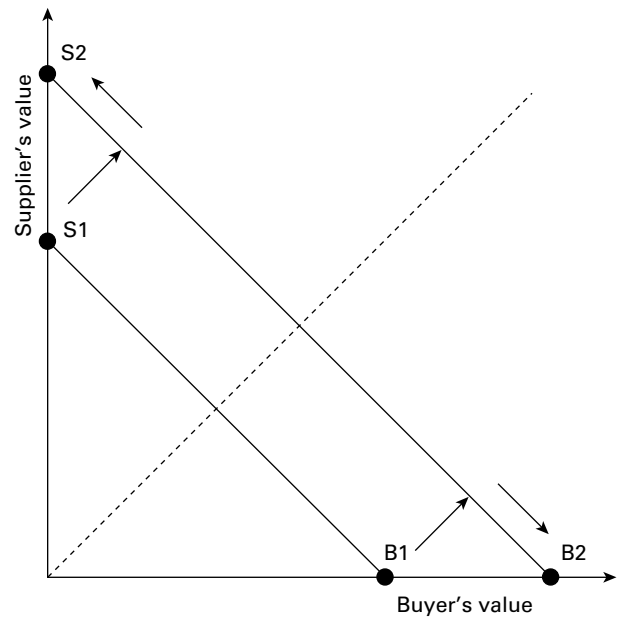


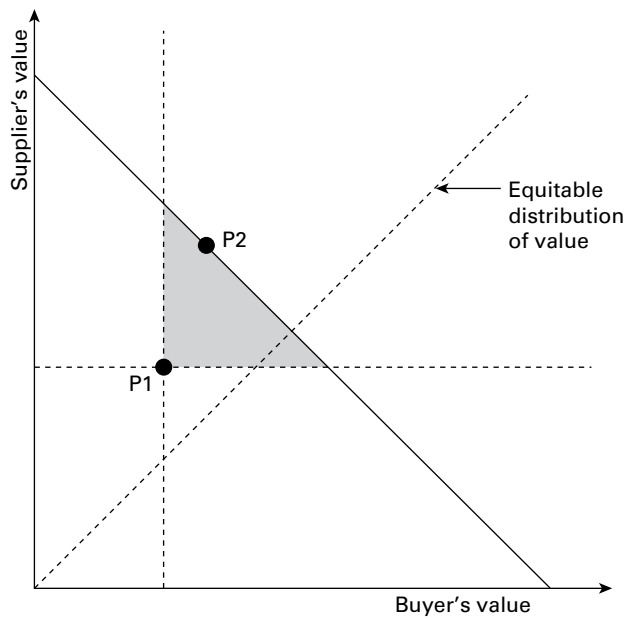
FIGURE 4.2 Cooperation and the exchange process



However, even when buyers and sellers increase the cooperative element of an exchange by actively working together to add value to the relationship, the competitive element to it remains, ie cooperative relationships can be adversarial or non-adversarial. This is because the fruits of the cooperation (in the form of either lower production costs for the vendor or a higher valuation of the vendor's products on the part of the customer) have to be divided up. If, for example, the effect of collaboration is to reduce the supplier's costs by £100 a unit, there would be an issue about whether the vendor should pass all of the savings on to the customer or whether it should retain some of them in the form of higher profits. Alternatively, if the supplier invests £100 in developing its products and as a result increases the value to the customer by £200, should the vendor raise its prices by £100 to cover just the cost of the investment, or by the full £200?

Figure 4.3 illustrates this dual dimension to the exchange process. In Figure 4.3 the two parties start the relationship at point P1, which sits above the point where the dotted line (which runs 45° from the origin) bisects the line of surplus value. Ex ante, therefore, while the association operated to the advantage of both parties, it benefited the vendor more than it did the buyer. Ex post, after the contract price has shifted to point P2, this is still true. The diagram clearly shows that the gains from collaboration have been mutual. This is because point P2 sits both above and to the right of point P1 (indicated by the shaded triangle). And whenever a new contract price moves

FIGURE 4.3 Cooperation and conflict in the exchange process: supplier-dominated supplier development



to the right of the original settlement it indicates a gain to the buyer; whenever it moves above the original settlement point, the vendor has gained also. This is what economists refer to as a Pareto improvement. However, while both parties have gained from the collaborative process, they have not gained equally. The vendor is still, relatively speaking, the better off (because the contract price sits above the dotted diagonal line, which indicates an equitable settlement).

Whether a relationship is predominantly adversarial or has a significant cooperative component, what determines who wins out in this competitive process are the incentive structures that underpin the exchange relationship. Take, for example, the vendor that finds itself in a highly competitive market where its many customers are free to pick and choose where they buy their goods and services. Such a context forces the vendor into a Dutch auction in which it is forced constantly to drop its prices to buy its customer's business. In such a situation, the surplus value is bound to pass to the consumer (ie towards the *x*-axis). Compare that to a situation in which a particular customer has invested heavily in the vendor's technologies, even building the value proposition that it offers its own customers around the technologies of a particular supplier. This happened in the case of the PC market where PC manufacturers fell over themselves to advertise the fact that their machines had 'Intel inside'. In the end, it became impossible for PC manufacturers to compete unless they were able to make this boast. Unfortunately, this had the effect of handing enormous leverage over to Intel and as a result the surplus value passed from the consumer to the producer (ie towards the *y*-axis).

Consequently, much of supply management is reduced to a game between poachers and gamekeepers in which the vendor assumes the role of the poacher (trying to 'steal' its customers' scarce financial resources), while the procurement manager assumes the role of the gamekeeper, in trying to stop them. What follows is a cat and mouse game in which, through a combination of guile and the development of distinctive capabilities, the vendor attempts to close markets, while the buyer's procurement manager responds in kind with a range of counter-strategies, designed to stop its vendors by keeping its supply markets contested. To the victor go the spoils. Power (formally defined as the ability of one party to adversely affect the interests of another) and the pursuit of power are at the heart of the exchange process (Lukes, 1974; Cox, Sanderson and Watson, 2000; Cox *et al*, 2002).

To some, it might appear that the competitive elements of an exchange have been overstated. While it is true that some people in life are maximizers (ie they are always looking for the highest possible return from a deal), critics would argue that most people are in fact happy just to 'satisfice' (ie obtain a settlement that provides them with a deal that they can live with). If two people cooperate on a venture, then generally speaking those people are happy to split the proceeds. This may or may not be true; it is hard to say. What is true, however, is that such an approach is suboptimal and imprudent. That satisficing is suboptimal should be self-evident. The fact that it is also imprudent needs further elaboration.

The issue of prudence arises in a number of contexts. First, it puts the profitability and even the survival of a firm at risk. The reason that firms come into business in the first instance is to make a return for shareholders. While it is true, as a number of resource-based writers have observed, that markets are often heterogeneous (ie they are capable of supporting laggards as well as world beaters), it is not true that markets are infinitely forgiving of the weak (Peteraf, 1993). Firms that fall too far behind the competitive frontier are on borrowed time. Firms that forget about the competitive elements of an exchange, however, risk seeing their costs rise and falling behind the competitive frontier.

The second problem with cooperation and trust is that it demonstrates an unwarranted confidence in the capacity/willingness of others to reciprocate. Many firms that acquire leverage are happy to use it. Even those who do not possess a structural advantage may attempt to use guile instead, where they think it will pay off for them. Furthermore, denials that this is not true cannot be taken at face value (Williamson, 1985). The thing about people is that very few of them are honest all of the time. One only has to reflect on one's own experience to see that this is true.

According to business economists, economic agents are not simply self-interested but they pursue this self-interest with guile – not all of the time, but sufficiently often that opportunism is a fact of commercial life. What permits the existence of opportunism is two things: a lack of honesty (obviously); and a lack of transparency between buyers and sellers. Economists distinguish between public and private information (Molhow, 1997). Information is regarded as public if it involves something that is widely known. Information is regarded as private when access to it is restricted. When 'restriction' means that one side in an exchange knows something that the other side does not, then an information asymmetry is said to exist. It is information asymmetry that permits dishonesty to pay.

Business opportunism exists in a number of forms but for buyers the three guises in which it is most common are adverse selection, moral hazard and hold-up. Adverse selection is ex ante opportunism or misrepresentation that arises prior to the signing of a contract. Shorthand definitions of the concept might revolve around buying a 'lemon' or being sold a 'turkey'. The scope for adverse selection varies but is more common under some circumstances than others. Commentators often distinguish between search, experience and credence goods. Search goods are products that allow buyers to make systematic comparisons prior to a purchase. They are normally tangible products like chairs, pens or iron ingots. Experience goods, by contrast, are products that can only be evaluated subsequent to purchase. Typically, they include services like cinemas or restaurants. However, the category can also include tangible products like cars or records. The final category of good is the credence good. Credence goods defy easy evaluation, even after consumption. They include intangible services such as advertising, consultancy or medical services. What makes evaluation so hard usually comes down to a difficulty with attributing blame or success. For example,

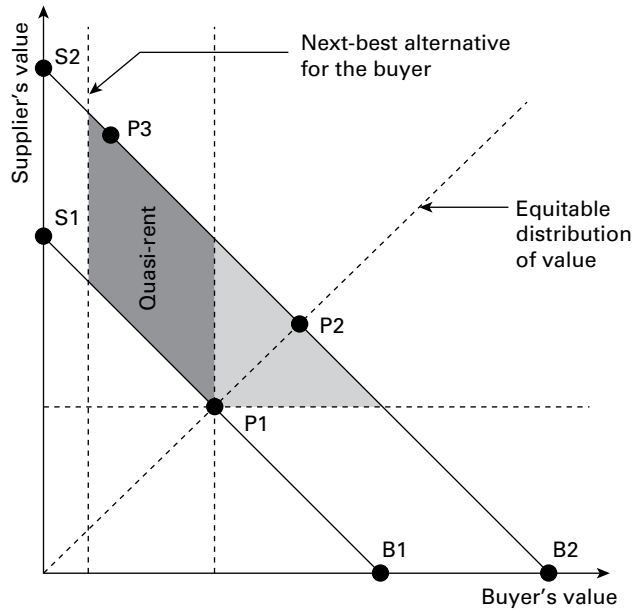
a piece of professional advice might have been responsible for a commercial disaster. However, the blame might lie with some other concomitant factor. The point is that where pre-contractual evaluation of a product is difficult – either because evaluation is inherently difficult or because the buyer lacks the resources or expertise to undertake it – the buyer is open to the risk of adverse selection. Experience goods and credence goods, by definition, are difficult to evaluate prior to purchase.

If adverse selection involves being suckered before a contract is signed, moral hazard and hold-up involve being suckered once a party has signed on the dotted line. Moral hazard is concerned with shortfalls in effort. For example, prior to an agreement, a consultancy company might promise to dedicate its best staff to the task of servicing the client and set its costs accordingly. Unbeknown to the client, however, once the contract has been secured, the work is passed down to junior colleagues whose time is charged out at inflated rates. Alternatively, moral hazard may involve charging a client for materials that were never used or which were used but which came from another job and which had been paid for by another client.

Hold-up occurs as a result of an extended association with a supplier, where the terms of the association cannot be fully specified in advance and where the association requires one of the parties to incur significant sunk and/or switching costs. As, with time, the full requirements of the relationship are revealed, this combination of factors allows the non-dependent party to renegotiate the terms of the deal in ways that are most favourable to it. According to some observers (Klein, 1980), it is the incompleteness of the original agreement that gives rise to the need for subsequent renegotiation. However, for Williamson it is the existence of high sunk and switching costs, in combination with the initial uncertainty, which is the source of the problem. It is this that can support blatantly opportunistic behaviour in which the non-dependent party is even able to renege on promises that are covered by a legal agreement. The calculation here is that any benefit that can be obtained through legal redress will be insufficient to compensate for the damage to, or loss of, the relationship. The dominant party is in a position to leverage the weaker party up until the point where it is more profitable for the weaker party to exit from the relationship than to continue to be extorted. Economists refer to the return enjoyed by the dominant party as a quasi-rent.

This is illustrated in Figure 4.4, where both parties start with equal power and an initial settlement point P1. As a result of the dedicated investments made in support of the relationship, the surplus value increases from B1–S1 to B2–S2. Based on the initial agreement, the buyer has an expectation that the final contract price will locate somewhere around point P2, and that the distribution of benefits in the relationship will remain equitable. In effect the relationship will deliver a win–win. However, in this case it is the buyer, rather than the supplier, who has made all of the dedicated investments. Based on the supplier's calculation of the buyer's sunk and switching costs, this allows the supplier to push the actual contract price to P3. This leaves

FIGURE 4.4 Sunk and switching costs, and the problem of hold-up



the buyer worse off than it had been at the start of the relationship. However, it is still more efficient for the buyer to agree to the contract price than it is for it to write off the sunk and switching costs. Only if the supplier attempts to push the buyer beyond the threshold that marks the buyer's next-best option does it make sense for the buyer to exit from the relationship.

Regardless of whether Williamson is right and hold-up is the product of strategic behaviour, or Klein is right and it is the product of the need to recalibrate the relationship as future contingencies become known, the relationship still needs to be renegotiated. This renegotiation, though it can deliver gains for both sides, is still a competitive process.

Incentivization and the question of make vs buy

Nowhere are the issues of competition between buyers and sellers more acute than with respect to outsourcing. This is evidenced by the fact that so many outsourced contracts go wrong. One survey found that in only 5 per cent of cases did outsourcing prove to be an unqualified success (details of this survey are reported in Lonsdale and Cox, 1998). More often than not,

respondents indicated that it was something of a curate's egg (that is, good in parts). Thirty-nine per cent of respondents in the survey said that their outsourced contracts were simultaneously moderately successful and moderately unsuccessful. Of course, this may have something to do with the way in which the contracts were managed. (The issue of contractual mismanagement will be discussed in the next section.) Such is the scale of disappointment, however, that it suggests that something deeper than simply poor contracting is at work.

On the face of it, the decision to outsource should not be particularly problematic. It should involve a simple cost comparison between the expenses associated with undertaking the activity in-house as opposed to the expenses associated with contracting it out. For example, the size of the firm's requirement might be insufficient to cover the fixed costs associated with production in an efficient fashion. Under these conditions, sourcing externally, from a firm that can amortize its fixed costs more efficiently, might make eminent sense. Alternatively, a particular activity might be suffering from a lack of effective managerial oversight. Managerial time within the firm is a scarce resource and most of it tends to be devoted to the firm's key activities. Residual activities tend to get overlooked and production suffers as a result. It is this thinking that in effect underpins much of the core competence writing. If your firm can't do something well, find another firm that can.

Outsourcing tends to go wrong, however, because it exposes the firm to either a strategic or a contractual risk. Strategic risk arises if the firm outsources its competitive differentiator. Within strategy, there are three types of differentiation: cost leadership, product differentiation and niche production (Porter, 1980). In each case the firm is attempting to achieve the same thing through differentiation, ie break the relationship between cost, price and profit in order that it might earn an economic rent or sustained producer surplus. In a competitive marketplace, the consumer's ability to pick and choose between alternative vendors drives the firm's prices down towards the marginal cost of production. This is the last thing a firm wants.

In the case of cost leadership, the firm is attempting to earn a rent by developing a uniquely efficient production process that is difficult for its competitors to imitate through the creation of ex post barriers to entry. So long as the firm is able to stave off competitive imitation it can afford to drop its prices below those of its competitors and still make a higher return. In the case of product differentiation, by contrast, the firm is attempting to develop a superior utility proposition for the customer. The idea here is that when people comparison-shop and realize that the firm's products are better than those of its competitors, they will be prepared to pay a premium for the product that offers the higher utility. Again, its ability to sustain its producer surplus and turn it into a rent is contingent upon its capacity to hinder or retard competitive imitation. Finally, niche production also seeks to target customer's utility. This it achieves, however, not by creating relatively superior products but by servicing segments of a marketplace that nobody else is particularly interested in.

Because being able to differentiate competitively is so valuable to the firm (and indeed it is what strategy is all about), firms must be able to protect those resources and capabilities that generate the differentiation in the first place. However, if the firm outsources such a resource or capability then the odds are that it will end up paying to its supplier the rent that it should be earning for itself.

Outsourcing can also expose the firm to significant contractual risk (moral hazard and hold-up). Again, this involves the surplus value passing to the vendor, rather than being retained by the consumer. Sustaining the performance of a vendor depends upon a firm's ability to monitor or motivate it. Monitoring becomes more difficult after a competence has been outsourced because either the staff that used to manage the activity move onto the supplier's payroll, or else they are lost from the equation altogether. Once the organization lacks the resource, or at least resource that is sufficiently qualified to exercise proper oversight, the supplier starts to renege on its commitments.

Avoiding the risks of hold-up in an outsourced relationship involves maintaining motivational incentive. Such motivation might take the form of a carrot (bonuses for good performance) or a stick (the cancellation of the contract if the performance is poor). But in order for the incentive structure to work, the threat of sanctions as a last resort must be credible. This means being able to monitor the supplier to see if it is complying with the terms of the deal; and having the ability to punish the supplier (by invoking penalties or by threatening exit), if it is not. Imagine a myopic and doddery old teacher trying to keep discipline in a playground if his head teacher has told him that even if he catches one of the children misbehaving, he is not allowed to threaten him or her with punishment. Under such circumstances the children in his charge would run wild. So it is with suppliers.

The tasks that the firm has to perform, therefore, concern being able to spot those transactions for which there is significant scope for opportunism and being able to craft safeguards against the risk. Where contractual safeguards cannot properly be introduced, then the firm would probably be better to retain the competence within the organization, rather than to outsource it.

Hold-up is always a problem with outsourced contracts because effective monitoring is always an issue. However, sometimes the risks are particularly acute. Contracting that takes place in a highly volatile or uncertain environment is difficult because it raises the issue of renegotiation. Buyers attempt to draft contracts in as complete a fashion as possible, but when an environment is particularly volatile, specifying all the terms of an agreement in advance is likely to prove next to impossible. This in itself need not present a difficulty unless the firm becomes locked into its outsourced provider. If this happens, the supplier may choose to renegotiate on terms that benefit it, rather than its customer (Williamson, 1985).

As was indicated in the preceding section, contractual lock-in occurs if the contract requires the buyer to make some form of highly specialized investment in the relationship. The investment might take the form of time. An organization that has spent months negotiating and implementing an

outsourced relationship might be reluctant to write off all of this hard work – especially if re-sourcing means repeating the effort with no greater chance of success next time around. Alternatively, firms might have made substantial and non-fungible investments in specialized training or equipment (otherwise known as asset-specific investments – Williamson, 1985). Less creditably, though, firms are often reluctant to call time on a poorly performing supplier if the managers who negotiated the contract have a significant reputational investment in the deal. Calling a halt to the affair means admitting that they got it wrong, and nobody likes doing that. Whatever the form of the lock-in, the effect is the same: the firm loses its capacity to impose costs on the vendor and thus its ability to impose discipline.

Of course, just because an outsourced contract presents the firm with a risk, it does not follow that the risk cannot be managed and that outsourcing should not take place. One strategy often pursued by firms involves unbundling a contract. This means separating out those elements that pose a risk from those that do not. The highly risky elements are retained in-house and only the less risky elements are outsourced. The supplier may even be asked to post a bond or share the costs of the dedicated investments, as a sign of its good faith (ie to show that its word of honour and commitment to the relationship are credible).

Incentivization and the relationship management choice

Outsourcing requires the firm to understand what it is that allows it to leverage its customers (in the case of strategic outsourcing) and what it is that allows its 'potential' suppliers to exploit it (in the case of both strategic and tactical outsourcing). Effective relationship management is about reversing things by understanding what it is that allows the firm to control and leverage its suppliers. The question is to what end? This is where we are required to reintroduce the subject of surplus value.

The first decision that the firm must ask itself is whether the relationship should include a value-added element. Many commentators would argue yes, citing the benefits that often flow from extending the cooperative elements of a trade. Lean thinking, for example, highlights the seven supply chain wastes that often plague buyer–supplier relationships. These relate to overproduction (1), unnecessary inventory (2), waiting (3), motion (4), transportation (5), defects (6) and inappropriate processing (7) (for a discussion of these see Hines *et al*, 2000). Yet, just because extended cooperation might potentially generate additional value it doesn't mean that it will or that the buyer will be the main beneficiary if it does. Four factors play a part in determining the buyer's calculation about whether cooperation is worthwhile: the upfront investment, the potential pay-off, power and risk. Creating a value-adding relationship requires an investment, even if only in terms of

the time and managerial effort that it involves. The first thing that the firm must ensure is that the expected payback matches the upfront investment. No firm is going to spend a lot of time developing its supplier of toilet rolls. The improvement for the buyer is likely to be minuscule compared to the effort.

What complicates the calculation is that both the investment and return may be hard to determine ex ante. Take defence contractors. Suppliers of defence equipment work closely with their customers (governments) to ensure that the weapons they develop are the ones that the customer wants/needs. The industry, however, is notorious for delays in introducing new equipment and cost overruns. In a number of instances the additional cost to which the customer ends up committing itself runs into the £billions. When the equipment finally arrives, it may be too late to be useful. It may not even work properly. Consequently, there is the issue of which party takes the risk and which party obtains the reward. This is a question of power. A simple example will illustrate the nature of the calculation the buyer faces.

Take two firms: a buyer (A) and its supplier (B). B proposes to A that an upfront investment of £50 is capable of yielding cost savings of £200. In other words, the additional surplus value that has been created through cooperation comes to £150. If A exercises leverage over B it will probably think that cooperating is a good idea. As it has the power it will probably insist that B takes all of the upfront risk, agreeing to cover B's costs only if the initiative pays off. This is a no-lose situation for A. If, however, A and B are interdependent then the calculation becomes more complex. B will probably insist that A shares both the investment and the reward. This means that A must invest £25 (half the £50 cost) to get a payback of £100 (half the £200 cost savings). This leaves it with a net gain of £75 (£100 savings – the £25 costs). Once again cooperating makes sense – although the pay-off for the buyer is smaller than in the first example. What if the costs are fixed but the gains are far from certain, however. Say, for example, there was only a 25 per cent chance of a successful outcome. Under these circumstances the firm would be investing £25 to get a 25% × £100 return. The cost–benefit calculation here is finely balanced (£25 cost – £25 return = zero). Change the parameters again (eg increase the upfront investment by £1) and the initiative may cease to make commercial sense. This is why power is so important to all relationships: it affects the pay-off structures of buyers and sellers and thus over-determines the management of the relationship. It decides which side takes most of the risks and which side extracts most of the rewards. Furthermore, the same calculation pertains whether the firm is thinking in a dyadic or a wider supply chain context.

Incentives and the role of contract

The second set of supplier management issues facing supply managers concerns the management of the chosen vendor. Supply management involves two

issues: relationship management and contracting. Relationship management concerns how the buyer and seller are going to interact on a day-to-day basis. Is the association between the two essentially going to be an arm's-length one, or is something closer going to be called for? If the firm has opted to pursue a value-adding relationship then presumably close interaction is required. The contracting parties will need to trade information, mutually adapt their processes etc, so that the maximum value-adding potential is achieved. At the same time, relationship management will also involve managing the tensions that exist between the two. Some forms of cooperation, for example, might be deemed neutral in the sense that they add value to the relationship without disturbing the commercial balance within it. Other forms of cooperation, however, are far from neutral. For example, if the buyer calls for the supplier to open its books, then the buyer is acquiring a considerable advantage over its supplier in that it now knows just how much money the supplier is making from the deal. Both buyers and sellers, therefore, tend to want to manage the relationship so that while it adds value it doesn't tip the balance of power the wrong way. The same goes for performance measurement. Performance measurement may be a way of monitoring how quickly things are improving – or if they are not improving, where and why this is the case. However, performance measurement is also a mechanism of control and both sides tend to be aware of this.

In contrast to relationship management, which tends to contain a value-adding element as well as a controlling element, contracts are primarily about control. They are about specifying, in a legally binding way, the manner in which buyers and suppliers are to work together, ie who is responsible for doing what. They are also about specifying (again in a legally binding way) the outputs of the relationship: what the supplier is expected to deliver, what the buyer is expected to pay, and which party owns the rights to any exploitable technologies or processes that might emerge from the association.

Conventional contracts take two main forms: tight and flexible (Williamson, 1985). The shift from tight to flexible contracts tends to occur as the risk within the relationship increases. Risk, in this context, has a very specific meaning. It refers to events that can be foreseen but that have a probability of occurring of less than one but greater than zero. Where the probability is one or zero (ie the event is certain), this means that an element to a deal can be specified (or ignored) with total confidence. This allows the parties to use a tight contract. For example, if an organization requires laptops for a hundred employees, it is relatively easy for it to specify when it wants the machines, what it will pay and what level of after-sales support it will need.

By contrast, where there is a lack of clarity surrounding particular aspects of the deal, but where the lack of clarity falls within clearly defined limits (ie where the probability is between one and zero), the parties may seek to include a flexible element to the contract to take account of this ambiguity. This allows the requirement/reward relationship to be adjusted in a predictable way. For example, an organization requiring the development of a new piece

of software may know what is needed but may not know how long it will take to develop the new product. Because the organization is aware, however, that the main variable driving cost will be the staff-hours required to develop the software, the terms of the contract are set out so as to reflect the range of potential effort levels.

However, some events are genuinely uncertain in the sense that they were not, or could not have been, anticipated prior to reaching the original agreement. Such events may range from occasional but devastating acts of God (or man) to the more mundane. For example, many IT agreements are entered into before the requirement has been properly worked out. Under such circumstances it is simply not possible to draft a contract flexible enough to take account of all future possibilities. In the place of contracts, therefore, firms must use relational agreements. The purpose of such agreements is to provide a structured framework within which the terms of a deal can be renegotiated as the future becomes clear.

Although a buyer–supplier relationship may largely consist of one of these control mechanisms, on occasion it can contain elements of all three. For example, short-term, arm's-length relationships tend to call for tight contracts but may include a subsidiary element. Longer-term arm's-length relationships tend to require the flexible element to increase. Long-term cooperative relationships (whether they are adversarial or non-adversarial) tend to call for all three.

Of course, while contracts aim to serve as instruments of control, whether in fact they succeed in this function depends on the ex post power balance. As we saw in our discussions on outsourcing and contractual risk, if the buyer loses his or her power then the contract may not be worth the paper it is written on. As the political philosopher Thomas Hobbes once put it, 'contracts without the sword are but empty breath'. In the case of either a tight or flexible contract the threat of the courts is only credible if they can be accessed at relatively low cost and if the plaintiff believes that it has a good chance of winning. Where fault is ambiguous or where an agreement has been poorly drafted, then the use of a contract as an incentive mechanism will start to break down. The reluctance to use this mechanism may then be further eroded by the fear that if the plaintiff fails to make an effective case, then it will also be saddled with the costs. In addition to this, the plaintiff may also have to manage a disintegrating relationship while a replacement is found – assuming that one can be found in a timely manner.

In the case of relational agreements, where there may be no contract or at least where the terms of the contract do not cover the issues in question, the courts may not be an option at all. Neither might be the termination of the agreement. This is because the incidence of significant sunk and switching costs in arrangements that are likely to require a relational agreement tends to be quite high. This is why observers like Williamson (1985) generally recommend that parties look to mechanisms like the posting of hostages, which can be forfeited should the relationship collapse, as a way of maintaining some control. And, if such arrangements cannot be agreed upon,

they would advise that either the organization look for a different vendor or else it should consider the possibility of vertical integration.

Incentives and the impact of internal politics

While all of the proceeding discussions are fundamental to the process of the supply management, they are not in themselves complete. This is because so far the firm has been treated as a black box. However, this is not an accurate representation of either the buyer or the supplier. Each is a complex political entity, comprised of different functional actors, each with differing expectations regarding how the other party can and should be managed. Unless the internal politics of the firm are properly aligned to the external opportunities, then the ability to manage the other party effectively may be lost.

However, for the buying organization, creating this effective internal alignment is easier said than done. Operationally, the key to effective supply management is usually effective demand management, but as often as not a supply manager will experience considerable difficulty in getting the managers in other functions to recognize this point. In order to source effectively it is essential that buying organizations develop appropriate specifications, avoid unnecessary (last-minute) changes to specification, create regular patterns of demand and ensure that as little buying as possible takes place outside of the organization's commercial rules.

Most importantly, however, it is essential that organizations do not unnecessarily fragment spend, thereby spreading their demand across an artificially large number of suppliers. The reason for this is twofold. First, it raises transaction costs – substantially in some instances. Second, it reduces the potential leverage that the organization has over its suppliers. And, as has already been indicated: generally speaking, the weaker the leverage, the poorer the deals.

Of course, a certain level of fragmentation will always arise. For one thing, different business units within an organization often have very different missions and as a consequence have very different supply requirements. Additionally, when attempting to consolidate demand, organizations are often confronted by legacy issues. Standardizing demand may offer only a false economy if it is accompanied by significant write-off costs. Finally, organizations have to balance the short-term gains that may arise from obtaining volume deals with the long-term risk that they may become overly dependent on a particular supplier. Over time this dependence may translate into higher prices and poorer service. Together, these factors combine to create what the authors have described elsewhere as a 'natural level of fragmentation' (Lonsdale and Watson, 2005). This natural level can be defined as the point at which any further consolidation results in a 'net reduction in organizational performance/welfare, notwithstanding any commercial gains that might have accrued from the consolidation initiative' (p 161). Where exactly this point lies will vary by commodity, organization and time.

Furthermore, where that point lies will often be one of the major areas of dispute between supply managers and their internal clients. This is because issues of consolidation are as much political issues as they are technical ones. There are a number of reasons why an internal client may not recognize that there are benefits to be obtained from consolidation. First, there is the issue of functional culture. Managers from different departments are usually functional specialists. Their specialisms may be largely commercial (as in the case of sales or purchasing), or largely operational (as in the case of human resource management (HRM) or production). Alongside the specialized knowledge that resides in a department there is often also a strong functional culture. This culture reflects the training of staff but it also reflects the management priorities of particular departments. For example, because a production manager's performance is measured in terms of faults or downtime, he or she is likely to be particularly sensitive to anything that might spoil or interrupt output. Such sensitivity may be justified, if what is being proposed poses a real threat to operational sustainability. For example, it would be ridiculous for an oil company to attempt to save a couple of thousand pounds on its spend on industrial valves if the downside risk was several hundred thousand pounds in lost production if the new and untried products failed. However, a natural sensitivity can easily become an unnatural oversensitivity. The same production manager may refuse to participate in an initiative that will save sixty thousand pounds because there is an infinitesimal chance that the new product might fail.

Second, there is the principal–agent problem. Principal–agent problems arise because managers and indeed all employees have divided loyalties. For example, managers have a loyalty to the organization that pays their wages. For many commentators, this loyalty constitutes (or should constitute) the manager's primary loyalty. In practice, however, managers also develop loyalties for those around them, and particularly departmental colleagues. And less creditably, managers also have loyalties to their own interests (Milgrom and Roberts, 1992). Where firm and department/personal priorities conflict, it is often the firm's priorities that are sacrificed.

This is significant from the perspective of a consolidation programme because although such a programme is intended to benefit the organization as a whole, it does not necessarily follow that consolidation will benefit all departments equally (or at all), or that the initiative will be without cost (or indeed that these costs will be evenly distributed). It is relatively easy for a manager to sign up to a consolidation programme if the supplier that stands to get most of the organization's business is the one that he or she is already using and the price that is being offered represents an improvement. It is less clear, however, that a manager would be enthusiastic if the new deal is more expensive for him or her, or if it involves the termination of a relationship that is particularly valued.

Regardless of whether the dissent arises because managers have failed to understand the advantages of the initiative, or because they understand the advantages for the organization but are anxious to avoid the costs to their

department (or them personally), such dissent is likely to make implementation problematic. Faced with such opposition, organizations have one of four options. Option one involves taking the path of least resistance and doing nothing. Options two, three and four all require the organization to confront the problem. Option two involves persuasion: demonstrating to the manager concerned that any fears are exaggerated or unfounded and setting them against the very obvious benefits. This may or may not work. However, it is most likely to work where a hostile manager has misunderstood the issues involved. It is less likely to work when a manager understands the issues and realizes that the initiative is not in his or her particular interest. Under these circumstances, the supply manager may pursue option three: coercion. Coercion involves the threat of sanctions or the use of the organization's authority structures to override the opposition of the hostile party. The limitation of this strategy, however, is that the procurement function often sits towards the bottom of the organization's hierarchy and the procurement manager lacks the clout to make credible threats. Furthermore, more senior colleagues may prove reluctant to intercede on the procurement manager's behalf if it involves confronting one of the organization's more powerful constituencies. Option four, therefore, is bribery. Bribery involves compensating a manager for the costs of participation. It is perhaps not surprising if a manager does not want to get involved in a consolidation programme if all of the benefits flow to the centre. However, if some of the benefits can be passed back to the manager, then the initiative may appear to be more worthwhile.

Conclusion

Exchange takes place in the first instance because it is mutually profitable. Closer forms of cooperation occur because they can increase this level of profitability. However, mutually profitable exchange is not the same as equally profitable exchange. Buyers and sellers are competitors as well as collaborators. Consequently it is important for supply chain managers to understand the following things: first, they must understand when it is not sensible to exchange (that is, when exchange imposes unacceptable levels of strategic and contractual risk). Second, they must also understand (when it is sensible to exchange) how to craft the incentive structures that will maximize the return to their organizations. Obviously, such structures need to cover relationships between buyer and supplier. However, they are also needed to regulate relationships within the organization. This is because poor demand management can have significant knock-on effects. Consequently, managers within an organization need to be encouraged (through the threat of sanction or the promise of reward) to engage in activities designed to maintain the organization's control over its external environment. At root, therefore, the study and practice of supply chain management is the study of managerial and contractual incentives.

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Time compression in the supply chain

05

ADRIAN BEESLEY
DHL Supply Chain

This chapter explores the 'time compression' approach to business process improvement in the supply chain. The concept and strategic relevance of this approach were first published in the West in the early 1990s; however, it is an approach that still offers good potential and a fresh approach to achieving competitiveness through re-engineering. The rate of adoption of 'time compression' has been slow and part of the reason for this is that the approach requires the total commitment of the whole business, from the top of the organization downwards. Coupled with this is the fact that change within any organization has always been challenging, particularly when it involves making difficult decisions in one department or function to benefit another for the good of the whole company or even supply chain. Supply chain objectives and their relation to time compression implementation strategies will be touched on, coupled with explanations of achievable benefits and case study examples.

Over 200 years ago, Benjamin Franklin stated that 'Time is Money', and this was reiterated in 1990 by Stalk and Hout who claimed that 'time is the last exploitable resource'. Today 'time' is still largely ignored by many companies owing to enduring approaches that create inertia in organizational structures and associated business processes. Managers have always used time to manage their operations but control has usually been limited to a segment, or business function, within the supply chain. For example, in the past, 'time' has been used for 'work study' and human performance measurement, but this approach is based on the use of past observations in relation to operations usually associated with a long-established and outdated business processes. Moreover, this approach, and even some modern-day approaches, focus purely on the value-adding elements of business process that often account for only 5 per cent (sometimes referred to as the business process velocity) of total process time. This emphasis on just the value-add time

tends to be focused around making people work faster, often with a risk to quality, safety and ultimately livelihoods as competitiveness starts to become an issue. There is also another problematical dimension to these approaches in that the time-based implications of individual actions recognized only one side of a 'trade-off' that may have holistic implications in a much broader supply chain context. Examples include companies that manage capacity and cost through applications and frameworks such as traditional accounting, functional budgeting, manufacturing resource planning (MRPII) and even enterprise resource planning (ERP). The resultant scope of thinking is usually constrained by not recognizing how time, stock, resource and service interrelate with each other along the supply chain. Using 'time' as a measure creates a deeper understanding of the total holistic business process, therefore providing scope for optimization and a pragmatic approach to change. The use of time in this context is directly linked with competitiveness, and this is what is meant by the 'time compression' approach.

Time compression and competition

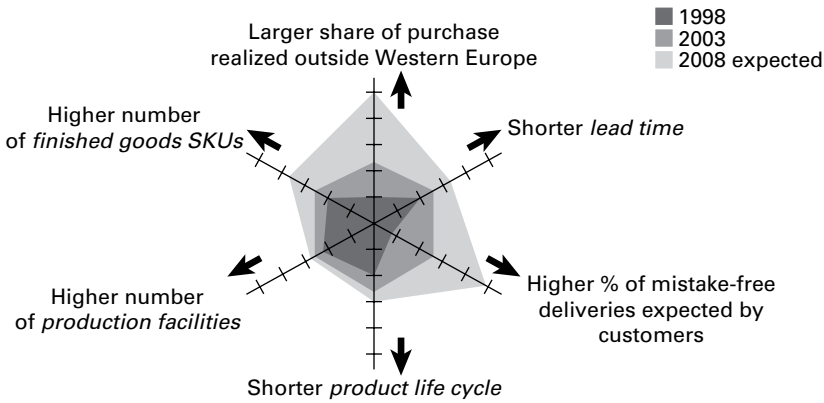
Wormack, Jones and Roos's landmark work within the automotive sector in 1990 pointed out that competition had become more aggressive and customers more demanding, so there was a constant need for a new source of competitiveness. In 1991 Reich went further and demonstrated the general applicability of this statement in a global context across many industrial sectors. Global competitive forces around the world are placing increasing pressures on markets and supply chains. Demand for increased service, product performance and variety across supply chains that extend across the globe create new requirements and challenges.

The time compression approach is one route to addressing these demands and improving the design, balance and flexibility of the supply chain. If this approach is combined with a focus on customers that operate in markets that are time-sensitive, then a further dimension is added. Stalk and Hout (1990) make the comment that 'the world is moving to increased variety with better levels of service and faster levels of innovation. For suppliers that operate and service these sectors, time based competition is of significant advantage'.

A survey conducted by the European Logistics Association in 2004 identified factors that are increasing the complexity of supply chains; see Figure 5.1. This highlights the current and continuing trend to source product outside of traditional supply markets, and this is coupled with the concerns and demand for mistake-free deliveries. Despite the presence of these two significant factors, the increase in stock-keeping units (SKUs) will continue, as will demand for shorter lead times.

These results have today manifested themselves, with cycle times being a key consideration for most companies in the West. It is interesting, however, to note that the more holistic approach offered by time compression remains

FIGURE 5.1 Complexity factors relative change (2003 = 100)



an opportunity for many companies. This, for example, is borne out by the content of numerous industrial requests for quotation (RFQs) directed to third-party logistics providers over the past decade. The majority of these tend to focus on cost reduction, with often little or no consideration for the attainment of holistic supply chain benefits.

The question is why some of the major corporations seem to ignore or do not directly engage with this approach. The answer may lie in the fact that the use of time compression to some extent relies on viewing the supply chain as a business process that can be designed and managed, ie the original concept of supply chain management (SCM). Some commentators such as Lamming (2002) consider that the idea of managing the supply chain as a holistic entity using approaches such as SCM is totally impractical. He considers SCM to be a flawed concept because it has been around since 1982 and industry is still having difficulty with implementing and mastering this area of potential competitiveness. This may well explain, or support, the reason why some of the more insular approaches to business improvement still dominate company key objectives. This debate will no doubt continue irrespective of whether SCM or, say, network management is the approach for the future. Opportunities, however, for time compression still exist and this will be explored further.

What is time compression?

The key aspect for the use of 'time' is that it is not necessarily about being faster or the fastest. Quality is paramount to competitiveness and substituting, say, quality for speed is not the primary objective. A time compression approach focuses on how companies use time to deliver a sustainable fast response to customer needs, through business processes that are organized

around a strategic time-based focus. The concept is about strengthening the holistic supply chain structure to achieve time-based objectives, with tactical decisions being made at the correct level to enable the speed of response.

The term time compression was originally introduced by New in 1992, and in its most basic form relates to the reduction of the time consumed by business processes through the elimination of non-value-adding process time. Value-add processes are defined as entities that transform inputs into outputs that are of value to the customer and that they are willing to pay for (or negate their costs) and involve no correction or rework, ie right first time. Some processes may be identified as producing very little added value and this may highlight the need to totally re-engineer them. This can take advantage of a number of possible strategies detailed below.

One of the reasons why the approach is important relates to the levels of time compression that can be achieved across business processes. Within, for example, a typical UK manufacturing company at least 95 per cent of the process time is accounted as non-value-adding. This well-established statistic was supported in the UK by the TCP (University of Warwick's Time Compression Programme) in 1995 and in the United States by Barker in 1994. Consultants in 2004 (SUCCESS, 2004) confirm that these sorts of value-add statistics still hold true, making the approach powerful as well as relevant in today's business environment.

If this statistic is viewed in the context of a typical supply chain, as little as 0.01 per cent of time can add value. However, as New (1992) demonstrated, all of these percentages require qualification on two counts. First, a large proportion of the non-value-adding time is due to product queuing, so the value-adding percentage is a function of how much is being pushed through the supply chain at a particular point in time. Even if a particular supply chain is grossly inefficient, but had only one order during a particular period, the actual value-adding time would be high because of minimal queuing. A second consideration is that inventory should add value and it is, therefore, usually included in the overall value-adding percentage. Consequently a view has to be taken on how much of the inventory element of the pipeline – usually measured in days or hours of throughput cover – is actually adding value. The amount of value added by inventory is intrinsically linked to the process cycle times, as well as demand throughput levels and predictability.

The statistics do, however, show the enormity of the opportunities for companies and their associated supply chains – and they differ significantly from any perceived opportunity that might be available from, say, a cost-based approach.

Time compression can be achieved using any one or a combination of seven strategies identified by Carter, Melnyk and Handfield (1994) and these can be applied from company level through to a total supply chain. These are summarized below:

- simplification, removing process complexity that has accumulated over time;
- integration, improving information flows and linkages to create enhanced operability and visibility;
- standardization, using generic best practice processes, standardized components and modules and information protocols;
- concurrent working, moving from sequential to parallel working by using, for example, teams and other forms of process integration;
- variance control, monitoring processes and detecting problems at an early stage so that corrective action can be taken to avoid problems with quality and waste;
- automation, applied to improve the effectiveness and efficiency of entities and activities within the supply chain process;
- resource planning, allocating resources in line with SCM best practice. For example, plan by investigating bottleneck activities and consider use of multi-skilled workforces to provide resource flexibility.

These strategies should ideally be utilized in the sequence they appear above. However, depending on any particular supply chain or company situation, various stages and combinations may be more pragmatically deployed to account for changes that are already, or about to be put, in place. Through the use of these strategies, time compression can directly achieve increases in value-add time and help to contribute to objectives associated with fundamental principles of SCM and best practice. Putting aside the debate surrounding the merits of SCM, a brief description of the nature of the key SCM principles and how they relate to time is detailed in Table 5.1. It can be argued that these principles hold true irrespective of whether a company is operating using a holistic approach to SCM or a more focused and less total 'system'-based approach to process re-engineering.

TABLE 5.1 SCM principles relating to time

	Nature of the principle	Useful attributes of a time compression approach
The principle of end-user focus	Long-term supply chain profitability is dependent on the end (ultimate) user being satisfied. This acts as the focus for all supply chain design, development and process engineering.	Time compression requires that the end user is identified as the principal anchor point. This provides the focus for all time-based parameter measurement across the supply chain.

Continues

TABLE 5.1 *continued*

	Nature of the principle	Useful attributes of a time compression approach
The principle of horizontal boundary definition	Different end-user needs are more competitively satisfied by channels (horizontally defined routes or workflow) designed and engineered ideally across the supply chain from a logistics service perspective.	Time defines the principal characteristics of the logistically distinct channels and service needs. The time compression approach provides a good diagnostic and basis for redesign.
The principle of vertical boundary definition	Boundaries of ownership and control (dividing the chain vertically) should be positioned to suit the needs of the end user according to best practice and make/buy theory.	The consumption of non-value time highlights where ownership and general boundary issues exist and require adjustment.
The principle of inventory positioning	The positioning, levels and characteristics of inventory are best determined in a total supply chain context to suit end-user needs in line with stock and postponement theory.	Time and cost provide a good deterministic framework with cycle time as a fundamental driver of stock positioning, levels and service. 'Value add stock' is a time-based diagnostic.
The principle of control over demand dynamics	Understanding and levels of control over demand dynamics are best achieved by having a holistic supply chain perspective. The principal basis is through information integration and the use of best practice relationship management.	Time measures the problem and time compression tackles the root causes of demand dynamics.
The principle of cooperation and coordination	The attainment of the above principles requires cooperation and coordination between supply chain participants. For this to work effectively each SC participant must have self-defined and motivating objectives based on trust and some common business aspirations.	Time provides a common and trustworthy metric across the supply chain that highlights the opportunities and issues.

The time compression approach – competitive advantage

The time compression methodology can be applied at two levels: first, as a holistic approach in the context of, for example, the above principles, and second, as a competitive market focus. The former could be regarded as an internal time focus of the key supply chain processes that lie on, or close to, the critical path of the business process. The latter element is the supply chain's external time that is of direct value to the customer. Both are interdependent and therefore have outcomes that are strategically significant.

When examining business strategy from first principles, reference is made to Ohmae's (1965) strategic model. He states that competitiveness relates to three basic elements: the customer, the competition, and the company that is under scrutiny. There must be differentiation between the elements of value and cost if competitiveness is to emerge. A time compression approach addresses these two sources of differentiation in a specific way. The first objective must be the elimination of non-value activity – that is, waste – and thereby maximize the value created in the supply chain. The removal of non-value activity in turn gives rise to a cost advantage, hence forming the basis of cost differentiation. Tersine and Hummingbird (1995) state that 'managing time is the mirror image of managing quality, cost, innovation and productivity. Reducing wasted time automatically improves the other measures of performance in a multiplier fashion'. If, however, companies go for the reverse and apply cost reduction initiatives without reference to the time-based implications, additional costs may be incurred elsewhere in the supply chain. An example relating to the inventory positioning principle can be used to demonstrate this point. At the outset of a cost reduction initiative it could be proved that upgrading a warehousing management system (WMS) will deliver cost advantages. It may, for example, help to reduce product storage and retrieval times, and drive cost reductions associated with resource utilization. However, a time-based examination of the holistic business process may lead to considerations about whether the particular segment of the supply chain in question should operate on a 'just in time' or a 'make to order' basis (Beesley, 1996). This total supply chain perspective may remove or displace the stock point and hence the requirement for a WMS at this point. In addition, if process times are compressed in other parts of the supply chain, the economic structure of the supply system may change the appropriate locations for inventory stock points, and the short-term cost savings associated with the proposed warehouse system could be negated by a new inventory regime. If the new WMS is still established, its associated payback demands may impose an inappropriate constraint preventing future supply chain optimization. This will have ramifications in terms of cost as well as service levels, flexibility and agility.

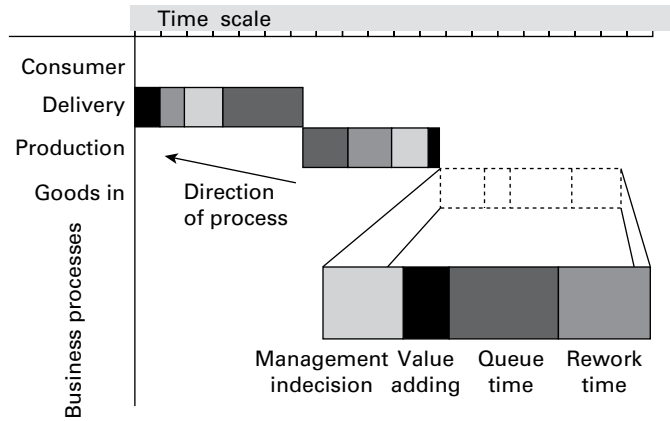
The time compression approach – cost advantage

Cost reduction will generally occur as a direct result of the removal or compression of non-value-added time. This time compression can result in a number of cost savings associated with the removal of fixed and variable overheads (such as rent and management), direct costs (such as labour and materials) and working capital. Other cost savings will depend on the nature of the compression, perhaps minimizing risk in the decision process by making relevant information available earlier in the process. The reduction, or even removal, of a rework activity can result from process change such as compression of information queues. These improvements can also have ramifications downstream and upstream of the chain by reducing or removing expediting activities that are in place to cope with ongoing inadequacies.

The cost implications of compressing time are extensive and complex but rarely absent. This is why the prescribed approach is to focus on time, which directly affects the service a supply chain can offer, without the complications of having to identify every cost 'trade-off'. The cost-based focus has been encouraged in the past by the use of performance measures linking profit margins with cost. With the 'time compression' approach there may be a requirement to determine cost values associated with the processes to assist with evaluation and project prioritization. Generally, the time-based implications of any proposal are easy to comprehend and quantify, because the length of time consumed by processes is typically a proportional representation of the costs (New, 1992).

The SUCCESS programme, a joint university and industry-led initiative, developed a tool kit called the Supply Chain Time and Cost Mapping (SCTCM). This usefully combines time-based process mapping (Beesley, 1997) with process cost analysis. The former highlights opportunities using value-add analysis (see the example in Figure 5.2), and the latter translates and attributes functional costs to processes. SCTCM has the benefit of being able to see how time, value-add and cost interrelate with each other along the supply chain. This can be useful for prioritizing projects, analysis and gaining buy-in to the time compression approach. This, however, needs to be carefully weighed against the issue of collecting vast quantities of cost-based data at the risk of prolonging total project duration. It may also be a particular issue when the cooperation of process owners and operators is required for the project because it can then be perceived as a cost-cutting exercise. As a consequence, using these individuals to help with data collection, analysis and solution design may become more challenging. SCTCM is, however, a positive recent development, which keeps time compression on the re-engineering agenda through the use of a rigorous project tool set and application process. The link to commerce's acute focus on cost provides the approach with the added credibility and robustness that is often required.

FIGURE 5.2 Time-based process mapping – value-add analysis



Time-based process mapping – value-add analysis

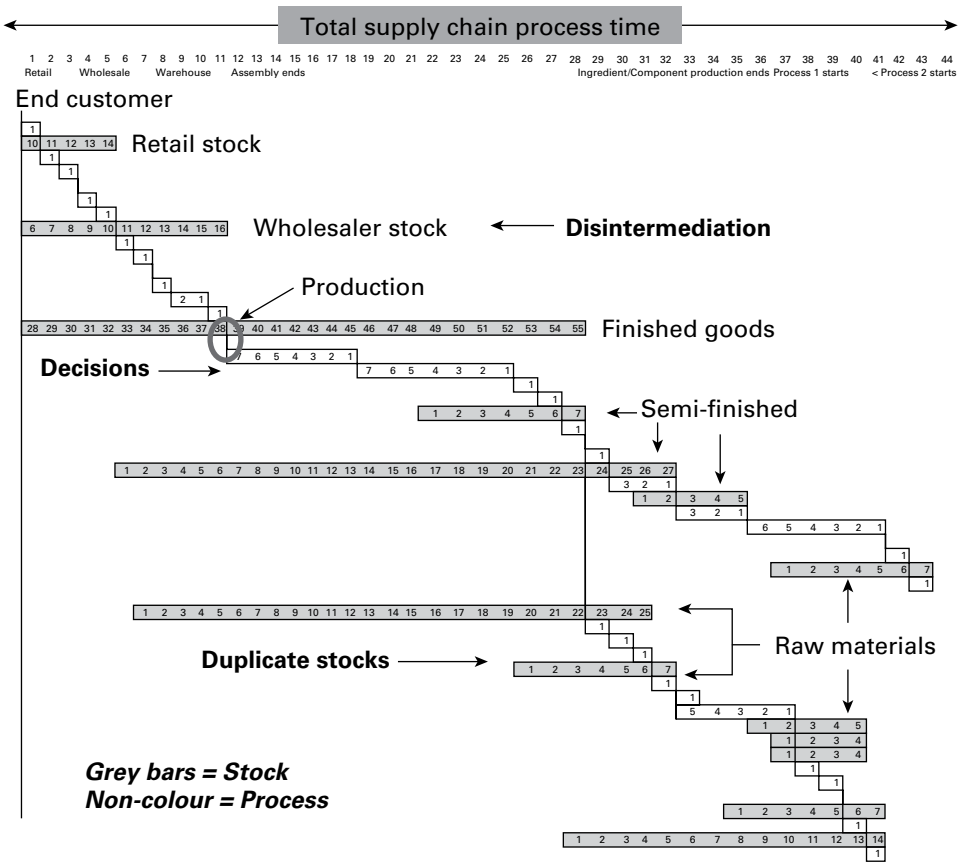
The time compression approach – quality advantage

The achievement of time compression requires a quality-based approach. This can be viewed from two perspectives of quality. First, time compression demands that product quality is to a specification that matches customer needs and more specifically end-user needs. Anything less will obviously have strategic market implications, such as a loss of customers and goodwill. This will consume unnecessary time in the sales, marketing and manufacturing process, which will have to rectify or replace the product or customers. An investigation of these time-wasting activities can, therefore, highlight possible root causes of problems that may be founded in quality issues. Time, therefore, provides the focus for quality improvement.

The above complements the second dimension of quality where it is not just important for the customer but also for the company. This is the total quality management (TQM) approach (Oakland and Beardmore, 1995), which also focuses on waste elimination. One key issue with TQM programmes is that they have been known to lose impetus because of a lack of focus. Mallinger (1993) and Glover (1993) identify the need for a holistic approach to provide a focus for TQM to operate effectively. A time compression approach provides this because it uses a simple measure that is visible to the total supply chain and not just a small isolated segment. It can thus link and integrate all of the elements of a TQM approach using the key metric of 'time'. An example of this might be a focus on the time taken to make critical decisions that in effect constrain an order or product batch being processed. Typically sales and operations meetings tasked with matching demand and production may represent this process constraint, as illustrated in the TBPM shown in Figure 5.3. By implication, the lapse times of these

FIGURE 5.3 Time-based process map of an entire supply chain

(This UK example shows the key processes that move material out of the ground and maps the processes that evolve the material into something that fulfils customer demand. Value time is not displayed in this view; however, value analysis revealed that the aspects noted in bold are key issues. The longest process time in this example was the decision-making process, which consumed 14 days and is therefore the largest element of the finished goods supply lead time. In contrast, the overall production time of just a few minutes is the shortest element.)



meetings sit on the critical path of any supply chain process. The majority of this time is non-value-add and therefore provides a key focus for addressing the total quality of all activities that interplay with the process. Examples will include the major quality-related aspects, from systems to produce accurate and timely information through to the more routine but easily underestimated aspects such as people attending meetings on time, effective communications and proper prioritization of tasks and activities. The non-value activity, particularly the low-profile issues, may not be generally recorded from a cost perspective but the delay on the critical path can be measured in terms of inventory cover and customer lead time and is therefore high visible.

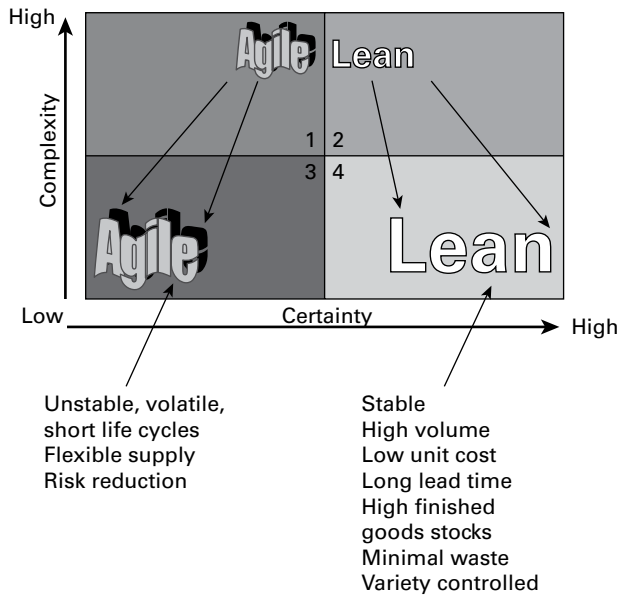
The time compression approach – technology advantage

Technology should not be applied purely for reasons associated with what is on offer or mimicking the competition. Its application must take account of the individual circumstances of the business and its customer needs, and then ensure a competitive differentiation. A focus on the time-based impact of the application of technology will help steer a company to this goal. Examples of technologies that can achieve time compression are numerous and some of the more notable developments (Barker and Helms, 1992) include: computer numerically controlled (CNC) machines, robotics, computers in manufacturing (CIM) and logistics-related examples such as the WMS application mentioned earlier. All of these reduce time for individual activities, but the time-based impact must be considered holistically in order to check that the technology is appropriate for the supply chain. A key perspective is that many automated systems cannot cope with high levels of demand variation, largely because the technology is designed against very exacting functional specifications. A time compression approach provides the focus for the application of technology when the seven strategies identified by Carter *et al* are addressed in a carefully considered sequence. This usually considers the low- or non-technology strategy solution before moving to state-of-the-art automated solutions, such as computerized material handling and control or the various forms of ERP. This approach will ensure that the application of technology is strategically significant as well as delivering tactical productivity gains.

The time compression approach – customer focus

Different customer and ultimate end-user needs are satisfied by channels that are capable of delivering different types of service. Different product

FIGURE 5.4 Generic supply strategies



SOURCE: adapted from FhG ISI, 1993

and market sectors have different service needs. The most appropriate way to meet these needs is through channels that are specifically designed to have distinct logistical capabilities. The alternative is to push everything through the same channel – but the result will be that some customers will be over-served while others are under-served. This will have an adverse effect on costs, customer goodwill and ultimately sustainable profitability. This is all linked with the principle of horizontal boundary definition and is important in channel construction because of the significant impact it can have on the customer.

One of the key impacts of the requirement for distinct logistics channels is the need to align them to different types of market and product segment. Figure 5.4 illustrates a simplified form of segmentation into four generic supply categories for differing product and market types (adapted from FhG ISI, 1993). The horizontal axis represents levels of demand certainty, with the vertical axis showing levels of product complexity. Different product types fit into one of the quadrants according to the certainty and complexity criteria.

The chart shows that products that have a volatile demand pattern and low constructional complexity will require flexible supply operations to minimize risk. An agile approach is required so that the business process can respond rapidly to new customer requirements in a market that is populated by 'fast follower' competitors enabled by low product complexity. Conversely, products that have more stable and predictable demand are usually in more cost-focused supply situations demanding lower unit costs through tighter management control and probable large economies of scale.

There are therefore two basic supply concepts, one where a business process must be agile, for example a high fashion garment supply chain, and one lean, where a typical example would be commodity-based products such as industrial chemicals. It must be recognized that a range of different products lie between these extremes and may therefore require a mix of both approaches. For example, quadrant 1 would be represented by super-value goods such as the manufacture of aircraft. These are highly complex items sold into markets with some uncertainty and influenced by fluctuating business cycles and therefore require process agility. Some lean approaches will, however, be required to underpin the longer-horizon investments in a supply market that has the time to evolve and apply competitive pressure. Quadrant 2 is the converse of 1 in that it is characterized by fast-moving consumer goods (FMCG)-type products, which generally sell in more consistent market demand conditions, giving rise to high competition and the need for a lean cost focus. This, however, is mixed with some need for agility in areas linked with product development and innovation.

The various stages of development and evolution of product in terms of its life cycle may cause it to move across segments. The latest FMCG LCD TV has moved from quadrant 1 to quadrant 2 and is progressing towards quadrant 4.

Benefits of time compression

There are two categories of time compression benefit. The first is internal time, which has indirect impact on the customer as it relates to the consumption of time within a company. The second is external time, which relates to all aspects of time that have direct impact upon the customer, such as lead time from a stock or decoupling point such as a warehouse facility. The net effect of internal time improvements has ramifications on external time-based benefits through cost and service interrelationships.

Internal time benefits in most manufacturing facilities, such as cycle time reductions, give work-in-progress reductions and productivity increases. Stalk and Hout (1990) claim empirically that for every halving of cycle times and doubling of work in process turns, productivity increases by 20 to 70 per cent. A halving of manufacturing lead time using the same number of people reduces costs by 50 per cent. These changes are reflected in the return on assets where increases of 80 per cent are possible. Then 45 per cent less cash is required to grow the company at an equable rate.

Generally, the longer the elapsed time in the supply chain, the greater the commercial risk associated with under- or over-forecasting demand. This results in the use of speculation stock for future customer needs (Mather, 1992). If, for example, a fashion-associated product has to be ordered from the Far East nine months in advance, then the risk of forecasting error is high. Consequently, the costs associated with potential markdowns are high where significantly large stocks of inventory are held, and in the converse situation where minimal or under-stocking occurs then the opportunity cost

of lost sales and goodwill is substantial. The key point for time compression is that if lead times (cycle times) are compressed, not only is cycle stock (pipeline inventory) reduced, but the period over which forecasting has to be performed reduces – and the shorter the period, the better the forecast accuracy. The better the forecast accuracy, the less demand variance will exist and the less buffer or safety stock is required. Less overall demand for inventory means that less has to be produced and supply processes can respond more promptly. Again, therefore, lead times compress and a virtuous time compression cycle comes into existence.

The internal benefits provide scope to assist the external benefits of a time compression approach. The primary aspect to consider is the consequence of compressing customer lead times and the opportunity to increase business turnover and possibly prices. Stalk and Hout infer that customers of time-based suppliers are willing to pay more for their products for both subjective and economic reasons:

- The customer needs less stock (cycle and buffer stock).
- The customer makes decisions to purchase nearer the time of need, therefore reducing risk.
- Reduction of cancelled/changed orders, with less time available and less need to change.
- Increase in the velocity of cash flow.

The factors influencing risk have an implication on market share. By being faster and more reliable than the competition, market share can be increased. A time-compressed supplier can use its flexible delivery system to supply increased variety to the customer in the form of increased style and/or technological sophistication. If this is delivered with a response advantage, the time-compressed supplier will attract the most profitable customers. Conversely, competitors will be forced to service the customers that are prepared to wait and, as a consequence, be prepared to pay less for the product. Generally, time-compressed suppliers appear to grow at three to four times the rate of their competitors and three times faster than overall demand with twice the level of profitability. When the slower competitor companies do decide to become time based they must do so from the disadvantaged position of having to incur the costs of regaining market share without securing the full benefits.

Experience from TCP has shown that the general price and market share advantage must be considered in the context of the local market and the logistical characteristics of product being supplied. For example, in the UK during the 1990s, as the spectre of cheaper overseas sources became a reality, time compression enabled companies such as H&R Johnson to optimize its business processes. This enabled it to retain market share against cheap foreign imports of ceramic tile products rather than gaining a specific price advantage. Some price advantage could, however, be applied in time-sensitive market segments such as high-fashion products where process time from design concept to full volume provided a sustainable strategic differentiator over distant competitors.

Demand acquisition approaches such as customer relationship management (CRM) help predict, define and place new customer demands on supplying companies within short time spans. The need to respond to this level of rapidly communicated customer transparency has become the new competitive frontier. Companies that do not adjust their business processes fast enough will quickly lose ground to the competition. Agility coupled with lean is key, with a focus on the use of time compression as an enabler of process delivery and reinvention.

Examples of the application of time compression

Many companies in the United States, Japan and Europe use a time compression approach either as an open policy or as something philosophically buried within the strategic mix (Stalk and Webber, 1993). Table 5.2 illustrates the nature of, and results from, a number of TCP projects.

TABLE 5.2 Results from a sample of TCP projects

Company	Scope of the project	Compression achieved	Strategic significance of the improvement
H&R Johnson	Customer lead times	Two weeks to two days	To counter competitive import products and retain a strategic segment of the market
Massey Ferguson	Process time	Reduced by 20%	To reduce cost of inventory by compressing cycle times via a manufacturing cell
British Airways	Warehouse link removed	Two days' compression	To maximize on aircraft flying hours, reduce inventory costs and increase asset utilization by moving into a contract market
Fairey Hydraulics	Component arrears	50% reduction	Retain market share and reduce inventory costs
GKN Hardy Spicer	Inbound logistics	Reduced by 85%	Reduce raw material and operating costs to maintain competitiveness
CV Knitwear	Time to develop product	Reduced by 50%	To meet the customer's time-based requirement for an increased number of ranges each year. Customer retained

Time compression of a global supply chain

The following case study has been compiled from a number of projects to demonstrate a diverse range of applications within one example. Use of this hybrid hypothetical example has also enabled demonstration of some world-class solution examples while maintaining confidentiality.

The case study demonstrates the application of a combination of time compression strategies focused on the attainment of a number of the supply chain principles in a global context. The principles addressed and the various strategies are, along with others, detailed in Table 5.1 on page 71. The example takes one of the big Western retailers and an aspect of its global supply chain involved with sourcing product from a major low-cost manufacturing nation.

Two categories of product will be considered, defined by their market and product segmentation relating to the four generic supply strategies above. The first is a product group that has stable demand but a low margin, due in part to intense competition. This might be, for example, wall fixings such as screws and nails, and would require a lean supply chain concept capitalizing on the stable product demand, thereby underpinning a low-cost solution. In contrast, a fashion product category such as women's skirts has less stable demand, with more scope to attain higher margins as competition from exact product replicas or substitutes is more limited within the initial short sales launch time frame. To cope with the higher demand variability and volatility, the fashion product supply chain must have the ability to react to change via fast product replenishment or product reinvention. The supply chain has to be agile rather than lean, with emphasis on risk mitigation via resource deployment rather than a pure cost minimization approach.

This form of product categorization enables constructive supply chain design (or re-engineering) based on the *end-user focus* which in these examples is highlighted by the need for different levels of flexibility and cost attainment. These 'end-user' demands translate into logistical requirements which can be met by specific logistic *(horizontal) channel* design specifications. One key aspect of the design specification of any channel is the *inventory positioning* and this will depend on supply and demand variability coupled with lead times. These factors will give rise to appropriate types or forms of inventory being held in specific quantities at strategic locations within the channel. An example for the agile channel might include the need for inventory to be held close to the retailer but in semi-finished form, thereby postponing final product assembly, at a location a short distance, and therefore with a short period of risk exposure, from the market. Products designed using *standardized* components and modules lend themselves well to postponement.

The majority of supply chains are under the ownership of different legal entities, such as companies, and also under the influence of different organizations, such as departments and employees. These entities legally and organizationally interact with each other and create areas of focus and specialization along the supply chain at the same time as creating constraints and check points (eg for quality or *variance control*) at the various interfaces

(*vertical boundaries*). The optimal operation of any channel is strongly influenced by the position of these vertical boundaries and the influence that they exert on the supply chain. These boundaries must therefore be designed and negotiated into the channel in line with the application of concepts such as make/buy decision theory, best practice outsourcing and the idea of organizational process design. In our two-channel example the question of who should own the inventory is one key aspect of this issue. Often the weakest channel partner is left with the cost of ownership; however, in the agile or lean supply chain the suppliers may, for example, own the inventory in the retail store. This might be for good logical reasons of control and focus in a retail environment that has to merchandise and replenish thousands of other diverse product lines.

Ownership of either the inventory, process or the company entity is a major influence, hence the focus on conflict resolution in supply chains with aspirations to use partnership and empowerment approaches. At a more generic level some form of *cooperation and coordination* will always be required between the various forms of interface along the supply chain. System-based exchange of information and data has transformed the way supply chains can operate and has expanded the scope of what can be achieved between the interfaces. For example, systems (generically a form of *automation*) allow for the rapid transfer of data globally along supply chains. For practical purposes this is usually instantaneous (*concurrent working*) and *integrated* in that interconnecting process links are available, compatible and can respond. In our agile channel example, retail sales information can be made available to the supplier on the other side of the world. They are motivated and can respond accordingly and for example be in a position to authorize and generate replenishment orders on behalf of the retailer. This form of linkage alleviates the effects of *demand dynamics* where time delays in the supply of information along the chain creates uncertainty, causing suppliers to mitigate against risk using standby resources and processes that are non-value-adding and result in unnecessary costs.

The final aspect of this example considers the inbound flow of materials to support the manufacturing operations. There is a natural tendency to focus on the parts of the supply chain that directly affect customers to the exclusion of the inbound supply chain. Vendor management initiatives and carefully considered inventory ownership policies often provide the desired focus on this sometimes neglected area. However, scope often exists to investigate and map the entire inbound supply chain and consolidate into appropriate *horizontal channels* and to *simplify* the types of flows using a unified approach for handling raw materials that have logistically distinct characteristics. In the example of fixings, supply of metal rods, chemicals and other materials all arrived at the factory via a range of different channels – some via direct delivery via a carrier network, others supplied in bulk to the factory warehouse, some supplied from a vendor regional warehouse or a combination of all three types of supply via a range of providers. An equal level of complexity and variety existed to support the range of information

flows and communications. Typically these supply arrangements and associated communication complexities arise for historical reasons and establish themselves over a period of time.

The inbound supply chain operated and sustained manufacturing but no one could identify the logistical cost of the operation as this was hidden within the procurement cost. Further to this, the complexity of all the channels made service level agreements difficult to maintain and manage, giving rise to safety stocks and non-value-add cost. The inbound supply chain was mapped from a time, cost and value-add perspective. Horizontal channels of supply were identified and a neutral third-party logistics provider was given responsibility for implementation and delivery. This provided ownership, the ability to consolidate flows and a new focus on the factory as a customer of the logistics service and not just the product. *Resource* allocation in terms of inventory, transport, warehouse and IT capacity was designed into the solution on the basis of balancing service and cost, rather than using a just-in-case mentality driven by pure procurement and sometimes emotionally perceived needs.

Time compression and the future

At the time when the author was working on the Time Compression Programme, no significant tool existed to assist with the production of time-based process maps. Excel spreadsheets help to a limited extent but are not automated or tailored sufficiently to use in a seminar environment. Typically seminars are the appropriate way to engage users and obtain buy-in to any diagnosis, change plan or potential solution.

Since the TCP disbanded, software tools have come a long way and the following wish list of support tool features is now a reality:

- Discovery of process:
  - Simple process flows with automatic translation into a TBPM.
  - Cross-reference every element contained in above into a relational database.
  - Every aspect of process, including time, cost and resource levels, embedded within one map.
- Realization, improvement and deployment of process:
  - Ability to perform and enable what-if, impact analysis and re-engineering.
  - Provision of logical links to objectives, customer value propositions, organizational structures, functions, regulatory structures, quality conformance regimes, supporting documents, software applications etc.
  - Software requirements definition, testing and implementation.

- Continuous improvement of process:
  - Enable change via effective communication and user engagement.
  - Support ongoing operations and continuous improvement.
- Governance of change:
  - Version control all of the above between users and various versions, scenarios and variances of the process so that incremental improvements can be rolled out over time.
  - Notification provided to all stakeholders when changes affect their role.

One software application that exists and provides most of the above and which is being further developed to support time compress re-engineering is Nimbus Control (Figure 5.5) (Gotts, 2007). The potential that this tool offers for assisting business improvement in general is immense. It is therefore anticipated that time compression, alongside a range of complementary business initiatives driven by the use of tools such as Control, will become more widespread in the near future.

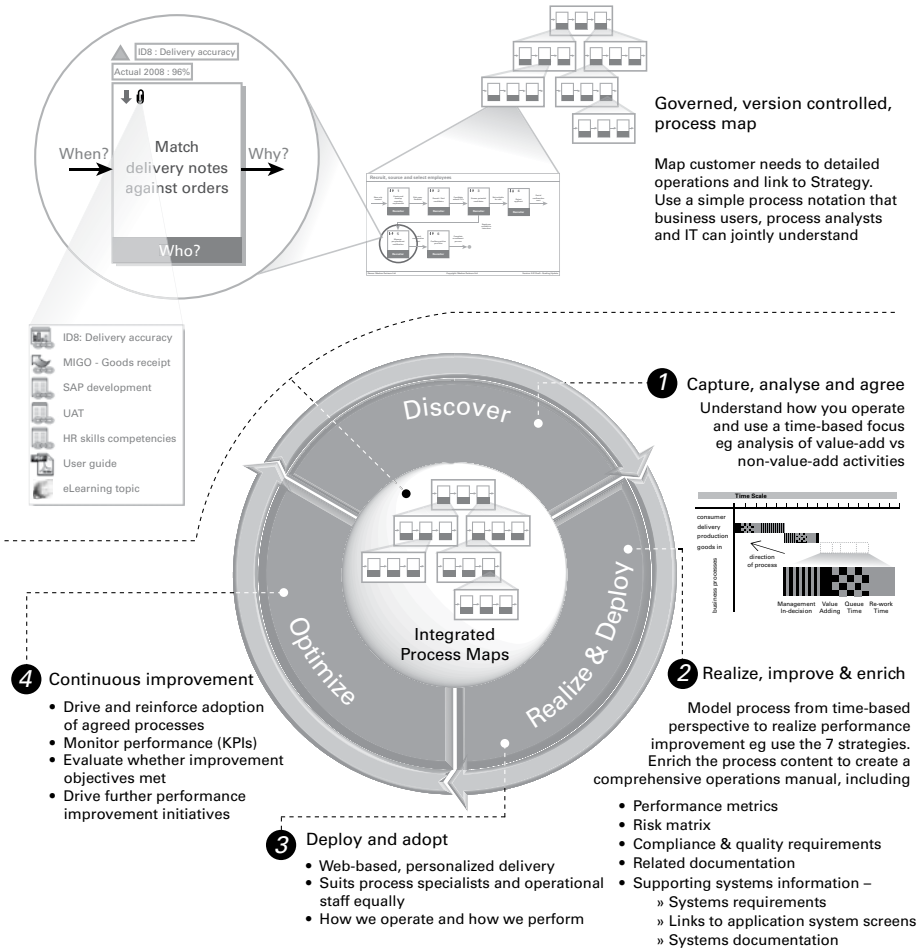
Conclusion

Time, as a measure, has been established as being strategically significant for contemporary business. The scale of time compression that is possible in most businesses is very significant because non-value-add time in most processes is at least 95 per cent. The impact of commercial benefit is wide and includes increased market share, price, productivity and innovation together with reduced levels of commercial risk.

Time compression has been established as a mechanism for addressing most of the aspects of business strategy and overarches the key objectives associated with in-company logistics and managing the broader supply chain. Six principles aligned with the latter have been identified and linked to the idea of the time-based approach. To identify and achieve the time compression objectives, some tools such as time-based process mapping have been noted and coupled with a strategic re-engineering framework.

The approach supports a new source of competitiveness for time-sensitive markets and, as a focusing criterion, it enables one company or supply chain to be compared with another in terms of the internal and external benefits of time. This can provide the impetus for change and an improvement plan. Even the end user or the internal supply chain customer not operating in a time-sensitive market would find it difficult to argue that a benefit could not be acquired from the application of time compression. The approach does, however, require a top-down commitment and for full impact a lead organization within a supply chain needs to drive the initiative. This can become a challenge where trust is an issue and there is the need for an unbiased hand to guide, arbitrate and have a stake in the process.

FIGURE 5.5 Nimbus Control



SOURCE: www.nimbuspartners.com

Looking towards the future, companies must blend leanness with agility in order to be able to respond to at least two possible key challenges. The first is ensure that supply chains are designed, operated and evolved to meet and drive end-user needs. The second is to manage the supply chain in a dynamic commercial environment that is making network management rather than supply chain management a challenging reality. The time compression approach's simplicity and transparency across company and functional boundaries provide a good platform for meeting these challenges.

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Building more agile supply chains

06

REMKO VAN HOEK
Cofely

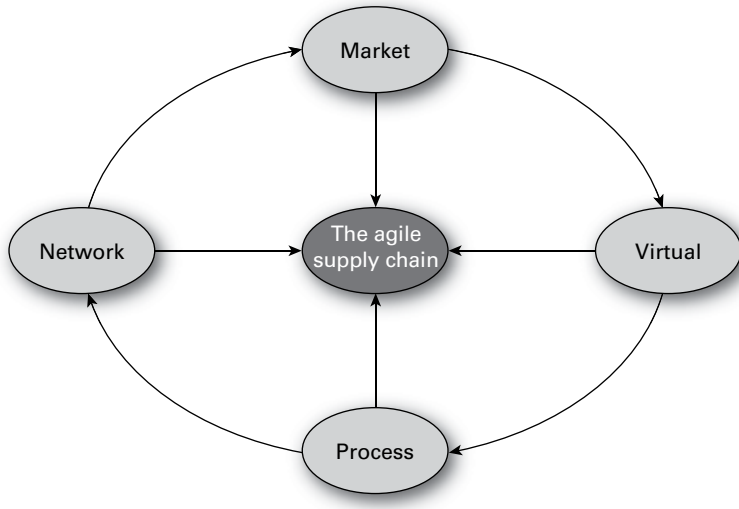
Introduction

There is no shortage of strategic opportunities for using supply chains and supply chain capabilities to achieve competitiveness and to achieve faster, more profitable company growth. There is a shortage of companies that achieve full potential and develop and leverage all needed supply chain capabilities. For almost a decade now, the benefit of creating a more agile and responsive supply chain has been widely accepted. Recently, however, the head of the supply chain of a major European manufacturer asked me: 'We have realized the need to become more agile for years and have tried several things but do you have any suggestions for how we can actually accomplish higher levels of agility?'

The point is clear: there has been a more or less clear vision of the benefits of creating an agile supply chain going back to Harrison, Christopher and van Hoek (1999), defining it in terms of responsiveness to markets based upon the dimensions of market sensitivity, virtual integration, process integration and network integration (as shown in Figure 6.1). This vision has been widely cited and reinforced since, as a key competitive ambition and supply chain best practice aspiration (eg Christopher, 2004; Lee, 2004). However, there has been a shortage of studies and cases of companies actually turning the vision or ambition into reality, let alone tools that they use to do so – and the theoretical argument in the above-referenced pieces are not sufficiently helpful in that respect.

So we now know that the market turbulence of the 1990s was only a start, and that continuing uncertainty makes the responsiveness that comes from agile supply chains a more valuable consideration than ever before. The key word here is 'consideration'. If there is one rule in supply chain

FIGURE 6.1 Theoretical framework for creating the agile supply chain



management, it is that 'there is no universal solution to all operating circumstances'. So the key questions for this chapter become: 1) where to implement agile capabilities, or 'which operating environments most favour an agile supply chain?'; and 2) how to approach implementation of agile capabilities.

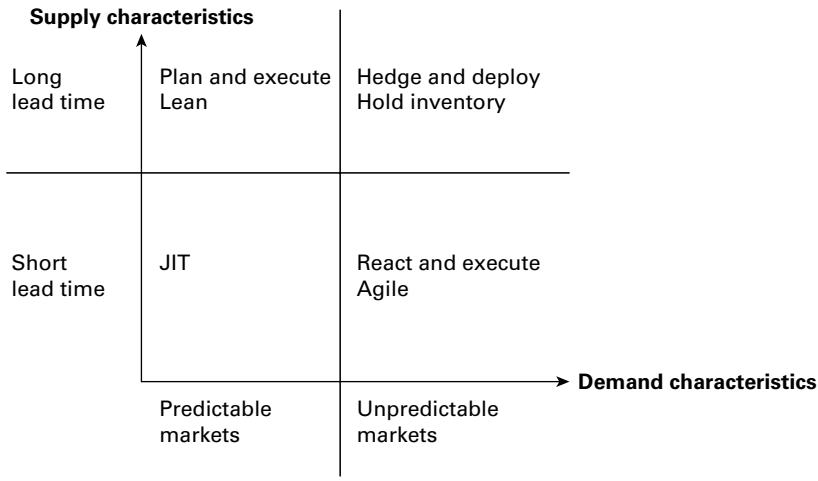
The first part of this chapter introduces contingencies or operating factors that help answer the first question. It incorporates these factors into a more comprehensive description that shows when a supply chain should focus on agility, leanness and other options. The second part will introduce four pitfalls that companies commonly find themselves in, and through which – despite good intentions and efforts to improve agility and responsiveness – they achieve anything but that. Instead they underperform by driving practice away from the agile vision and generating cost of complexity with little value return.

Operating circumstances requiring agility

Factors previously introduced include demand volatility, product variety, forecastability and 'fashion-type' short life cycles and fast delivery. Van Hoek and Harrison (2001) introduced demand and supply characteristics as dimensions impacting the relevance of agile versus alternative approaches (Figure 6.2).

The relevance of factoring in demand and supply characteristics lies in the notion that creating the agile supply chain is about linking supply capabilities

FIGURE 6.2 Leanness and agility under demand and supply



to demand requirements. In this respect, demand and supply 'characteristics' may be too general a term. There is an underlying dynamic between the two dimensions: supply abilities are to be created in response to demand requirements. Then one may think of the two dimensions as 'demand' indicating the viability of agility, and 'supply' indicating the feasibility of agility.

Responding to demand with a short lead time is a relevant feature of responsiveness to demand – but it also is a relatively basic one. It certainly does not capture a comprehensive set of responsiveness enhancers. When considering relevant agile capabilities, additional operating contingencies should be included. The remainder of this section will discuss demand and supply contingencies to be included in the categorization for operating environments.

Demand contingencies

Returning to lead times, the length of response time is predominantly a relative measure; when developing a cross-industry categorization for operating environments the absolute length in weeks, days or hours may be less relevant than the relative length. Lead-time tolerance is often the most relevant factor, as it captures any leeway that supply chains have in responding to demand. It also incorporates the fact that reliability of delivery may be more important than absolute lead time. A lead-time tolerance, therefore, contains both a speed and a reliability element.

'Forecastability' of demand is a better measure than predictions of market conditions because it is more closely linked to supply chain management capabilities. Market conditions are generally very difficult to predict at

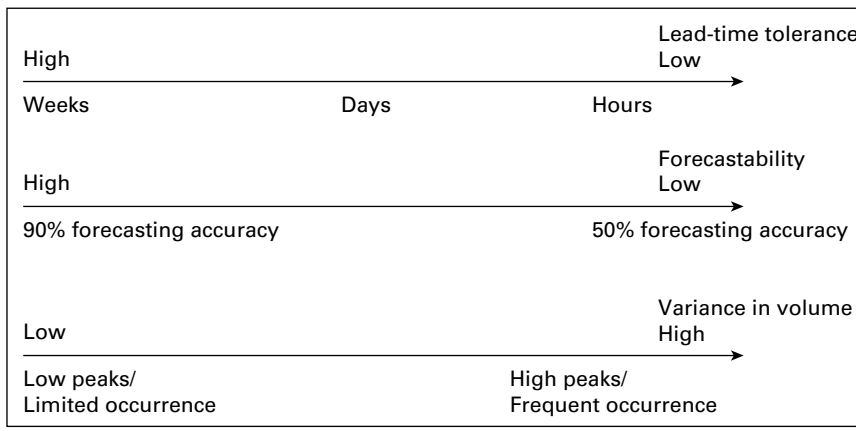
the detailed level (of individual stock-keeping units (SKUs), for example), but that does not mean that companies cannot forecast demand relatively accurately. More importantly from the contingency point of view is the fact that forecastability includes a supply chain management requirement of aligning mid- to longer-term capacity decisions to demand, rather than the hard-to-predict market conditions. Of course, one might argue that an ultimately responsive system removes the need to forecast, but this is more of a theoretical perspective than a realistic one. Irrespective of the supply chain's responsiveness to actual orders, companies still have to forecast for mid- to longer-term factors, including advanced orders to suppliers, long cycle-time production processes and capacity-building plans.

Demand for a product is rarely stable, but contains spikes and valleys. It is traditionally difficult to accommodate this variance in demand across a given time period, because every supply chain has a limited capacity and other constraints, such as maximum order volumes or limits on the availability of expensive slack capacity. However, there are two underlying features here: the difference between peak and valley of demand, and the frequency with which upswings and downswings occur.

For the latter, a standard seasonal pattern may have just one peak (in the summer for garden furniture, for example), whereas the fashion industry may have a minimum of six or eight seasons. Retail promotions may have peaks every other week. These seasonal swings in demand may be significant, with peak demands often accounting for 60 to 70 per cent of total demand.

Figures 6.3 shows an operationalization of the above three demand contingencies – lead-time tolerance, forecastability and variance in volume.

FIGURE 6.3 Demand contingencies impacting the viability of an agile supply chain



Supply contingencies

What are key supply contingencies that impact the feasibility of creating an agile supply chain? It is in this area that most gaps in current knowledge exist, as most of the publications on agile supply chains focus on the relevance of the approach itself in modern markets. Given the strength of this argument in favour of agility, and its importance in the current uncertain economic landscape, it is time to move beyond this basic view and consider the four layers (at least) of supply contingencies – or requirements for an agile supply chain.

'Postponement' has been widely identified as a mechanism that can support the creation of responsive supply. Delaying inventory allocation in the supply chain creates hedging options for responding to demand. This logistics postponement (delaying time and place functionality decisions) is helpful in the distribution segment of the supply chain but ultimately offers only partial responsiveness. It still assumes that stocks of finished goods build in anticipation of unknown demand, with all the risks of stock-outs still largely in place. Stock-outs generally have a very high cost in agile environments. It is for this reason that 'form postponement' is used – to delay the specification of final form and function of products until the last moment. Many companies do this by delaying packaging, labelling, adding documentation or product peripherals. Extending postponement into manufacturing, assembly, module manufacturing, etc may help create the greater flexibility required for agility.

Associated with the need for form and function customization is the manufacturing and engineering principle of 'design variance' across products and product lines. In order to achieve levels of customization beyond the appearance of products, designs may have to vary beyond packaging – even beyond modules and into components and more basic features of design. This creates obvious design, manufacturing, sourcing and inventory complexities, which have to be dealt with in agile operating environments. This contingency also shows how creating an agile supply chain requires more than revising logistics and distribution management – it can have an impact all the way back to product design (the impact on suppliers and trading partners is discussed in the next contingency).

'Supply chain partner modularity' specifies the extent to which individual companies participating in the creation of an agile supply chain will have to align operations through the redesign of management practices and interfaces for the flow of goods and information. Some examples may help clarify this. Traditional sourcing and contract logistics has a buy–sell approach that suggests interfaces limited to a transactional level; just-in-time (JIT) sourcing has more extensive interfaces with sharing of demand data and alignment of operations. Integrated contract manufacturing, in which a third party controls the majority of build and make operations, extends the interface beyond aligned supply into integrated form and functionality creation. Fourth-party logistics is similar to this, with a third party taking over the organization and coordination of the entire flow of goods, information and management for the entire logistics function, and based around tightly structured interfaces. These approaches lead to a modular supply chain in which boundaries

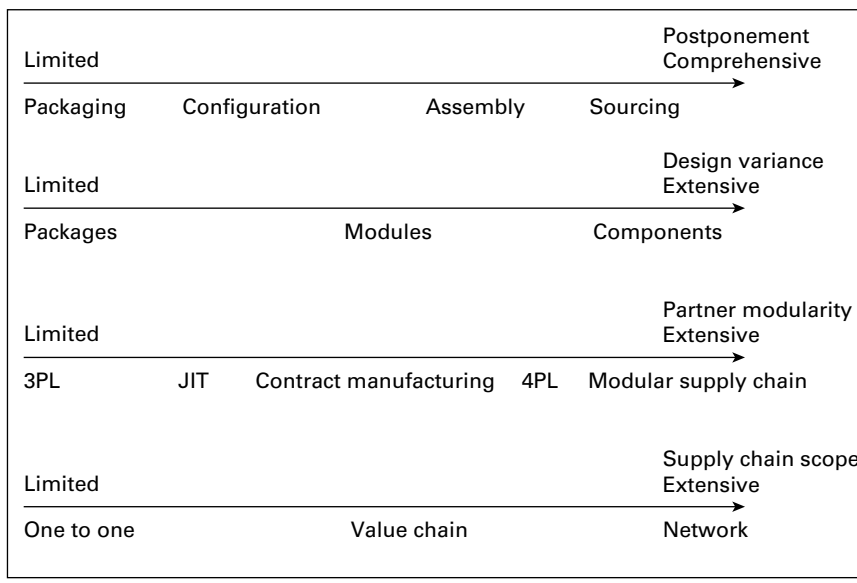
between partners are blurred and players are all orchestrated around real demand and service to the end customer.

It is important to note here that this contingency is not limited to upstream suppliers, but also involves the downstream trading partners between the company and end customer. This is traditionally a hard set of interfaces – compared with upstream suppliers who are paid for their supply efforts, giving companies an obvious lever in the structuring of these interfaces. The implication of agile reasoning, however, is that downstream partners and direct customers can also encourage alignment around this approach. Then channel interfaces should be structured around end-customer demand contingencies. Service to the end customer gives the key to this; it is an objective that all supply chain players share and where there is significant unification in purpose and objectives.

This brings us to a final contingency, which is the 'supply chain scope'. In order to completely meet the standards demanded for customization, modularity and partner integration, the scale or scope of supply chain involvement may be significant. It goes far beyond traditional views, and develops one-to-one interfaces that extend into a 'value chain'. A value chain is a sequence of one-to-one interfaces leading up to a customer, while a supply chain has many-to-many interfaces and interconnections, which must be dynamically rearranged around key processes and players in response to real demand. A network approach is far more appropriate here.

Figure 6.4 shows an operationalization of the above four supply contingencies – postponement, design variance, partner modularity and supply chain scope.

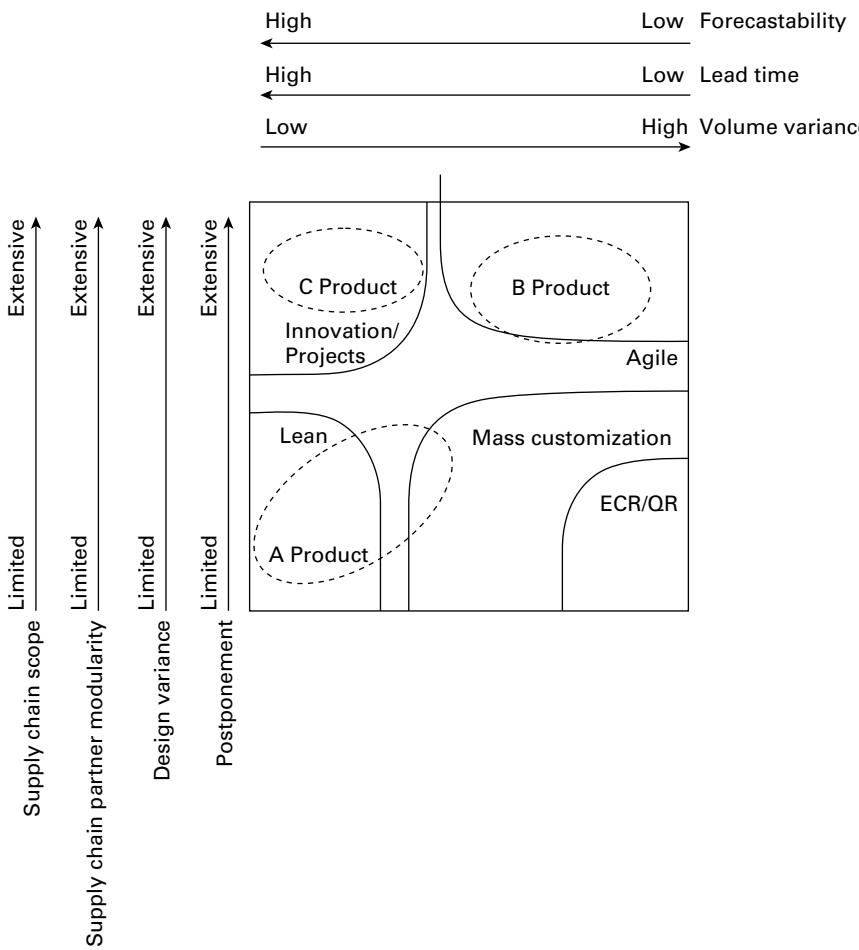
FIGURE 6.4 Supply contingencies impacting the feasibility of an agile supply chain



The categorization for operating environments

Figure 6.5 shows a categorization for operating environments based on the contingency factors introduced in the previous section. In the categorization a number of alternative approaches to agility are mentioned. The first consideration is to distinguish A, B, C products – based on Pareto analysis. Here A products (accounting for 80 per cent of volume and 20 per cent of orders) are more standardized, and the greater forecastability, lower volume variance and less customization make them more suited to lean approaches. B products are more variable and more suited to agility.

FIGURE 6.5 Categorization of operating environments



Efficient customer response (ECR) and quick response are generally better in environments where demand requirements particularly impact delivery and distribution, but have less effect on upstream operations. Mass customization is generally better in environments with modest to significantly challenging demand that can be met with medium postponement and customization.

Agility is positioned near project environments. This is the right place from a supply contingency point of view, but is not so good from a demand contingency perspective. For example, in environments of innovation and single projects, lead-time leeway is often significantly bigger.

With contingencies and operating environments considered, the question that remains is: how to avoid pitfalls in implementing agility? This is the focus of the next section.

Mitigating the minefield of pitfalls

Figure 6.6 conceptualizes the 'minefield' of creating the agile supply chain. If all goes well, companies accomplish the four central dimensions of the agile supply chain as introduced in the previous section. However, lacking practical guidance and experience, there are pitfalls at every step of the way and companies can be found to be:

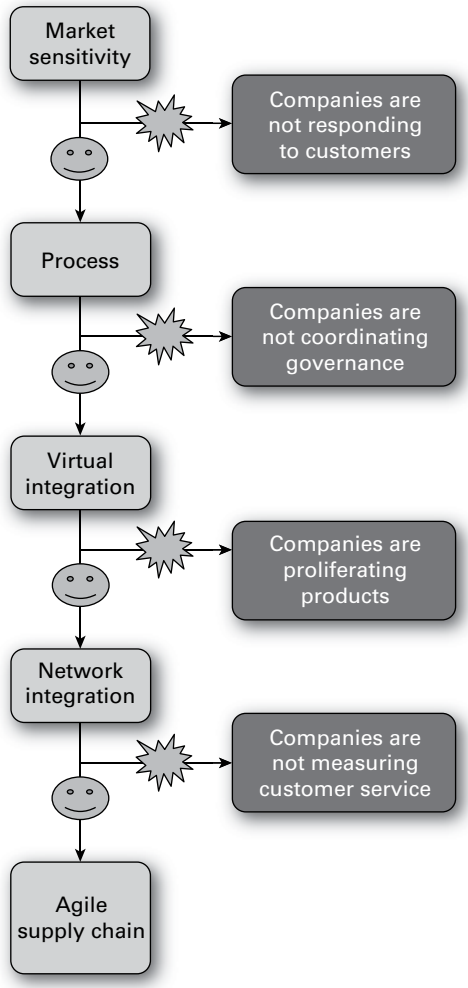
- not actually responding to the customer as opposed to creating market sensitivity;
- not coordinating governance, which allows for too much or too little responsiveness as opposed to virtual integration;
- proliferating product in meaningless and valueless areas due to failures in process integration;
- despite a coming focus on service, not actually measuring that, leading to failed network integration.

Poor response to customers

It is common practice for companies to measure customer service in multiple ways. Customer satisfaction is the most widely used measure. However, there are several challenges with customer satisfaction measurement and surveys:

- Average scores hide extremes at the end (problems and excellence).
- What opinions and strategies are behind subjective measures?
- Who is speaking? There are many different voices within the customer organization.
- What is the value of individual responses averaged out (innovators, key accounts, marginal accounts)?
- A lack of clear implications for service (what does a 3.75 mean in comparison to a 3.95 score?).

FIGURE 6.6 The 'minefield' of creating the agile supply chain



In response to these challenges, companies such as GE, Honeywell and the Ford Motor Company have developed 'voice of the customer' (VOC) processes. These aim to go beyond customer satisfaction measurement by crafting a more comprehensive exchange with selected customers.

Typical features of this exchange include:

- Senior manager to senior manager meetings to avoid leaving the exchange to revenue-pressured situations, to signify commitment and to elevate the conversation.
- Expansion of the interaction to an ongoing exchange to drive beyond measurement at points in time only and establish sustained improvement and alignment.

- Involving additional functions, including logistics and engineering, and multiple contacts on the customer side in order to broaden the exchange into a bidirectional learning and alignment opportunity.
- Establishing joint improvement initiatives to turn the exchange into more than a listening exercise, including so-called 'at the customer – for the customer' teams.

The key distinctions between voice of the customer processes and customer satisfaction measurement are related to the direct communication with the customer:

- Contact is based upon conversation, not surveys, which helps capture the story behind the survey scores and learn more about what actually drives scores.
- It often starts with a senior executive sponsor talking to a customer peer and is followed by cross-functional work groups at a management and execution level working together on improving responsiveness and process alignment where that matters to the customer.
- Listening is ongoing, not a point measurement, as initial conversations are followed up with reviews of process improvements.
- The process is customer centric as opposed to measuring average market performance scores.
- The process captures multiple inputs from the customer, not just a single respondent; this is important because there are many voices of the customer and it matters who is talking.
- The results are linked to action, with project teams deployed 'at the customer, for the customer'; hence the outcomes of the review are not internalized but used as a basis for customer-focused action.
- The former (voice of the customer processes) actually improves customer relations owing to improved learning about the customer, relationship development and resource investments to address service issues, and improvement opportunities.

Overall, the voice of the customer leads to much better market sensitivity as opposed to running the risk of misguided interpretation, or limited channels for capturing market input.

Governance does not support virtual integration

Agility requires the ability to be able to respond to local market requirements and opportunities. But this does not mean that companies should not aim at leveraging skills and capabilities across the regions in which they operate – let alone avoiding reinventing the wheel across parts of the organization. Local responsiveness and global efficiency need to be integrated into a network

organization that is a virtually integrated entity, despite operating in multiple locations and regions.

One way in which I coped with this pitfall at Nuon (a $6 billion European utility) when I worked there in the procurement organization was to use account plans with internal stakeholders and customers to balance business needs and local considerations with global category opportunities. The account plan was a simple one-page template used to capture priorities in collaborating with the business, ensuring alignment between procurement and internal customers and stakeholders without being able to control those business unit peers directly. Effectively this account planning was used as a practical way to achieve virtual integration.

Around the annual business planning cycle, procurement would discuss with the business unit its main priorities for the coming year and how procurement could help achieve those. Main areas for joint focus and projects or collaborative initiatives between procurement and the business unit would be captured, including key performance indicators (KPIs) to measure success. During the year the plan would then be revisited in a discussion between procurement and the business unit's management team to evaluate results so far and progress in the collaboration. Using account planning proved an effective way to keep governance simple yet practical and work oriented.

Meaningless product proliferation

A particular area of concern when it comes to process integration is product proliferation. Owing to process misalignment between several parts of the supply chain, companies often end up proliferating products, driven by internal misalignment rather than market driven. How this often happens is that research and development (R&D) wants to innovate and expand product ranges, sales wants to create more opportunities to sell, while supply chain and operations want to avoid margin reductions from cost of complexity in operations. A lack of process integration leads to uncontrolled efforts disconnected from market opportunity.

New products are created, hoping that this will aid in growing the business by offering more revenue opportunities. In theory this improves the ability to respond to customer demand. In reality, however, companies typically get wrong a lot of product proliferation and end up creating too many products that do not sell, adding cost and needless complexity into their supply chain.

One company found that the bottom 25 per cent of products generated less than 1 per cent of revenue and were actually unprofitable, reducing the company's overall profit. Another company saw its SKU count double in two years, with SKU growth far outpacing revenue growth, resulting in a reduction of volumes per product and return on investment in designing and marketing products – while mushrooming the cost of warehousing. While all of this is happening, the supply chain is left holding the bag, with the business not really owning any responsibility for SKU management. One

warehouse manager of this company said: 'When I meet people from the business I ask them how many SKUs they have in the warehouse. They never get it right and always underestimate.'

To summarize, common flags for product proliferation include:

1. growth of SKU count outpacing revenue growth;
2. SKUs that do not meet revenue and volume thresholds for generating return on design, marketing and shipping them;
3. SKU management is not distributed across the business and there is no accountability for, or even transparency of, SKU proliferation in the business.

Additional complexity flags can be found in the warehouse and sales, including:

- Warehouse flags:
  - ongoing order and shipment size reduction;
  - a constant need for more stock locations in the warehouse;
  - nightshifts and rush shipments outside seasonal peaks.
- Sales flags:
  - a catalogue that is as thick as the Yellow Pages, running the risk of confusing customers;
  - more products than any sales person could every carry in the boot of a car;
  - special SKUs are being added based upon special (key-)customer requests, events or market opportunities but they may not be removed after the event.

Faced with a lot of the bad consequences of SKU proliferation outlined above, Company A, a consumer products company, has reduced SKU count by 30 per cent during the past three years while growing the company and adding new products, breaking away from flag 1. It did so by actively managing to avoid flags 2 and 3. The company initiated an SKU management effort – introduced by the CEO – with a mandate that 50 per cent of SKUs that do not meet revenue thresholds will be cut each quarter. The reason for the target being 50 per cent and not 100 per cent is that new products are being developed in the market that might not yet have come to flourish fully, there are products that do not perform steadily every quarter (because of seasonality, for example), and it leaves the business some autonomy in making cut decisions. Key to this approach is that it establishes SKU management as an ongoing discipline. A lot of companies do one-off efforts but a manager from Company A says: 'Without sustaining the management focus, SKU count is likely to creep back up in no time. You cannot expect behaviour to just change without ongoing focus and accountability.'

In order to accomplish this accountability, SKU count has been elevated to one of the measures on the global dashboard that is reviewed monthly

by the senior executive team. Additionally, a so-called 'glide-path' has been established. This is a set of SKU reduction targets on a timeline. In addition to sustaining the focus on – and accountability for – SKU reduction, incorporating the SKU count on the dashboard also removes decisions from the execution level. The supply chain team has dedicated a person to the SKU effort and this person creates transparency to the business about its SKU count, flags them when they are not on the glide-path and offers help in reducing the SKU count. Because senior management owns the outcomes of the effort at the dashboard level, the supply chain team is positioned as aiding the business rather than being the bad guys. Furthermore, it removes discussion about the effort from the execution level. According to the senior supply chain executive, this is important because otherwise, 'you end up with emotion involved at this level resulting in endless discussion instead of focused action'.

Incorrect measurement that focuses responsiveness wrongly

All companies include customer service in some form in their performance measurement system. However, almost all operationalize this measurement internally, leading to responsiveness that is misguided and focused wrongly – not being directly and fully on customers. In particular, most companies measure delivery service in one or multiple ways based upon their internal definition of success. Typically the measures focus on how reliably and fast the company delivered against the timetable it put forward. This misses the point, as this timetable might not be aligned with the customers' needs. So companies are not tracking responsiveness to customer need at all. The better way is to ask customers for their desired delivery window and measure execution against that customer-defined measure of success. General Electric realized this when it presented high delivery reliability scores from its own measurement to customers and received a negative reaction. In short, customers reacted that performance was not at all good according to their own measurement, which considered the time when they needed deliveries to take place.

GE changed its measurement set towards what it called Span measurement. Span stands for: the range of delivery around customer-requested due dates. Essentially, the company now measures, across all deliveries globally, how close it was to the delivery date the customer requested when ordering. In its plastics business the company brought Span down from 30 days to just a few days – meaning that every customer can depend upon GE delivering any product, anywhere in the world, when they ask for it, with a maximum variation of a few days.

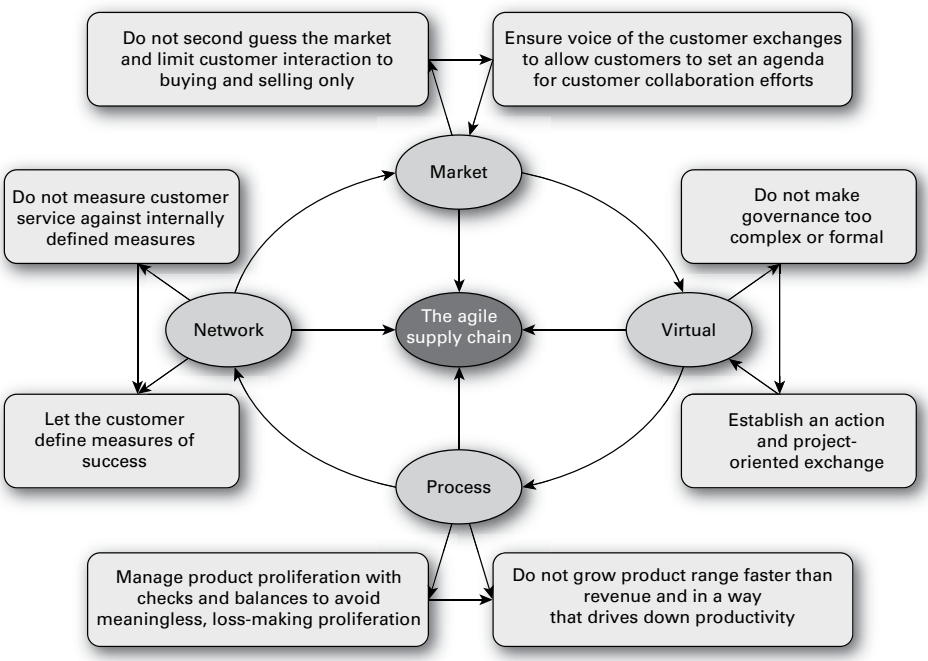
Experience from GE suggests the value of several actions to improve measurement for agility:

- Share measurement dashboards with customers, and aim to measure your performance using the measures that customers use to measure your company.
- Do not measure against your own measures of success, but ask the customer what defines success.
- Hold all parts of the supply chain accountable against the customer-defined measure of success, so that there is no escape from market sensitivity.

Enhancing the vision of agility

This chapter has offered practical findings from aspiring practitioners, several years of research and dozens of case studies. As valuable a starting point as the theory surrounding the vision of creating an agile supply chain is, it is still only vision-centred. The experiences and cases presented in this chapter show where the vision can be supplemented, thereby enhancing the theoretical framework presented in Figure 6.1. Figure 6.7 captures the particular axioms identified and visually displays the enhanced agile supply chain theoretical framework.

FIGURE 6.7 Enhanced agile supply chain theoretical framework



Conclusion and reflections

This chapter has attempted to offer additional insight into the questions of where and how to consider developing agile capabilities in the supply chain. The identification of operating environments that favour – or disfavour – agile supply chains gives a more realistic chance of successful implementation. Avoiding the implementation pitfalls will further increase the likelihood of success.

As one of the authors of the original agile supply chain vision, I would like to apologize to the head of supply chain referenced at the start of this chapter – I hope that this contribution will be more helpful and make up for the shortcomings of the original vision.

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Using marketing and logistics to fulfil customer needs

07

DAVID B GRANT
University of Hull

'There is only one valid definition of business purpose: to create a customer. It is the customer who determines what a business is. What the business thinks it produces is not of first importance – especially not to the future of the business and to its success. What the customer thinks he is buying and considers "value" is decisive – it determines what a business is, what it produces and whether it will prosper.'

PETER DRUCKER

'The customer is the immediate jewel of our souls. Him we flatter, him we feast, compliment, vote for, and will not contradict views.'

RALPH WALDO EMERSON

Introduction

The notion that marketing and logistics are related has been around since the turn of the twentieth century when early writings in marketing related to distributive trade practices due to the increasing significance of 'middlemen'

who were performing more functions between producers and consumers (Weld, 1915). Middleman specialization included activities still prevalent today such as assembling, storing, risk bearing, financing, rearrangement, selling and transporting. Such activities provide place and time utility, ie products in the right place through movement and at the right time through availability. Conversely, manufacturing provides form utility of goods through making tangible products from raw materials, while other marketing activities such as credit and quantity discounts provide possession utility. The operative instrument for such middlemen is the channel of distribution.

Hence, customer service represents the output of a firm's business logistics system and the physical distribution or 'place' component of its marketing mix. It is the interface between logistics activities and the demand creation process of marketing that measures how well a logistics system functions in creating time and place utility for customers (Grant, 2012).

A disintegration or segregation of physical distribution from the other three marketing mix variables of product, price and promotion began in the 1950s with the introduction of the marketing concept. Physical distribution activities were reduced to only physical supply and distribution functions, and the notion of physical distribution customer service was misplaced (Bartels, 1982).

However, a move to reintegrate physical distribution and marketing began when LaLonde and Zinszer initiated a refocus on logistics customer service with their major study, *Customer Service: Meaning and Measurement*, published in 1976. Their definition of logistics customer service was presented as:

> a process takes place between buyer, seller and third party. The process results in a value added to the product or service exchanged... the value added is also shared, in that each of the parties to the transaction or contract is better off at the completion of the transaction than they were before the transaction took place. Thus, in a process view: Customer service is a process for providing significant value-added benefits to the supply chain in a cost effective way.
>
> (1976: 15)

The concept of a customer service process suggests that logistics activities are more like services than goods. There are distinct differences between services and goods within the marketing mix category of product, and Hoffman and Bateson describe the four important characteristics that distinguish services from goods as:

> intangibility as services cannot be seen, smelt, felt, tasted or otherwise sensed similar to goods; inseparability of production and consumption as most services involve the customer in the production function; heterogeneity or inconsistency of the service from the perspective of the service delivery and customer experience; and perishability of the service if it is not consumed at the moment in time it takes place, i.e., the service cannot be inventoried.
>
> (1997: 43)

Primary logistics activities include transportation, warehousing, inventory management and order processing, and usually do not physically transform or affect goods. Logistics activities can certainly be heterogeneous, eg order cycle

time variability and consistency, and are also intangible, eg the storage or delivery of a good, and perishable, eg a lorry leaving on its delivery route.

Thus, logistics activities generally encompass characteristics and classification of services: ie benefits received by a customer such as time, place and possession utilities are provided by way of a service or enhanced product offering from logistics activities rather than from attributes of a basic product. However, customers have become more sophisticated and demanding since the 1980s and their expectations of suppliers' abilities to meet their needs have subsequently increased. Accordingly, many suppliers, retailers and service organizations have striven to improve logistics customer service processes to establish or maintain a competitive advantage. Desired outcomes are satisfied customers, increased customer loyalty, repeat and increased purchases, and improved corporate financial performance (Grant, 2004).

What is less clear is how customers, and indeed consumers, view how inseparable logistics activities are from other marketing activities. The customer is involved in the ordering and receiving stages but is usually passive throughout the provision of the logistics activities, provided service variability is within accepted bounds.

However, common definitions of logistics discuss the efficient and effective flow of goods, services and related information from point-of-origin to point-of-consumption in order to meet customer needs (Grant, 2012). Hence, it is implied that customers and consumers are involved in the logistics process to some degree.

When consumers set out for their weekly grocery shop to a retail supermarket, which can be considered a massive 'cash and carry' warehouse, they pick and pack goods, transport the goods to their homes, and put away the goods as inventory in their own personal cupboards or storage centres. Consumer logistics has therefore received some attention in recent years (Teller, Kotzab and Grant, 2006, 2012), and has become more important with the advent and growth of online retailing. Consumers now have a choice between undertaking their own physical distribution during a weekly grocery or other non-grocery shop, and outsourcing that task to the retailer or a third-party logistics service provider.

Products and prices are relatively easy for competitors to duplicate. Promotional efforts also can be matched by competitors, with the possible exception of a well-trained and motivated sales force. A satisfactory service encounter, or favourable complaint resolution, is one important way that a firm can really distinguish itself in the eyes of the customer or consumer. Logistics can therefore play a key role in contributing to a firm's competitive advantage by providing excellent customer service.

Thus, the application of logistics customer service would be well-served by the use of concepts and tools from the services marketing area. However, theories and techniques in the marketing discipline have been slow in finding application in logistics research, notwithstanding calls for reintegration with logistics and calls for other interdisciplinary applications in logistics (Stock, 1997, 2002).

The foregoing raises practical questions regarding logistics customer service and its application within firms. For example, what is the state of play in logistics customer service today? What are important elements of logistics customer service? And, how can firms establish appropriate customer service strategies and policies? These issues are explored in the following sections.

Logistics customer service today

Firms attempt to meet various shareholder/stakeholder requirements in the ordinary course of their business. Profitability, calculated from sales revenue (or turnover) minus expenses, is one of those requirements and is by no means assured for those firms that do not consider both factors carefully. Without profits, shareholder capital and retained profits will erode and bankruptcy might result.

Logistics costs such as inventory, warehousing, transportation and information/order processing comprise a firm's expenditure on customer service. Further, the objective for the firm is to maximize profits and minimize total logistics costs over the long term, while maintaining or increasing customer service levels. Such an objective might be considered a 'mission impossible' and firms must carefully choose among the various trade-offs to satisfy customers' needs and maximize profits while minimizing total costs and not wasting scarce marketing mix resources. Thus, there is a necessity to evaluate trade-offs between determining/providing additional customer service features sought by customers and the costs incurred to do so.

However, customer service levels may be higher than a customer would set them and, thus, choosing when to meet and when to exceed customer expectations is a key factor for firms. Not all service features are equally important to each customer, and most customers will accept a relatively wide range of performance in any given service dimension.

Further, most firms in the supply chain do not sell exclusively to end users. Instead, they sell to other intermediaries who in turn may or may not sell to the final customer. For this reason, it may be difficult for these firms to assess the impact of customer service failures, such as stock-outs, on end users. For example, an out-of-stock situation at a manufacturer's warehouse does not necessarily mean an out-of-stock product at the retail level. However, the impact of stock-outs on the customer's behaviour is important.

Empirical consumer research over the last 40 years has found that an average out-of-stock rate for fast-moving consumer goods retailers is 8.3 per cent, or, an average on-shelf availability of 91.7 per cent. Consumer responses to stock-outs include: buying the item at another store (31 per cent), substituting a different brand (26 per cent), substituting the same brand (19 per cent), delaying a purchase until the item becomes available (15 per cent), and not purchasing any item (9 per cent). Thus, 55 per cent of consumers will not purchase an item at the retail store while 50 per cent of consumers will substitute or not purchase the manufacturer's item (Corsten and Gruen, 2003).

One way to establish a desirable customer service level at the retail level is to take into account such consumer responses to stock-outs. When a manufacturer is aware of the implications of stock-outs at the retail level, it can make adjustments in order cycle times, fill rates, transportation options, and other strategies that will result in higher levels of product availability in retail stores.

These observations reinforce the notion that firms must adopt a customer-orientated view and seek out customer needs. Firms also have to ask customers the right questions to ensure important and relevant criteria are captured. And yet, despite 30 years of research and application of logistics customer service, the correct questions may still not be being asked. Empirically examining the factors for establishing an agile supply chain, one finds four critical barriers: companies are not coordinating governance and are proliferating products, but from a customer service perspective many firms are not considering the customer's point of view nor are they measuring customer service in a meaningful way.

This suggests that a customer's product and service needs and their subsequent supplier selection criteria for logistics services go beyond usual business-to-business criteria such as product quality, technical competence and competitive prices. Customer evaluation of logistics suppliers may include a number of intangible factors related to the service being provided as the customer seeks added value or utility from it.

An example is whether customer service representatives are on call 24 hours per day and what level of support is provided by the representatives. Amazon has introduced real-time, in-person tech support for its Kindle Fire tablets. When a customer presses the 'Mayday' button on a Kindle Fire HDX, a small box appears on the tablet. In the box is live video of a friendly Amazon customer support person. The customer can slide the support person's face around the screen so it does not block any key buttons or settings, and can then ask a question. If the customer prefers, the support person can simply take over and navigate and press the buttons, all while the customer watches it happen in real time (Kelly (CNN), 2013).

A firm must therefore have the ability to recognize and respond to customer needs if it is to have any chance in satisfying them and achieving the benefits of loyalty and profitability. But to do that it must initially determine what the customer's needs are, both from its own perspective and from that of the customers. The next section discusses possible logistics customer service elements and strategies.

Logistics customer service elements and strategies

LaLonde and Zinszer (1976) suggested that logistics customer service contains three distinct constructs: pre-transaction, transaction and post-transaction,

FIGURE 7.1 Elements of logistics customer service and relationships

Construct	Variable name
Pre-order (Pre-transaction)	Availability Appropriate OCT Consistent OCT
Order service and quality (Transaction)	Accurate invoices On-time delivery Complete orders Products arrive undamaged Accurate orders Consistent product quality Products arrive to specification
Relationship service (Post-transaction)	After-sales support Delivery time Helpful CSRs Customized services
Relationship quality (Post-transaction)	Trust Commitment Integrity
Global satisfaction *(The outcome . . .)*	Overall supplier quality Feelings towards suppliers Future purchase intentions

SOURCE: Grant, 2004: 191

which reflect the temporal nature of a service experience. A more recent study (Grant, 2004) from the customer's perspective, as opposed to the supplier's perspective, found similar constructs of logistics customer service. However, Grant's work found that the post-transaction construct also includes elements of relationships; his entire set of variables related to the three constructs is shown in Figure 7.1.

Firms can use this list of elements to develop their own customer service features; this list is by no means exhaustive but does provide an appropriate starting point for firms to develop logistics customer service strategies. They will likely have to add or delete some elements to service their own sectoral and local requirements.

These two studies also confirm that firms should categorize customer service elements into dimensions related to pre-transaction, transaction and post-transaction events when facilitating operations design and customer service planning. This categorization will enable firms to determine critical events in their service and allow them to monitor and follow up on service failures, as will be discussed in the next section.

The impetus to develop a logistics customer service strategy can be either proactive, reactive or a combination of both. A proactive impetus follows from a firm's desire to satisfy its customer's needs, while a reactive impetus results from a service failure.

Reactive techniques

Understanding and obtaining information about customer requirements necessitates an exchange of information between customers and firms. Complaint analysis is one such exchange concerning perceived customer dissatisfaction resulting from a customer service experience or critical incident.

Complaints derive from a 'moment of truth' between supplier and customer that is considered a critical incident. Critical incidents are defined in psychology as:

> any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act. To be critical, an incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning the effects. (Flanagan, 1954: 327)

Thus, a critical incident is a moment of truth that becomes representative in the mind of a customer (Lewis, 1993).

The critical incident technique (CIT) was developed as a process to investigate human behaviour and facilitate its practical usefulness for solving practical problems (Flanagan, 1954). CIT procedures consist of collecting and analysing qualitative data to investigate and understand facts behind an incident or series of incidents. Some uses of CIT applicable to business include training, equipment design operating procedures, and measurement of performance criteria or proficiency.

Complaint handling is significantly associated with both trust and commitment (Tax, Brown and Chandrashekaran, 1998). These concepts are important for supplier–customer relationship development. Complaint analysis thus has a role as part of a post-transaction process but is not a complete form of information for firms when used in isolation. However, such information does not provide an understanding about what customer service features actually provide customer satisfaction.

Complaint analysis has also been called a defensive strategy since its focus is directed at aggressively protecting existing customers rather than searching for new ones (Lapidus and Schibrowsky, 1994). Therefore, firms using only complaint analysis or CIT techniques might find it difficult to determine current and future success factors and establish a competitive advantage.

Proactive techniques

It is important that a firm establish customer service policies based on customer requirements and that are supportive of the overall marketing strategy. What is the point of manufacturing a great product, pricing it competitively, and promoting it well, if it is not readily available to the consumer? At the same time, customer service policies should be cost efficient, contributing favourably to the firm's overall profitability. A proactive customer service strategy allows a firm to consider all these factors.

One popular method for setting customer service levels is to benchmark a competitors' customer service performance. One major question is what to benchmark, and the Supply Chain Council's supply chain operations reference (SCOR) model provides a framework to analyse internal processes – plan, source, make, deliver and return (Shaw, Grant and Mangan, 2010).

There are several issues about the effectiveness of benchmarking, for example it may promote imitation rather than innovation; best practice operators may refuse to participate in any benchmarking exercise; it focuses on particular activities and thus there is a failure to allow for interactivity trade-offs; and, there is difficulty in finding well-matched comparators.

Further, while it may be interesting to see what the competition is doing, this information has limited usefulness. In terms of what the customer requires, how does the firm know if the competition is focusing on the right customer service elements? Therefore, competitive benchmarking alone is insufficient. Competitive benchmarking should be performed in conjunction with customer surveys that measure the importance of various customer service elements (Shaw, Grant and Mangan, 2010).

Opportunities to close differences between customer requirements and the firm's performance can be identified, and the firm can then target primary customers of competitors and protect its own key accounts from potential competitor inroads. The service quality model developed from the services marketing discipline and presented in the next section enables a firm to identify such differences and follows the call to use more interdisciplinary techniques in logistics customer service.

The service quality model

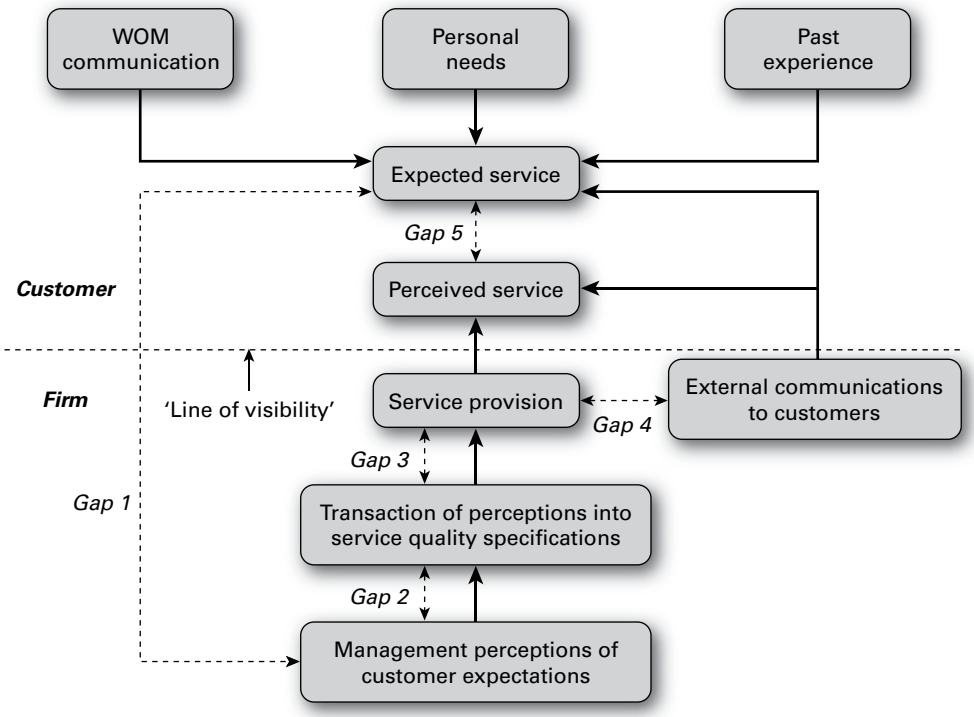
Customers evaluate services differently to goods, due to their different characteristics. One popular method to investigate such evaluations is the service quality or 'gaps' model (Parasuraman, Zeithaml and Berry, 1985). Customers develop a priori expectations of a service based on several criteria such as previous experience, word-of-mouth recommendations, or advertising and communication by the service provider.

Once customers 'experience' a service they compare their perceptions of that experience to their expectations. If their perceptions meet or exceed their expectations they are satisfied; conversely, if perceptions do not meet expectations they are dissatisfied. The difference between expectations and perceptions forms the major 'gap' that is of interest to firms.

Figure 7.2 presents this model and includes the customer's and the firm's positions. The expectations and perceptions 'gap' is affected by four other 'gaps' related to the firm's customer service and service quality activities, which are for the most part invisible to the customer.

First, the firm must understand the customer's expectations for the service. Gap 1 is the discrepancy between consumer expectations and the firm's perception of these expectations. Second, the firm must then turn the customer's expectations into tangible service specifications. Gap 2 is the discrepancy

FIGURE 7.2 Service quality or 'gaps' model



SOURCE: adapted from Parasuraman, Zeithaml and Berry, 1985, p 44

between the firm's perceptions of consumer expectations and the firm's establishment of service quality specifications.

Third, the firm must actually provide the service according to those specifications. Gap 3 is the discrepancy between the firm's establishment of service quality specifications and its actual service provision. Finally, the firm must communicate its intentions and actions to the customer. Gap 4 is the discrepancy between the firm's actual service provision and external communications about the service to customers.

Gap 5 is associated with a customer's expectations for a service experience as compared with their perceptions of the actual event, and is the sum of the four gaps associated with the firm, ie Gap 5 = (Gap 1 + Gap 2 + Gap 3 + Gap 4). The firm must minimize or eliminate each discrepancy or gap that it has control over in order to minimize or eliminate the customer's discrepancy or gap related to the service experience. Using the service quality model forces a firm to examine what customer service and service quality they provide to customers in a customer-centric framework, and is particularly important in an online retail setting as retailers try to fulfil consumer needs.

This is particularly important in the fast-growing online retail sector, which is considered in the next section.

Issues in online retailing service

During the past decade the internet has created a retail and consumer revolution by providing a new, convenient channel for shopping. The online retail market is growing rapidly and now covers a large assortment of products and services. Throughout this period retailers have had to ensure they offer consumers appropriate customer service and a pleasant online shopping experience, including the order fulfilment process.

The responsibility of many physical aspects of the fulfilment process, which previously lay with the consumer in-store and beyond, is now taken on by the retailer. This final extension to usual definitions of logistics management from 'point of origin to point of consumption' is referred to as the 'last mile' process and means that greater complexity now attaches to a retailer's distribution system. This has major implications for a retailer as the efficient management of distribution and fulfilment in the 'last mile' can reduce costs, enhance profitability and thus provide competitive advantage.

Online retailing of physical products accounts for two-thirds of total online sales in the UK and the Internet Measurement Research Group (IMRG) surveyed consumers in mid-2013 and found that 25 per cent of them said that online shopping was preferable to shopping in-store at Christmas due to better product ranges and special deals. Over 95 per cent of survey respondents said they planned to shop for some gifts online for Christmas, with about 50 per cent of respondents purchasing half of their shopping that way. Nearly two-thirds planned to use a mobile device to do so, and this represents a significant growth to almost one-quarter of online sales in 2013 compared to less than 1 per cent of sales in 2010 (Leggatt, 2013).

These online purchases involve the handling and transferring of physical products, ie packing, picking, dispatching, delivering, collecting and returning. Further, a product purchased online or 'virtually' cannot be used by the consumer until it is delivered to them at the right place, at the right time, in the right quantities and in the right condition.

Thus, from a consumer's perspective, fulfilment is generally considered to be of the utmost importance and a crucial attribute affecting their judgement of service quality and satisfaction. As such, fulfilment is a major challenge facing internet retailers and is possibly a major barrier preventing consumers from purchasing online.

Xing and Grant (2006) and Xing *et al* (2010) developed and tested an electronic physical distribution service quality (e-PDSQ) framework from the consumer's perspective to address the foregoing issues facing retailers who sell on the internet. The framework consists of four constructs: availability, timeliness, condition and return, and related variables, as shown in Table 7.1.

TABLE 7.1 E-PDSQ framework constructs and variables

Constructs	Variables
Timeliness (T)	Choice of delivery date Choice of delivery time slot Deliver on the first date arranged Deliver within specified time slot Can deliver quickly
Availability (A)	Confirmation of availability Substitute or alternative offer Order tracking and tracing system Waiting time in case of out-of-stock situation
Condition (C)	Order accuracy Order completeness Order damage in-transit
Return (R)	Ease of return and return channels options Promptness of collection Promptness of replacement

SOURCE: Xing and Grant, 2006, p 285

This e-PDSQ framework was empirically tested in a survey of online consumers in Edinburgh, UK and confirmed the framework's appropriateness. Price was the most important online purchasing criteria. This suggests it is the principal motivator in the online market, which is getting more price transparent due to consumers who are becoming more price sensitive.

The five variables most important to consumers in an online delivery context were order condition (reflecting its role in demonstrating a retailer's reliability); order accuracy (considered important for repeat business); order confirmation (which demonstrates consumers' unwillingness to wait and their intolerance with out-of-stocks); and easy return and prompt replacement (which reflect consumers' concerns over product returns).

This study provided a parsimonious set of e-PDSQ variables and constructs for retailers to use to design and operate their online offerings, based on the Parasuraman, Zeithaml and Berry (1985) service quality model, and thus demonstrates how firms can adapt and use models and ideas from other disciplines to provide effective customer service in a logistics context.

However, from a logistics perspective the study also highlighted challenges for retailers and their third-party logistics service providers (3PLSPs) who are responsible for the fulfilment process, particularly multi-channel retailers as opposed to pure player retailers such as Amazon and Asos (Xing *et al*, 2011).

Between 25 and 30 per cent of online purchasers do not remain at home to collect their goods when they are delivered. Leaving aside these apparent bad manners, the non-delivery of goods to consumers imposes extra costs on the retailer and its 3PLSP to try and deliver again, deliver to a pick-up point, or cancel the order.

To overcome this issue many retailers are now looking to implement 'unattended delivery' as an option for consumers to choose when purchasing online. Tesco is providing 'click and collect' for non-food products at some of its Metro and Express stores, while Asda has recently announced it will be providing collection points at several London Tube stations for consumers to pick up grocery or other purchases on their way home (Anderson, 2013).

Other ideas for the future include Amazon's intention to deliver small items by what they term PrimeAir, using 'drones' or 'octocopters' that have electric motors. However, this solution is projected for 2019 or thereabouts, as Amazon has to test the technology to ensure it works and conforms to US Federal Aviation Authority rules and regulations (BBC, 2013). While this idea conjures up a 'Jetsons-style' future, it doesn't address the issue of no one being at home. What would the drone do in that case?

In the meantime, what additional strategies should retailers adopt to ensure consistent fulfilment, handle seasonal peaks and ensure cyber-Christmas stockings are filled? Unipart Logistics (2013) considers that planning is critical and suggests setting up a cross-functional 'seasonal team' under a single manager to forecast potential seasonal activity using previous year's data; plan necessary changes to infrastructure, processes and manpower for the season; trial capabilities and resources in advance of the season; and plan for increased levels of returns during and after the season.

Summary

Customer service is a necessary requirement in logistics activities and is affected by various environmental factors shaping today's marketplace, including increasing online purchases by consumers. Logistics customer service has its roots in the marketing discipline and logisticians can use and learn from marketing techniques and methodologies to investigate customer service.

A strategy for logistics customer service requires a basic trade-off between costs incurred and enhanced profit received. Each industrial sector will also have its own unique needs and issues that further complicate such considerations. However, while the importance of individual customer service elements varies among firms, there is a common set of elements presented above that should provide a useful starting point for most firms.

A global perspective focuses on seeking common market demands worldwide rather than cutting up world markets and treating them as separate entities with very different product needs. However, different parts of the world have different customer service needs such as information availability, order completeness and expected lead times. Local infrastructure, communications

and time differences may make it impossible to achieve high levels of customer service. Also, management styles in different global markets may be different than those prevalent in the firm's 'home' environment.

Although customer service may represent the best opportunity for a firm to achieve a sustainable competitive advantage, many firms still do not implement logistics customer service strategies, or do so by simply duplicating those implemented by competitors. The service quality framework discussed above can be used by firms to collect and analyse customer information, determine what is really important to customers, and thus enhance their customer service initiatives. Globally, customer services provided by the firm should match local customer needs and expectations to the greatest degree possible. A successful output of such customer service considerations will be a satisfied customer, which should lead to increased profitability for the firm.

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People powering contemporary supply chains

08

JOHN GATTORNA
University of Technology, Sydney

Introduction

In some ways a lot of progress has been made in the supply chain field (including logistics) since the dawn of the internet. The concept of linking enterprises together to facilitate the smooth flow of products, services, information and finances came alive once we had access to the omnipresent capabilities of the internet as a communications medium, and the related burst of software development. The convergence of these two fields of activity allowed us to break away from the constraints of flawed organization designs and poor IT connectivity, and in the process 'operationalize' the concept of supply chain management, at last!

But in achieving this surge of progress we failed to grasp the fundamental reality that what really drives supply chains is people and their behaviour – not technology, or infrastructure, or assets, or anything else – those are just enablers at best and bit players at worst. Even the supposedly best organizations in the world have missed this fundamental point, although the likes of Dell and Unilever are now moving quickly to readdress this serious oversight.

The people that drive contemporary supply chains

First and foremost, it is customers who drive supply chains. Whether as a single consumer or a complex corporate customer, these are the people who set the die through the way they prefer to buy particular products and/or services. And by the way, those in the so-called service industries take note – everything I say in this chapter applies to you equally as much as to those with tangible products to sell.

Customers are in effect the 'head of the dog' and as such they should be wagging the tail (suppliers). But unfortunately, in the two decades since the mid-1990s – of easy business and easy money – suppliers have been allowed to design their logistics systems and infrastructure to suit their own purposes, rather than heeding signals coming from customers. Hence the onset of the 'one-size-fits-all' mindset, because this seemed to indicate a way of managing the marketplace with just one value proposition – easy if you can make it work. And work it seemed to, until relatively recent volatile times when we found out that customers were different after all!

Unfortunately, many companies have persisted with the 'one-size-fits-all' mentality right up to the current time, in the mistaken belief that things will get better again. Wrong. Things can only get worse if this policy is pursued, because the number of exceptions will increase exponentially, and so will the corresponding cost-to-serve. Time to rethink and reset your supply chains.

There is only one way to tackle the increasingly complex operating environment today, and that is: to go back and re-engage with customers, and let this experience guide and inform you as to how to design and manage contemporary supply chains. Meet the complexity at source, and not in some artificially protected internal environment. This was the challenge I and other researchers set ourselves two decades ago – to find a new business model that would work no matter how dynamic the market was. And we found it, and labelled it – *dynamic* alignment.

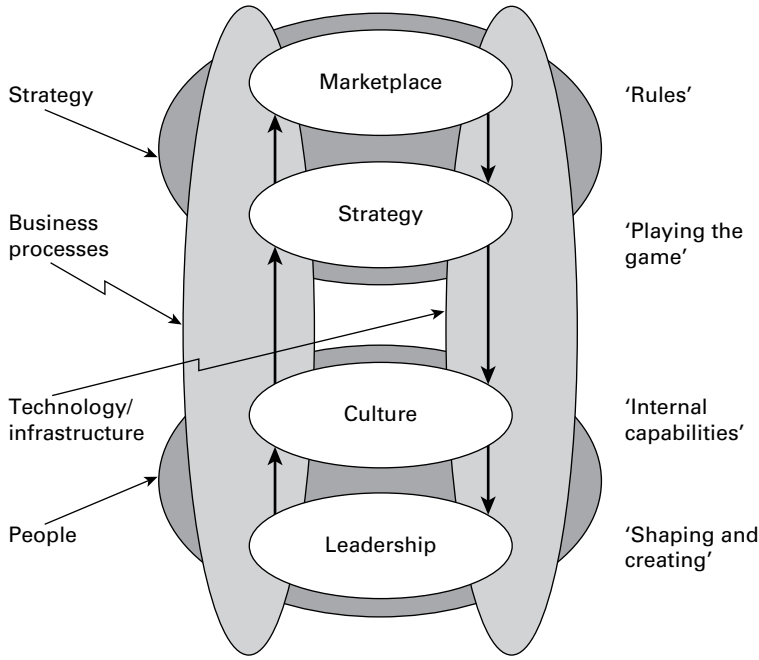
Dynamic alignment control

The great thing about this business model is that it is not a logistics or even supply chain model – it is a multidisciplinary business-to-business model. By going back to the fundamentals of how firms work, we found a way of linking the customer with the firm across a bridge of 'strategy'. Here is how it works.

From research and empirical observation we found that firms that performed well on a sustainable basis seemed to have superior alignment between the following four elements: customers, strategy, internal cultural capability and leadership style. I have depicted this configuration in Figure 8.1.

Furthermore, the firms that seemed to perform best, across all industries, seemed to be those where the leadership of the enterprise had a deep understanding and empathy for their marketplace and the customers within. It seemed that if these two fundamentals were in place, the appropriate strategies followed, as did the shaping of the appropriate internal cultures necessary to propel those strategies into the marketplace. The trick is to have in place a management team that really does understand the marketplace. This is the clear and inexorable precondition for success.

FIGURE 8.1 Elements of the 'dynamic alignment' framework



SOURCE: adapted from Figure 1.2 in Gattorna, 2006, p 16

But as we have already hinted, any marketplace you want to consider will have differences within it – people (customers) are just not the same all over. They look different and *are* different. The question is: how different? And are useful approximations possible on some bases?

So the big question we set out to answer in the early 1990s was: if we can't treat the marketplace as if all customers are the same, just how many different groupings or customer segments are needed to gain an adequate 'fit'? Is it 100? Is it 1,000 different segments? If so, then we are in trouble because such numbers are administratively unmanageable in the workplace.

The solution was right there in front of our eyes all the time.

Traditionally, enterprises had segmented their markets in just about every way possible, but almost always invoking their own internal perspectives, eg by size; by profitability; by industry sector; by type of institution. All these methods of slicing and dicing your markets are interesting at best, and downright misleading at worst. Indeed, to put it bluntly, we have been looking in the wrong places all along!

In truth, there is only one right way to segment your marketplace for purposes of informing supply chain design, and that is along behavioural lines. Look for clues to the 'buying behaviours' that exist in your served markets.

The rest will act as useful secondary filters if you want to cull your customer base down, as many leading companies are now doing.[1] And there are established research methods to do just this, eg conjoint analysis, although there are shortcuts from the full-on methodology that give answers which are almost as good.

So, over two decades of empirical work and observation in a wide variety of industries around the world we discovered the *patterns* we were looking for, and what these told us was as follows: 1) for any given product/service category there are never more than three or four dominant buying behaviours, which together account for up to 80 per cent of that market;[2] 2) here comes the dynamic bit – customers will change their dominant buying behaviour if the situation they find themselves in is such that they have no other choice; witness what has happened in markets all over the world due to the ongoing impact of the global financial crisis (GFC) in 2008–09.

So this was the answer we had been seeking, and it was an encouraging answer because it meant that any enterprise could get up to an 80 per cent fit to its market with three, or possibly four (at most), different value propositions – a very manageable number. Quite a few enterprises around the world are busily doing just this, as we speak!

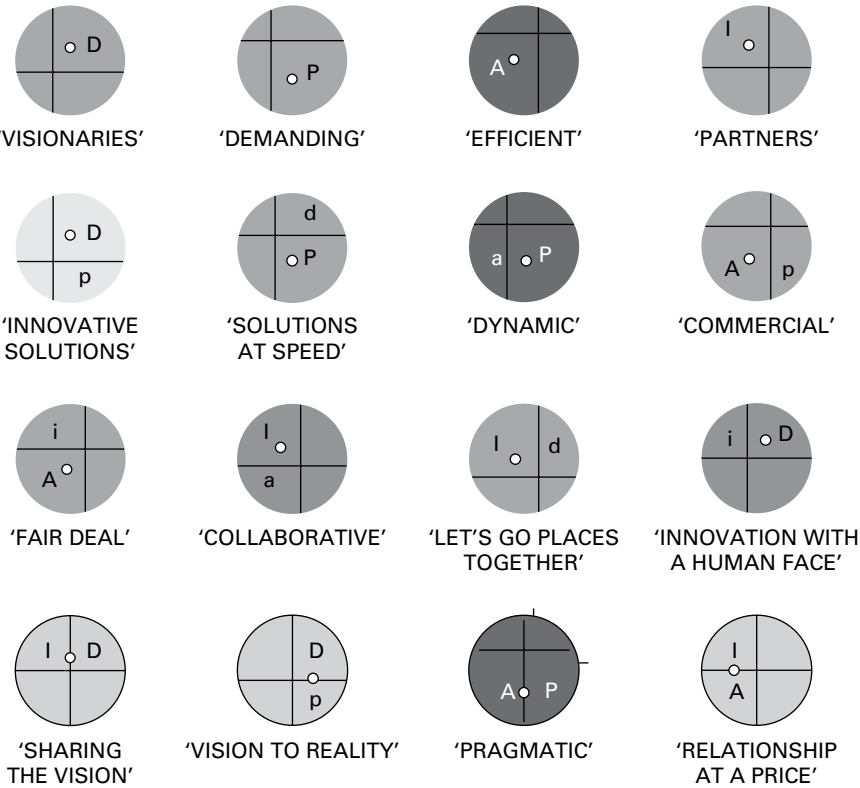
Finding the behavioural metric – key to unravelling the puzzle

The key to unravelling this puzzle lay in finding a common metric that could describe what went on at all four levels of the dynamic alignment model – market, strategy, internal culture and leadership style. Three of these four levels have a common factor – human behaviour, and the fourth (strategy) can easily be described in the selected behavioural metric.

Through our research into the work of Carl Jung[3] and Icak Adizes[4] we found the coding system that was to lead us towards the answer mentioned above – not one but three or four different behavioural patterns at most would provide an adequate fit to most if not all markets. This coding system, which we labelled P-A-D-I, is the DNA of business enterprises driven by human beings.[5]

Based on their work and our own observations, we came to the conclusion that there were up to 16 variants of human behaviour, as depicted in Figure 8.2, but never more than three or four of these were evident in any market at any one time.

FIGURE 8.2 The 16 possible behavioural segments/logics



SOURCE: Gattorna, 2006

We have observed all 16 behaviours at different times and labelled these for ease of communication, but the most common buying behaviours were undoubtedly the four described in Figure 8.3.

FIGURE 8.3 Four most common dominant buying behaviours

You must identify the dominant buying behaviours evident in your marketplace – normally 3 or 4 at most

Collaborative	*Efficient*	*Dynamic (QR)*	*Innovative Solutions*
Close working relationships for mutual gain	Consistent low-cost response to largely predictable demands	Rapid response to unpredictable supply and demand conditions	Supplier-led development and delivery of new ideas
Ia 	A 	 Pa	 Dp
• Mostly predictable • Regular delivery • Mature or augmented products • Primary source of supply • Trusting relationship • Teamwork/partnership • Information sharing • Joint development • Forgiving • Price not an issue	• Predictable demand within contract • Regular delivery • Efficiency low-cost focus • Multiple sources of supply • Little sharing of information • More adversarial • Standard processes • Power imposed • Transactional • Very price sensitive	• Unpredictable demand • Commodity relationship • Time priority/urgency • Opportunity focus • Ad hoc source of supply • Low loyalty, impersonal • Fewer processes • Outcome oriented • Commercial deals based on pragmatism • Price aware	• Very unpredictable demand • Higher risk • Flexible delivery response • Innovation focus • Rapid change • Individual decision making • Solutions oriented • Management of IP • Incentives/ego • No price sensitivity

SOURCE: adapted from Figure 2.2 in Gattorna, 2006, p 41

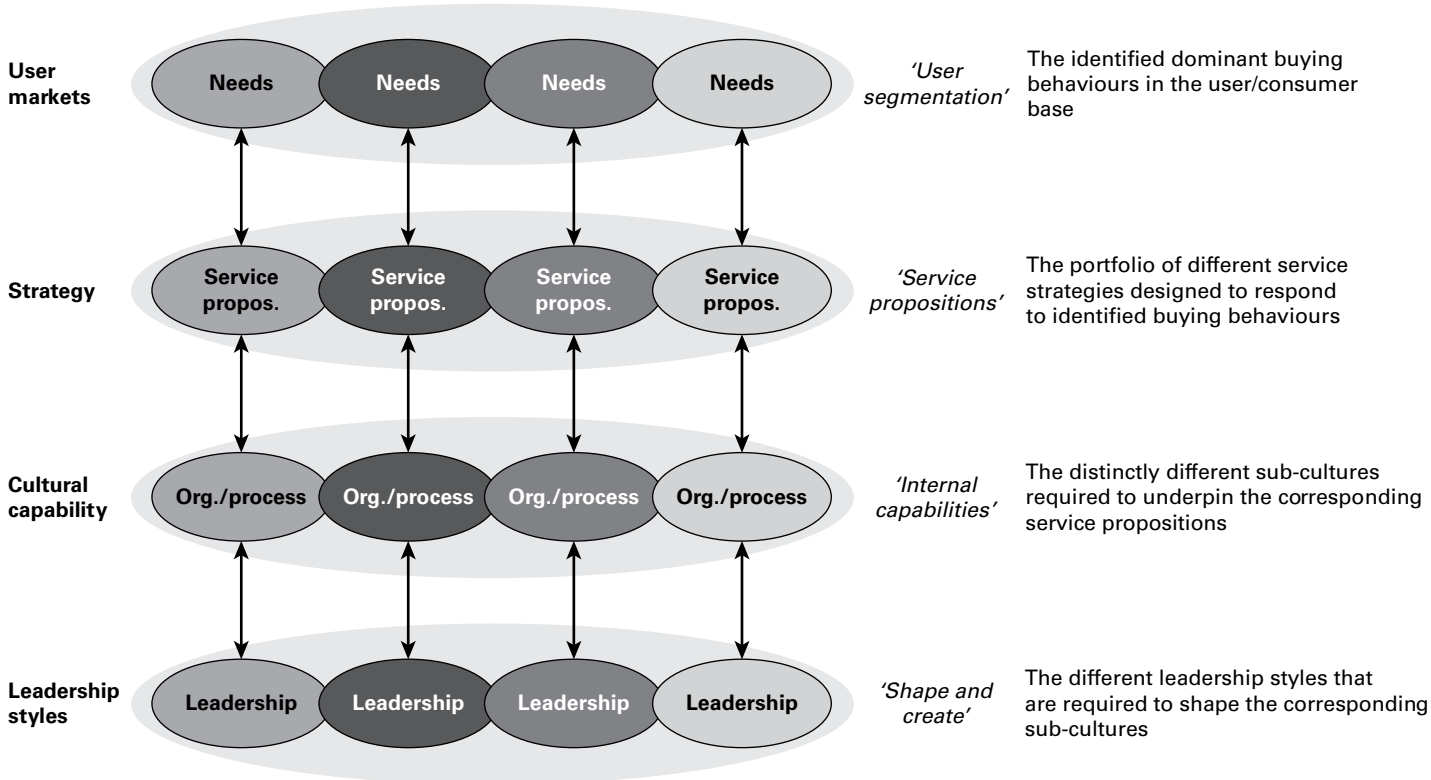
Now the head of the dog is back in control

Just as Gary Barter, the golf pro I go to for lessons,[6] is always saying that 'the left arm drives the company', the same principle applies to business: the customers drive the enterprise, often in ways that they don't fully appreciate.

Now that we have established that four behavioural segments largely describe many of the product/service markets being served, it is a short step in logic to recognize that this in effect means the existence of up to four discretely different supply chain configurations. I have described these four generic supply chain types in Figures 8.4 and 8.5. Variations around these four do occur, but it is rare.

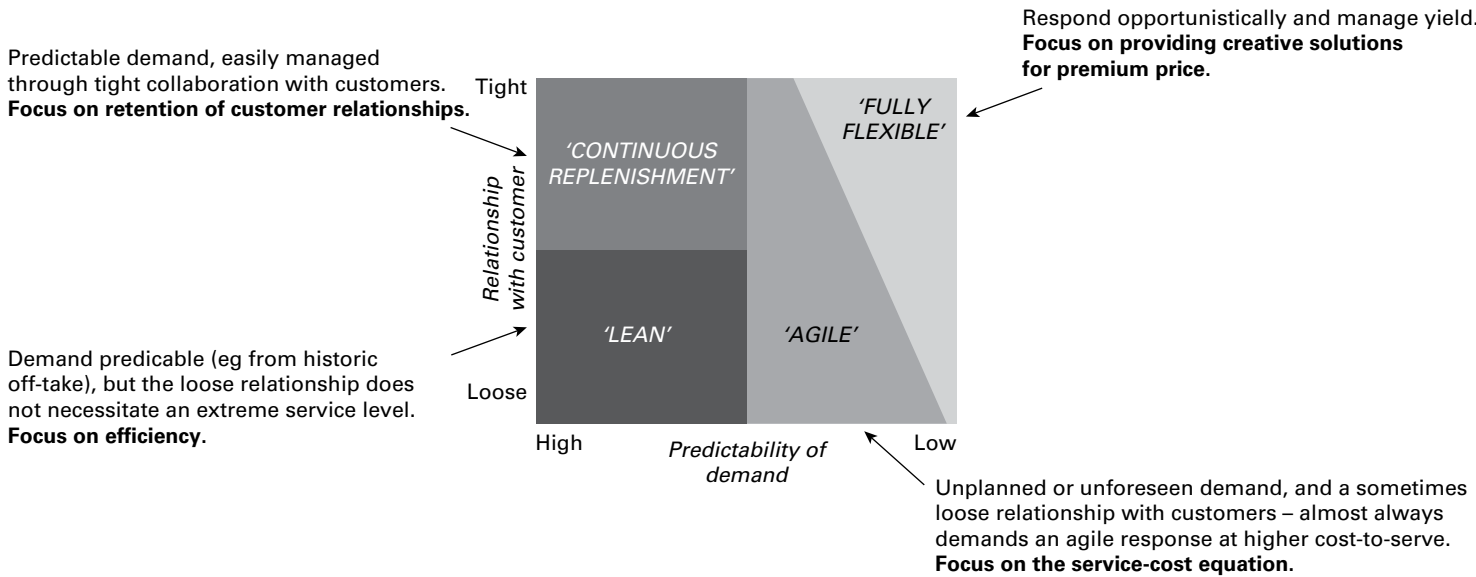
So, designing supply chains becomes relatively easy. All you have to do is 'reverse engineer' back after interpreting the behavioural segments in your market. You may even choose not to service all four – that is a judgement call you can make.

FIGURE 8.4 Multiple supply chain alignment on the customer side



SOURCE: adapted from Figure 2.1 in Gattorna, 2006, p 40

FIGURE 8.5 Four generic supply chain types



SOURCE: adapted from Figure 2.3 in Gattorna, 2006, p 43

But the 'forces of darkness' are lurking

So far, so good – until we get beyond the design phase to implementation, and we hit the next big snag. People, again, and this is not an issue confined to those people working in logistics or the wider supply chain. It involves all the people in the business.

What we found from empirical observation is that 40–60 per cent of best-laid plans were never implemented, and the reason was not anything to do with competitors. It was simply a matter of people in the rump of the enterprise saying 'No', they don't want to do this or that as instructed. These are the internal people factors that so many organizations do not understand how to deal with, or worse still, are in denial about.

In my view, unless and until senior executives in enterprises come to grips with this impediment to alignment, we will not progress much further in pursuit of peak performance over the next decade; this issue simply has to be addressed and resolved, just as we are coming to terms with the external influence of people in the form of customers and suppliers.

Listed below are the 12 capability levers that we need to understand and work with in shaping the types of subcultures that are required in the enterprise at any given time and situation. We know about all of them individually, but the trick is in the way we combine them into different recipes to address different change requirements:

- organization structure, reporting relationships, and decision rights;
- positioning people in the organization according to their natural strengths;
- processes;
- IT systems;
- key performance indicators (KPIs)/performance metrics;
- corresponding incentive schemes or motivators;
- planning systems;
- job design;
- methods of internal communication;
- training and development initiatives;
- role modelling;
- recruitment from external sources with both the required technical skills and appropriate mindset to support planned initiatives;
- leadership style of the top management team.

The four generic supply chains discovered

Now we have all the ingredients, it remains to describe how these all come together in each of the four generic supply chain configurations. This is best done diagrammatically as depicted in Figures 8.6, 8.7, 8.8 and 8.9. The different leadership style required for each type of supply chain configuration is also depicted in the same set of diagrams.

FIGURE 8.6 Continuous replenishment supply chain configuration: demand side

MARKET SEGMENT	'COLLABORATIVE'	CLOSE WORKING RELATIONSHIPS SOUGHT WITH SELECTED SUPPLIERS
FULFILMENT STRATEGY	**VALUE PROPOSITION**	**STRATEGIES** • Share information • Seek strategic partnerships • Seek long-term stability • Build mutual trust 
INTERNAL CULTURAL CAPABILITY	**CULTURAL LEVERS** 1. OD 2. People positioning 3. Processes 4. IT/Systems 5. KPIs 6. Incentives 7. Job design 8. Internal coms. 9. T & D 10. Role modelling 11. Recruitment	**'GROUP' SUB-CULTURE** • Relationship 'cluster' • Ensure bias in cluster is towards personnel with 'F' in their MBTI profile • Standard processes, eg Customer Account Management • CRM; VMI; ECR; CDP; CPFR • Emphasis on loyalty and retention • Encourage participative schemes • Authority/autonomy negotiated by consensus • Consultative; face-to-face • Team building • Managers with ESFP/MBTI profile are ideal • Recruit team players
LEADERSHIP	12. **LEADERSHIP STYLE**	**COACH** • Conscientious • Lead by teaching • Concerned for others • Loyal; committed; politically astute • Seeks agreement by consensus

FIGURE 8.7 Lean supply chain configuration: demand side

MARKET SEGMENT	'EFFICIENT'	REQUIRE RELENTLESS FOCUS ON COST AND EFFICIENCY
FULFILMENT STRATEGY	VALUE PROPOSITION	STRATEGIES • Seek economies of scale • Low cost production and distribution • Forecast demand; mature products; predictable lead times
INTERNAL CULTURAL CAPABILITY	CULTURAL LEVERS 1. OD 2. People positioning 3. Processes 4. IT/Systems 5. KPIs 6. Incentives 7. Job design 8. Internal coms. 9. T & D 10. Role modelling 11. Recruitment	*'HIERARCHICAL'* SUB-CULTURE • Organize clusters around core processes • Ensure bias towards personnel with 'S' in their MBTI profile • Standard processes; emphasis on cost • Replace legacy systems with ERP system • DIFOTEF; forecast accuracy; productivity ratios • Conformance to policies • Centralized control – rules and regulations apply • Regular; structured on 'need to know' basis • Emphasis on analysis and measurement • Managers with ISTJ (A) MBTI profile are ideal • Recruit players with deep analytical skills
LEADERSHIP	12. LEADERSHIP STYLE	TRADITIONAL • Leads by procedure; precedent • Implements only proven business practices • Cost controller; efficiency focus • Uses information to control • Seeks stability • Is risk averse

FIGURE 8.8 Agile supply chain configuration: demand side

MARKET SEGMENT	'DYNAMIC'	RESPONSE REQUIRED TO UNPLANNED OR UNFORESEEN DEMAND
FULFILMENT STRATEGY	**VALUE PROPOSITION**	**STRATEGIES** • Fast decision making • Fast delivery • Rapid response in unpredictable conditions
INTERNAL CULTURAL CAPABILITY	**CULTURAL LEVERS** 1. OD 2. People positioning 3. Processes 4. IT/Systems 5. KPIs 6. Incentives 7. Job design 8. Internal coms. 9. T & D 10. Role modelling 11. Recruitment	***'RATIONAL'* SUB-CULTURE** • 'Clusters' designed for speed and focused on specific sub-segments • Ensure bias towards personnel with 'N' in their MBTI profile • Process short-cuts; fast response; postponement techniques • Software applications: SCP; APS; Network models • Absolute speed of response • Achieve targets; cash and in-kind bonuses • Authority/Autonomy established by clear and published limits • Formal; regular; action-orientated • Problem solving; resource allocation and management • Managers with ENTJ (P) MBTI profile are ideal • Recruit personnel who are results-driven
LEADERSHIP	12. **LEADERSHIP STYLE**	**COMPANY BARON** • Leads by objectives (MBO) • Embraces change • Goes for growth • Focuses on what's important • Analytical; fact-based negotiations

FIGURE 8.9 Fully flexible supply chain configuration: demand side

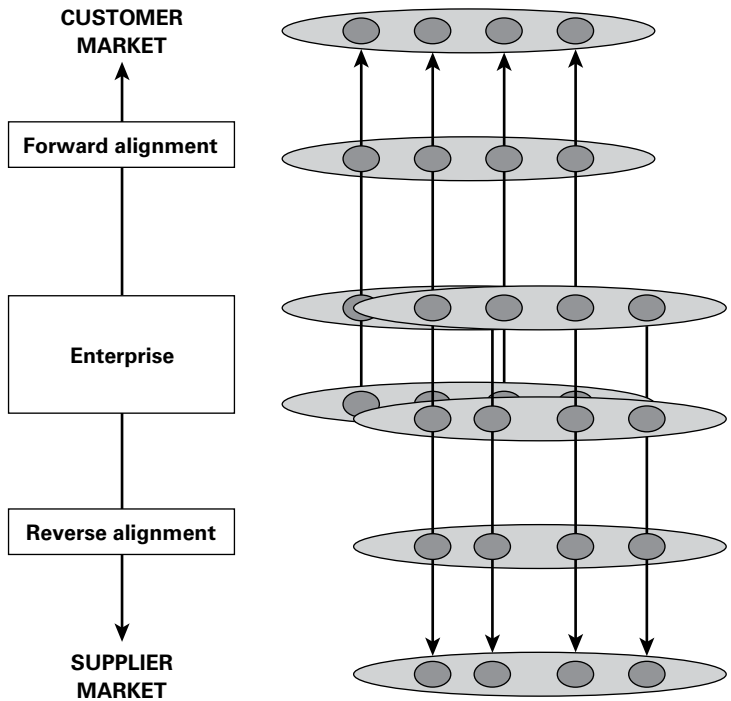
MARKET SEGMENT	**'INNOVATIVE SOLUTIONS'**	**CREATIVE SOLUTIONS REQUIRED, VERY FAST**
FULFILMENT STRATEGY	**VALUE PROPOSITION**	**STRATEGIES** • Meet unplanned/unplannable demand • Innovative solutions, delivered fast
INTERNAL CULTURAL CAPABILITY	**CULTURAL LEVERS** 1. OD 2. People positioning 3. Processes 4. IT/Systems 5. KPIs 6. Incentives 7. Job design 8. Internal coms. 9. T & D 10. Role modelling 11. Recruitment	**ENTREPRENEURIAL** • Small multidisciplinary 'cluster', usually on standby, but can be full-time • Ensure bias towards personnel with 'P' in their MBTI profile • No standard processes; use local initiative at the time • Low systems requirements; event management applications • Emphasis on finding creative solutions, very fast • Reward individualism and risk-taking behaviour • Autonomy through empowerment • Spontaneous and informal • Lateral thinking; brainstorming • Managers with ENFP (D) MBTI profile are ideal • Recruit enterprising, resourceful personnel
LEADERSHIP	12. **LEADERSHIP STYLE**	**VISIONARY** • Leads by inspiration; is authentic • Informal • Decisive • Cares about ideas • Values innovation

The supply side as a mirror image

But there is more. On the supply side of our enterprises there is a stakeholder that has largely been ignored in the past – suppliers. They have gone about their business, seemingly in isolation, unconnected to the supply chain as we know it. Those days are also gone as enlightened enterprises move to reconnect their procurement functions and suppliers on the back end of the enterprise to the rest of the business. The silos are gone, and working together in multi-functional clusters is the way forward to improved performance. Figure 8.10 is a schematic that depicts how the two sides of the business, forward and reverse, are connected.

Indeed, the whole area of supply-side sourcing is coming back into focus once again as the world reels from the impact of the 2008 financial services meltdown on the real economy. Since the start of the new millennium, multinational corporations in particular have been pursuing global sourcing strategies in the relentless search for lower-cost sources of inputs to manufacturing. This in turn has had the effect of 'making supply chains longer and more fragmented, and this is exposing firms to greater costs and risks'.[7] The same research also found that most firms were still largely basing their procurement decisions on a minimum price approach rather than a more sophisticated 'total cost of ownership'.[8] Finally, the same global trade appears to be significantly contributing to the emission of greenhouse gases because of the added transportation legs involved, and this flies in the face of efforts to reduce such emissions. Maybe we will see a change back to regional and local sourcing as a result of this new factor that is concerning the community at large. Indeed, from our own work we see a clear trend towards a sub-segment, within the overall 'Collaborative' segment, which appears to be very empathetic towards the environment, and will punish suppliers along the supply chain who do not take appropriate measures to minimize their carbon footprint.

FIGURE 8.10 Supply side alignment, the mirror image of the customer side



Buyer behaviours
- Collaborative
- Efficiency/consistency
- Demanding/quick response
- Innovative solutions

Demand-side strategies
- Continuous replenishment
- Lean
- Agile
- Fully flexible

Cultural capabilities
- Group
- Hierarchical
- Rational
- Entrepreneurial

Leadership styles
- Coach
- Traditional
- Company baron
- Visionary

Procurement strategies
- Continuous replenishment
- Lean
- Agile
- Fully flexible

Supplier behaviours
- Trusted and reliable partners
- Planned creativity
- Process driven
- Opportunistic

SOURCE: adapted from Figure 3.5.2 in Gattorna, 2003

Supply-side alignment

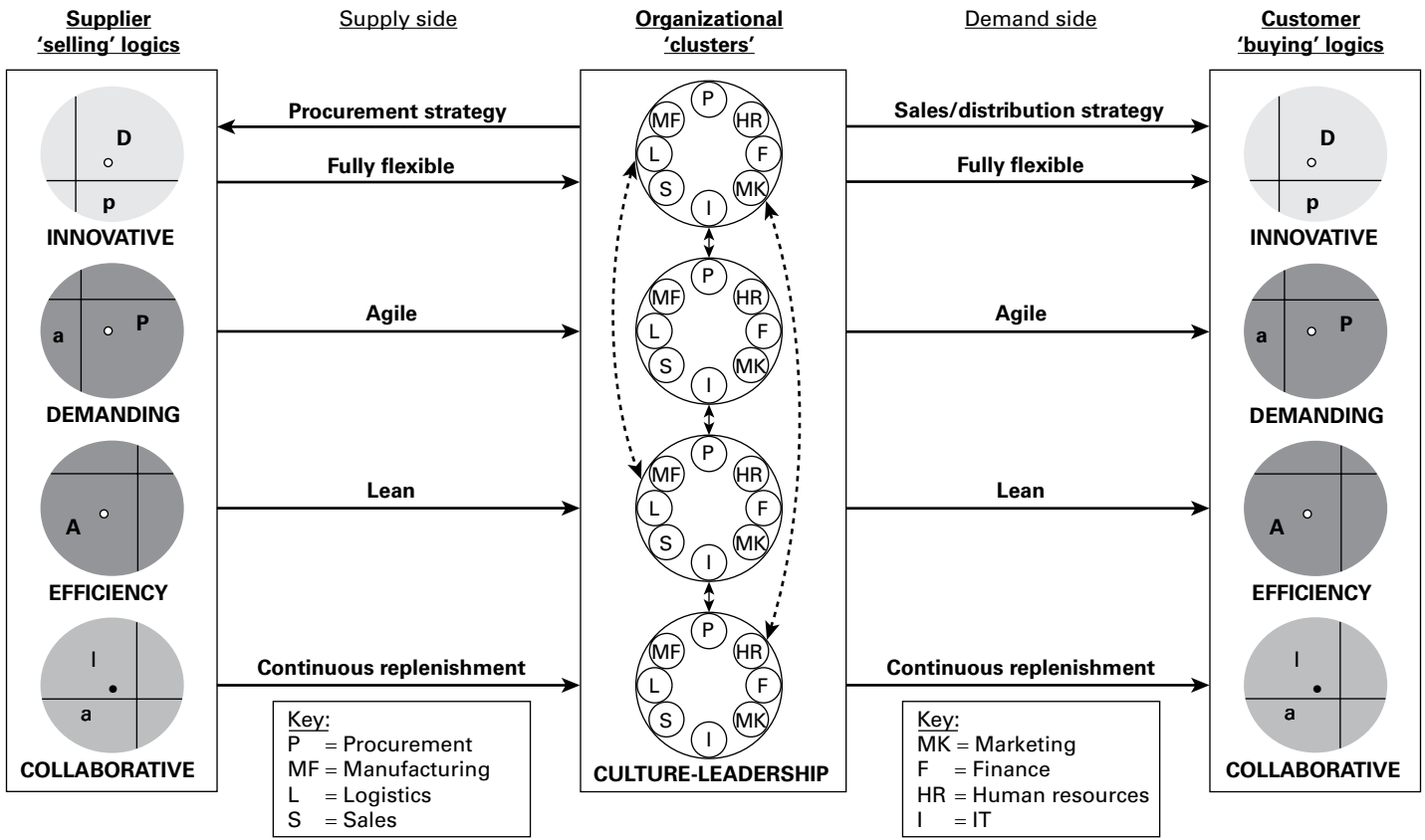
Like demand-side alignment, supply-side alignment is multidimensional, and takes its lead from the market side. However, it seems that many of the activities practised on the supply side (strategic sourcing; global sourcing; spend analyses; etc) have been taking place in a relative vacuum, with little direct reference to demand-side customer buying patterns. Even worse, assumptions are too often made inside the procurement side of the business about the assumed 'selling behaviour' of suppliers, and this leads directly to inappropriate procurement strategies. For example, Brazil's largest meat processor, JBS, was endeavouring to gain a larger share of the live cattle herd for slaughter, and the conventional wisdom inside the firm was that all ranchers (suppliers) are sensitive to the price they are paid, and will move to the buyer who offers a few more dollars per head. When a behavioural segmentation of sellers was undertaken, the results were quite the opposite. Over three-quarters of the ranchers were found to be inclined towards some element of relationship with the buyer, and open to a service package involving different combinations of technical assistance; training and development; credit; and other non-price factors. As a result, the buying company was able to adjust its procurement strategies to reflect these underlying buying preferences and thereby better align with the supply market.

Hybrid supply chains

In the end, the most common situation in industry is that different combinations of demand-side and supply-side supply chain elements occur. It is rare to see a pure 'lean' or pure 'agile' supply chain all the way through. This then brings into focus the question of organization structure, which we will have to leave for another day. Suffice to say that our recommendation is that enterprises embrace a multidisciplinary 'cluster' design, as depicted in Figure 8.11.

As depicted, the individual clusters are designed around the characteristics in both the customer and supplier segments, in a pure sense. However, where there is a mix of different elements, say lean on the supply side and agile on the demand side, then the corresponding clusters will work in a coordinated way to get the desired alignment at both ends. This is the innovative new aspect in supply chain management, which has the potential to lift performance by a quantum.

FIGURE 8.11 A new and dynamic business model for supply chains of the future



SOURCE: Gattorna, 2009, Figure 9.6, p 143

Reverse logistics

Finally, to round things off we must mention 'reverse logistics' where the customer becomes the supplier, and again we must embrace 'alignment' principles for best results. We will handle this topic by studying the different reverse paths that it is possible for a product to take.[9]

The continuous replenishment return path – where relationships are the key driver

Bessemer is an Australian company that has made and distributed premium quality aluminium cookware for 40 years. It offers customers a 40 per cent discount on a new product with a trade-in of an existing product. Many of its customers are loyal devotees of its product and this very attractive incentive keeps them repurchasing. As the items have a longer than normal life cycle, however, the repurchase period may be 8–10 years after the original sale.

On many dimensions this is a very savvy approach. Returns constitute one-third of the total aluminium used in production. At a cost per tonne, at the time of writing, of over USD 2,000 and as recycled product requires considerably less processing, the economics are very attractive. The offer also enhances the 'premium' brand image by providing an additional benefit, and positions Bessemer as a responsible manager across the full life cycle of the product.

The return path is supported by the extensive national network used for forward movements, and the complexity is minimized because the returned item is introduced into the return path when it is exchanged for the new item. When each depot reaches an economic transfer quantity (usually a pallet), the items are dispatched, mostly with the vehicle delivering new stock. The quantities returned, after many years of this operation, are quite predictable.

This is a classic example of leveraging a loyal customer base appropriately and developing a stable and cost-effective return operation around that relationship. The continuous replenishment return path will often be built on dependencies. In this case the manufacturing operation is highly dependent on the returns as inputs, and the marketing arm is dependent on the incentive to maintain and build an ongoing relationship with customers. Stable patterns also lend themselves to fine-tuning based around analytics, and in this case the variability of supply would be a key element in the analysis.

The lean return path – where cost is the key driver

Where items are expected to have no reclaimable value, or for regular and stable recycling of low-value inputs, the key driver is usually cost, and the emphasis is on routine patterns with minimal need for management intervention.

The household waste recycling process, where paper, glass, steel and aluminium are removed on a regular weekly/fortnightly basis and directed through a predictable separation process, should be designed around the reliability and rigour of a lean path.

The agile return path – where time is the key driver

Where there is an opportunity for resale, time usually needs to be the key driver in the returns process. Studies undertaken on the Hewlett-Packard Equipment Management and Remarketing (EMR) operation found that laptops being refurbished for resale in secondary markets could take over four months through the various phases of staging and processing before being made available for sale.[10] Obviously the recovery value of computer equipment deteriorates rapidly and time lost is value lost in these markets. One source of delay in this process was the use of the same manufacturer for refurbishment as for original equipment production. Inevitably new production was given a higher priority. A complicating factor in this market was also management's perception that they needed to limit sales of refurbished items in order to hold up the price of new laptops. Analysis as part of this study, however, found that the markets for each were different and there was little substance to this concern.

Time-sensitive returns should be treated as a value stream, not a waste stream. The priority is to manage lead times, avoid bottlenecks and support the operation with a flexible organization structure geared around identifying and quickly capturing market opportunities.

The fully flexible return path – where it's all about risk

Whereas the fully flexible supply chain features rarely in the forward supply chain, in the reverse supply chain it is a feature of every major manufacturer's armoury – but hopefully only in their contingency plans. A fully flexible path requires fast, dynamic and creative responses to unforeseen situations. For most companies this means recall programmes, natural disasters or other, similarly high-risk, situations.

The recall programme is an important reverse logistics situation. It requires detailed contingency planning with specialized arrangements, and capacity commitments from logistics providers that can be turned on immediately they are needed. Despite all the planning, however, when the situation arises it will inevitably also require creative and fast decisions responding to the particulars of the situation. Reputational risk is so high in these situations that cost cannot be a consideration, just as holding or paying for spare capacity can often be justified as a risk minimization strategy.

Last word

I hope that the impression that this chapter leaves you with is that there is an enormous upside available if a truly *customer-centric* dynamic alignment business model is adopted in full. It applies first at the customer end, but then naturally influences what we do inside the enterprise and backwards to our supply base, and it also guides and informs us as we try to design a sustainable reverse logistics process for our products and services.

Notes

1. Linfox, an Australian-based 3PL that serves 11 Asian markets, has culled its customer base over the past three years by 40 per cent, and at the same time doubled revenue and doubled profits
2. See Chapter 2 in Gattorna (2006), pp 38–39 for more details
3. See Adler, Fordham and Read (1971)
4. Adizes (1979)
5. See also Gattorna (2006), pp 16–24 for a more detailed explanation
6. Gary Barter is an award-winning teaching golf pro based at the Australian Golf Club, Sydney
7. Christopher (2007), p 3
8. Christopher (2007), p 3
9. I am indebted to my colleague Deborah Ellis for her input to this section
10. Guide, Muyldermans and Van Wassenhove (2005), pp 281–93

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Linking supply chain management to shareholder value

09

HEIMO LOSBICHLER
University of Applied Sciences Upper Austria

FARZAD MAHMOODI *Clarkson University*

Introduction

Intense global competition, short product life cycles, and the need to create shareholder value have resulted in significant interest in supply chain management over the past several years. More recently, the force and speed of the global downturn that began in 2007–08 has further reinforced the importance of supply chain excellence as a key to unfreeze cash, reduce operating cost, and meet rapidly changing customer demand. Against a backdrop of economic uncertainty and rising supply chain risk, it is more critical than ever to select the supply chain initiatives that create the most shareholder value.

This chapter describes the link between supply chain management and shareholder value creation. We first define economic value added (EVA) as the primary financial metric, and conduct an analysis of three North American and European companies that are generally perceived to be supply chain leaders. Then we link supply chain management to shareholder value and propose a comprehensive five-step framework to identify supply chain initiatives that create the most shareholder value by utilizing EVA. Finally, we describe the difficulties and pitfalls in creating shareholder value along the supply chain.

Financial performance and its drivers

The goal of a corporation and its top executives is generally to maximize the long-term financial performance of the company and its value to shareholders. Financial performance and shareholder value are measured by utilizing a

variety of metrics. In today's global equity markets, companies are expected to generate competitive returns for the investors. For publicly traded companies, the total return to shareholders (TSR) is measured by the increase in stock price plus the dividends. It is the external financial performance of a company and a very critical view of shareholder value (fuelled by stock option programmes) that can easily divert management's focus to short-term strategies that might be rewarded by the financial markets but turn out to be a burden in the long term. Even Jack Welch, former CEO of General Electric, who is regarded as one of the strongest proponents of the shareholder value movement, said amid the consequences of the 2008–09 economic crisis that he never meant to suggest boosting a company's share price should be the main goal of the top executives (Welch, 2009).

Although shareholders can only increase their individual wealth from an increase in stock price and dividends, TSR is an inappropriate metric because it is not always clear what drives a company's stock price. In the long run, stock prices are driven by company profits or cash flows. Therefore, we refer to shareholder value in this chapter from the perspective of the internal financial performance of a company. Even from this internal perspective shareholder value goes by many names. Over the years two basic concepts related to either discounted cash flow or economic profit (eg EVA) has been proposed to measure shareholder value. Despite the ongoing debate about which metric is superior for determining the value of a firm (Anderson, Bey and Weaver, 2005), in practice EVA is the metric that most executives value.

The key performance metric: EVA

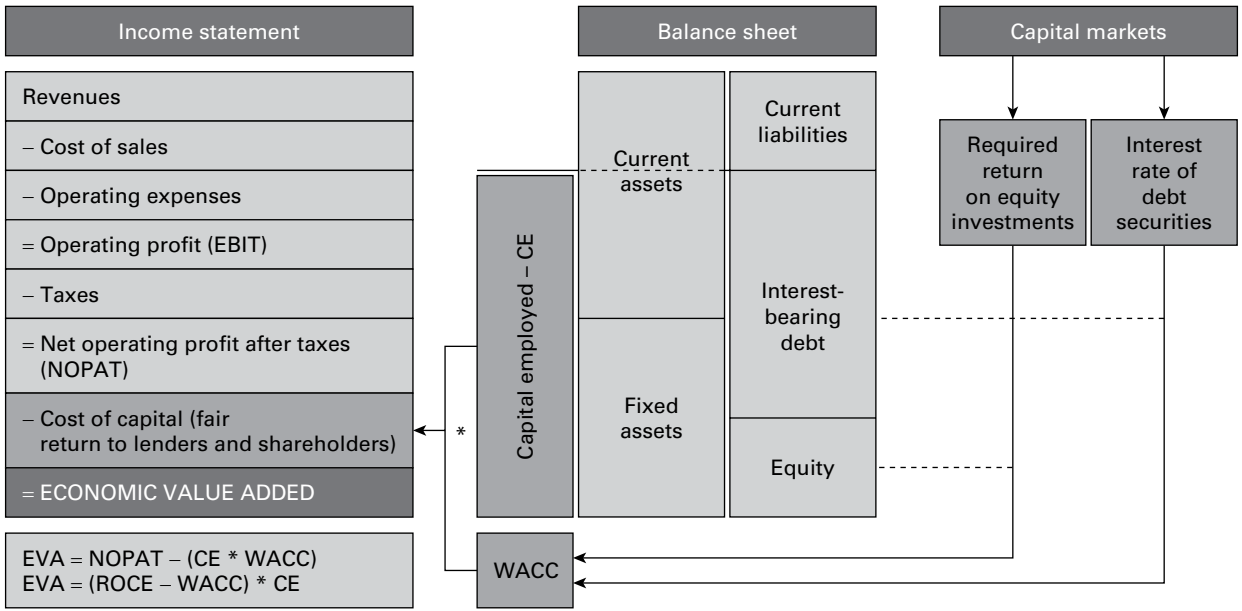
EVA is defined as the residual wealth calculated by subtracting the total cost of doing business (ie operating costs, taxes and cost of capital) from the revenues. It is a comprehensive measure that enables managers to determine whether they are earning an adequate return (Stewart, 1991). While accounting profits measure profits earned, EVA defines the difference to what should have been earned in other investments of similar risk. If EVA is positive, the operational business can cover total costs, including the cost of the capital employed (ie equities and liabilities). Thus, if the company is earning a higher return than other investments of similar risk, the stock price should increase and shareholder value is created. However, if EVA is negative, value is being destroyed and the company faces the flight of capital and a lower stock price.

As illustrated in Figure 9.1, EVA is a measure of net operating profit after taxes, less cost of capital employed. EVA is also the spread between a company's return on capital employed (ROCE) and the weighted average cost of capital (WACC), multiplied by the capital employed (CE):

$$\begin{aligned} \text{EVA} &= (\text{ROCE} - \text{WACC}) * \text{CE} \\ \text{ROCE} &= \text{NOPAT} / \text{CE} \end{aligned}$$

(NOPAT = Net Operating Profit After Tax)

FIGURE 9.1 Calculating EVA



The key point is that value is only created when revenues exceed all costs, including cost of capital (ie ROCE has to exceed WACC). Management guru Peter Drucker described EVA as: 'There is no profit unless you earn the cost of capital. Alfred Marshall said that in 1896, Peter Drucker said that in 1954 and in 1973, and now EVA has systematized this idea, thank God.' (Drucker, 1998)

Drivers of financial performance

As indicated above, the return on the capital that is required for doing business has to be higher than the interest rate we pay for the capital to lenders and shareholders. Thus, the return of capital employed (ROCE) is EVA's major driver and ROCE can easily be mapped to its basic drivers: revenues, costs and capital employed (assets). Note that it is better to break down capital employed into fixed assets and working capital. This allows the analysis of the trade-offs between lower inventory and higher equipment efficiency. As a result, ROCE and EVA have four basic value drivers, which all can be impacted by supply chain management initiatives:

- higher revenues measured by revenue growth;
- lower cost measured by profit margin;
- lower fixed assets measured by fixed asset utilization;
- lower working capital measured by cash-to-cash (C2C) cycle time.

The C2C cycle time is a composite metric describing the average days required to turn a dollar invested in raw material into a dollar collected from a customer. The C2C cycle time is equal to days' sales in inventory (DSI), plus days' sales outstanding (DSO), minus days' payables outstanding (DPO), as illustrated in Figure 9.2.

Figure 9.3 illustrates the basic link between supply chain management and shareholder value: supply chain initiatives can affect all four value drivers of

FIGURE 9.2 Cash-to-cash cycle time calculation

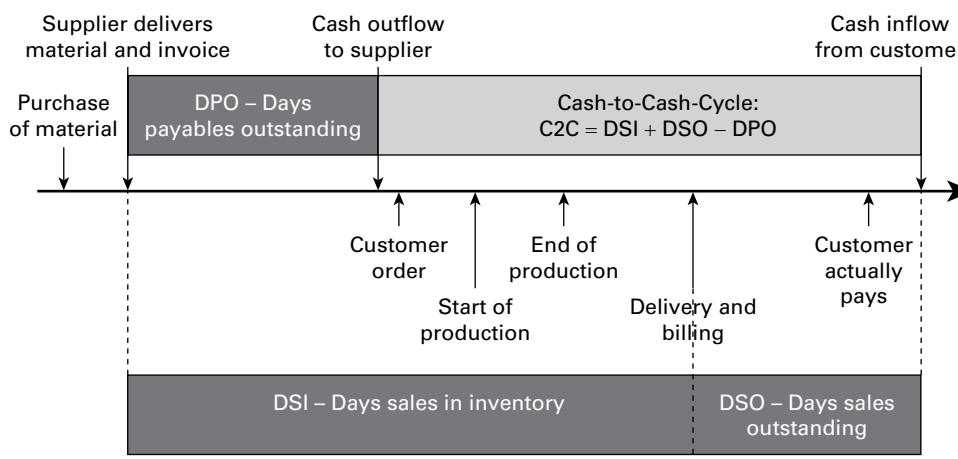
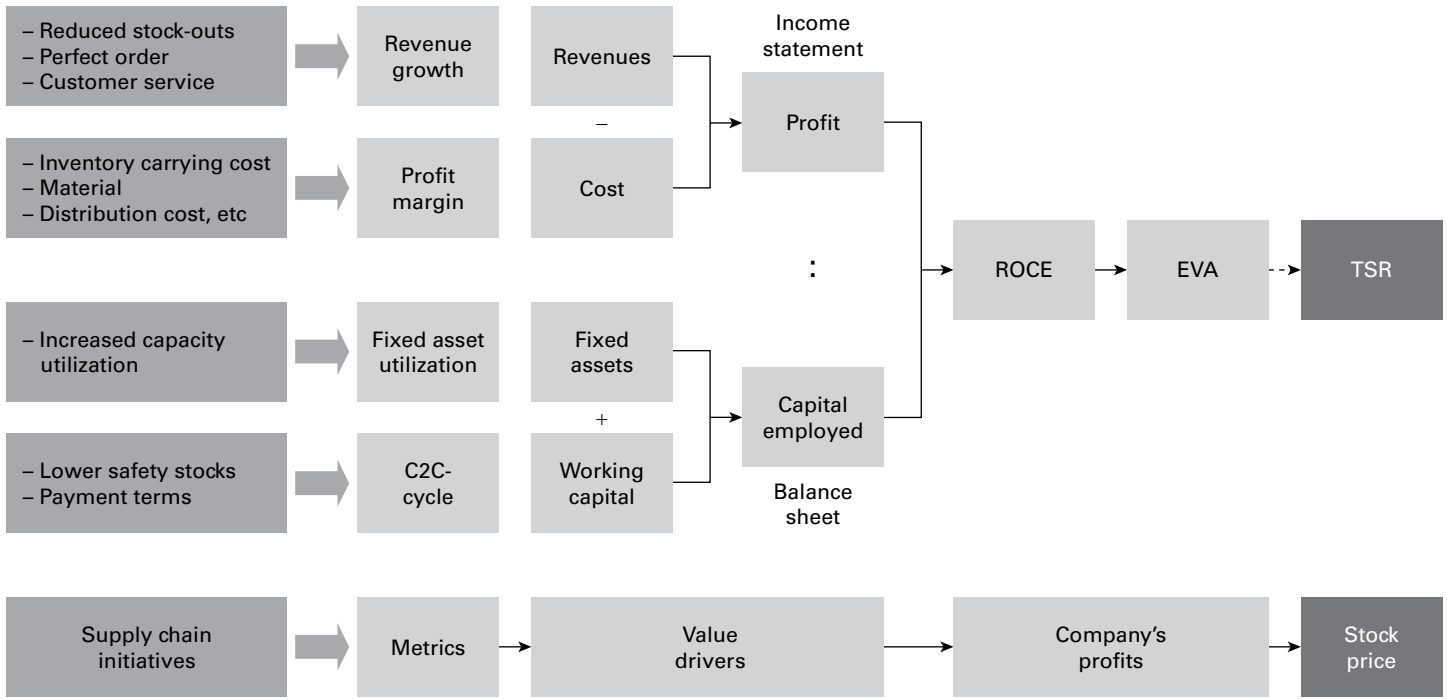


FIGURE 9.3 Link between supply chain management and shareholder value



a company's internal financial performance measured by EVA. This financial performance enables companies to pay dividends to shareholders and drives companies' stock price, in the long term. Thus, supply chain management can create shareholder value.

Note that EVA is a comprehensive metric that accounts for the trade-offs between income statement and balance sheet. Supply chain decisions often simultaneously affect more than one driver of financial performance. In fact, they involve trade-offs between revenues, costs and assets. For instance, lower unit costs as a result of offshoring can be offset by higher in-transit costs, an increase in the lead time and higher inventory-carrying costs due to increased safety stock requirements. For example, the source with the lowest unit cost may not have the highest impact on shareholder value (Ferreira and Prokopets, 2009). Utilizing EVA can help managers make better decisions and extract greater value from supply chain initiatives.

Linking supply chain management and financial performance

Supply chain management competency has been cited as playing a critical role in creating shareholder value by directly impacting revenue growth, operating costs, working capital and customer satisfaction (Camerinelli, 2009). In addition, numerous studies have examined the supply chain management competency as a means of creating competitive advantage (eg Cook, Heiser and Sengupta, 2011; Christopher, 2011). Research has shown that supply chain effectiveness can lead to increased firm financial performance (eg Craighead, Hult and Ketchen, 2009). Such outcomes have been primarily attributed to lower cost and increased efficiency in the supply chain.

Greer and Theuri (2012) investigated the linkages between firm supply chain leadership, as determined by Gartner's Top-25 supply chain ranking, and overall financial performance. The goal of this study was to determine the overall financial health of supply chain leader firms and whether they demonstrated more financial health compared with firms not chosen as supply chain leaders in the same industry sector. Their results indicated that firms identified as supply chain leaders consistently outperformed their non-supply chain leader peers in accounting-based costs, activity and liquidity ratios. They also concluded that the decisions made by supply chain managers have an impact on the financial health of the firm.

Ellinger *et al* (2012) examined the influence of supply chain management competency on customer satisfaction and shareholder value (as measured by EVA). Utilizing data from Gartner Supply Chain Group's 2007–10 Top-25 supply chain ranking, they assessed the supply chain management competency. The results indicated that firms recognized by peers and experts for superior supply chain management competency exhibited higher levels of customer satisfaction and shareholder value than their respective industry averages.

Hartmann, Kerkfeld and Henke (2012) utilized a performance measurement model to empirically validate whether purchasing and supply management contributes to the company's financial success, and whether the financial value contribution is mediated by benefits of cost, quality and innovation performance. Their survey results indicated that a comprehensive implementation of purchasing and supply management activities contributed to an improvement in purchasing and supply management outcomes, which in turn mediated company success.

According to a McKinsey study (Constantine, Ruwadi and Wine, 2009), companies with high-performing supply chains enjoy lower distribution and logistics costs, better customer service and better inventory performance than ordinary performers. This study, based on in-depth interviews with more than 60 company operations executives across Europe and North America, assessed the performance of companies in more than 50 aspects of supply chain management, including business processes, corporate culture, network configurations, organizational structures, supporting infrastructure and the capabilities of personnel.

Finally, Leuschner, Rogers and Charvet (2013) conducted a meta-analysis to determine the impact of supply chain integration on firm performance. Their results indicated that there is a positive and significant correlation between supply chain integration and firm performance.

Major challenges in supply chain integration

According to Grey *et al* (2003), supply chain initiatives such as vendor management inventory, postponement and risk pooling can have a significant impact on all four drivers of financial performance. However, the benefits of such initiatives are notoriously difficult to quantify due to supply chain integration issues, resulting in supply chain misalignments. Major challenges in supply chain integration include:

- Many supply-chain-related expenses cut across organizational units; the practice of grouping expenses into natural accounts such as salaries, rent, utilities and depreciation fails to identify or assign operational responsibility. In addition, budgeting process generally lacks systems perspective by viewing requirements in any specific activity on a unit-cost basis, resulting in efficiency in one area without full appreciation of the impact on other areas.
- Traditional accounting practice fails to assign appropriate inventory carrying costs by primarily focusing on the cost of capital (ie understate the carrying costs by not including insurance, taxes, obsolescence, damage, spoilage, shrinkage, overhead, etc).
- The two largest individual supply chain expenses (ie transportation and inventory) are generally reported in a manner that obscures their importance and are not meaningful to other senior executives. For example, utilizing metrics such as transportation costs per mile, or warehouse picking costs per unit versus more systemic and

comprehensive supply chain metrics that relate supply chain activities to the overall financial objectives of the organization.

As a result, companies focus on what they can see and measure rather than what is relatively invisible and hard to measure. For example, since lost revenue does not appear on the income statement, companies tend to focus on supply chain solutions that are slow and cheap rather than more agile and expensive.

What supply chain leaders do in practice

In this section we describe the supply chain characteristics, practices and strategies pursued by three North American and European companies that are generally perceived to be supply chain leaders in their respective industries: Zara, Dell and Wal-Mart.

The unique supply chain management practices of Spanish garments retailer Zara has enabled it to gain competitive advantage over other global fashion retailers (Loeb, 2013). Zara's parent company (Inditex) has been opening an average of more than a store a day for the past few years, leveraging its centralized distribution infrastructure to rapidly expand its online presence. Zara brings a large variety of high-fashion apparels to the market very quickly, based on customer feedback, at a relatively reasonable price by utilizing a responsive supply chain. Zara's vertically integrated, aligned and agile supply chain enables it to place the latest designs in any store across the world in two to three weeks. The company produces more than 12,000 fashionable designs a year in a limited quantity, with new designs appearing in the stores twice a week. Such small and frequent shipments has kept inventories fresh and scarce, compelling customers to frequently visit the store in search of what's new and to buy now, because it *will* be gone tomorrow (Anderson and Lovejoy, 2007).

Zara's quick turnaround on merchandise helps generate cash that eliminates the need for significant debt. Potential bottlenecks are avoided because Zara is vertically integrated. For short lead times, 60 per cent of the manufacturing processes are outsourced in countries close to the Zara headquarters, and the postponement strategy is utilized effectively. Finally, Zara maintains a strong relationship with its contractors and suppliers, viewing them as part of the company (Anderson and Lovejoy, 2007).

Dell provides a large variety of customized products (with highly uncertain demand) at a reasonable price by utilizing a responsive supply chain. Dell has transformed its supply chain into a multi-channel, segmented model, with different policies for serving consumers, corporate customers, distributors and retailers in order to maximize both customer service and profitability (Blanchard, 2010). Dell spearheaded a process in which a 'back-end' intranet links its material planners directly to supplier inventories in order to share a wide variety of real-time information regarding its customers and its own assembly plants. Dell immediately shares incoming order information with its suppliers, who deliver to Dell plants from supplier-owned warehouses located near the plants. The suppliers also use this information to improve the accuracy of

their forecasts, because of long delivery lead times of some of their parts from second- and third-tier suppliers. From the time a customer order is received at Dell's plant, a personal computer can be shipped in less than four hours, and the computer can be in the customer's possession the next day.

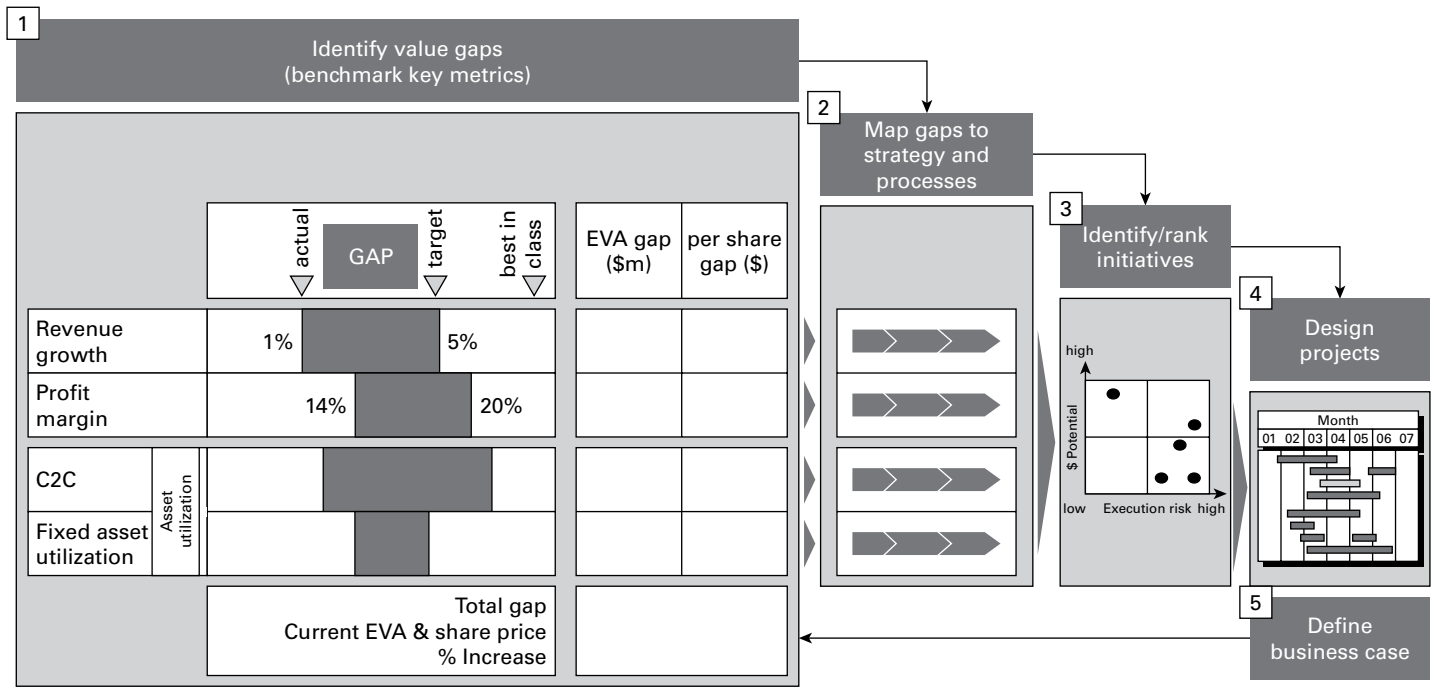
Wal-Mart, the largest retailer in the world, is believed to be one of the best supply chain operators of all times. Many analysts attribute Wal-Mart's leadership status in the retail industry and its phenomenal growth to its pursuit of a hybrid supply chain management strategy that focuses on both efficiency and responsiveness (Gilmore, 2012). The company has been able to offer a large variety of products at the lowest cost. Two major factors have contributed to this success: efficient and responsive distribution and transportation systems (resulting in reduced logistics costs and lead time), and its computerized inventory system, which has shortened replenishment cycles, speeded up the checking-out time and recording of transactions, as well as minimizing inventory carrying and stock-out cost. Furthermore, Wal-Mart has been able to reduce its purchasing costs by procuring directly from manufacturers, bypassing all intermediaries, as well as utilizing its enormous purchasing power to obtain more favourable terms from its suppliers. Finally, Wal-Mart has utilized sophisticated technology and information systems to track sales and merchandise in its facilities, and to communicate effectively both internally and with its supply chain partners across the globe. The benefits of such supply chain practices includes lower costs, reduced lead times, higher inventory turnover, increased warehouse space, reduced safety stocks, better customer service and better working capital utilization.

There are clear trade-offs between possessing responsive and efficient supply chains. While agile supply chains create shareholder value by primarily increasing revenue growth and shortening C2C cycle time, efficient supply chains create shareholder value by increasing a company's profit margin and fixed asset utilization. It is critical to view supply chain management as a powerful tool that can help optimize the trade-offs between the many financial levers in a company: working capital, payment terms and stock levels, operating margins, product write-downs and write-offs, etc.

Framework to identify initiatives that create the most shareholder value

A framework is required to help supply chain managers create value and achieve supply chain excellence. While the supply chain operations reference (SCOR) model advocates a set of supply chain performance indicators as a combination of reliability, cost, responsiveness and asset measures, it does not guide managers to identify the supply chain initiatives that create the most shareholder value. We propose a five-step framework that spans from identifying value gaps to defining the business case for selecting specific supply chain initiatives, as depicted in Figure 9.4.

FIGURE 9.4 Proposed framework to create value and achieve supply chain excellence



Step 1 – identify value gaps

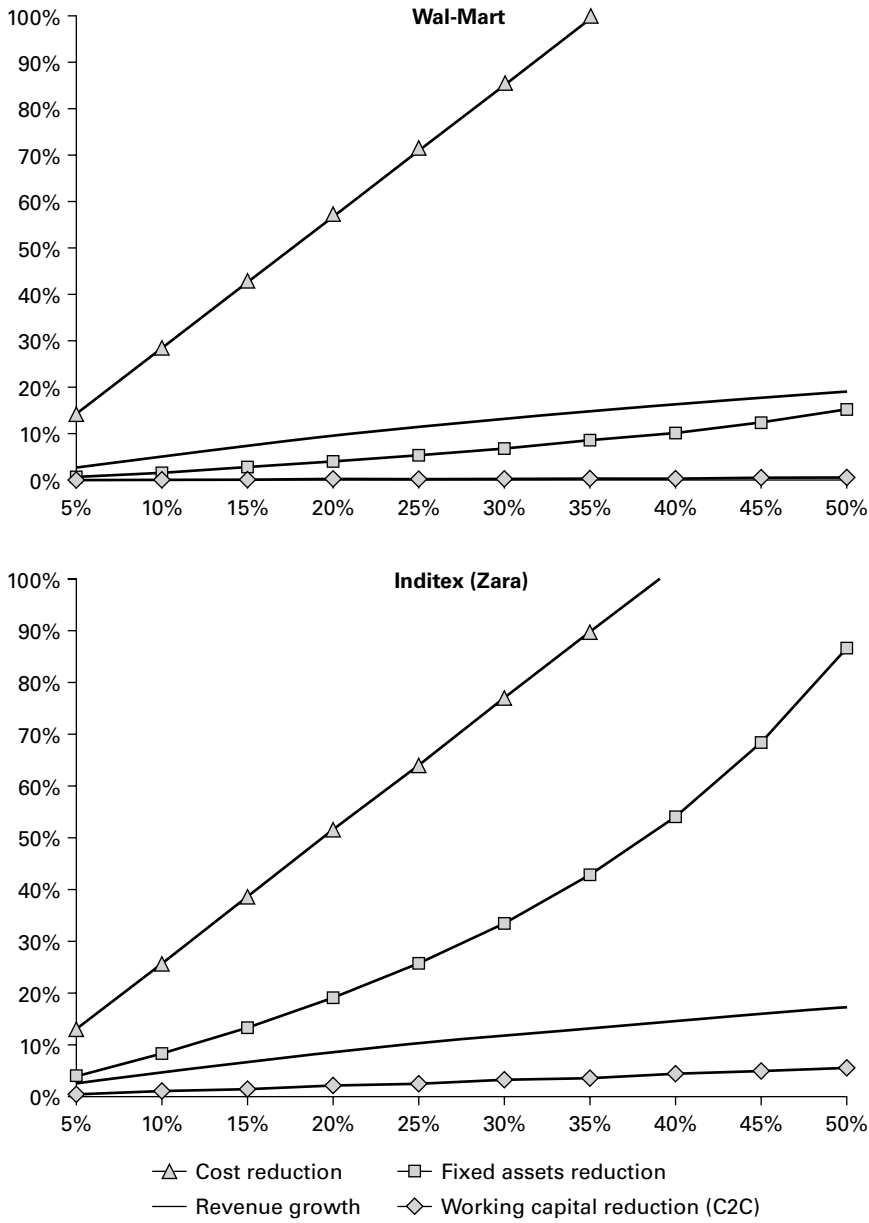
Management's attention first needs to be directed to the areas where the potential for value creation is high. Therefore the first step is to conduct a high-level financial performance gap analysis. The four value drivers – revenue growth, profit margin, fixed asset utilization and cash-to-cash cycle time – should be benchmarked with a peer group. Value gaps can be identified and targets can be set. For example, if a company's revenue growth rate is 1 per cent per year while its peer group is experiencing a 5 per cent growth rate per year (and the best in class is growing by 8 per cent), then the gap of this value driver (compared to the peer group) is 4 per cent. Subsequently, the improvement in ROCE and EVA (ie EVA gap) can be calculated by applying 4 per cent additional growth to the company's current growth rate (see step 1 in Figure 9.4). The gaps can be converted into ROCE, EVA or stock price gaps. The size of these gaps helps to identify those supply chain drivers that offer the greatest leverage on shareholder value and ensure that managers only consider the supply chain initiatives that can create the most value.

We have already analysed the financial leverage of the four value drivers for the supply chain leaders. The financial impacts we present rely on numerous assumptions. For instance, which liability accounts are deducted from current assets to determine working capital? This task is critical, as it has a significant impact on the outcome and requires accounting expertise, but a detailed presentation of the balance sheets and description of these assumptions would go beyond the scope of this chapter.

Figure 9.5 illustrates the impact of the four value drivers on ROCE for Wal-Mart and Zara. Cost reduction by far provides the highest leverage to improve financial performance. For Wal-Mart, a 5 per cent reduction of total operating cost (cost of sales plus operating expenses) would boost ROCE by about 14.1 per cent (from 17.9 to 32.0 per cent), assuming everything else remains unchanged. In contrast, a 5 per cent reduction of fixed assets would only account for a minor ROCE improvement of 0.9 per cent. Note that these figures rely on certain assumptions. For instance, we assumed an 80 per cent variable cost model for determining the impact of revenue growth. If we compare Wal-Mart and Zara we can see that increasing the fixed asset utilization is more attractive for Zara than revenue growth. This is not the case for Wal-Mart because of its hybrid strategy. Finally, Figure 9.5 illustrates the limited potential of working capital improvements for Wal-Mart and Zara because they have optimized working capital over many years. Wal-Mart's cash-to-cash cycle time equals 9.7 days while Zara already has a negative cash-to-cash cycle time of –18.6 days (these numbers and Figure 9.5 are based on the 2013 annual reports).

Determining EVA-gaps and analysing the leverage of the value drivers at the beginning guarantees that managers only consider supply chain initiatives that can create the most value.

FIGURE 9.5 The impact of the four value drivers on ROCE for Wal-Mart and Zara



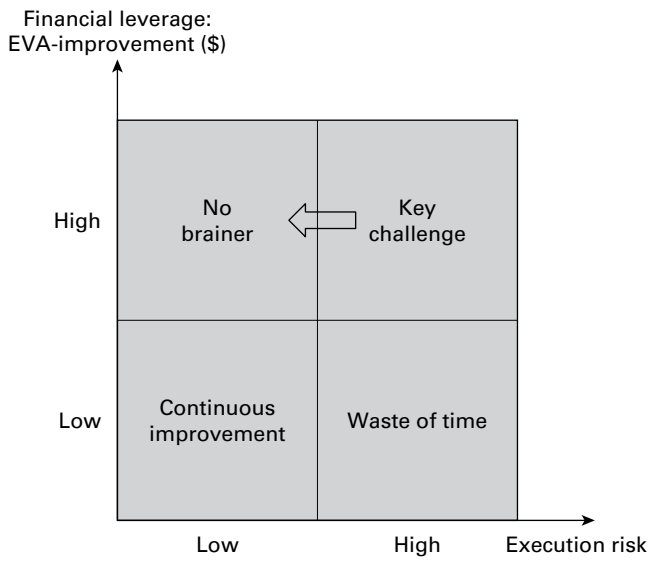
Step 2 – map gaps to supply chain processes

In the second step, the identified gaps have to be mapped to the company's strategy and its supply chain processes. For instance, if the company desires shorter cash-to-cash cycle time and its unique selling proposition is short delivery times, the company may carry significant amount of inventory resulting in a higher cash-to-cash cycle time. Upon comparison of the company's cash-to-cash cycle time with its peer group in step 1, the company will realize that its cash-to-cash cycle time is longer. Subsequently, in step 2, the company is required to justify this choice rather than blindly reducing inventory and potentially losing customers. However, if the value gap is simply due to supply chain inefficiencies, then the company should address root causes and make process improvements.

Step 3 – identify and select supply chain management tools

The goal of this step is to identify and select appropriate supply chain initiatives that can improve the identified business processes and close the value gap. An EVA impact matrix, categorizing supply chain initiatives based on their level of execution risk and their corresponding financial leverage (ie EVA improvement), such as the one depicted in Figure 9.6, can help evaluate the estimated EVA improvement and its difficulty of implementation. This would offer a systematic framework to unveil and rank supply

FIGURE 9.6 Financial leverage versus execution risk matrix



chain initiatives according to their attractiveness in terms of financial leverage and likelihood of success. Note that at this stage it is not necessary to quantify the financial impact precisely.

To be successful, it is important to distinguish between the potential financial leverage and the difficulty to achieve the expected improvements. For instance, in Figure 9.5 the great leverage of cost reductions is illustrated. If Zara was able to reduce total cost by 20 per cent it could boost ROCE from 62.4 per cent to an amazing 113.7 per cent. But how likely is such an improvement? Most companies' supply chain initiatives are typically designed to reduce stock-outs, lead times, purchase prices, transportation costs, warehousing costs, inventory carrying costs, fixed costs, as well as increasing service levels. Despite all these efforts, according to a recent study (Mahmoodi, Losbichler and Hofer, 2014), the majority of European companies were not able to make sustainable improvements in the four value drivers from 2003 to 2011, as illustrated in Figure 9.7. Note that the profit margins and cash-to-cash cycle times of the European manufacturing companies have remained fairly flat, their revenue growth have been inconsistent, while their fixed asset utilization have improved only slightly. Thus, European companies have not been able to improve their financial performance from 2003 to 2011; their ROCE decreased slightly from 10.0 to 9.7 per cent.

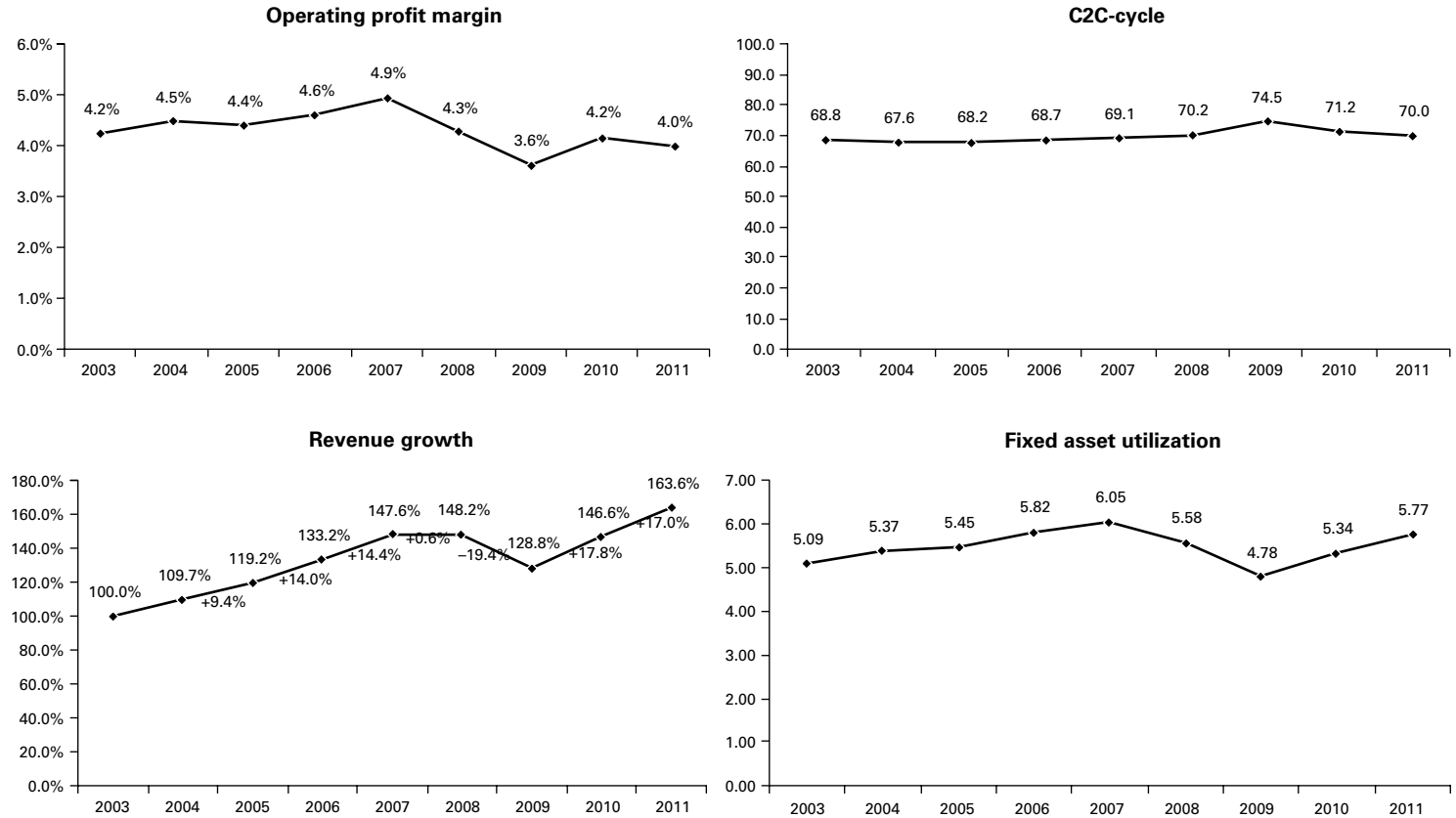
Step 4 – design projects

This phase transforms the alternatives for optimizing the supply chain into specific projects. For each project, the scope, targets and resources should be defined. These project plans are needed to develop the business case, as discussed in step 5.

Step 5 – define the business case

For each individual project a business case has to be developed to determine the value created. Therefore, the impact on the four financial value drivers (ie growth, profitability, fixed asset utilization, and cash-to-cash cycle time) must be determined. Because of the complex nature of supply chain initiatives (ie they typically impact several corporate functions), managers should be aware that developing the business case for each project independently can lead to double counting of benefits or ignoring synergies. Business cases should be determined for the portfolio of initiatives (Grey *et al*, 2003). Clearly, using scenarios created in interdisciplinary teams can be very helpful. Then, the potential value created for each project and required investment is evaluated to determine which projects should be accepted and rank the accepted projects. Finally, the EVA improvement as a result of the business case should be compared with the identified EVA gap.

FIGURE 9.7 Long-term development of the value drivers in European manufacturing companies (2003–11)



Difficulties in improving supply chain financial performance

While only few executives question the relevance of supply chain management as a tool to improve a company's financial performance, many remain critical about its ability to achieve major improvements across the entire chain. This may seem to be a paradox, but it is the nature of supply chain management that is diminishing the power beyond a firm's border. Many supply chain management efforts to improve the financial performance in one area of the supply chain will actually be offset by a decline in other downstream or upstream areas. For example, lower purchase prices will reduce the buyer's cost, but will also lower the supplier's revenues and profits. Lowering working capital by shortening the cash-to-cash cycle time through longer payment terms to suppliers will be correspondingly offset by the increase of the supplier's cash-to-cash cycle time. In such a scenario, the supply chain cash-to-cash cycle time will not change at all, as illustrated in Figure 9.8.

Good intensions can produce bad results, as improvements in one area of the supply chain may be offset by the decline in other areas of the supply chain. In fact, improvements in one area can actually lower the overall financial performance of the supply chain. Consider a company that shifts raw material inventory to its supplier in order to relieve its balance sheet. This shift would reduce its working capital and its associated capital carrying cost. If suppliers have higher cost of capital than the company does, total supply chain carrying cost will actually increase. Someone in the supply chain will have to absorb these higher costs. Depending on the company's bargaining power, it is fairly common to shift working capital to suppliers.

FIGURE 9.8 Company's C2C cycle time versus supply chain C2C cycle time

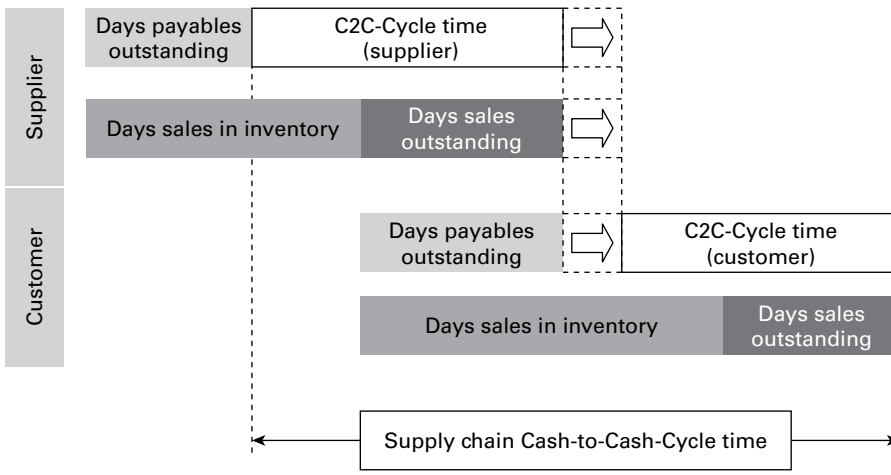
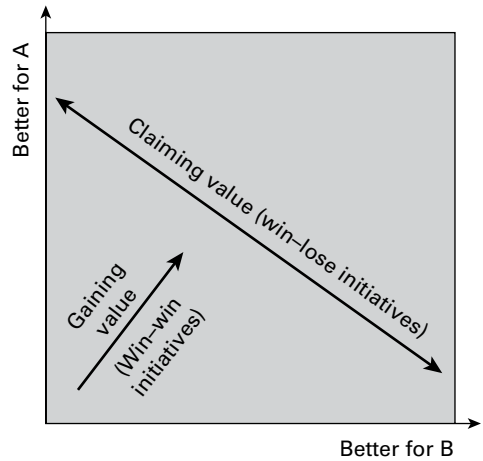


FIGURE 9.9 Win–win versus win–lose initiatives



In the third quarter 2009, for instance, Amazon stretched out its bill payment to 72 days, up from 63 in the year-earlier period. Amazon's sales rose 28 per cent in the quarter, but accounts payable nearly doubled, helping push free cash flow up 116 per cent to $696 million (Peers, 2009).

To unfold the power of supply chain management, companies have to be aware of the supply chain initiatives' impact across the supply chain, and differentiate between 'win–win' and 'win–lose' initiatives. While win–lose initiatives usually involve shifting or 'claiming' financial performance, win–win initiatives involve 'gaining' financial performance for the different parties in the supply chain, as illustrated in Figure 9.9. Increased liquidity by lowering inventory based on increased synchronization and visibility, or cost savings by perfectly aligning business processes, are examples of win–win initiatives.

Improving the financial performance across the supply chain

As indicated before, to take full advantage of supply chain management companies need to consider supply chain initiatives' financial impact across the entire supply chain, resulting in win–win scenarios. This would require overcoming supply chain integration issues, as discussed earlier. Possible strategies to overcome these challenges, and to better align the supply chain include:

- Activity-based costing – tracing the costs of activities performed and then relating them to specific product or customer segment that generate revenue. This is certainly easier said than done as identifying the activities, related expenses and the drivers of expenses is very tedious and time-consuming.

- Utilizing comprehensive supply chain metrics such as cash-to-cash cycle time or supply chain days of supply. Note that such metrics are impacted by multiple functional areas (eg logistics, marketing, procurement, manufacturing, etc), resulting in a systems perspective.

As supply chains have become more extended in recent years, coordination and information sharing among supply chain members to improve system efficiency has become more common. Such collaborative relationships among supply chain members are gradually replacing the more self-serving and opportunistic behaviour among the firms. Although such collaborative relationships among supply chain members are not commonplace, a number of exemplary companies have begun to practise them with their best suppliers. According to Davis and Spekman (2004), the increased popularity of vendor-managed inventory systems, continuous replenishment programmes, and collaborative planning, forecasting and replenishment programmes, are examples of the growing acceptance of such collaborative supply chain relationships.

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10

Outsourcing: the result of global supply chains?

STEPHEN RINSLER
Bisham Consulting

Background

There can be no doubt that outsourcing has become big business. From the early beginnings in the mid- to late 1970s many companies have travelled the outsourcing road and, as technology and accessibility to shared electronic data have increased, so has the range of services offered by outsourcing companies.

In the past few years the government has openly encouraged outsourcing, and the original private finance initiative (PFI) and other deals have spawned. Not all the outsourcing arrangements in the private or the public sectors have been successful. There is a steady but small stream of processes being 'taken back in-house' and there have been some high-profile failures in the press.

We will explore why outsourcing takes place and how to avoid some of the pitfalls that undoubtedly can occur. We have tried to place outsourcing in the context of the more recent moves to source manufacture from overseas, particularly the Far East.

The drive for lower process costs and better margins has driven the outsourcing of product manufacture, often from the Far East. It is possible that this form of outsourcing has peaked, given the increasing emphasis on carbon footprints and the more pragmatic reason – that of difficulties in managing sourcing over much extended supply chains. The risks involved have often been mitigated by raising stocks and suffering reduced market flexibility, both of which reduce margins. It is therefore the pursuit of higher margins that caused companies to pressurize their outsourcing partners to collaborate, to increase asset utilization whilst still increasing customer service.

Definition

Outsourcing describes the deliberate movement of a series of connected business processes to a third party who manages them on behalf of the company. The classic processes were IT, warehousing and distribution, facilities management and payroll, and to these can now be added: call centres, manufacturing, web development, home shopping, credit cards, and even merchandising and design. In these movements the commercial risk and assets are usually passed to the outsourcing company.

However, not all companies refer to the process of business process management transfer as outsourcing; for some, they are just buying a service or a series of products. In this case the transfer of assets is unlikely.

The definition of outsourcing does not and must not imply abdication of responsibility.

Examples

Some retailers over the years became very vertically integrated. They would manufacture their own goods, own and run their stores, own and run their warehousing and distribution to store services, and some even ran their own store loyalty schemes: eg Co-op stamps.

Now, many retailers outsource all their manufacturing, they do not own and may not even run or own their stores, they have outsourced their warehousing and distribution, a bank runs their store cards, and some have outsourced their design, packaging design and merchandising by franchising their floor space to design or cosmetic houses and niche labels.

For others, including manufacturing companies, warehousing and distribution are outsourced, and even those who run outsourcing services often outsource their accounts and IT functions.

Reasons for outsourcing

The reasons for outsourcing are many, but not all of them are based on hard business analysis. You may have heard these reasons:

- We do not have the management expertise.
- We need to jump the learning curve.
- We want to move fast.
- The area requires major re-engineering.
- We do not have the management resources.
- We pay too much to do it ourselves.
- It is not core.

- The business is going through major change, and we need to make more areas variable cost.
- We need to focus our resources for training, investment, time etc.

Some of the strategic reasons above can be overshadowed by the personal objectives of the management involved. Some like to follow a trend and therefore outsourcing is encouraged; some, when joining a company where that department has been outsourced, start the process of reintegration in order to enlarge their role.

These reasons for outsourcing can therefore be structured into five groups:

- financial;
- technology;
- managerial;
- resource management;
- personal.

Financial reasons for outsourcing

The reasons centre on two main types: flexibility and financial risk. Although companies now have to declare in their statutory accounts and too many stock exchanges the value of assets leased and the methodology used by their businesses to access their markets, it is still the case that some companies have limited access to investment funds and see the need to leave the raising of cash to their outsourcing partners. Sometimes the outsourcing provider can borrow at a better rate than the company since their operation has a lower risk through better focus; sometimes the additional borrowing costs are worth the flexibility.

Flexibility of use of resources is also an important factor; if the company's use of the resources can be pooled with others, creating better scale and better marginal costs, then using an outsourcer ensures some independence of management of those resources and releases the company from having to manage the other users of the facilities.

Another facet of outsourcing in the past has been the pensions factor. Over the last five years, many larger companies having seen their pension deficits soar reacted by closing their occupational pension arrangements. Thus the actuarial savings that could be forecast on outsourcing a section of the business no longer exists. Where there are still occupational pensions to be taken into account outsourcing crystallizes the deficit at the point of transfer, but it only does so for those people who transfer under TUPE (Transfer of Undertakings (Protection of Employment) Regulations) arrangements.

Technology

Technology half-lives have fallen dramatically over the past 20 years and the predictions are that they will fall faster still. Competitive edge comes from

the rapid integration of new technologies into the company (if they are relevant). Consider the board looking at the choice of investing in the skills necessary to sell to its clients or the skills needed to operate the latest technology in its delivery vans or the warehouse. If resources need to be rationed, is it better to concentrate on the sales skills and the sales systems that can be made individual to the company or on distribution skills and technology that are more of a commodity?

Many manufacturers maintain their own machinery completely. Current technology comes often in 'black boxes' that are replaced on failure and the skills of the supplier used to renew them, the maintenance skills are outsourced. Major UK utility companies have agreed the outsourcing of their maintenance since the engineering companies have better skills, the latest training and the latest diagnostics; the utility company acts as the voice of the consumer in this instance.

Health and safety legislation and the tighter requirements of the insurance industry are leading to some companies outsourcing operations because specialization of knowledge and service leads to lower risk and costs.

In addition, the role of IT and the necessity for robust, integrated systems have moved business in two directions: one where they purchase integrated systems and outsource the systems analysis and implementation to IT consultancies; or one where they supplement their IT support staff with analysts and programmers, often through a consultancy to whom they delegate the resource provision to create the company's own software.

But there are other technologies on the horizon. One of them is 3-D printing; a disruptive technology as it could tear up current perceptions of the supply chain. Raw materials and substrates are likely to be moved, therefore more tanker movements rather than finished packaged goods? Outsourcing makes the company flexible, but you need to be aware of the contract length you agree. Contracts of more than 5 years are likely to prove to be increasingly inflexible.

Resource management

One facet of the management of a company never changes: forecast resource requirements and the forecasts are never right. Therefore resource investment is generally higher than necessary as the quantified upside risks are allowed for and mitigated. However, be circumspect about forecasts, offset the emotional risk of 'things turning out lower than expected' and resources can turn out to be too low, but on the flip-side, offset for high sales forecasts when additional investment in stock and manufacturing could be wasteful. What is clear is that forecasts are always wrong; however, it is the degree of inaccuracy that is important.

By focusing on your core resource business areas you can probably match investment and requirements more closely than in your other business areas. In the periphery areas you have to apply the same focus as the core areas to optimize your resources. Given that many of these areas will not use your core

skills, the likelihood of understanding the risks properly, optimizing the area well and achieving good service levels and costs is much lower if you were to manage them yourself than if you were to outsource them to a specialist.

Furthermore, the outsourcing company can act as an independent manager for your resources, should you wish to pool your resources with others and spread the fixed costs.

Management skills

The point has been made that businesses should concentrate their management skills and training resources in those areas in which they can make a real difference to the profitability of their company, or they should find partners to help them. Remember that you own the company vision and strategy; that is part of the management and entrepreneurial skills you need to run a successful business. Maximizing your selling and procurement skills, ensuring you have the right products and services to sell to your clients, ensuring pricing provides the cash return you need for investment and paying for services bought should be the management skills you provide.

However, if outsourcing is the answer then there are important new skills to develop, namely the skills of choosing your partners, working with them and managing them.

Personal

It is rare for managers to have totally altruistic motives when deciding to insource (take back an outsourcing contract) or to outsource a series of business processes. Unless there are clear strategic reasons for a change to be made, bringing back processes can often be to enlarge their role, just as pushing for outsourcing can be to ensure a job move.

In the past, strange decisions have been made: for example, a major retailer started to backload goods that were delivered by manufacturers to reduce costs by raising the utilization of their fleet. Then it was found that their primary movements from regional distribution centre (RDC) to store were being delayed as the fleet was not returning at regular times because both the extra running time and the pickups compounded to increase the round trip time variability. The fleet was enlarged to cope with that. It is probably not known whether the final cost model was more or less expensive than the original model.

The question that was not asked was whether the fleet was required in the first place.

Current relevance

Given the pace of globalization, it is inevitable that outsourcing will take place. It is not usually sensible for manufacturers to set up their own manufacturing

plants in the Far East. Some have, particularly if the products can be sold for internal consumption in the country or region of manufacture as well as for exports, but in the main, retailers or manufacturers are taking only part of the output of a Far East plant and therefore manufacture, distribution to the port and customs clearance tend to be outsourced. It is not always economic to have one's own management in place in China or Taiwan or Indonesia etc. There are specialist skills in arranging consolidated shipments from a port, and the use of freight forwarders to ensure the shipping is booked and the goods are customs cleared in the UK is very normal.

These extended supply chains have risks like any other supply chain but we will discuss the amplification of the risks later. However, the rise of concerns about the carbon footprint of extended supply chains and the move to reduce shipping carbon emissions will inevitably raise questions about Far East manufacture. The volatility of sterling against the US dollar, the higher price of fuel oil, the political uncertainty of some locations, the rising costs of labour and the realities of managing over long distances and many time zones are causing a return to European manufacturing for some companies.

How different is the public sector from the private sector with regard to outsourcing?

There are some fundamental differences between the public and private sectors: public businesses are about cost containment rather than long-term profit sustainability. Public finances have not easily differentiated between capital expenditure and operating costs and, therefore, to remove all expenditure from the public borrowing figures is often the driver. Investments to reduce costs are far easier in the private sector where a return over time can be benchmarked against the internal rate of return for that company. The pensions' factor is still a major one for the public sector. It outsources the pension risk at the same time as the business.

It is probably the experience of government trying to build its own systems that has led to the level of IT and business process outsourcing that is currently being progressed. Government often wishes to distance itself from the day-to-day management of projects and is trying to move the risk of overrun expenditure to its contractors. Politically that is understandable, but as we will see later, it is crucial that organizations outsourcing business processes continue to keep a close eye on the efficiency of any data and management interfaces and the delivery of the strategy.

The other major difference is that of the stakeholder community. The private sector includes customers, employees, shareholders, regulatory bodies and suppliers (for many, the local community should also be included and the press often is included in this category); the public sector has customers, employees, regulatory bodies and suppliers but also parliament, ministers, voters, the civil service, and a much closer media scrutiny.

The pitfalls in outsourcing

Given that outsourcing arrangements are about two companies joining together to provide a service or a range of products, then the pitfalls become fairly easy to list when one views the arrangements dispassionately from the outside as a third party. They are in the main caused by differences in strategy, objectives, culture and, at a basic level, how the two sets of management who have to liaise with each other on a daily basis work together, trust and respect each other.

However, from the start, success comes from how well any tender document was detailed, how well the tasks were described and how open the client management were about their ongoing strategy and the reasons for outsourcing. Any hiding of real facts at this stage and the contract is likely to end in considerable difficulties.

Similarly, any over-expectations raised by the outsourcing company, particularly in terms of timing, complexity and the level of cost savings the client might enjoy, will also ensure that the contract flounders quite early in its life.

Major initial questions that must be addressed

The board, and it has to be at that level for major outsourcing arrangements, must review the following questions with care. They are designed to highlight the strategic changes needed to accept outsourcing:

- What are the company's current strengths, weaknesses, opportunities and threats (SWOT) in its markets, with its profitability, of its product development in terms of its competitors and in terms of its supply chain from sourcing to customer service?
- Does outsourcing resolve some of the weaknesses and threats and open up opportunities to build 'new' or consolidate our current strengths?
- What should our partner look like?
- What will we be depending on them for?
- Who should drive the outsourcing project at board level, who should be the 'project manager'?

With these questions answered honestly, the job of writing the tenders and evaluating the outsourcing companies' responses will be that much easier. Once outsourcing has been agreed as part of the strategy, the major questions to be answered by the client company to avert the outsourcing pitfalls are:

- What is our current strategy for this business process and what strategic changes are we looking for?
- What are the boundaries to our outsourcing?

- How do we want to write the tender: with detailed templates or open format, looking for different (and the best) solutions?
- How will we evaluate the tenders?
- How will success and failure be judged in the contract itself?
- How will we remunerate and reward them?
- How will we link the organizations?
- How can we reduce internal frictions and the feelings that they are just another supplier?

Strategy and the changes we need

Outsourcing is about dovetailing other companies' expertise and focus into your company to improve competitiveness and customer service. You must keep control of the strategy – you cannot outsource that; however, your outsourcing partner will also have a strategy and the marrying of the strategies is an important part of the early meetings between the companies and should form part of the selection process.

Partners with diverging strategies cannot work together for long, and outsourcing cannot be a two-minute wonder; the time period for an outsourcing contract should reflect the life of the underlying assets supporting the contract, and the time and effort required to tender, renegotiate and implement a new contract.

The outputs from the strategy that your stakeholders – customers, shareholders, employees etc – can see need to be defined. For example: customer service levels, return on investment etc. These should be discussed with your outsourcing partner only if their input to your business processes has an effect on these outputs.

What are the boundaries to outsourcing?

There needs to be a board process that challenges the added value that in-house processes provide to the overall success of the company. This is part of the input into the company SWOT analysis. The in-house picture then needs to be compared with the SWOT analysis that includes the outsourcing of some of the business processes. The changes to the SWOT analysis need to be tracked; at some point the risks outweigh the benefits and the boundaries to outsourcing are defined. Of prime importance, and to be analysed carefully, are the threats or risks that change between the two pictures: what threats and risks do we mitigate by outsourcing? What extra ones do we get in replacement and how (or can) we mitigate them? (We discuss risks in global supply chains a little later.)

How will success and failure be judged?

Many outsourcing arrangements start without clarity on this question; what is genuinely important to the company and its customers is not clearly understood, the key performance indicators (KPIs) have not been agreed, the measurement methodology is not clear and reporting arrangements have not been defined. This does not allow the two partners to have the same vision of the operation, and the lack of clarity will inhibit either side learning how to improve the services etc. In many ways, if the first question on strategy has not been answered then it is likely that this one will remain cloudy.

The indicators of success and failure and the rewards and redress required need to be fully laid out in the contract before the operation starts. The KPIs (for a warehouse operation) can cover: customer service measured in customer terms, budget performance (savings), damages, stock losses, accident rates, productivity measures etc.

So when looking at the remuneration of the partner, bonuses for beating customer service targets and a sharing of the budget savings are a good way of incentivizing the partnership. Sharing the losses, with penalties for poor customer service, is another powerful way of ensuring the correct behaviours.

Tender process

The tender process is a chapter in its own right, but what is important strategically for successful outsourcing is that there is sufficient detail in the tender about the current operations, a clear statement of the key performance requirements and a strategic vision, which is shared with the prospective partners. Without the detail – and it can be large amounts of data: orders by day for a year, routing of dispatch: pallets or parcels? Additional work required on goods received, etc – and without a clear proforma of the response required, it will be difficult to evaluate the various replies. Honesty will provide better answers and will build better relationships; both are needed if the operation is to be successful over time.

To be fair, it is very hard to ensure that the analysis of the tenders and the current supply chain is on like-for-like basis. Data is often not available, and if it is it is often not in the granularity or accuracy required. The time taken to complete these exercises should not be underestimated. Given the dislocation to the business and the time needed to ensure that the handover progresses well, not to complete the comparative analysis in depth, and well, is a risk to the business that can only be mitigated by ensuring the appraisal is done well.

Company linkage and reducing internal friction

Outsourcing of a number of business processes implies that those outsourced need to communicate, to link with the rest of the company's business processes.

Thus not only are there data linkages that need to be forged, but the management and administration of the two companies need to be joined as well.

A lot of time and care must be taken to ensure a high degree of efficiency about the interfaces; slow, inefficient interfaces will cost money, increase friction between the two groups and in the end result in poorer customer service and lost sales. Thus, a good strategic board will ensure that teams are built across the interface; the outsourcing company must not be held at complete arm's length such that face-to-face meetings are not accepted as part of the contract's life. The managers working the interfaces must be compatible with each other; they must work together and respect each other. Attempts must be made to ease any cultural differences.

That does not mean that both sides should not challenge each other. No challenge, no creativity – and an operation will slowly fossilize; but challenge must be constructive. The internal assassins to the process of outsourcing must be dealt with.

Summary

In summary, most of the pitfalls experienced by companies outsourcing are down to:

- not completing the business analysis and business case properly;
- not being open about strategy or other market or business factors that are germane to the evaluation of the business the outsourcer will perform as they build their bid;
- a failure to gain the buy-in of the company management during the tender process;
- not assigning sufficient resource (on both sides) during implementation;
- being unconstructive during the life of the contract and failing to integrate the outsourcing company into your planning phases;
- the contractor not assigning the right people with the right skills and competences to the contract.

Outsourcing can only work with the active cooperation of both sides.

Global supply chains and the outsourcing risks

Global supply chains, somehow, have brought the promise of better margins and both retailers and manufacturers have rushed to move the source of manufacture and some services to Eastern Europe, India and the Pacific Rim, including China. While manufacturing costs have undoubtedly fallen, not all commodities have fallen as well: shipping costs, for example, have risen as the laws of supply and demand have remained true.

It should be noted that the new extended supply chain hides a number of potential risks that, if not properly managed and accounted for, could have a severe effect on profits. Boards need to have identified and evaluated the costs of these risks in order to judge the real business case for overseas sourcing. The fact that some companies are now considering sourcing from countries that are geographically closer to Europe means that the balance may be shifting away from much-extended supply chains.

What are these important risks? They fall into the following five groups:

- supply chain risks;
- management risks;
- financial risks;
- political risks;
- geographic and natural event risks: tsunamis, severe storms, earthquakes, etc.

Supply chain risks

These arise through the new geography that is a backdrop to the outsourcing arrangements. The factory is no longer in the UK or nearby in Europe. Many of the problems are the same as the original supply chain but the risk of not resolving the issues increases with distance, time zones and the language and culture divide. The problems of quality, of specifying exactly what you want after the first proofing runs, of tying the supplier into your business are good examples.

You may now have lower operating costs because you have agreed a single long-run production slot with your supplier but the slot is usually not very flexible. Thus changes to quantity and timing are much harder to arrange. Under-order stock then ask for a smaller, more expensive additional run to be slotted into the production schedule and you may have to have the quantity sent by air-freight in order for it to be on the shop floor in time for the sales period. Realizing this additional cost, you may feel forced to over-order stock deliberately at the start. Many retailers now have higher stocks than they used to have; that requires larger warehouses and results in lower warehouse productivity. Then the sales forecasts and the merchandising forecasts are not met: clearing unnecessary stock through the sales channel generally requires heavy discounting, which means a reduction in profits. In Europe you probably would not have the need to agree to such a production arrangement.

Then there is the quality of goods on arrival; having been packaged (often badly) in the container, you now have an extensive new operation of finishing, steaming, and sometimes pricing etc that has to be done in the UK in order to make the merchandise look shop-ready. Who pays for the stock as it resides in customs awaiting clearance?

Your extended supply chain is forcing you to make decisions on fabrics, design and colours earlier and earlier in the process. There is the real risk that

the product range needs to be specified before you have sold this year's same-period merchandise, raising the risk of getting it wrong.

Many of the above are judgemental risks that supply chain or merchandising managers have to take, but then there are the physical, environmental risks in the supply chain: hurricanes, tsunamis, earthquakes and typhoons all play a part in the equatorial climate and geography; they are risks that must be quantified, and sourcing strategies and contingencies should take the results into account. But not all risks are negative – what if you sell more?

Management risks

The longer the supply chain, the greater the number of nodes, the greater management time that is required to achieve a smooth result. This resource will probably be more than the company currently has, and even if functions are outsourced there will be the need to coordinate the outsourcing partnerships.

The greatest concern in this area for most retailers is quality. It can be difficult to oversee the accreditation and auditing of suppliers and manage proofing runs over a long distance. Once product is agreed, production schedules have to be monitored, which requires time, personnel and particular skill sets.

Outsourcing requires regular contact between the various parties to make it work. The question to bear in mind is: has the cost of the additional merchandising and quality management been taken into account?

Outsourcing is not about abdication; you still need to control the strategy, you need to spend time integrating the outsourced service and you need to ensure that customer service is provided at the level you require. The more central the activity is to the heart of the company, the more time that is required to really ensure that the outsourced operation is integrated. How the organizations are linked is one of the keys to the success of outsourcing.

The other management risks are that you did not define the strategic changes that you are looking for and you may not have shared them with the prospective partner. You may not have decided how success and failure will be judged and, therefore, may not have decided whether any form of gain share is appropriate to the contract. Another risk that requires to be dealt with is the risk of poor internal communication about the potential to outsource and, once the contract is implemented, communicating the successes.

Financial risks

Your suppliers like hard currency, quite often US dollars, and thus a significant proportion of your costs will be exposed to the fluctuations of that currency. If the dollar strengthens and your margins decrease as you are connected to UK price competition, you are forced to try to reduce the purchase price, which may result in reduced product quality and greater finishing costs.

It is possible to hedge the dollars by buying in advance, but there is a cost to these transactions. As an alternative, you might buy product in pounds sterling, but if there is currency movement against the supplier, they must in the long

run recover lost margin or refuse to do business with you, resulting in time and expenditure accrediting a new supplier.

Shipping costs will increase markedly as routes become more popular, which results in a reduction of your margins. If the price of oil increases, so will your shipping surcharges. Were these potential costs taken into account in the budget for outsourcing?

Your extended supply chain requires you to offset the supply risk by receiving the stock earlier, and because the stock is produced in one run, shipping costs can be minimized by shipping the whole quantity together. But this will result in extra warehousing and financing costs. What must also be taken into account is the cost of the additional write-down of any unsold stock, as you needed to forecast sales earlier in order to meet the manufacturing schedules – and the market size has changed. You will also require financial information systems that allow all the various costs to be posted against each product in the range so that the real margin can be reviewed. These costs are shipping and handling, reworking stock on arrival to make it store-ready, etc.

Political risks

These are very hard to assess but we have had some examples recently: EU trade quotas, instability in some countries, your suppliers having very different working conditions compared to European plants. These risks can directly affect your ability to trade or can become consumer relations issues that affect your brand.

Other risk analysis

The risk analysis required is a detailed review of each step in the extended supply chain, starting with ranging and supplier selection and following the course of the product and information flows through the supply chain. At each stage the possible failures (the risks) to the process need to be understood and assessed. The classic quadrant:

High value: Low impact	High value: High impact
Low value: Low impact	Low value: High impact

needs to be populated. Once done, contingency plans, a necessity for at least the high-value/high-impact risks, need to be detailed and agreed. These could include sourcing alternative suppliers and holding additional stocks, starting the next season early, putting in place better systems and management controls etc. Risk analysis should also cover the contingency requirements should it be decided, or be necessary, to take the outsourcing back in-house or move the management of the processes to a new company.

Natural event risks

Natural disasters are very hard to forecast and assess as has been proven recently by, for example, the Tsunami in Japan in 2011, the winter storms in New York State and New Jersey and the winter storms and severe floods in the UK in 2013/14. What has become clear is that it is not often that your tier 1 suppliers disrupt your production in these circumstances: one is very close to them and should risks appear to increase then offsetting the risk with additional stock is not so hard to arrange. If the risk to supply disruption is frequent or high then either the supplier ceases to supply or alternative suppliers are found to ensure continuity.

However, the experience from Japan was that secondary, tertiary and even down to level 6 suppliers could have very serious effects on the supply chain if their output was disrupted. Furthermore, the stripping of stock from the supply chain meant that the loss of manufacturing facilities resulted in very fast knock-on effects, faster than the time period to find alternative suppliers.

Some companies have spent considerable resources looking back up their supply chains to discuss, understand, document and then mitigate the risks at each level. They then try to 'listen' for advanced warnings of events: early tremors, tracking of weather systems likely to turn into severe storms, signs of political risk etc, and feed this data into their contingency plans and then ensure they are carried out. The concern must be that the skills needed to do this consistently are not usually available inside most companies (see Alan Braithwaite, Chapters 12 and 16, this volume).

Summary

The benefits from overseas, global sourcing need careful analysis both before starting the transfer and at regular intervals thereafter. The analysis requires the whole cost of acquisition of each product to be determined to allow comparison with other countries, including the UK. What is most important is that the analysis must be conducted dispassionately and that the interests of consumers and shareholders remain the most important consideration.

'Getting it wrong' is not hard – losing control of the strategy is all too easy and forgetting to continually monitor the risks in your 'whole' supply chain, again, is too easy. Outsourcing requires continual effort to manage the outsourcer and to monitor their environment, but such management resource is at a very different level from running the whole operation oneself. A company that harnesses the skills, the resources and the development that an outsourcing company can bring and that adds the outsourcer's cultural diversity to its management mix, in the long run, will provide its products and services at a lower cost and higher added value than its competitors as a result of letting experts run some of its operations. It will be more profitable than its competitors and quite possibly more flexible.

Risk in the supply chain

11

LARS STEMMLER
HSH Nordbank AG

Introduction

Risk management is an established tool in the financial environment of the business world. The same holds true for logistics and the concept of supply chain management. The increased level of integration and cooperation along supply chains leads to new risk categories. Risk management might help in the understanding of the key risk drivers of supply chains and enable the partners to optimize their internal risk management system – at least developing an understanding for supply chain risks. Not least the 2011 Fukushima nuclear reactor meltdown in Japan made it evident that some form of risk management is required in a logistics environment, as Japan was cut off from maritime supply chains for several weeks.

This chapter suggests an expansion of risk management into the scope of the supply chain. The objective is to provide arguments to actively pursue risk management as a planning tool. The chapter is written from the perspective of a non-financial firm such as a logistics service provider. This will highlight also the practical perspective of risk management.

Risk management and the supply chain – a new perception

The identification, assessment and controlling of risks are inherent to managing commercial undertakings. Risk management was developed in the financial services industry before it spread to other sectors. However, in many companies risk management is 'just' considered a legal obligation following the introduction of the Sarbanes–Oxley Act in the United States. The statutory requirement to establish a formal risk management system also took hold in Europe. For example, the German commercial code stipulates the development of an early warning system in order to identify risks that threaten the existence of the company at an early stage.

A number of companies have realized the potential of risk management to improve planning processes and help to mitigate potential and actual sources of risk in a sense of proactive risk management (Hopkin, 2013). It is not just banks that actively pursue risk management. Companies of other sectors are increasingly becoming aware of the potential value-added of an integrated risk management. The fate of Ericsson is just one example:

> The effect on Ericsson, a Swedish mobile-phone company, of a fire in a New Mexico chipmaking plant belonging to the Dutch firm Philips, has become a legend. The fire, in March 2000, started by a bolt of lightning, lasted less than 10 minutes but it caused havoc to the super-clean environment that chipmaking requires. Ericsson, unable to find an alternative source of supply, went on to report a loss of over USD 2 billion in its mobile-phone division that year, a loss that left it as an also-ran in an industry where it had once been a leader. (*The Economist*, 2005)

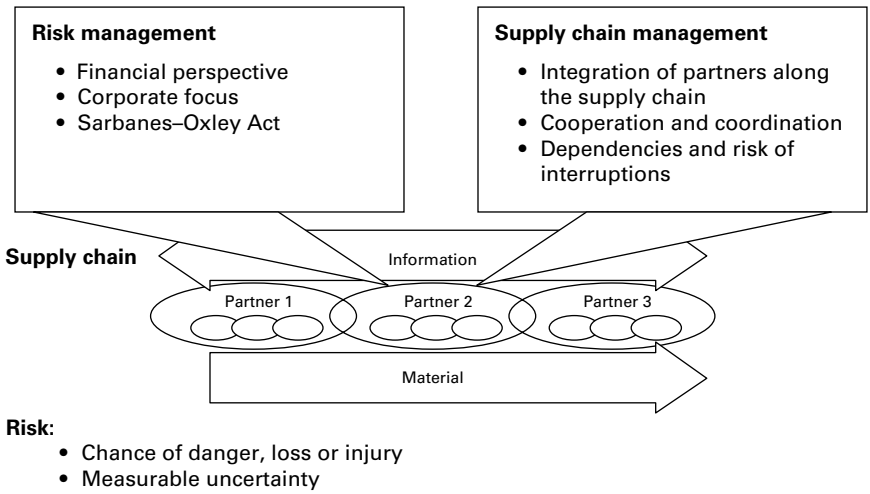
The Ericsson example, as well as the Fukushima event mentioned earlier, highlight a necessary shift in perception regarding risk management. This shift is driven by logistics. The framework for this new perception of risk management can be set out as:

- The logistics function provides a clear competitive advantage to a company regardless of what strategy it pursues. With either of Porter's (1999) strategies of cost leadership or of differentiation, logistics helps to fulfil the company's objectives and to deliver added value to the customer. The example of Ericsson's disrupted supply chain is clearly the tip of the iceberg.
- Supply chain management aims at integrating partners along the supply chain, reducing interfaces and smoothing the flow of material, information and finance. However, the higher the level of integration, the higher the probability of dependency on single partners. In addition, global sourcing adds a further dimension of uncertainty in terms of long transport legs, unstable political environments and different levels of commitment to quality and reliability.
- A close-knit international supply chain results in complex processes of coordinating and administering the partners along the chain. Different levels of accountability of staff and partners, as well as different legal environments, have to be taken into account. The focus of risk management necessarily shifts from an enterprise-only to a supply chain perspective.

Deep integration requires careful and attentive operational management. The need to respond quickly and effectively to interruptions, delays and other incidents is met by contingency plans based on a sound risk management.

These developments clearly have an impact on the scope and functionality of a company-focused risk management system. However, the concept of risk management can actively be employed along a supply chain. It enables all partners contributing to a supply chain to limit adverse risks to the chain.

FIGURE 11.1 Risk management in the supply chain – a new perception



For this objective to be achieved, risk management along the supply chain has to address the following issues:

- all three flows – material, information and finance – along a supply chain and its associated processes;
- the boundaries of the system, which have to be pushed beyond the own organization to cover the full length of the chain;
- the challenge to cover not only the strategic but also the operational level, turning the risk management system from a statutory reporting function into a planning function as well as a function providing operational responsiveness.

Figure 11.1 illustrates the scope of risk management in a supply chain management context.

Objective and process of risk management

What do we associate with the term 'risk'? Risk denotes the chance of danger, loss or injury. In a commercial environment the chance of a good bargain must also be summarized under the term. Risk is to be differentiated from the term 'uncertainty'. Whereas risk assumes that the probabilities of the possible results of an event are known, this is not the case with uncertainty. Hence, risk is measurable uncertainty.

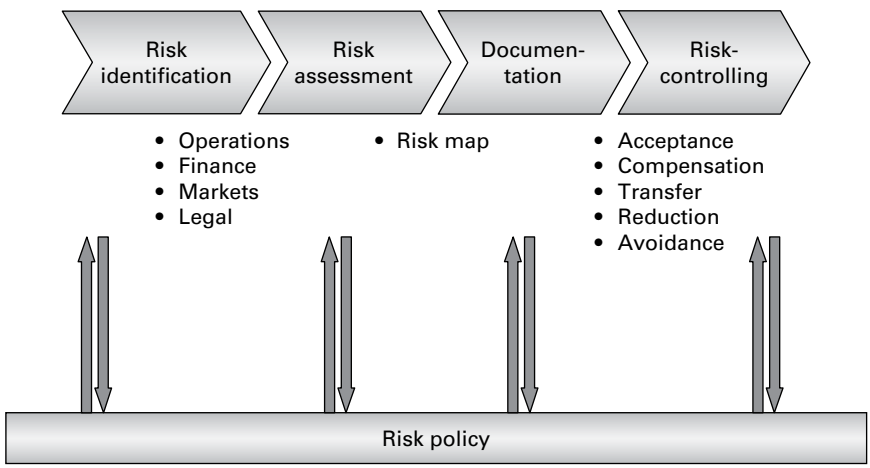
Risk management includes activities to identify, analyse and assess, communicate and control risks (Müller, 2003). In an ideal case, risk management

is directly assigned to the top management providing continuous support to ensure the company's ability to survive in the marketplace (Burger and Buchhart, 2002). Risk management is governed by the internal risk policy, making the enterprise in extreme cases either a risk-taker or a risk-avoider.

The risk management process describes systematically the framework and methods, from initially identifying the risks to finally controlling them (Holzbaur, 2001). The first activity is to identify and describe all actual and future sources of risk – at this stage of the argumentation – to the company (see Figure 11.2). In a second step, the risks are to be assessed. When determining the exposure of a company, risks are characterized through the quantification of the probability of the occurrence and the extent of the potential damage or gain. The risk exposure can be illustrated by means of a risk map or risk portfolio, leading to a segmentation of risks into commonly three categories (see Figure 11.2). Category A risks represent risks that have a potentially disastrous impact on the company, both in terms of high probability of occurrence and high damage potential (with only adverse risks normally included in the analysis). On the basis of this analysis, appropriate measures can be taken in order to control risks. Measures are taken in accordance with the stipulations of the risk management policy. A feedback loop is obligatory to ensure the effectiveness of the measures.

In theory, the risk management process looks consistent and straightforward. However, practical experience shows that not only does the quantification pose considerable problems to line managers but also the identification of risks in the first place poses an almost insurmountable challenge for them. The quantification, estimating both probabilities of occurrence and the monetary level of impact, is limited through the lack of data of past experiences of similar events in other companies. Further, the identification of risks is often

FIGURE 11.2 The process of risk management



subject to managers' reluctance of not being prepared to admit the existence of risks in their fields of responsibility: admitting to the presence of risks is considered a sign of weakness. But the efforts should nevertheless be made to come up with a meaningful risk portfolio.

From an enterprise perspective to the supply chain perspective

Having outlined the risk management process, let us now focus on how to incorporate the requirements of a sophisticated supply chain management into risk management, and answer the question of what benefits are produced for whom.

Ensuring supply chain integrity

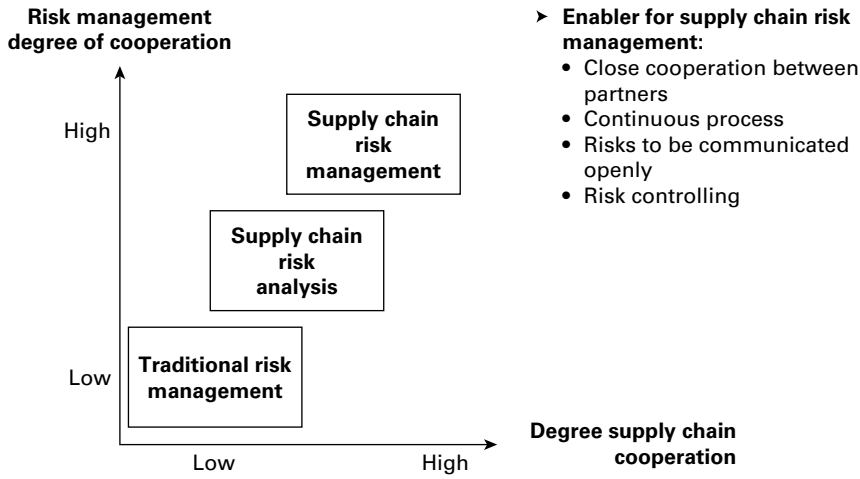
Supply chain management can be described as a holistic management approach to integrating and coordinating the material, information and financial flows along a supply chain (Handfield and Nichols, 1999). Further, this includes the management of the interfaces between the partners involved in this chain, particularly from an information management and technology point of view (Schary and Skjøtt-Larsen, 2001).

A supply chain is basically a sequence of processes with inherent risks – however, the processes are owned and managed by different legal entities. This requires interorganizational cooperation. Conflicting interests due to the legal and economic independence of the supply chain partners are to be aligned to a single supply chain objective. If successful, the competitive advantage of these partners increases considerably.

There are a number of implications of supply chain management on risk management. As already said, risk management is an important tool to ensure the economic integrity of an organization. This holds particularly true if the boundaries of this organization are clearly set, for example by means of arm's length transactions. In a supply chain management environment these boundaries become blurred, which does not mean that they no longer exist legally, but operations-wise it becomes very difficult to identify the separating line between the two companies. Just consider employees of a logistics provider doing packaging work on the premises of the shipper. The implications on the risk management system are obvious – the scope of the 'traditional risk management' is to be extended to integrate a supply chain. At the same time, having to ensure process quality, risk management evolves into logistics.

Parallel to an expansion of the scope of managing a supply chain, risk management has to grow in responsibility as well (see Figure 11.3). The higher the degree of integration along a supply chain, the larger the required scope of

FIGURE 11.3 Supply chain integration to be supported by risk management



SOURCE: Kajüter, 2003

risk management becomes. And the concept of supply chain risk management is raised.

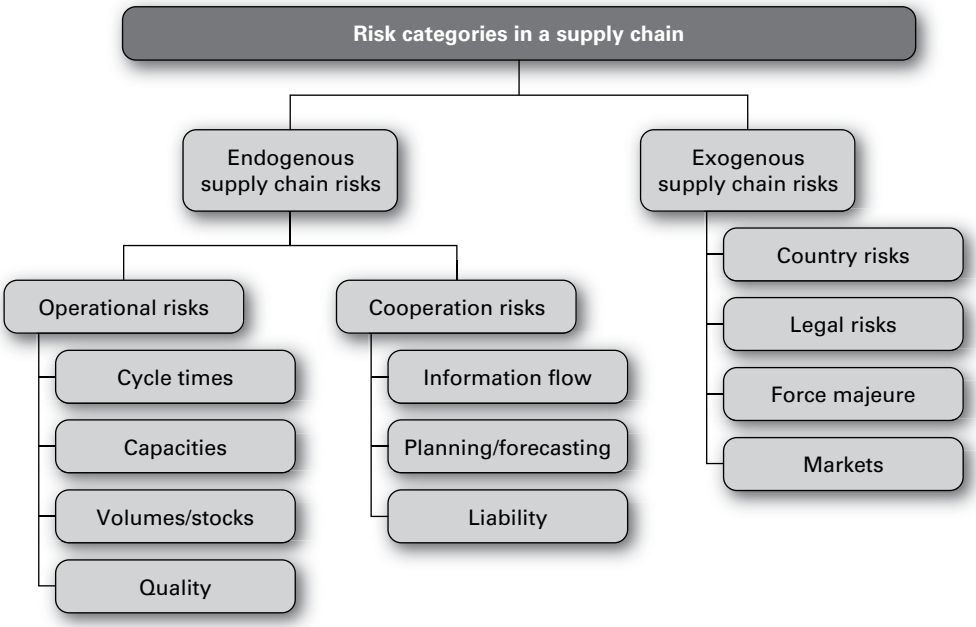
Martin Christopher (2002) suggests defining supply chain risk management as 'the integration and management of risks within the supply chain and risks external to it through a co-ordinated approach amongst supply chain members to reduce supply chain vulnerability as a whole'. The vulnerability of the chain stems from external and internal risks to it. The objectives of supply chain risk management are clearly laid out by Kajüter (2003). He sees risk management in the supply chain as 'a collaborative and structured approach to risk management, embedded in the planning and control processes of the supply chain, to handle risks that might adversely affect the achievement of the supply chain goals'.

Practitioners can agree to these definitions and clarifications, and they will clearly see the need for an interorganizational management of risks. As with organizational or company-specific risk management, identifying the relevant risks is the first task to master in the process of supply chain risk management. It is here that the first challenges are encountered. The following section focuses on developing a framework for risk identification and assessment along a supply chain.

Risk-assessment and control along the supply chain

The process of supply chain risk management is similar in all respects to the process of company-specific risk management. A preparatory step is to define

FIGURE 11.4 Risk categories extent into supply chain specific risks



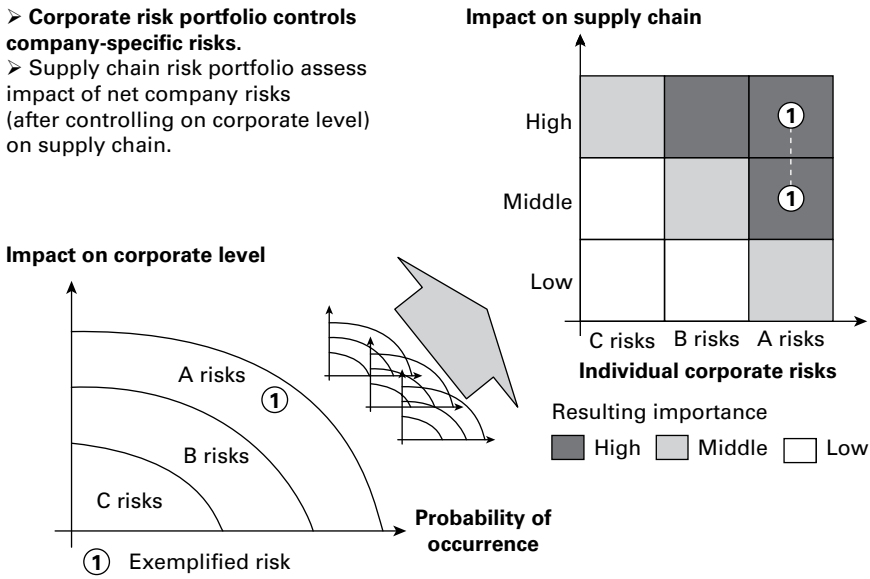
a risk management policy. Along a supply chain, companies with different industry backgrounds, sizes and ownership structures have to work together to achieve a common goal. Their differing interests have to be merged in a consistent risk management policy.

Having clarified how much risk the partners are prepared to take, the identification of supply chain risks is the next step. Figure 11.4 illustrates the two different types of risks inherent to a supply chain: exogenous and endogenous risks. The former result from the interaction of the supply chain with its environment, whereas the latter stem from the interaction of the supply chain partners (Chapman *et al*, 2002).

The endogenous risks can be divided into the categories of organizational risks (those of individual partners) and specific risks from integrating, coordinating and cooperating along the supply chain. Company-specific risks are adequately described in traditional risk management maps. Specific supply chain risks can now be identified, for example risks of a sharing of information on integrated platforms (integration), risks of a high level of interdependence amongst the partners (cooperation) and risks stemming from interwoven processes (coordination).

The prime objective of supply chain risk management is to identify those risks posing the major threat to the supply chain. A measurement tool is needed here to help transfer (existing) company-specific risk maps into a supply chain risk map and to integrate the supply-chain-specific plus the endogenous risks.

FIGURE 11.5 Supply chain risk assessment using ABC classifications



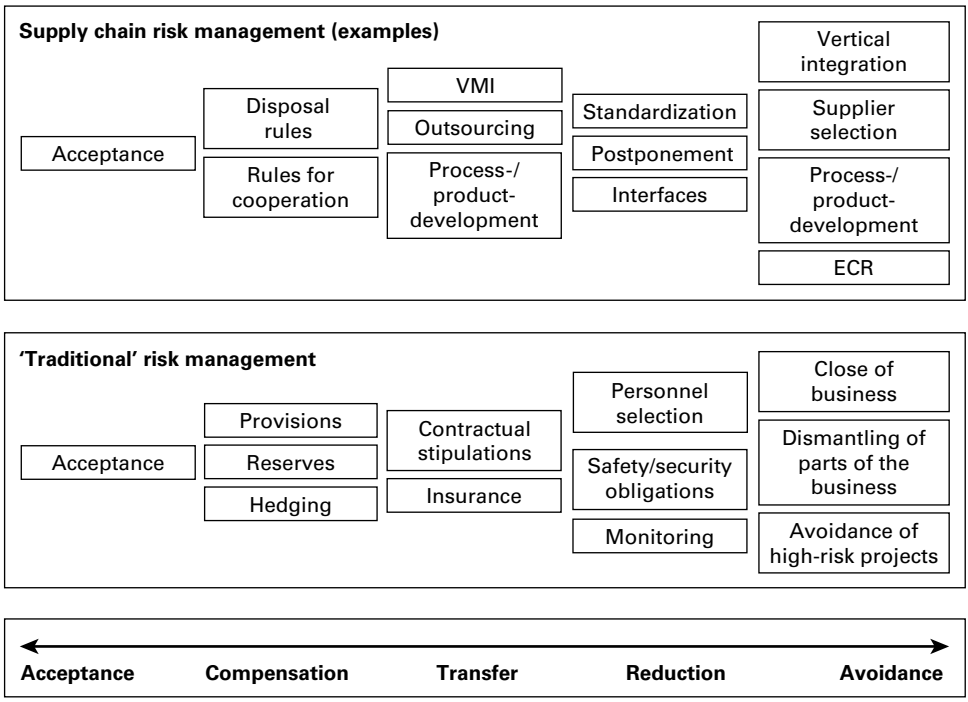
SOURCE: Kajüter, 2003

How this can be done is illustrated in Figure 11.5. The company-specific risk portfolios form the basis for an ABC classification of these risks, ideally after an interorganizational risk-controlling process. The ABC classification leads a two-dimensional matrix showing the probability of the risk-relevant event and the severity (net impact after company-specific risk management) of this event (level of damage in monetary terms). The product of both gives the expected value of the risk (Walker, 2013).

Following this step it has to be decided which of these risks have what implication on the supply chain. Each risk in the ABC classification is assigned a high-, medium- or low-impact category leading to the supply chain risk map. Into this map the supply-chain-specific risks as well as the endogenous risks are also integrated. The latter two categories are evaluated using an expected value. Regarding the impact on the partners along the supply chain, an aggregated figure for possible damages has to be found.

As with traditional risk management, the phase of risk controlling concludes the overall process of risk management. Accepting the risk or avoiding it are the poles in between which risk controlling takes place. Avoiding the risk might mean doing no business at all (see Figure 11.6). Accepting the risk means in the last instance simply living with it. In between there is an array of measures to control risks. These measures can be summarized under the categories risk compensation or mitigation, risk transfer, and risk reduction and exit (Walker, 2013).

FIGURE 11.6 Risk controlling between avoidance and acceptance



SOURCE: Inderfurth (2002), modification author's own

The ability to reduce business risks is to be preferred over other measures. On a supply chain level, risk reduction includes a particular focus on interfaces. Risk transfer – although comparatively easy to achieve in traditional risk management, for example by means of buying insurance – is by definition a difficult approach for a supply chain, as we are not obliged to look at individual companies but the whole chain. Risk compensation along a supply chain – on a company level achieved through provisions or hedging – manifests itself in rules governing the cooperation between the partners. One partner is obviously not prepared to compensate another one monetarily. However, compensation can be initiated through behaviour. Partners might agree on defined actions to be taken on a mutual basis.

Risk compensation in terms of mutual rules is to be delimited from risk transfer measures, for example outsourcing or vendor-managed inventory (VMI). The latter measures feature a far more institutionalized contractual basis. Whereas in rules-based risk compensation schemes each partner takes risks (close to risk acceptance), transferring risks amongst the partners means selecting those partners who are willing to take a risk from another. In a supply chain perspective this only contributes to an indirect reduction of risks, as the risk is transferred to the partner who can manage it better than the other.

What becomes apparent when discussing risk controlling is that risk management does not mean simply reacting to emergencies along the supply chain but pursuing an active approach anticipating supply chain risks. Having looked into the toolbox of risk controlling it becomes further apparent that deciding on suitable measures is a complex task in terms of decision making and implementation amongst the partners – even assuming that there is a consistent risk policy in place.

The latter issue is worth exploring in some more detail, bearing in mind that we would like to pursue a practitioner's view in this chapter. The following section sheds some light on obstacles to profound supply chain risk management.

Implementation in practice

Obstacles to implementation

The necessity and the theoretical framework of supply chain risk management sound convincing. Parallel to the development of supply chain management, which introduces a high degree of integration, cooperation and coordination among supply chain partners, the company-specific risk management systems have to keep up and need to expand from the traditional financial perspective into logistics, as well as focusing on supply chain risks. No doubt, there are specific supply chain risks to be addressed. However, implementing risk management focusing on the supply chain might end in a 'prisoners' dilemma'. Let us look at the most commonly observed obstacles of implementing risk management on a company level:

- *Risk identification*. Risks shall be collated in a risk map and subsequently reported to top management. Hence, at middle management level or in operating units of an organization, managers tend to hide risks by simply denying their existence.
- *Risk identification not done through neutral eyes*. External help is expensive, so that risk identification is carried out internally, resulting in a different perception of certain risks. For example, if carried out by accounting staff, operational risks are either not understood or considered more severe compared to financial risks (zur Horst and Leisten, 2002).
- *Required quantification lacks understanding*. A basic requirement of sound risk management is to quantify the potential loss or damage and to estimate the probability of occurrence. If a process fails, the company loses sales in the amount of the damaged lot size. What if a customer deems this company as no longer reliable and holds back future orders? Regarding the probabilities, estimating the failure rate seems simple, but what about political risks?

We need to be aware of risk-on-risk, ie incident chains, for example in transportation where documentation errors might lead to routing errors that in turn result in missed delivery deadlines. Incident chains with multiple outcomes pose challenges to a reliable quantification of risk; further, the same final incident, ie a missed deadline, might have various causes (Walker, 2013).

Assuredly, any risk management system should be implemented under the auspices of the company's auditors. However, obstacles multiply with a supply chain perspective:

- *Admitting the risks*. Drawing a supply chain risk map implies that any risk with a potential impact on the complete chain is to be disclosed by its 'owner'. You run into a problem here if there is a dominant player along the chain, for example a manufacturer in the automobile industry. A supplier or logistics provider cannot simply admit that there is a risk. On the contrary, there is a strong tendency towards risk transfer from the manufacturer to partners up and down the chain (Kendall, 1998).
- *Putting effort into risk management*. How much effort are companies prepared to put into a concept that potentially is a risk in itself, ie the risk of being blacklisted as a result of disclosing risks during supply chain risk management?
- *Relying on the risk map*. Bearing in mind the hidden risks as discussed here, can each partner rely on the input of other partners, or does risk controlling tumble into mere 'risk engineering'?

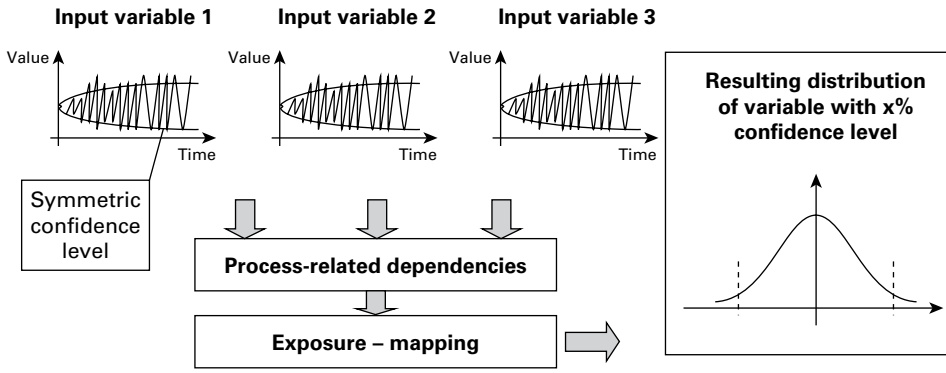
An option for avoiding these issues is to use a 'bottom-up' approach rather than the traditional 'top-down'.

Bottom-up instead of top-down, and in time

Risk management must provide tangible benefits to managers, particularly on an operational level. Coming back to our initial example of Ericsson, simply insisting on an answer to the question of what ensures business contingency is too broad an approach. Unfortunately, risk management – in the traditional sense – is a top-down management tool imposed by regulation and law. Trying the opposite way – bottom-up – might be part of a solution. Admittedly it is far more cumbersome, as a bottom-up approach starts with a process model of the supply chain. This is where the supply chain operations reference (SCOR) model might be useful. Alternatively, many companies already have quality managers in place, and process charts to hand that include detailed descriptions that are amended by the required stochastic information (see Figure 11.7). Simulating the processes under different risk-oriented parameters and putting also the know-how of security managers into the simulation results in a robust picture of a risk. To avoid difficult-to-model dynamic simulations Carrel suggests using simpler static scenario analysis instead (Carrel, 2010). The focus is first of all operational: how well do our processes and those of the supply chain work?

FIGURE 11.7 Random walks with 'at-risk' models

- **Using value/cash flow at risk models from the financial sector.**
- Simulation of a value corridor of a variable whose thresholds are not crossed with a given probability.



SOURCE: Wiedemann and Hager, 2003

More strategic issues come in when looking at the materials flows and the stock levels at the links and nodes of the supply chain. These links and nodes can also be modelled as processes and subsequently simulated, bearing in mind different performance and cost levels. Aggregating those processes, a company map and then a supply-chain-risk map emerges.

Finally, the human element adds a crucial dimension to risk management. What managers can stimulate in their organizations is proactive information gathering to be used in early warning schemes. This should include the allocating of authority to individuals or committees to respond to this information (Walker, 2013). Clear and precise response plans outline the required actions for the most severe risks and provide guidelines for staff to follow. Feedback loops and learning cycles across all entities along a supply chain provide the link to prevention in risk management and to the development of a risk culture (Carrel, 2010).

Conclusions

The management of the supply chain generates its own risks. The objectives of the supply chain are to integrate and collaborate in the management decisions; the single task of collaboration brings its own risks. Those risks include endogenous risks of a supply chain, such as operational and co-operation risks. A supply chain risk portfolio is suggested to initiate the risk management process along the supply chain, leading to a toolbox of risk-controlling measures on a strategic and operational level.

This is the opportunity for risk management to expand from the financial and corporate perspectives respectively, into the field of logistics and inter-organizational cooperation. However, easy as it sounds, problems that have to be addressed include:

- the challenge to turn risk management from a mere statutory obligation into a planning tool;
- the identification of hidden risks and overcoming dominant players in the supply chain;
- the quantification of probabilities and damage levels;
- the pursuance of a bottom-up approach for supply chain risk management to avoid the overload of top management, as in the case of a top-down approach;
- the integration of the human element.

An elegant but complex task might be to simulate (parts of) the supply chain by means of stochastic modelling in order to support the risk mapping and to evaluate the influence of variations of different risk parameters.

Despite the efforts needed, the supply chain partners should develop a sound understanding of how well the processes work along their chain, and the key risk drivers in the structure.

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Managing supply chain vulnerability

12

ALAN BRAITHWAITE
LCP Consulting Ltd

Supply chain vulnerability is a core economic tension

Goethe wrote in the 18th century: 'the dangers in life are infinite and among them is safety'. This quote from a previous era neatly encapsulates today's tension in supply chain design – the extent to which one takes the challenge of driving business forward or a conservative approach to designing to mitigate and manage vulnerability. Much of the inherent vulnerability of 21st-century supply chains can be attributed to their scale, distance and complexity; but these designs have been strategies from which great benefits have flowed, notwithstanding their inherent risks. For many, taking the safe course of action of avoiding such extended, complex global supply chains would have been equally risky, even to the point of being terminal.

To this inherent risk in scale and scope must now be added an increasingly difficult geopolitical, economic and climatic world. So while companies have been pushing the envelope to gain competitiveness, they have been pushing against an environment that seems to be becoming more hostile.

The challenge that this chapter addresses is how to maximize the gains and minimize the exposure to disruption. It draws heavily on a Master's thesis project by Dionne Reid at Manchester Metropolitan University in 2012/13 (Reid, 2012). It also draws on earlier research carried out for the Department for Transport by the author in conjunction with Professor Martin Christopher at Cranfield School of Management (Cranfield, 2003).

Business risk, disruption potential and the need for resilience is now recognized

More than 90 per cent of organizations surveyed by the World Economic Forum in 2012 indicated that supply chain risk management has become a greater priority in the last five years. This has been driven by a number of interrelated risk drivers that have emerged and have increased the level of risk exposure for organizations. Academic sources suggest that these include: lack of ownership; inertia and chaos; human errors; financial strength of customers enthused from a focus on efficiency rather than effectiveness; the globalization of supply chains; the rise of the internet; focused factories and centralized distribution; and the reduction of the supplier base.

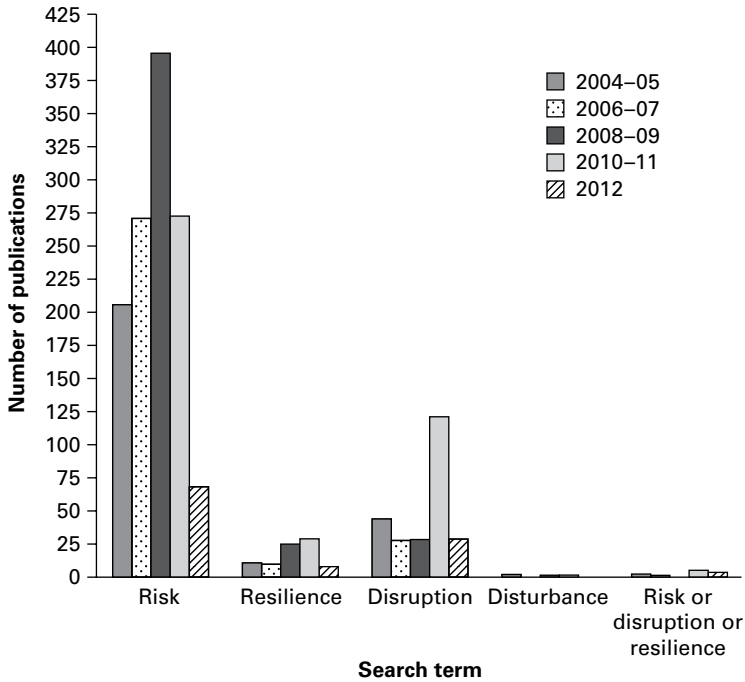
These risk drivers affect supply chain structures and impact directly on network-related risk sources. We have moved conceptually in our understanding of supply chain from a neat and protected sequence of activities to dynamic interactions between supply chains of different firms and in different regions. Much of the focus of the commentary on risk, disruption and resilience has tended to focus on global sourcing and supply. Since WTO figures show that trade is as much as 60 per cent of global GDP, this is hardly surprising. The rewards of the economic model by which a company achieves strategic competitive advantage often go hand-in-hand with risks and challenges stemming from rapid global growth, inadequate controls around current processes, lack of visibility and the difficulty of harnessing multiple ERP systems, to name a few.

The speed with which the topic has risen on the business and research agenda can be seen from analysis of its incidence in both the *Financial Times* and the academic literature. The FT publishing trends from 2004 to 2012 are shown in Figure 12.1 against the search terms: risk, resilience, disruption, disturbance, and risk or disruption or resilience.

Clearly this data shows that the core terms are risk and disruption, most probably because these are newsworthy. Resilience is climbing in awareness but from a low base. There is a spike in publications in 2008–09 for the search term 'risk' and in 2010–11 for the search term 'disruption'. This is due to world events such as the 2008 earthquake in China, the riots in Kenya and the tornadoes in the United States, and the tsunami in Japan in 2011 that caused disruptions to many global supply chains. It is worth noting that the 2012 sample is about one-quarter of the others as the work covered only the first half of one year, compared to two-year blocks for the other analysis.

The academic literature is equally affirming of the trend and focus. Analysis of the EBSCO and ProQuest academic publication databases shows a huge surge in publications in the last eight years but particularly in the last four years. This analysis is shown in Figure 12.2. It divides the focus of the papers into 3 core blocks: identification, response and improvement.

FIGURE 12.1 *Financial Times* publishing trends on risk and resilience, 2004–12



SOURCE: Reid, 2012

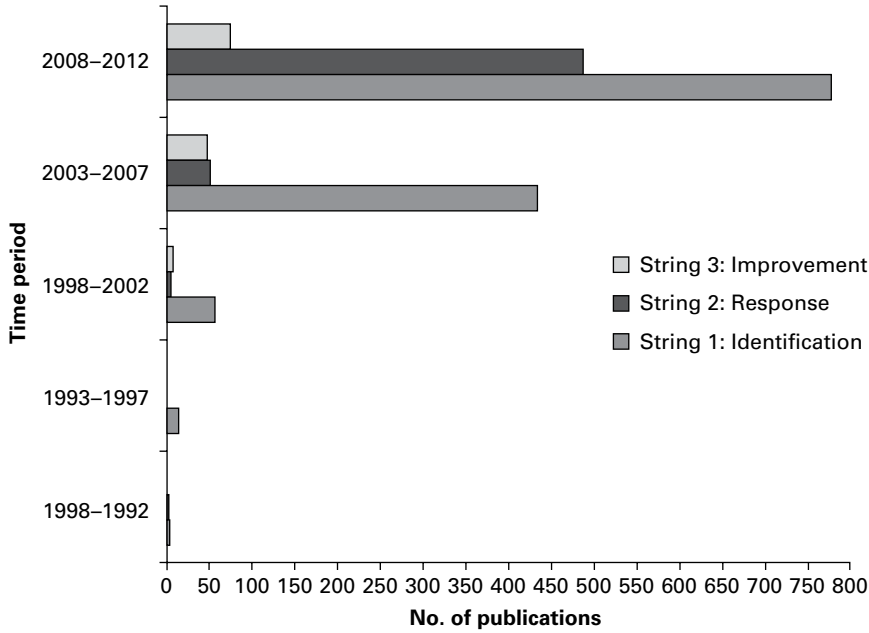
The analysis is revealing in the continuing primary academic focus on risk identification, and hence the shape of supply chain strategy designs to mitigate it. However, it is clear that the area of response to disruption events is the fastest growing and has really come into focus since 2010. The final category of improvement has remained in background.

Researchers and the World Economic Forum (WEF) have put a lot of effort into classifying the extent to which risks may be controllable. Manuj and Mentzer (2008) offer the classification in Figure 12.3, and the WEF, the analysis in Figure 12.4.

Reid's systematic literature review exposed the fact that despite there being noteworthy research into the whole area, much of the focus was on risk management as opposed to disruption resilience. Some gaps in thinking and practice that were found to need further work were identified as:

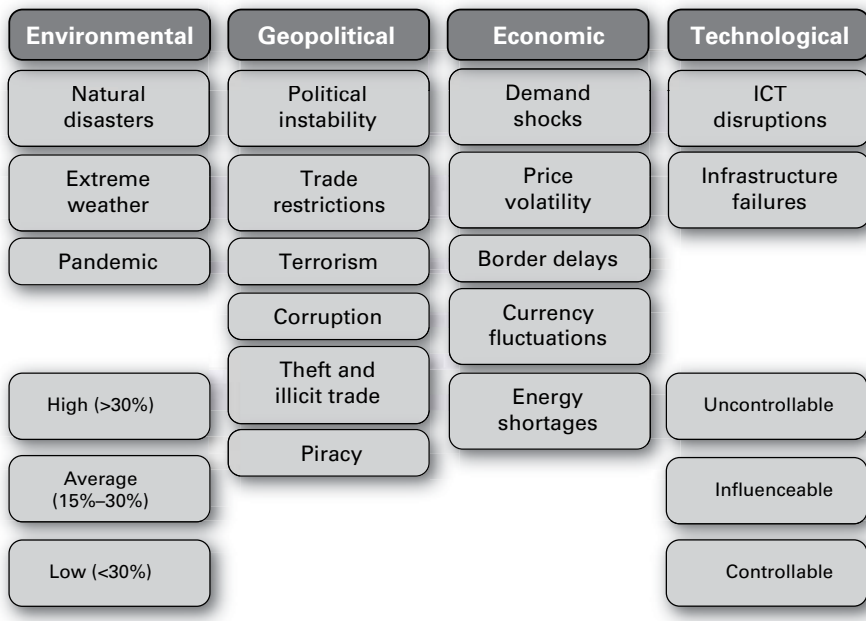
- *Criteria for monitoring risks*
  Since there are multiple risk sources and multiple ways of categorizing them, there is a requirement to understand how organizations are actually monitoring their risk sources.

FIGURE 12.2 Academic publication trends by key themes



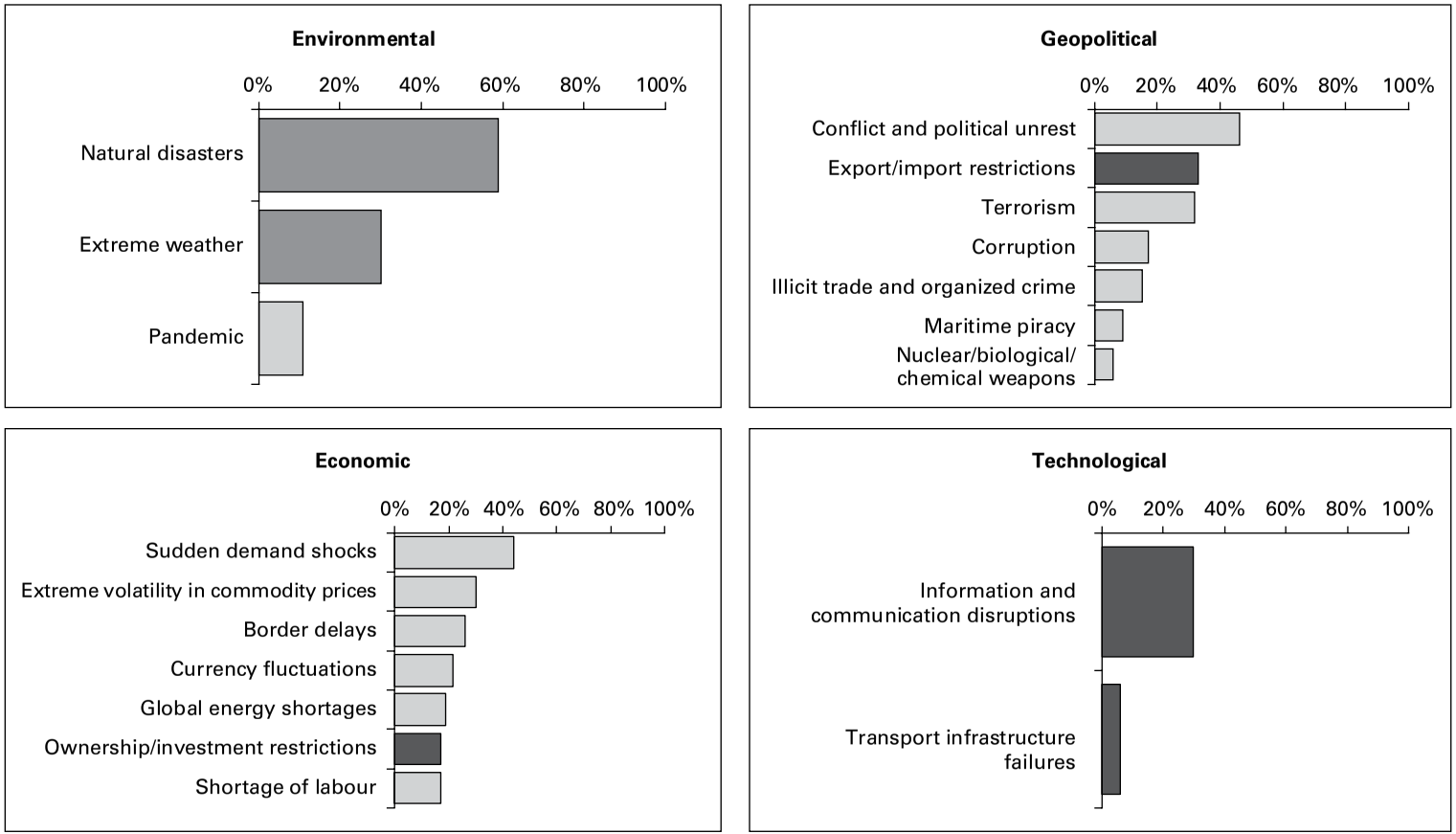
SOURCE: Reid, 2012

FIGURE 12.3 Risk source probability versus mitigation controllability



SOURCE: adapted from Manuj and Mentzer, 2008

FIGURE 12.4 Triggers of global supply chain disruptions



SOURCE: adapted from World Economic Forum Supply Chain and Transport Risk Survey, 2011

Work by Mena *et al* (2011) revealed that although using a number of informal approaches to cope with risk sources, most companies did not have a structured supply chain risk management and mitigation system. This suggests there is opportunity for firms to improve their approach to managing supply chain disruptions.

- *Ensuring adequate supply chain visibility*
  The literature review demonstrates that the complex nature of modern supply chains impedes visibility and that visibility is a key barrier to the implementation of tools for resilience. However, there is not sufficient information in the literature as to whether organizations truly understand how their supply chain networks extend or what they are doing to enhance their visibility in the face of multiple sources of potential disruption.
- *Staff management and training*
  Another barrier to tool implementation was identified as staff training. In the literature, the focus was on the tools and strategies that organizations could employ; however there was little information on the training required for staff to manage events and use the tools effectively.
- *Appropriate levels of bureaucracy and organizational culture*
  Organizational culture in relation to supply chain disruption resilience featured the least in the literature. Although Christopher and Peck's (2004) resilience framework encompasses the dimension of culture, it does not highlight the core values to drive appropriate behaviour. There also was no evidence on the appropriate level of bureaucracy required to deal with disruptions swiftly; this is even though professionals acknowledge the potential economic loss if they do nothing about disruption. Supply chains are interactive systems, whose operational efficiency allows risks to propagate fast and efficiently (Wildgoose, 2011).

There are some companies that are now addressing these gaps, and we will return to the cases and the tools that are being deployed. However, the case of Nokia, Ericsson and the Philips Microchip factory fire is worth mentioning at this point. While it is the most often quoted story of supply chain risk, its reporting often ignores the key point of Nokia's competitive response. Nokia's vice-president of purchasing and supply was alerted to the fire at the time it happened. He activated the response instantly, knowing that a fire in a clean manufacturing site will disrupt output for months (criteria). He empowered his team to travel to the site and also to other suppliers the same night (visibility of the market and overriding any bureaucracy) and to contract for their capacity within hours or days (training and skills). In contrast, Ericsson delayed their response believing that the fire was minor and then, when they did respond, found that Nokia had locked up all the spare capacity in the market.

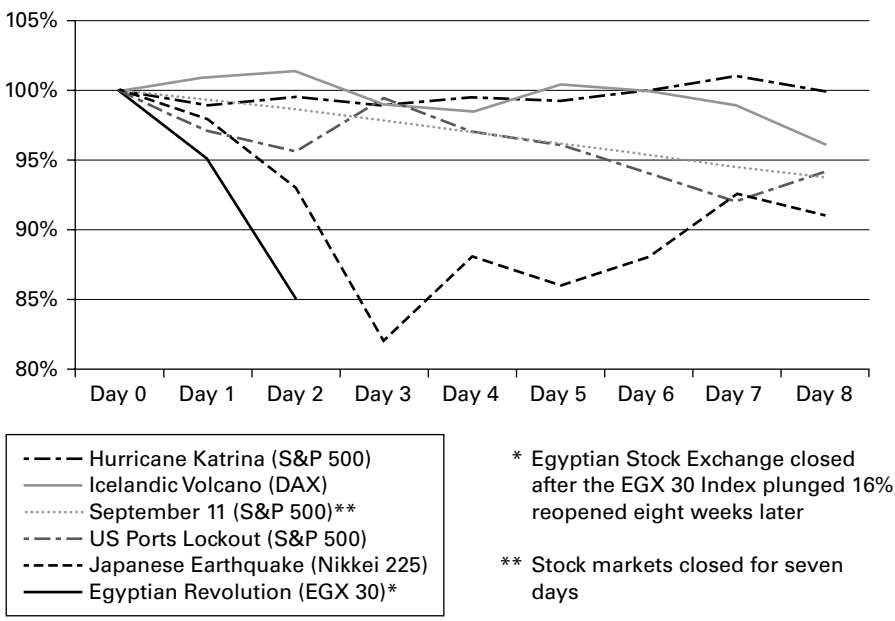
The financial impact of supply chain disruptions

As a result of the fire at the Philips factory, Ericsson was driven out of the mobile handset business altogether, which was a very severe financial impact. The reality of supply chain disruption is that the downside is invariably faster and more dramatic than the competitive upside from pushing the envelope. There are two measures that serve to illustrate this point.

At the national level, stock markets generally fall, but not consistently, in response to natural and economic disasters. Figure 12.5 shows a WEF and Accenture chart of how markets responded to such events.

At the company level, share prices are much more severely affected by disruptions from risk events. Singhal and Hendricks (2000) evaluated the impact of what they quaintly called supply chain 'glitches' on shareholder value; to do this they analysed a sample of 861 profit-warning announcements associated with supply chain difficulties. They found that announcing these glitches was associated with an 8.62 per cent market-adjusted reduction in shareholder value and that, if a period of 60 days before and after the announcement is included, the total effect is about minus 20 per cent.

FIGURE 12.5 Stock market responses to global events



SOURCE: adapted from WEF 2012, models for addressing supply chain and transport risk, based on published Stock Exchange closing prices

Glitches are classified as including: parts shortages; changes by customers; ramp and roll-out problems; production problems; development problems; and quality problems. These are more prosaic risk events and not normally directly linked to natural and economic disasters. However, it is worth noting that this analysis work was first completed in 1999 and 2000 when the incidence of major environmental events was less frequent. Or perhaps their knock-on effect was less because structures were not so integrated?

Clearly from this data, we can conclude that so-called 'foul ups' are not isolated problems, and they destroy shareholder value. They affect customers and suppliers alike, often with equally disastrous results. Observations of how companies actually mitigate risk in supply chain design, planning and execution point to the fact that many do not adequately govern the relationship between their corporate strategy and supply chain management. In these circumstances disruption is inevitable as risk events crystallize for which supply chain design was inadequate and/or mitigation responses were insufficient.

However, the landscape of governance has changed and continues to change as a result of the enacting of the Sarbanes–Oxley Act (SOX) in 2002. This was a direct response to the financial and accounting scandals of a number of major corporates including those affecting Enron, Tyco International, Adelphia, Peregrine Systems and WorldCom. These scandals cost investors billions of dollars when the share prices of affected companies collapsed, shaking public confidence in the US securities markets.

The law has set new or enhanced standards for all US public company boards, management teams and public accounting firms. Top management must now individually certify the accuracy of financial information. This covers a whole swathe of requirements including auditor independence, corporate governance, internal control assessment and enhanced financial disclosure. In supply chain terms, the effect of the SOX Act is seen in rather detailed assessments of corporate risk in the US Stock Exchange Commission filings (SEC). The levels of disclosure and analysis in the SEC 10K documents are increasing; risks are enumerated and described and their consequences and mitigations are set out.

Such legislation is now also found in many other countries such as Japan, Germany, France, Italy, Australia, Israel, India, South Africa and Turkey. The UK is a notable exception, although many large listed companies are dual listed and therefore comply anyway. But the same does not apply to smaller companies and the suppliers' suppliers and customers' customers of these major corporates. Given the experiences in the public domain and the anecdotal finding that only 60 per cent of businesses that experience a major disruption are in the same structure three years later, managing supply chain vulnerability should be a priority in all boardrooms.

Designing for resilience

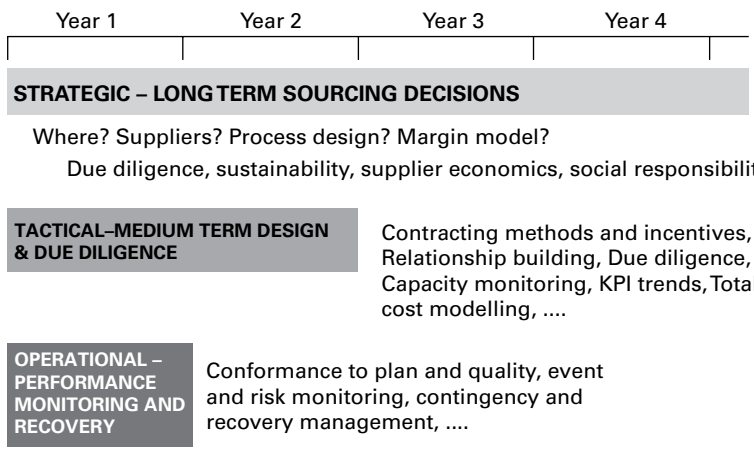
The FT analysis of the use of headings and terms showed that resilience is not fashionable. However, from the impact analysis of risk events, it is arguable that we should be talking in supply chain terms less about risk and more about resilience. The next section of this chapter looks at processes that can support supply chain design for resilience. The big questions are how to manage to avoid, mitigate and recover from disruptions.

The first concept that is important in this quest is to look at what can be called 'levels and horizons'. Figure 12.6 shows this by dividing the levels of decision making into strategic, tactical and operational, and aligning the horizons over which such decisions apply.

Strategic decisions are made for most businesses (certainly manufacturing businesses) on a long-term horizon, at least two years out. These decisions are about where to produce or source, how the business will interact with its sources and markets, and the associated economics and social responsibility. Once a decision is made to source in a particular way, some of the outcomes are 'hard wired' and adverse events will have predictable outcomes. As an example, if we single source product from a supplier on an earthquake fault, we have created an accident waiting to happen. The president of Honda is on record after the tsunami and Fukushima disaster in Japan in 2011 as saying that his company would dual source in future.

Tactical decisions can be varied in shorter time frames but still not instantly. These decisions include the form of contracts, the incentives that might be paid for specific performance, and the balance of supply and levels of inventory that will be made or held. Here the information that might be

FIGURE 12.6 Supply chain resilience management levels and horizons



used to inform a tactical decision would be the capacity utilization of a facility or supplier; the greater the utilization the more will be the risk of disruption if there are operational disruptions. Equally, if there are expected peaks or troughs in demand or specific events, the business may make tactical decisions to ensure that risks are minimized and resilience is increased. The extended horizons of the S&OP (sales and operational planning) processes can deal with expected supplier shutdowns, market peaks and seasonal events. An example would be the application of intelligence that a supplier was financially stressed and might not survive; in such a situation the creation of additional tooling or putting in place shadow contracts would be key decisions. Land Rover failed to make such a decision in 2002 when its body supplier called in the receiver. If they had been aware of the situation and/or acted on it, the company might have been able to mitigate lost production and the investment in buying the assets from the receiver.

At the operational level, the decisions are quite short term, working within the strategic and tactical frameworks that have been established. Here it is about responding to events that may occur inside or outside the business. Examples might include plant breakdowns, transport disruptions, quality failures, or second- and third-tier supply chain failures. An example would be the 2010 Icelandic volcanic disruption that hampered air freight in northern Europe and required that routes through southern Europe were quickly opened. Another would be supplier non-conformance leading to air freight to keep the supply chain running without failure.

Management teams need to be thinking in all three levels simultaneously. But if the strategy and tactics are not correctly framed, the team will inevitably be forced into operational recovery from time to time. The first step on this journey is to understand and map the chain across the many tiers of supply and demand. Each tier will have its inherent risks of failure based on capacity, utilization, reliability, environmental risk, social issues and conflicts with other markets; the tiers will interact with each other and it is important to understand this in as much detail as possible. Figure 12.7 illustrates the scope. Each statistical symbol shows the potential for failure, through the chain. These statistics are additive rather than compensating, which means that the experience at the final customer is invariably badly skewed to lateness and poor service. One of the most difficult factors to understand and quantify is how your chain interacts with others that are using the same facilities and suppliers; if there is competition for capacity, then the impact may be very severe, as Ericsson discovered.

Work by the author with Cranfield School of Management created a supply chain risk and vulnerability handbook (Cranfield, 2003) and this provides a structured framework to think through and plan for structural and tactical supply chain risk. Figure 12.8 shows the conceptual model, which we call the honeycomb of resilience. The underlying principle is that there are external determinants of risk that relate to the business environment of demand and supply. Also there are internal determinants that relate to how the organization is aligned to its external environment. Design for risk mitigation is the

FIGURE 12.7 The scope of supply chain risk (by the author on behalf of Cranfield)

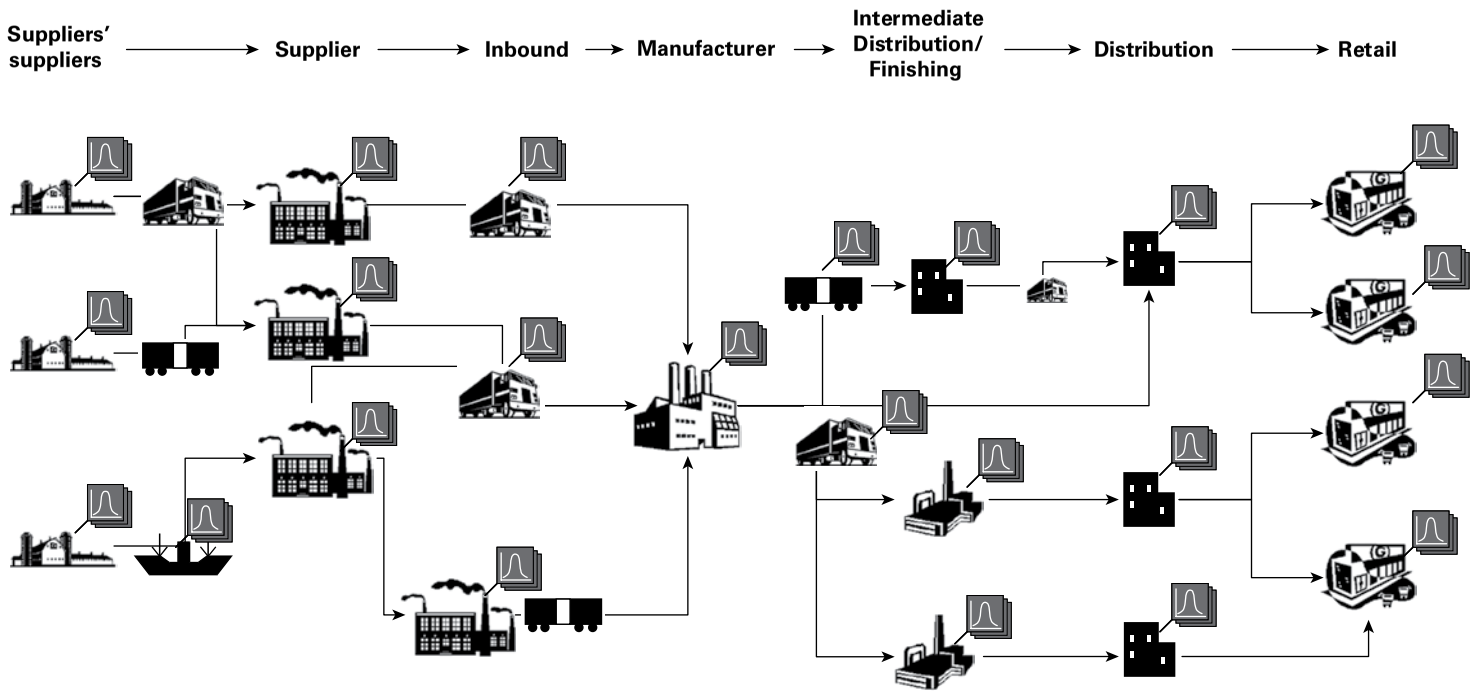
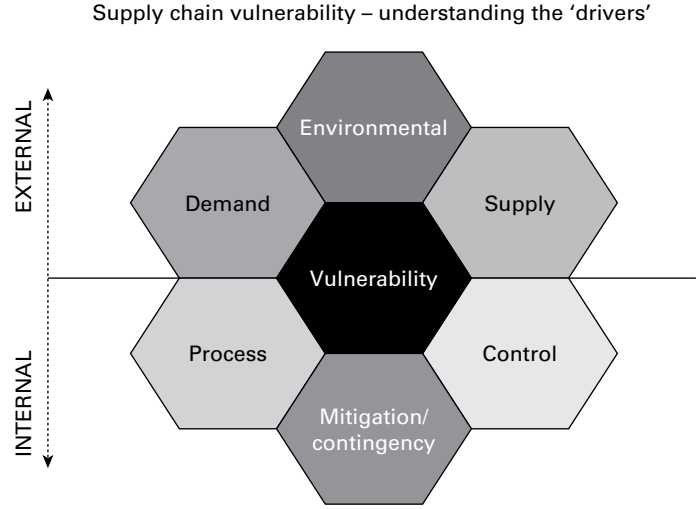


FIGURE 12.8 The supply chain risk 'Honeycomb' – a means to design for endemic risk in supply chains



SOURCE: Cranfield, 2003

third internal determinant and is how companies can address the risks in the other five areas.

As an example of how this model works, it should be immediately clear that a company with a volatile market and suppliers on long lead times with extended planning, scheduling and manufacturing processes is riding for a fall. Putting in inventory to cover expected customer demand is almost certain to lead to both excesses and customer dissatisfaction; actions to design the chain to postpone final customization and plan for generic inventory are mitigating measures. In contrast, is a company operating in a market where demand is stable and/or customer lead times can accommodate longer lead times from suppliers and greater levels of stock as the main mitigations.

The following points step through the honeycombs and shows how it fits together.

The external drivers are the risk areas that are most commonly thought of by managers. This is for exactly the reason that they are external and therefore may be perceived as 'unmanageable'. The risks of unpredictable demand, unreliable supply and the effects of external shocks in the business, social and climatic environment are all the areas that can easily be used as scapegoats for unexpected outcomes. The internal drivers of process, control and mitigation/contingency are more tightly under the direction of the firm itself and are therefore less obvious as being sources of vulnerability.

Making vertical and diagonal connections between the external and internal dimensions areas can provide a conceptual breakthrough in understanding

how risk is uniquely embedded in the individual firm's supply chains. It also takes people away from a focus on probability; by definition, supply chain risks are improbably random, if they were not, the issue would have been dealt with.

External drivers consist of demand, supply and environmental dimensions. Demand risk relates to potential or actual disturbances to flow of product, information and cash, emanating from within the network, between the focal firm and its markets. In particular, it relates to the processes, controls, assets and infrastructure dependencies of the organizations downstream and adjacent to the focal firm. This boils down to risks associated with a firm experiencing demand that it has not anticipated and provisioned for through its chain to enable it to satisfy its customers' demands, or those of its customers' customers. This can be a failure on either the high or low side to accurately accommodate the level of demand. Demand risk is the most commonly articulated supply chain risk. It is often headlined as 'forecast accuracy', market volatility and the 'bull-whip' effect.

However caused, this is about events that are outside the tolerance of the firm's supply chain to accommodate. It is important to note that the consequences of the business not being able to meet demand are context sensitive to the situation of the business. So for example:

- Demand greatly exceeding supply may not be a major strategic risk as the firm can harden prices and reinforce the brand position in the market as being 'the hot product' – Apple and BMW are cases in point.
- But conversely an inability to meet exceptional demand could be interpreted by large customers as a failure of commitment to its market and cause them to look for replacement suppliers – there are cases, for example, of building supplies and fertilizers.
- Demand that is well below expectation is almost always a major threat since the supply chain will have been provisioned and investments made against the forecast; so substantial obsolescence may be incurred.

At the financial level, some level of demand risk can be accommodated but more may threaten the firm's existence. Hence evaluating the resilience of the chain to demand side risk is a key capability; we need to understand the scale/extent of possible risks, their costs – should they occur, and the duration for which the business might be exposed. This needs to include an ability to synthesize and assess the consequential impacts such as lost customer confidence and the effect on sales of other ranges.

Software solutions abound that address the need to improve forecast accuracy and provide visibility of downstream demand; developments in supply chain design are also aimed at avoiding the worst effects of unexpected demand through postponement strategies.

In so far as these are effective in increasing the ability of the business to anticipate volatile demand, they mitigate against the worst experiences of

demand risk. The effective operation of such solutions then becomes internal to the company and is essentially a control risk (to be discussed later).

Supply risk is the upstream equivalent of demand risk, it relates to potential or actual disturbances to the flow of product or information emanating within the network, upstream of the focal firm. So supply risk is risk that is associated with a firm's suppliers, or suppliers' suppliers being unable to deliver the materials the firm needs to effectively meet its planned production requirements/demand forecasts.

The reality is that supply risk is almost invariably thought of as 'failure' of 'their' processes and controls. Most often this is about breakdown, shortage of materials through the supplier's chain, quality and rework issues, or poor planning and hence committing to unreal delivery dates. It may be thought that an aspect of this risk arises when the supplier is unable to meet unforecasted demands placed on it by its customers; this is unreasonable since the key tests of supply side failure are about whether the demand was accepted by the supplier as being within its capacity and then whether it met the demand on time and to quality.

The consequences of supply side failure are usually financially debilitating. Typically, the firm's consequences of supply failures will include: 1) loss of output, revenue and profit; 2) customer dissatisfaction and long-term share loss. Since both demand and output capacity are 'perishable', supply side risks are particularly serious. And these may be compounded since, in the event of quality issues with supply, there is always the behavioural risk that substandard materials may be used in the hope that it will 'get by'; this in turn can lead to product recall and liability risks.

Another common experience of supply side failure is supplier bankruptcy or sector withdrawal. These events commonly occur without formal notice, causing considerable disruption; however they can usually be anticipated with the right intelligence systems in place. Contingency planning for such an event is an important control process inside the firm and this will be described later in this section.

Supply risk extends as well to logistics providers, who fulfil the 'links' in the chain. If a supplier's product is available, but the logistics provider is late delivering (or loses) the product, the firm will experience supply variability, albeit usually of a temporary nature.

Environmental risk is the risk associated with external and, from the firm's perspective, uncontrollable events. The risks can impact the firm directly or through its suppliers and customers. There are many recent examples of this, including the floods in Thailand in 2011 that disrupted global hard drive supply and the earthquake, tsunami and nuclear incident in Japan that seriously impacted Honda, Toyota and many other automakers. On shorter horizons and with less scale would be the explosion at the Buncefield fuel depot in 2005 in the UK.

Economic slumps fall into the environmental category and many markets have some experience of dramatic reversals of fortune leading to business failures and bankruptcies. The 2008–09 global downturn was the deepest

and longest depression for 80 years and many businesses without strong mitigation measures failed to survive. Government actions around taxation and regulation can influence markets or the supply landscape significantly and, although there is usually notice of this, some areas of business (for example tobacco) have experienced quite rapid changes of this type.

Finally, some companies are exposed to targeted sabotage such as product tampering, or terrorist actions, which can have dramatic effects on demand and the sustainability of the business.

Some of these risks are sufficiently remote to be insurable, which can mitigate against their costs; but it is fair to say that many of these factors are outside the insurance net and that the return on a claim will be unlikely to compensate the true loss of market.

Internal drivers consist of process, control and mitigation dimensions. Processes are the sequences of value-adding and managerial activities undertaken by the firm. The execution of these processes is likely to be immediately dependent on internally owned or managed assets and on a functioning infrastructure. Process risk relates to disruptions to these processes and failures in their predictability for the business; process risk pertains to execution whereas control risk relates to planning. The two dimensions are inextricably linked and interdependent, but nevertheless it is useful to consider separately the events that may go wrong physically and operationally versus those from a planning and management perspective.

There is a wide range of potential for failure inside the firm in the same way as with suppliers (supply risk) and customers (demand risk). Again these risks impact both on the ability to create and satisfy customer demand. The outcome is that sales and profitability will fall below expectations.

A failure in the firm's processes can be experienced in some or all of the following ways:

- variation in manufacturing yields, equipment and hence utilization;
- quality and rework issues associated with internal manufacturing and technical processes;
- warehouse operations leading to fulfilment issues;
- business and supply chain systems failures;
- transportation failures where the operation is under the control of the focal firm.

Failure to deploy and utilize the assets and resources of the business is largely unrecoverable as the time value of the asset perishes when it is not used. Firms with extensive operations experience have generally reached equilibrium in their operations where the processes have been mastered and there is a degree of predictability. ISO controls are good evidence of this achievement, as are sound internal performance management procedures. Failure of either of these would then be a control risk.

The greatest process risks are commonly associated with introducing new products, technology and customers as well as changes to facilities and operating methods. Controls are the assumptions, rules, systems and procedures

that govern how an organization exerts control over its processes. In terms of the supply chain they may be order quantities, batch sizes, safety stock policies, contracting methods, plus the policies and procedures that govern assets, suppliers and transportation management. Control risk is therefore the risk arising from inappropriate or misapplied rules and policies.

So control risks are associated with the firm's planning and management activities including the quality, accuracy and reliability of its operating procedures and its compliance with regulations and standards. This is the broadest category of risk, which as explained previously is the planning and control perspective of the process risk (execution). Control risks are almost invariably self-induced by either omission or commission. They could include:

- Systemic forecast error as a result of flawed or non-existent sales and operations planning.
- Inventory control accuracy or set-up failures.
- Inadequate or unsound scheduling methods that are unlikely to give rise to accurate commitments to customers.
- Accounting and financial control failures ranging from credit control to not securing the capital necessary to continue to fund the firm, resulting in missing payments to suppliers or employees.
- Information technology control failures due to incorrect algorithms or parameters or processing capacity and which impedes the ability of the firm to operate. This is distinct from hardware failures, which we would classify as a process failure in execution and for which operational contingency will be appropriate. Information quality, workflow design and security can significantly impact a firm's operations.
- Failure to comply with the regulatory environment leading to external actions to impose fines or closure.

Larger companies have addressed these risks in their standard operating procedures and do not anticipate shocks, but the many recent corporate scandals and the evidence from Singhal and Hendricks (2000) give some indication of the scale of the downside potential when there are control failures.

Mitigation is a hedge against risk built into the operations themselves and, therefore, the lack of mitigating tactics is a risk in itself. Contingency is the existence of a prepared plan and the identification of resources that can be mobilized in the event of a risk being identified.

In the honeycomb model in Figure 12.8, mitigation/contingency is an internal driver that can be put in place to compensate for some aspects of supply, demand, environmental, process and control risks.

Some classic mitigation in supply chain management is:

- inventory;
- capacity;

- dual sourcing;
- distribution and logistics alternatives;
- back-up arrangements;
- improved process and control integrity measures.

Inventory is the classic among these. Safety stocks are put in place to compensate for unusual demand or supply within the lead time to recover the situation. As an example, a pharmaceutical company with a single source of its active ingredient for a drug held 18 months' supply of inventory as contingency: this was because the supplier was located on an earthquake fault.

In contrast, a retailer might have worked out that the temporary loss of one of its four depots due to fire would not interrupt the business severely since product can be rerouted via the others – and the likelihood of two burning out at the same time is remote. However, if that depot had single national coverage, it would be wise to have a rehearsed contingency plan if not actual back-up.

Another example of contingency would be if a manufacturer operating on high levels of plant utilization has identified alternative outsourced capacity, against the event that the plant goes down or some other environmental shock occurs.

Computer systems are generally covered by back-up arrangements and this is considered standard contingency practice. Where this back-up takes the form of a complete disaster centre, then this is a mitigation measure since it incurs costs on an ongoing basis.

Failure to provide mitigation/contingency in any of these (and other dimensions) is a driver of risk. The big idea embedded in the honeycomb is that of 'connecting' between the risk elements. This is a particularly challenging idea since the linkages are very specific to the firm and its environment and it is therefore difficult to make generalizations.

The easiest way to demonstrate how the risk elements are connected is by examples and the following points are a platform for arriving at an initial understanding:

- *Demand risk*
  - Many companies in manufacturing and distribution are dependent on a small number of customers for a large part of their revenue; the loss of these customers, highly volatile ordering patterns or delays in new product call-offs represent serious risks to these firms.
  - However, such risks can be at least partially offset and managed through the existence of good controls for account management, for collaborative forecasting with customers and for commercial terms that recognize the cost of volatility; these controls can extend to the way in which suppliers are managed to connect them to the potential for demand volatility.

  - Such risks can also be managed by process measures to reduce lead times and increase supply responsiveness.
- Supply risk
  - Many companies are equally dependent on just a few suppliers that may provide unique products via specialist tooling or technology, or which may be simply very large in their trading relationships. Typically firms buy in goods that represent a minimum of 40 per cent and sometimes as high as 80 per cent of revenues, so disruption to supply threatens business continuity.
  - Such risks can be at least partially offset by control processes that monitor supplier capacity, viability and reliability, that share forecasts and plans with suppliers and get visibility of their schedules.
  - Mitigation of supply side risk could include strategic inventory holding and dual sourcing or arrangements to move tooling; contingency would include the identification of alternative sources of supply and planning for the introduction in the event of failures in the existing base.
- Environmental risk
  - Environmental risk is the mélange of external risks to the firm, its customers and suppliers that is most difficult to predict of all vulnerabilities as it spans weather, business environment, acts of war and so on.
  - Here the obligation on the firm is to identify the impacts that could arise based on known hazards: from the very short term of exposure of power failure through to severe business disruption due to strikes and natural disasters.
  - Environmental risks are likely to impact on both supply and demand, and an attempt to identify such events should extend to these communities. Mitigation is less likely in this area than contingency.
  - For example, the big retailers have contingency plans to fly in fresh food from around Europe in the event of a port or tunnel blockade, while others have emergency fuel capacity to maintain depot operations in the event of temporary fuel shortages.
- Process risk
  - All firms have core processes at their heart. For manufacturers, many of these will be technical; for retailers and distributors they will be in the areas of buying and distribution. Typically, manufacturers are more exposed to process risk than retailers and distributors with issues of yield, plant breakdown, quality issues, and product safety and health questions.

  - For many firms, especially in the areas of food, pharmaceuticals and engineering, these risks are mitigated through standard procedures such as GMP, ISO 9000.
  - They may also be mitigated through safety stock policies and controlled through supply chain visibility and lead time reduction programmes.
- Control risk
  - The controls that a company applies to its supply chain will impact on its ability to deal with demand, suppliers and to manage the processes by which the firm fulfils demand. Failures in inventory management, demand forecasting and manufacturing scheduling would all be examples of areas where control breakdowns could lead to risks being experienced.
  - The existence of programmes of supply chain performance measurement and key performance indicators (KPIs), with investments in computer systems to assist in the management of demand and scheduling are mitigating measures.
  - Training and people development programmes are equally valuable control mitigation measures, as are the existence of standard operating procedures.
- Mitigation/contingency
  - The lack of mitigation and contingency measures for the major areas of risk that the firm faces is a risk in its own right. The acid test of a firm's preparedness is that it has a risk management programme for its chain that has tried to formally identify the risks that could occur in its supply chains and consider its options in relation to them.

Some examples of disasters and the implications for resilience

It is useful to look at some recent disasters that have occurred in commercial supply chains in order to show how the specifics of the situation can be understood in the context of the framework. Four recent examples have been selected.

The first is the BP Macondo Well (Deepwater Horizon) disaster in the Gulf of Mexico in 2010. Chapter 4 of the US Government's National Commission on the BP oil spill and offshore drilling (National Commission, 2011) points to serious process and control flaws that led to the disaster. In summary, some combination of poor processes in the cementing and the installation or supply of the 'Blow Out Preventer' were compounded by overriding or ignoring of management controls and warnings on the rig. The author would

contend that the core contracting methods and governance between multiple parties on the rig created an accident waiting to happen; the report appears to support this conclusion. The outcome for BP has been huge costs, measured in billions of dollars, and constraints on its ability to explore, invest and develop its business.

The second is the Rana Plaza factory collapse in Bangladesh in 2013, which killed more than 1,000 people, injured about 2,500 and where 332 people are still missing, assumed dead; it shocked and appalled people around the world. This may sound harsh but this was a failure of suppliers occupying the building. For them it can be classified as a process and control risk, since warnings were ignored as to the state of the building they occupied. For their customers it was both a supply risk and a control risk, since due diligence on the state of the building was clearly lacking. It was expected that there would be severe reputational damage to the brands that were buying from the companies in the factory. However, six months later, this was not evidenced by their trading; they were not dependent on the supplies from the factory and the buying public has not deserted the brands. Nonetheless, it is highly likely that clothing retailers and wholesalers will have stepped up their due diligence controls as a result.

Third is the Japanese earthquake and tsunami that devastated a large area of its industrial heartland in 2011. The FT's analysis of how this impacted company profits found that it 'hit a slew of companies both within and outside the country but also created opportunities for many others'. It went on to say: 'Asian results for the quarter to the end of June, compared with the same period a year earlier, paint the most complete picture so far of how companies were affected by the disaster, underlining the sharp difference between Japan, where the impact on final production and the supply chain was severe, and other Asian countries, where it was much less marked' (FT, 2011). Companies severely affected were Toyota, Nissan, Honda, Nintendo, Toshiba, Panasonic, Sharp and Fujitsu. International businesses impacted included Caterpillar and Coca-Cola. For those companies buying from the affected, a single source policy had built in supply and control risks. Companies located with production in the area had control and process risk. Both groups had located sole supply in a major earthquake area without suitable contingency; of course they may have decided that the cost of this safety was too great, taking us back to the economic tension with which this chapter started.

Finally, there is the case of the Icelandic volcanic ash that closed the skies of Europe for many days in 2010 and impacted on the movement of people and goods by air. This was an event that was much less easy to anticipate in terms of impact. From the supply chain perspective, companies were in a dilemma in terms of response as to whether to wait for it to 'blow over' or put in place alternative routes from the south of Europe. By the time that course had been adopted, the cloud had passed. At the economic level, the major pain was suffered by the airlines; most companies were able to accommodate the event by operating their way out of it.

Emerging toolsets and services

This chapter should by now have conveyed the scope and complexity of identifying risk and managing vulnerability to secure resilience. Design and execution are required on different horizons, with many dimensions to be managed and choices to be made.

A variety of toolsets and services are emerging to assist in design, monitoring and incident management. It is not the role of this chapter to describe or endorse specific products, so these descriptions are generic to the areas in which products and service fall:

- Supply chain design has traditionally been about optimizing global networks from a cost and inventory deployment point of view. Emerging products and solutions are enabling visualization and mapping of chains against both supplier attributes and the environment. This visualization is critical in the context of looking beyond the first-tier suppliers and customers to understand where the mostly critical potential points of failure may be. In the context of the honeycomb model, this visualization with supporting data allows inductive thinking around the scenarios for vulnerability. From this, the business can frame the big choices.
- Monitoring is about both reviewing performance against plan and sensing for events that might impact on the performance of the supply chain. Reviewing performance against plan is generally known as 'event' or 'work flow' management. Successful introduction of such systems requires a huge effort in underlying data accuracy, recording due dates and tolerances; for that reason, their adoption has proved difficult. Large logistics and shipping companies such as the AP Moller–Maersk group have implemented systems that capture orders and monitor supplier and shipping performance against them, data that they have easily. Unless their information can be captured and analysed for systemic characteristics these systems are largely operational.
- The idea of sensing is likely to be more significant since it harnessed incomplete information from within the firm that is available over the internet. There are a number of companies in India that are providing such services. In this context, the case of BMW is particularly interesting and is described in more detail below. It is important to note that such solutions may contribute at the strategic, tactical and operational levels.
- Disaster recovery is about coordinating the whole network once a full-blown incident is encountered. There are solutions available

> now that are, in effect, virtual war-rooms; they enable the compilation of data from different sources that allow the centre to review and take decisions, communicate actions and get feedback. These are purely operational and short term in nature.

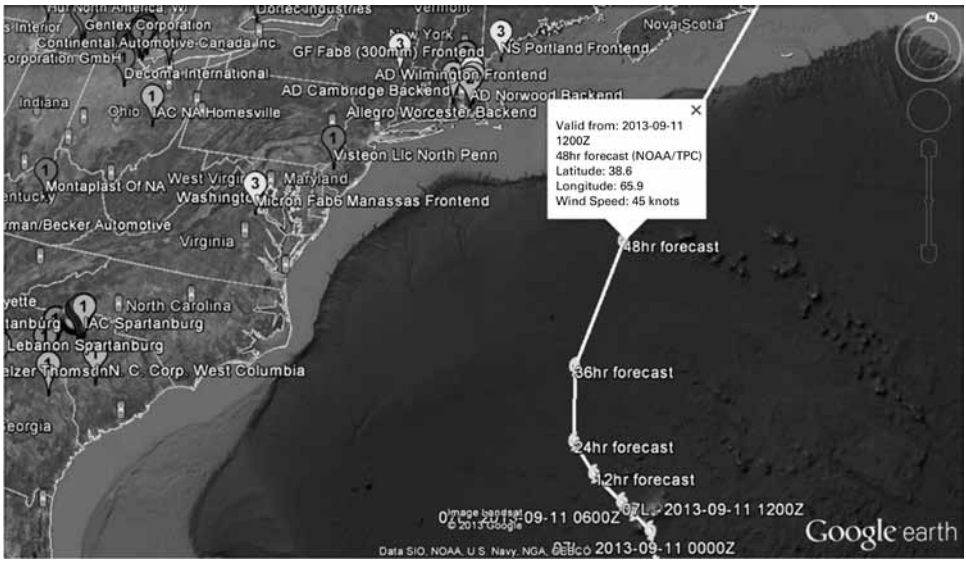
The case of BMW provides a valuable insight into how visualization and sensing can be used to identify and respond to potential risks in the supply chain. Even BMW in Germany experienced 'fall out' from the Fukushima earthquake but it took weeks to reach their headquarters in Munich. Like many vehicles, the electronics in the entertainment, navigation and control systems in their cars are fitted with parts from Japanese companies. BMW did not face any immediate stoppages following the earthquake, but the company found that it took many days to understand how its second- and third-tier suppliers were affected. From this they needed to understand where they might be impacted by delivery failures that would affect production across the group.

Eventually it emerged that a tier-one supplier would not be able to deliver because of just one minor part that was made in the Fukushima area. As a result, BMW decided it needed greater visibility and increased speed of sensing of issues. This led to a collaboration between BMW's Alex Scholz and Tom Kirchmaier from Manchester Business School and the London School of Economics. This team has built an early warning system that scans the internet to sift and coordinate information about its suppliers and the areas in which they are based.

Kirchmaier is on record as saying that it is about 'marshalling unstructured information of which there is an enormous wealth on the internet. Astonishingly, companies make very little use of it because it's difficult to know how to source and then condense it in a way that is useful and meaningful'. The information can be used with Google Maps; an example is shown in Figure 12.9 where tier-two and tier-three suppliers are clearly shown in the face of an incoming storm.

Scholz says that BMW needs to understand more about its chain of about 10,000 suppliers, which manufacture components worth €30 billion per year for the car maker. They are now trialling tools that can read, search, sort and select large amounts of information in a systematic way to build up interactive profiles of each supplier and sub-supplier. Information from earthquakes, other natural disasters and other threats to the supply chain can then be added, flagged and displayed within Google Maps on a large screen. Information from this analysis can be condensed, sorted and delivered to managers as text in an app. While it started as a tactical response tool the realization now is that it can be part of the strategic design and procurement thinking.

FIGURE 12.9 An illustration of the BMW tool on Google Maps



SOURCE: Alex Scholz and Tom Kirchmaier, Manchester Business School and London School of Economics

In conclusion – supply chain resilience is a capability

The management of supply chain vulnerability is a capability that is finding its moment in the development of supply chain thinking. The downside from supply chain risks is much greater than the upside from perfect supply chains. This means that companies need to be more alert to the tensions and build in resilience through formal processes of strategy and design. The tools are emerging, as the BMW case showed, that allow sensing and feedback to operational, tactical and strategic decision-making horizons. Within a few years such approaches will be commonplace in leading corporations.

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13

Information systems and information technologies for supply chain management

XINPING SHI AND SIMON CHAN

Hong Kong Baptist University

Introduction

Data, information and knowledge are critical assets to the performance of logistics and supply chain management (SCM), because they provide the basis upon which management can plan logistics operations, organize logistics and supply chain (SC) processes, coordinate and communicate with business partners, conduct functional logistics activities, and perform managerial control of the physical flow of goods, information exchange and sharing among SC partners.

Information systems (IS) are the effective and efficient means to manage those critical assets, and to provide sustainable competitive advantages. As far as SCM is concerned, information technology (IT) consists of telecommunications, networking and data processing technologies – and is narrowly regarded here as the technological tools used to develop IS, capture or collect data, perform data analysis for generating meaningful information, and exchange and share this information with SC partners. IT is clearly an important enabler for the achievement of SCM effectiveness and efficiency (Bowersox, Closs and Cooper, 2007; Simchi-Levi, Kaminsky and Simchi-Levi, 2003).

In this chapter, we explore the functionality of IS/IT in SCM and discuss its evolution and adoption.

Functionality of IS/IT in SCM

Efficiency-oriented IS/IT

From an information management perspective, IS/IT is conventionally utilized in the application of efficiency-oriented SCM to increase productivity and reduce operational costs. Specifically, it is used to:

- capture and collect data on each product and service in a specific logistics activity, such as purchasing, to provide accurate, reliable and real-time raw facts;
- store collected data in a specific IS in predetermined categories and formats, such as a customer database management system;
- analyse stored data to generate meaningful information for management decision making in response to SCM events, and to evaluate SCM performance in cost reduction and productivity enhancement;
- collaborate and communicate with SC partners, in order to reduce information time-lag and misunderstandings, and to make the data resources available and visible to all SC partners;
- standardize logistics operations and data retrieval procedures, and develop generalized and rigorous information management policies, regulations and control measures; and
- apply transaction cost theory to SCM to gain economies of scale and implement low-cost strategies.

Effectiveness-oriented IS/IT

Today, IS/IT is widely applied in the area of effectiveness-oriented SCM to enhance competitive advantage, add value and globalize operations. In particular, IS/IT is deployed to:

- enhance core competence and positioning of a focal SC organization through designing and controlling the sharing and flow of information;
- re-engineer SC operations and eliminate duplicated facilities or activities, for example vendor managed inventory (VMI) instead of physical warehouses;
- manage marketing, customer, product and service knowledge or expertise developed (accumulated) in SCM, and share this with suppliers and partners, for example collaborative planning, forecasting and replenishment (CPFR);

- manage partner and customer relationships through resource-based and relational views, to stabilize SC structure and enhance relations with adjacent upstream and downstream partners; and
- deploy SC resources and capabilities to compete with other SCs at worldwide level, and through international sourcing and offshore manufacturing.

There are two main driving forces for organizations to invest in IS/IT, develop technological advantages in SCM and push the development of IS/IT applications: changes in the business environment and technological advancement. Changes in the business environment demand growing capacity for data and information management in SCM, thus continuously pulling organizational IS/IT investment. Technological evolution supplies the tools and systems to facilitate and satisfy the demands of data and information processing and transmission, and delivers innovative technology such as wireless technology and radio frequency identification (RFID).

IS/IT development for SCM

The development and application of IS/IT in SCM can be divided into four main levels:

1. IS/IT in logistics functional areas – transaction support system. Here, IS/IT is typically used for applications such as bar coding technology in point-of-sale (POS) systems, order process and inventory management, warehouse management systems (WMS), transportation management systems (TMS) etc.
2. IS/IT for controlling information flows in integrated logistics operations across functional areas in an organization – intranet system, such as enterprise resources planning (ERP), groupware system and distribution requirement planning (DRP).
3. IS/IT used for information exchange and sharing between organizations – extranet system. The system is a structured and standard communication system, used to exchange logistics information among SC partners in certain transactions, such as ordering and trading information. Two of the most widely adopted extranet systems are electronic data interchange (EDI) and CPFR.
4. SCM system, or inter-organizational information system (IOS) – internet or network system for SC partners to exchange information, coordinate SC and logistics activities. Compared with an extranet system, an internet system is much more flexible and powerful in information distribution and conducting logistics transactions. Typical applications are electronic banking, electronic portal, electronic procurement and customer relationship management (CRM).

The difference between intranets, extranets and internets lies in who is allowed to access and use them. An intranet is intended only for internal members of an organization; an extranet is used by those who perform predefined logistics activities and transactions between two or more organizations. Internet systems allow anyone to access and use the system functions available and facilitate SCM information sharing.

Level 1: Transaction support IS/IT

At this level, IS/IT is mainly used as an efficient tool for supporting logistics operations, and the main concerns are whether IS/IT can provide reliable, accurate and real-time operation data and information to support core logistics activities. From an IS perspective, a database management system is the core technique. From an IT perspective, bar coding and scanning is the core technology to capture real-time sales data and convert it into information through POS, and then to produce receipts for customers – and to track stock-keeping units to provide accurate inventory status information and facilitate inventory replenishment. WMS help to maximize the turnover of warehouse space, utilization of equipment and productivity of labour, and to minimize the movement of goods, store time, and the lead time in responding to shipment and distribution scheduling.

Through data and information processing, TMS provides transportation planning, freight payment auditing, carrier selection and performance monitoring. It also performs administrative tasks, reviewing transportation bills and management–carrier relationships. Together, these transaction support systems support SCM to execute low-cost strategies and provide better customer services. However, they provide regional-optimal solutions in processing logistics data and information, they are often not integrated with other IS in an organization and may not be aligned with overall organizational objectives, and may be incompatible with SC partners' IS/IT when information exchange is required.

Level 2: Integrated organizational IS/IT

Integrated organizational IS/IT provides intranet systems that facilitate data, information and communication exchange within an organization, among widely dispersed logistics departments and locations. For example, an intranet system is used to share order processing, inventory and shipping status, and customer credit and accounting information within a firm. The characteristics of intranet systems are that they standardize organization-wide data and information structure and format, integrate isolated transactional support systems and allow data and information sharing.

ERP is the most widely deployed intranet system. It integrates logistics transaction modules with common, standard and consistent databases or data warehouses – and provides multiple interfaces to logistics functional users. It digitalizes logistics operational procedures, regulations, organizational policies and industrial standards into an integrated system, and also contains some advanced managerial support functions such as data

mining, decision support and executive report functions. Essentially, ERP uses the local area network and client–server technologies to implement an organization-wide information and communication framework, and to integrate functional logistics IS such as WMS and POS.

Level 3: Information sharing and exchange IS/IT

Extranet system is designed to control and coordinate the flow of logistics data and information for sharing with SC partners. The system creates an effective and formal communication channel between the SC focal organization and its upstream suppliers and downstream customers, and the information flow is structured in standard business documents with standard formats. With a resource-based view, organizations in an SC become more interdependent when one organization accesses information owned by other organizations and when uncertainty affects the supply of resources. When the business environment changes and shifts power downstream in the SC, those organizations with richer information about markets and customers gain an advantage over other SC partners.

EDI is the most widely deployed extranet system for inter-firm information exchange. LaLonde and Cooper (1989) have addressed EDI as one of the most important changes to affect SCM, and 'it is the glue that binds long-term relationship, and plays an important coordinating role in managing the interfaces between firms as business process go beyond the boundaries of the firm' (Mentzer, 2001). The main benefits of using EDI are: upstream SC partners can access timely and accurate information from markets and customers, and incorporate this into planning and scheduling; downstream SC partners can provide better customer services, responding to market changes and customer demands; all SC partners can reduce paperwork and enjoy quality communication. Other benefits derived from deployment of EDI are increased productivity, cost saving, accurate billing, and improved tracking and expenditure.

CPFR is also an extranet system developed for sharing logistics management processes with suppliers, and it enhances VMI and continuous replenishment by incorporating joint forecasting. SC partners exchange information related to past sales trends and scheduled promotions, forecast future market development and customer behaviour, and even share opinions and suggestions. The system contributes to SC partners by focusing on their core business values and benefiting from each other. Like EDI, CPFR can also improve SC efficiency, increase sales and timely responsiveness to markets and customers, and reduce fixed assets investment and inventory costs.

Level 4: Internet-based SCM systems

The internet is becoming the most useful business communication and information exchange system. It will eventually replace EDI because all information flows performed by EDI can be carried out through the internet, with low access costs and consistent transfer standards. Furthermore, it can synchronize information from all SC participants – including worldwide customers.

Perhaps the most outstanding feature of the internet is that it changes information exchange from one-to-one to one-to-many and many-to-many. Then traditional business partnerships can be changed into an SC organization with many alternative SC partners simultaneously, the stability and trust of conventional SC relationships become unstable, and the development of virtual relationships challenges all existing theories and empirical findings.

Organizations increasingly use advanced IS/IT for manipulating information flows in SCM. However, current IS/IT may not reflect real organizational needs for timely information control, information quality and visibility, reduced information costs, and excellent service. The roles of IS/IT in SCM have changed dramatically in the past few decades – and will continue to change with IT advancement in the future. This raises a series of strategic issues.

Strategic issues of IS/IT in SCM

SCM and IS/IT address information flow from different perspectives. SCM focuses on developing tightly integrated relationships with suppliers and customers; IS/IT focuses on the technology for developing a comprehensive system or sophisticated platform, often regardless of context. Users, organizations and IS managers are often overwhelmed by media hype and are unsure how – if at all – to migrate from their existing SCM real processes to digitalized or virtual SCM operations. We discuss this movement from the perspective of three stakeholders – SC users, SC focal organization and IS/IT managers.

Users' perspective

Users are the SCM operators, who are concerned about the processes, relationships with SC partners and the costs of using IS/IT for daily operations. Some strategic issues are:

- Does IS/IT fit organizational SCM strategies and core competence?
- Is IS/IT adoption compatible with current philosophies and practices?
- What changes in business process and SC structure will take place?
- How will existing suppliers and relationships be affected by the new IS/IT?
- What costs will be incurred during and after IS/IT adoption?

Just-in-time manufacturing and efficient consumer response in retailing have brought significant changes to SC practices. SCM attempts to achieve cycle time reduction and faster inventory turnover by establishing tight linkages with suppliers – and to move from a pure efficiency orientation to greater coordination and integration of business processes in functional areas, including product design and development, market research, production

planning etc. A high level of trust and extensive information sharing are required for successful implementation of these initiatives. But a focus on individual transactions and price reductions achieved by using IS/IT may be inconsistent with the SC philosophies of trust and long-term relationships, so IS/IT may jeopardize an organization's existing relationships with its long-term suppliers. Since the adoption of new IS/IT takes significant effort and time, organizations should check that there is alignment with current SCM strategies. A worst-case scenario is that the introduction of IS/IT is inconsistent and creates confusion among suppliers. Change management, both internal and external, is critical as there are many instances of good IS/IT not producing the desired results due to faulty implementation. For example, Nike had a major problem with production/distribution after introducing an advanced production planning system. They found later that their problem was not the software, but the quality of data input to the system.

Focal organization perspective

Some strategic issues faced by the SC focal organization are:

- Shall we build our own IS/IT or jointly develop IS/IT with SC partners?
- What strategic approach shall we take to developing IS/IT for all SC partners?
- How does the proposed IS/IT impact on our current SC operations?
- What will happen to existing long-term and arm's-length relationships with key customers?
- Will the adoption of IS/IT consolidate our leading SC position and enhance the competitiveness of our products?

A critical SCM decision is how to develop and introduce IS/IT, and still maintain trustworthy, long-term relationships with key SC partners. While long-term relationships and contracts provide stability, they reduce the flexibility of exploring alternative markets, the possibility of faster growth, or increasing profits in some markets. The focal organization needs clear objectives and strategic planning, collaboration with other SC partners to share the risks and benefits, and a careful analysis of the impacts of new IS/IT.

IS/IT managers' perspective

Some strategic issues confronting IS/IT managers are:

- How do we migrate from dyadic EDI platforms to the advanced SCM systems?
- How do we integrate our ERP or other functional systems with SCM systems?

- What internal and external IT infrastructure has to be developed with our suppliers/users?
- What are the system and data compatibility issues in interacting with non-standardized systems?

Naturally, IS/IT managers pay more attention than others to technological issues in the development of new IS/IT, because there are usually internal legacy systems that work with EDI middleware to communicate with their trading partners. EDI provides a standardized data format for two computers to communicate automatically without any manual intervention. This brings a high level of transaction efficiency, but it is not very useful for communication of unstructured information, or for evaluation and negotiation processes. Migration to new IS/IT may require interacting with different web applications and non-standardized data formats that may create problems with organizational intranet systems. For example, getting demand forecast information from multiple customers and incorporating it into intranet systems would require visiting customers' websites individually, retrieving information, checking their data formats and re-entering them in internal systems. This may be a step backward in technology for retailers unless interfaces are developed to retrieve information automatically from websites and store it in intranet systems.

An integrated SCM system that links all the SC partners may be the ultimate solution for IS/IT managers. While communication incompatibilities are relatively easy to overcome through XML and related technologies, data incompatibilities are harder to handle. Unless there is a significant benefit in moving from existing EDI-based systems to an SCM system, IS/IT managers will be reluctant to migrate.

IS/IT adoption for SCM

The strategic importance of IS/IT in SCM means that its introduction needs careful planning with SC partners to guarantee successful implementation. Four theories – resource-based view, relational views, transaction cost theory, resource dependence theory – provide theoretical foundations for IS/IT adoption in SCM. Here, adoption is defined as the development of the 'first' successful IS/IT using a new information-process technology in organizational processes or products.

Resource-based view and transaction cost theory

An organization is a bundle of assets (resources) and capabilities, and the firm's competitive advantage is derived from the possession of unique strategic resources and capabilities. These resources are: value, rareness, imperfect imitability and unsubstitutability (Barney, 1991; Wernerfelt, 1984). In this vein, IS/IT adoption is a strategic investment in the organization's capability

of utilizing information resources – and leverages the value of information to increase the firm's competitive advantages. Studies show that IT is deployed to develop organizational IS, to manipulate organizational information and for operational effectiveness (Mata, Fuerst and Barney, 1995; Santhanam and Hartono, 2003).

Transaction cost theory mainly focuses on the market governance structures of supplying relationships (Williamson, 1985, 1991). The core concept is that in a perfect market, a firm will optimize its supply of materials from specialized suppliers (or make its own). Firms engage in repeated and contract-based transactions with suppliers. In cases where the resources or products are highly supplier specific, time specific, and complex in nature, this is an appropriate approach. The transaction costs of managing the relationships and interactions with the suppliers – including searching, negotiating and monitoring execution of the transactions – are high. By reducing the transaction costs, IS/IT – especially SCM systems – allows a high level of coordination and increases the value of coordinated resources through economies of scale, vertical integration or virtual hierarchies (Clemons and Row, 1991; Holland, 1995; Johnston and Lawrence, 1988).

The resource-based view and transaction cost theory provide a sound foundation for SCM systems. According to these theories, adoption and diffusion of IS/IT can optimize a firm's internal and arm's-length market resources, and integrate vertical business operations with the firm's suppliers at lower transaction costs and higher efficiency. However, the theories focus on organizational resource utilization rather than interorganizational relations (IOR), and more on inter-firm coordination rather than SC partners' cooperation and resource sharing. Thus, vertical integration or a virtual hierarchy is a focal-firm-specific, economic-oriented and contract-based relationship; and the relationship may suffer from long-term instability when economic and market mechanisms change (Dyer, 1997; Premkumar and Ramamurthy, 1995).

Relational view and resource dependence theory

A relational view offers a theoretical understanding of the sources of inter-organizational competitive advantage from interorganizational alliances – SC partnerships or IOR (Dyer and Singh, 1998; Oliver, 1990). The relational view asserts that SC competitive advantage comes from: 1) the relation-specific assets of IOR; 2) substantial knowledge exchange routines, joint learning and partner-specific absorptive capabilities; 3) the synergistic effect of complementary and distinctive resources and capabilities among SC partners; and 4) the ability to employ informal self-enforcement relationship governance mechanisms (Dyer and Singh, 1998; Kanter, 1994; Zhara and George, 2002).

In line with social exchange theory authors (Benson, 1975; Blau, 1964; Emerson, 1962), Pfeffer and Salancik (1978) postulated a resource dependence theory, where resource dependence is based on an organization's ability to

1) control resources needed by other firms and 2) reduce their dependence on others for resources. That is, an organization must gain control over resources that are critical to its operations, and must reduce the uncertainty in acquisition of these resources.

Much research on resource dependence has been conducted (Gaski and Nevin, 1985; Oliver, 1990; Provan and Skinner, 1989). Organizational power – a firm's capacity to control, the actual act of control, and the impact of an organization's perception of dependence on its partners – has been intensively studied to reveal its influence on IOR. In addition, analysis of four dimensions – goal compatibility, domain consensus, evaluation of accomplishment, and norms of exchange – has made significant contributions to understanding the environmental influence of IOR. It has been found that a favourable transaction climate results in more cooperation and better information flows and decision making (Reve and Stern, 1986; Williamson, 1975).

Compared with the resource-based view and transaction cost theory, the relational view and resource dependence theory pay much attention to external resources and collaboration. The relational view focuses on a fair investment of relation-specific assets, and on the development and governance of routines for collaboration; resource dependence theory concentrates on asymmetric resource distribution in social and political settings, and how a powerful organization can employ the dependency of others to accomplish its objectives. Therefore, the relational view is trust-based, and resource dependence theory is power-based.

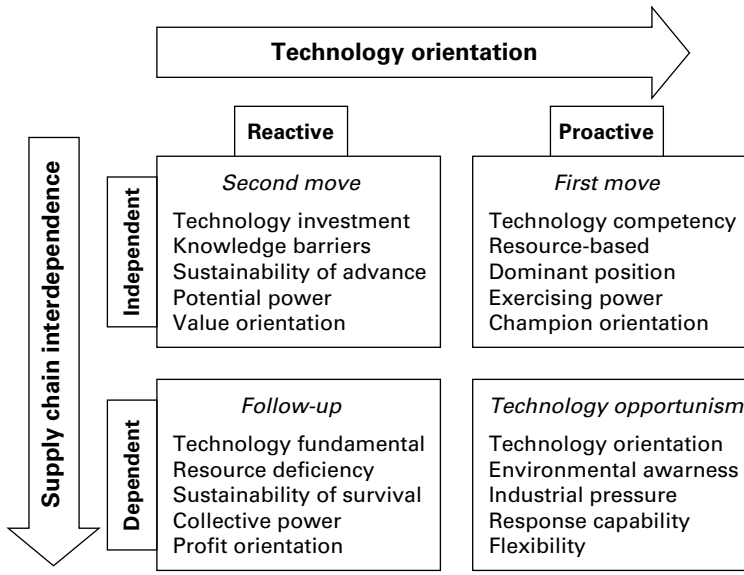
Using power, position and role differences, a focal organization in SC may exercise its coercive influence to control scarce and strategic resources, such as privileged information, knowledge and expertise, technology competence etc. The organization may force its dependent SC partners to adopt innovative IS/IT, such as SCM systems, that serve mainly its own interests (Pfeffer and Salancik, 1978). Evidence of coercive isomorphism has been found in EDI adoption cases (Hart and Saunders, 1997; Webster, 1995). Wal-Mart is a typical example of resource dependence theory, in the way it mandates its top 100 suppliers to use RFID labels. Suppliers who cannot satisfy this mandatory requirement endanger their business transactions and relations with Wal-Mart.

Strategic framework of IS/IT adoption in SCM

Based on these theoretical foundations for IS/IT adoption, we have developed a strategic framework (Figure 13.1) to specify strategies for IS/IT adoption.

Within the framework, the horizontal dimension – technology orientation – refers to organizational and inter-organizational technology capabilities, and the ability to develop products, services and operation processes that contribute to SC competitiveness. Facing an innovative IS/IT, the focal SC organization has two broad options: proactive and reactive. With a proactive approach an organization holds a positive attitude towards IS/IT, is motivated

FIGURE 13.1 Strategic framework of IS/IT adoption in SCM context



by IS/IT adoption opportunities, devotes resources to understanding and evaluating them, and is willing to initiate IS/IT adoption. On the other hand, with a reactive approach an organization shows less interest in new IS/IT, holds back from the system or technology, carefully investigates the implications and impacts of a new system or technology, does tentative trials of IS/IT, closely monitors trends in IS/IT among SC partners and industries, and controls the timing of IS/IT adoption.

Vertical dimension–supply chain interdependence refers to IOR in an SC context, and it reflects the relational view of mutual influence, exchange, interactions, knowledge and information sharing, coordination, cooperation and integration (Dyer and Singh, 1998; Hart and Estrin, 1991; Oliver, 1990). Interdependence has two positions. One is independent, suggesting that an organization has a powerful position in an SC network, more decision-making discretion and a strong influence on other SC partners, the firm's resources and operations are independent of its SC partners, and SC partners are heavily dependent on the organization. The other is dependent, suggesting that an organization in an SC network has limited resources, influence, ability to change SC structure and process, decision making, and bargaining for privileged information and favourable treatment. And there are potential substitute firms in the marketplace, competing to join the SC network with the dominant firm and replace dependent organizations.

The framework shows that there are four strategies for focal organizations to adopt.

First-move strategy

This is an aggressive and self-motivated strategy driven by intrinsic organizational demand for advancement, privilege and advantages over SC partners. A firm using this strategy clearly recognizes the benefits of IS/IT and initiates changes for the firm and SC as a whole. Through adopting IS/IT, the firm can further consolidate its SC position and enhance its influence. However, this strategy is expensive, and needs high technology competence and resources; it also presents a higher risk and lower measurable return of investment than other strategies. Further, deployment of this strategy may require the firm to exercise its power to force any unwilling SC partners to accept and use IS/IT accordingly. (Otherwise, IS/IT is adopted only in the focal organizational, with substantially reduced benefits.)

Dos Santos and Peffers (1995) found that banks that pursued the first-move strategy with ATM machines were able to increase market share and income – with the gains remaining over the long term. This empirically justifies a first-move strategy for capable firms that can lead technological change. Another attractive feature of this strategy for the SC-dominant firm is that successful IS/IT adoption will build competitive barriers, and define the rules and norms of the game in its own SC.

Second-move strategy

This is a conservative strategy, and is driven by the focal organization's management style and policies – and stakeholders' interests rather than potential opportunities from the adoption of IS/IT. A firm deploying this strategy has organizational resources, technology capability, SC position and influence – but it may regard IS/IT adoption as an investment, with evaluation focusing on the return on investment and risk management. The firm may strive to be a competent technology user, but not a pioneer of IS/IT or SCM systems – because its core values and assets may not be derived from technological innovation. When facing innovative IS/IT change, the firm may have knowledge barriers, and will hold back and take a 'wait and see' attitude.

The advantages of this strategy lie in its value orientation – and its rationale is in transaction cost theory. A firm does not invest resources in uncertain projects without obviously added value. Only when the investment environment is favourable, the IS/IT is approaching maturity and the value-add from investment in IS/IT is achievable and accountable will the firm take a positive view of IS/IT adoption. So it mainly uses IS/IT to enhance operational efficiency and cost-effectiveness – but cannot fully utilize the strategic benefits of IS/IT. The disadvantage of the strategy is obvious, as delayed adoption of IS/IT cannot give technology leadership and the firm cannot establish competitiveness based on a SCM system.

Follow-up strategy

This is a passive strategy for SC partners who do not have an initiative for active IS/IT adoption. It is adopted by organizations with limited resources,

small-scale operations and little influence on their SC partners. For firms taking this strategy, the theoretical foundations are transaction cost theory and resource dependence theory – and their business transactions are largely dependent on the dominant organization in the SC network. These firms generally adopt some almost outdated IS/IT to support their business operations, to connect with the dominant firm and to process essential business information – with EDI adoption in small businesses being a typical example. These firms may regard investment in new IS/IT as a waste, or at least a luxury – and they hardly achieve technology competency, using technology to satisfy leading business partners' requirements and business procedure.

Technology opportunism strategy

This is defined as a sense-and-respond capability for proactive IS/IT adoption, responding to new opportunities in ways that do not violate principles of fairness (Srinivasan, Lilien and Rangaswamy, 2002). There are two components of technology opportunism: technology sensing and technology response. Sensing is a firm's ability to scan internal and external innovation, acquire knowledge about and understand new technology – and then provide innovative products and services derived from utilizing or deploying the technology. Response is an organization's willingness and ability to respond to new technologies, to re-engineer its business strategy, and explore opportunities (Miles and Snow, 1978).

A firm using a technology opportunism strategy strongly believes that new IS/IT can create a substantial opportunity, so it proactively scans technological opportunities and seeks to capitalize on them. The firm is not restricted to traditional principles and experience, but understands, analyses and utilizes new IS/IT technology for developing innovative products and services. It is a strategy for ambitious and strongly self-motivated firms. The firm may be small or dependent on the dominant firm in an SC context, but it wants to be powerful by using IS/IT. It may actively cooperate with the dominant SC firm to adopt IS/IT, and create unique value for the firm itself and its SC partners. Microsoft's growth experience in the 1980s is an excellent example of a firm taking a technology opportunism strategy and successfully changing its position in the operating systems and software industry.

This strategy is particularly useful for small firms and requires flexibility in the managerial mindset and operations, and technological competence. Top management direct the firm, while operational flexibility and efficiency speed up organizational change. Of course, this strategy needs a risk-taker mentality, but the benefits of success are far great than the costs of failure.

Table 13.1 summaries the four strategies in 12 strategy evaluation scales, which measure an organization's strategic readiness for IS/IT adoption. The scales cover organizational, inter-organizational and technological issues, and suggest theory deployment in strategy selection for IS/IT. The scales can also be used as a checklist to help an organization make strategy choices, and evaluate whether it is ready to take a proactive strategy.

TABLE 13.1 Factors for strategic evaluation of IS/IT adoption

	First move	Second move	Following up	Technology opportunism
Organization size	Large	Large	Medium/Small	Small
Strategic importance of IS/IT adoption	Very much	Unclear	Not necessary	Ultimate
Leadership motivation of IS/IT adoption	High	Moderate	Low	Very much
Organization readiness of IS/IT adoption	High	Holdback	No	High
Pressure of SC competition of IS/IT adoption	Medium	Medium	Low	High
Pressure of SC partners of IS/IT adoption	Low	Low	High	Medium
Perceived SC needs of IS/IT adoption	Strongest	Strong	Neutral	Strongest
Relation of IS/IT adoption to SC core business	High	Medium	Unclear	High
Firm's mandatory power over SC partners	Strong	Moderate	None	Occasional
Perceived technology radicalness of IS/IT	Acceptable	High	Hardly acceptable	Appreciated
Propensity to IS/IT adoption risks	Risk taking	Avoiding	Risk averting	Aggressive risk taking
Technological slack for IS/IT initiation	Sufficient	Adequate	Lack	Specializing in RFID

IS/IT utilization in SCM

The utilization of IS/IT in SCM can have an effect on performance, but how can an organization make sure that IS/IT is fully utilized? We suggest the following considerations for fulfilling organizational and SC performance requirements:

1. It is reasonable to have a detailed understanding of customer and supplier requirements, as well as all SC partners' concerns. IS/IT adoption should be flexible and adaptable, depending on specific needs and how these needs are satisfied. Performance criteria for IS/IT adoption and utilization include regular reviews of the usage of SC partners.
2. IS/IT advancement has been moving away from logistics functional areas towards a process and SC orientation. Emphasis on the latter ensures more meaningful measurement of relevant processes and more timely and accurate process feedback and coordination.
3. To grasp IS/IT adoption opportunities it is vital to integrate the knowledge of logistics managers, IS/IT managers and knowledgeable SC partners. Logistics managers need to know more IS/IT – and information specialists must develop greater insight into SCM.
4. Financial resources are needed to ensure a smooth IS/IT implementation. Employees' cooperation and use of systems are also critical.
5. Managerial experience and expertise in managing SC relationships and IS/IT adoption also play a critical role in the implementation of SCM systems – and if management keeps a proactive attitude, encourage organizational learning and work together with SC partners, then SCM system adoption among all partners is close to success.

Summary

In this chapter, we show how IS/IT can make significant contributions to efficient and effective SCM. We discuss the development of IS/IT at four levels, reflecting the advancement of IT and the involvement of IS/IT in SCM. IS/IT development and adoption in SCM is complicated, and organizations have to take many strategic factors into account. Facing such a tough challenge, we provide a literature review of IS/IT adoption, and reveal the theories underpinning IS/IT adoption. We provide theoretical guidance – a framework of strategy adoption – and identity the conditions and resources for organizations to initiate IS/IT adoption.

Effective SCM requires SC partners to collaboratively develop a plan for coordinating the flows of goods and services, with timely information to ensure that these are delivered at the right time, to the right place and at the right price. IS/IT plays an important role in achieving SCM objectives. To fully utilize IS/IT potential, organizations need an effective strategy that

fits the organizational resources and relationships with SC partners – and they need to work together with SC partners to share the risk and costs of IS/IT development, and to enjoy the benefits derived from SCM systems.

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14

Improving management of supply chains by information technology

HEIKKI HOLMA
Seinäjoki University of Applied Sciences

JARI SALO
Helsinki School of Economics

Introduction

Supply chain management (SCM) literature is eclectic in nature and draws insights from different but overlapping areas of research (Storey *et al*, 2006; Stock, 1997). Along similar lines, Croom, Romano and Giannakis (2000) describe how 11 different subject literatures – including purchasing, logistics, marketing and organizational behaviour – have contributed to the supply chain domain. Despite attempts to map the terrain (eg Giannakis and Croom, 2004; Mills, Schmitz and Frizelle, 2004), the field remains disparate (Storey *et al*, 2006). The multidisciplinary approach gives a strong theoretical base but also some degree of fragmentation. In practice this means that SCM and uses of information technology (IT) in management of supply chains and networks are addressed in information systems journals and operation research journals as well as SCM-specific journals.

The term 'supply chain management' first appeared in the literature in 1982 (Oliver and Webber via Christopher, 1992). Usually, the beginning of modern SCM is located to the mid-1980s (Houlihan, 1985; Jones and Riley, 1985). In the 1980s just-in-time (JIT) philosophy was popular, as were attempts to

adjust production to meet demand. Gradually it was realized that SCM is something other than just an efficient physical supply of goods. Viewing the supply chain as a social system became more popular in the 1990s, as did studying a move from arm's-length relationships to alliances and partnerships (eg Bensaou, 1999). Studying IT was accompanied by studying information sharing. Electronic commerce was monitored as a potential way to reduce trading cost. For instance, Mason-Jones and Towill (1999) argued how important it is to encourage marketplace information to move through the supply chain.

Characteristic of the current decade is the shift of focus from supply chain management to demand chain management (DCM) (eg de Treville, Shapiro and Hameri, 2004). It is argued that the change of terminology from SCM to DCM better describes the change of managerial thinking from efficient supply to meeting the needs of the customer (Vollmann, Cordon and Heikkilä, 2000). The research has shifted from efficiency to satisfying the needs of the customer for service. The change of thinking to the markets, marketing and demand end of the supply chain is also revealed by Jüttner, Christopher and Baker (2007). They suggest that integrating marketing and SCM attempts to build a new business model aimed at creating value in the marketplace and combining the strengths of marketing and supply chain competencies (Lapide, 2006; Cecere, 2006). In the IS field, a focus on SCM has been shown with efficient consumer response (Kurnia and Johnston, 2003), use of SCM information systems like i2 (Tarn, Yen and Beaumont, 2002), use of extranets to manage suppliers (Vlosky, Fontenot and Blalock, 2000) and, recently, the use of radio frequency identification (RFID) systems and other mobile systems (Wu *et al*, 2005; Salo, 2009). The change is described in Table 14.1.

Christopher (1998) sees the following aspects as important in future supply chains, which may be also virtual ones: the use of shared information that enables cross-functional, horizontal management should become a reality. Information shared between partners in the supply chain is even more important, making possible a responsive flow of products from one end of the pipeline to the other. Virtual enterprises or supply chains will be more common, and in fact they can be seen as a series of relationships between partners based on value-added exchange of information (Christopher, 1998). We express Christopher's themes for managing supply chains successfully: responsiveness, reliability and relationships. Assumptions about 'the paradigm shift' to partnering and strategies of cooperation are also very familiar in marketing, especially among the Industrial Marketing and Purchasing (IMP) Group.

TABLE 14.1 Shift from shallow to broader focus

Paradigm shift	Leading to	Skills required
From functions to processes	Integral management of materials and goods flow	Cross-functional management and planning skills
From products to customers	Focus on markets and the creation of customer value	Ability to define, measure and manage service requirements by market segment, ie perfect order achievement
From revenue to performance	Focus on the key performance drivers of profit	Understanding of the 'costs-to-serve' and time-based performance indicators
From inventory to information	Demand-based replenishment and quick response systems	Information systems and information technology
From transactions to relationships	Supply chain partnership	Relationship management and win–win orientation

SOURCE: Christopher, 1998

Coordination of supply chains with information technology

Coordination of different social networks and relationships has become more vital. Relational factors associated with the critical links between suppliers, manufacturers and customers are emphasized as firms strive for more efficient ways to work in supply chains or networks (McGrath and Sparks, 2005). This development stems from firms focusing on their core competencies and outsourcing less important functions. Consequently, this tendency has accompanied partnership and network thinking. There are still some barriers to overcome. According to Günther, Grote and Thees (2006), improving interaction and collaborative planning are the real challenges in today's world of partnership thinking. Tight cooperation can be seen as a perilous idea, as partners still want to preserve their independence. Thus the challenge is mainly a challenge of coordination (eg Fawcett and Magnan, 2002).

Coordination can be seen as an essential part of integration, where the other important elements are cooperation and collaboration (eg Spekman, Kamauff and Myhr, 1998; Christiaanse and Kumar, 2000; Lee and Whang, 2001). According to Spekman *et al* (1998), cooperation is seen as a threshold

level of interaction. Coordination is a level of integration 'whereby both specified workflow and information is exchanged in a manner that permits JIT systems, electronic data interchange (EDI), and other mechanisms that attempt to make many of the traditional linkages between and among trading parties seamless'. Collaboration can be seen as the highest level of integration, which requires partners to have high level of trust, commitment and information sharing as well as a shared common vision of the future. The antecedent for successful IT adoption and usage in the supply chain is trust between the channel parties. If trust and the seeking of common interests in IT investments exist, a fruitful basis for effective IT usage is established (Cripps, Salo and Standing, 2009).

Although deep collaborative attitudes may not have been adopted in many industrial sectors, a certain level of coordination among the players involved in the supply chain is needed to ensure the effectiveness, efficiency, growth and long-term survival of the chain (Stern, El-Ansary and Brown, 1989). The viability of the total chain or network does not allow for too much independent and sub-optimizing behaviour on the part of individual channel participants. On the other hand, the capability of business partners to have access to shared information on a timely basis is critical for improving their performance (Lee and Whang, 2001). In particular, information flow about real demand is vital. This means that firms in distribution networks should cooperate in developing an inter-organizational system (IOS) in order to minimize sub-optimization and make a high degree of chain or network coordination possible. In fact this requirement has been realized in various supply chain management systems (SCMS), which firms have developed in order to improve coordination of the flow of goods and information across intra- and inter-organizational boundaries (Davenport and Brooks, 2004).

Lee and Whang (2001) express how important it is to develop coordination and interaction among business partners by using IT. Information sharing, planning synchronization, workflow coordination and new business models are the escalating degrees of coordination culminating in whole new ways of conducting business. For example, adopting e-business approaches to coordination promises improvements in efficiency, effectiveness, service and consistency in business. IT and its benefits are an important topic, as companies are beginning to make more use of the possibilities of the internet.

Argyres (1999) and Orlikowski (2000) also provide insights into how IT facilitates coordination and cooperation. Argyres' case of aircraft designing process shows how crucial the information system is to coordination. The system helped to create social conventions that supported designers in coordinating their activities. The social conventions further limited the need for hierarchical authority to promote coordination. Orlikowski (2000) discusses technologies-in-practice. These practices reinforce social structures and these structures become firm prescriptions for social actions or routines. If shared by others, these routines make actions within a community of users more predictable (Günther *et al*, 2006).

However, a lack of glue connecting member organizations (Gadde and Håkansson, 2001) and poor coordination of the distributed autonomy are

common problems in supply networks. Also, poor IT skills, complicated information-rich processes and lack of trust have been identified as major sources of problems in IT adoption in relationships (Cripps *et al*, 2009). Nevertheless, IT enables organizations to decrease costs and increase capabilities as well as affecting interorganizational coordination structures (den Hengst and Sol, 2002).

Attempting better coordination may lead to new business models. Lapide (2007) argues that the finest goal of any supply chain organization is to match supply and demand optimally over time. In fact the concept of demand chain management has widely been discussed as a new business model (eg Lapide, 2007; Cecere, 2006). Selen and Soliman (2002) have defined DCM as 'practices aimed at managing and coordinating the whole demand chain, starting from the end customer and working backward to raw material supplier'. Jüttner *et al* (2007) discuss the concept and its connections with marketing in detail. Coordination as part of integration can be argued to be crucial in the main elements of DCM: integrating demand and supply processes, managing digital integration, managing the cross-functional relationship between marketing and supply functions and configuring the value system. According to Langabeer and Rose (2002), DCM helps to advance the co-ordination of many demand-driven activities. Lapide (2006) describes how new strategies require coordinated decision making among supply chain, marketing, sales and customer service organizations.

According to Cecere (2006), the focus of firms is moving from planning, implementing and controlling operations in order to meet customer demand, to sensing demand, shaping a market response and driving profitable and reliable supply. As supply chain technologies have been developed more for demand and supply matching than for sense and response, this means quite a big transition in the supply chain market. Table 14.2 depicts different types of IT application that can be used to coordinate supply chains. Each has unique impacts on supply chains and when used in combination the changes are even more radical. Figure 14.1 outlines IT applications' relation to and influence on supply chain coordination.

Research methodology

We have undertaken a research project to see how IT can enhance coordination of activities within supply chains, with a qualitative twin-case study. The cases studied are in the wood and steel industries, partly because they have a long tradition of using new technologies (Juslin and Hansen, 2002). The authors conducted in-depth interviews at multiple organizational levels within these industries (Arksey and Knight, 1999). Qualitative data analysis was used to group the material into themes and analyse it (Miles and Huberman, 1984). The authors also used documents, minutes of meetings, industry reports and plant visits to triangulate the respondents' answers in order to validate the research results (Yin, 1989).

TABLE 14.2 IT-based systems for creating and integrating stable IT structures in supply chains

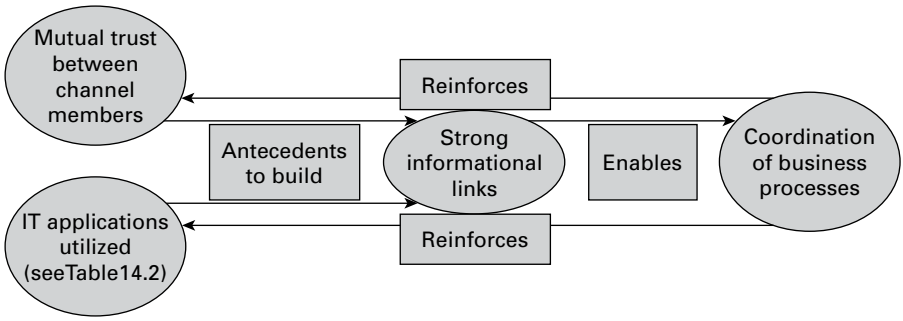
Information-technology-based system	Purpose	Source of information
Electronic data interchange (EDI)	Standard protocols are used to share information among participating companies through computer-to-computer exchange of electronic documents relating to purchasing, selling, shipping, receiving, inventory control, financial, and other activities.	Stern and Kaufmann (1985)
Electronic data interchange over secured internet (I-EDI)	Similar to EDI but over a secured internet connection. Usually cheaper and has higher scalability than EDI. Identical to web-based EDI.	Angeles (2000), Garcia-Dastuge and Lambert (2003)
Extranet	An extranet is usually built to communicate and exchange information with customers, suppliers, and other important third parties. In a technical sense, an extranet is formed when an organization permits outsiders to access their internal TCP/IP networks like the intranet. It is often less costly than the previous tools. Can be used to deliver more information-rich material than EDI.	Radosevich (1997), Vlosky *et al* (2000)
First generation enterprise resource planning (ERP1) system	Total automation of the procurement process, from the point where an employee places an order, through the internal approval process, and right to eventual fulfilment with the help of different software modules. May include human resource management, payroll activities and other financial documentation modules.	Motwani *et al* (2002)
Second generation enterprise resource planning (ERP2) system	Similar to ERP1 but extended beyond one organization to include inter-organizational parties. Provides a tool for managers to visualize inter-organizational processes. In practice it is hard to differentiate between first- and second-generation systems.	Gardiner, Hanna and LaTour (2002)
Enterprise application integration (EAI)	Used as an enabler application between applications that are otherwise incompatible. Achieves application integration through four layers: connectivity, transportation, translation and process automation.	Whiting (2003), Linthicum (2000)

TABLE 14.2 *continued*

Information-technology-based system	Purpose	Source of information
Web services	Can be used universally to standardize communication between applications in order to connect systems, business partners, and customers cost-effectively through the World Wide Web. Enables easier and faster integration with trading partners. Usually less expensive than EAI but only suitable for small organizations.	Curbera *et al* (2002), Chen, Chen and Shao (2003)
ERP adapters	Some ERP software houses provide adapters that enable integration between their ERP system and competitors' ERP systems. Provides real-time information retrieval and update.	Stoer *et al* (2003)
Supply chain management system (SCM)	Usually used to manage information and material flows between a manufacturer and a retailer. Retailing industry-specific solutions are labelled efficient consumer response (ECR) solutions.	Lancioni, Smith and Oliva (2000)
Mobile technologies (WLAN, PDA, RFID, M-CRM)	Can be used to mobilize various activities, including sales force automation (SFA), order pickups and other information and transaction flows between business parties. Warehouse and logistic processes are made less costly and more accurate. M-CRM encompasses customer relationship management via handheld devices such as a mobile or hybrid phone.	Aungst and Wilson (2005) Salo (2009)
Intelligent agents	Intelligent agents can interpret information and identify events based on some logical rule. Based on this, the individuals who have access to the system can make more accurate decisions regarding, for example, production, calls for bids, and logistic services. Limited access could be given to customers so that they could see eg in which phase of production their order is. May be used to coordinate business information in business networks.	Liu, Turban and Matthew (2000)

SOURCE: modified from Salo, 2006

FIGURE 14.1 IT applications, supply chain elements and informational links fostering coordination



CASE STUDY Sawmill industry

Considerable changes, such as shorter distribution channels, outsourced shipping operations, general rationalization and adoption of modern IT tools, have characterized the immediate past of our target industry, as well as the development of all traditional industries. Internal coordination, the first SCM development area of the company, was later accompanied by coordination of the supply chains and integration of business processes. Customer relationship management and working in networks dominated many discussions.

The facilities and cheapness of the internet compared to EDI systems have dramatically increased the use of IT applications. The adoption of e-business applications has correlated with company size. Large companies have adopted e-business tools more extensively but internet applications have increased in small and medium-sized enterprises (SMEs). The most commonly used internet business applications are customer contacts, basic web publishing, marketing, vendor contacts and price enquiries.

First steps towards the internet era at sawmills

In the sawmill, use of the internet along with open mail systems arrived in the mid-1990s. The first mobile phones came to the mill in 1990. The mobile phone improved communication significantly and saved time. In the late 1990s e-mail

replaced telex and fax but it was just a tool like any other. The advantage of e-mail was that it required no special modifications like EDI. Transferring messages between organizations by means of EDI was discussed in theory but never came into everyday use. At that time the company considered EDI standards and systems too bureaucratic and expensive. However, in the late 1980s an experiment having same features as a modern extranet was carried out with a foreign importer. Specifications and invoices were just transferred as bits. This type of data transfer could have made the relationship between the sawmill and the importer stronger, but unfortunately the arrangements in the supply chain stopped this experiment.

Further steps

Internal coordination and integration stems from the late 1970s in our case company. Progress was made gradually. By using new IT tools stock management is better coordinated. When the batch of sawn wood comes out of the process, the system gives it a number. The system asks where the packet should be taken and gives it a bar code. The code is registered in the information system. This system automatically updates the information if the packet is moved or shipped. From the managerial point of view the system is as follows: the process system sends data regarding when the products will be finished to a higher-level system and in the shipment phase it provides shipping documents and invoicing material.

Internal integration was put into practice between departments and controlled many functions, including procurement. But external integration with customers' systems never happened at our case sawmill in the way that it has been realized in the best practice companies or was already utilized in more developed industries.

Modern information tools help to monitor economic development. Production and sales could be seen on a computer screen just by pressing one button. Moreover, responsiveness and accurate and quick market information are crucial in the export business. In addition, customer satisfaction could be improved by being able to communicate quickly. New information applications are essential, because relying on the telephone affects the sending of non-profitable messages back and forth, losing essential details and not being fully able to express the needed information precisely. However, modern equipment does not guarantee transparency of the supply chain if its members do not trust each other and understand the importance of information sharing. The sales manager's portable computer connected to a GSM phone, enabling faster, more secure and easier operation, belongs to today's business. In general, computerization has meant better planning and the ability to set sales targets further ahead. It offers the possibility of getting rid of the pitfall of selling mainly from stock.

Coordination is needed to cooperate with other companies. Sometimes it is beneficial to work with competitors to fulfil orders or make shipments to remote markets with greater volumes and the ability to build up loads to the specifications required.

Our informants request that the chain should be more transparent. The actions and performance of other members in the supply chain should be better known throughout the chain. E-tools could be used for sharing demand data, inventory sizes, capacity plans and production schedules as well as shipping schedules more efficiently. The systems can be developed so that this type of information could be available to appropriate members in supply chains on a real-time, online basis without significant effort.

There is a tendency for our company and the industry in general to focus on key customers. Personal contacts and the impact of people are underlined in making long-term relationships. Partners seem mainly to have remained the same but delivery systems have changed. Deliveries have become more frequent but shipments are much smaller than before. This means that information sharing, planning synchronization, such as collaborative planning and joint design, workflow coordination and evolution of new business models adopting e-business approaches are challenges for the current sawmill industry. New systems should be created for developing routes for out- and inbound transport from and to sawmills as well as services aiming at customizing sawn wood products more fully than before.

Communication and information sharing must be well organized between the members. It is necessary to make sure that all members of the supply chain see the benefits. The motivating incentives for building tight systems must be clear in order to develop partnerships, supply chains and networks. Tight cooperation cultivates strong mutual informational links that may lead to the adoption of modern IT applications.

Current aims at IT adoption

Not only big companies but also SMEs have noticed enterprise resources planning (ERP) systems' benefits. An ERP system is a system navigating business, and it may contain many different applications such as wages calculation, sales, inventory management and production management. The main benefit is the real-time control possibilities. The management know at every moment how the business is running, and can make corrections if necessary. However, these kinds of systems are really new ones in the wood processing business.

A wood processing company producing glue-lam beams announced a new element in their ERP system, namely, sales transactions connected to a production management system. This system covers the whole chain from sales to production

and packaging. Every beam carries with it a great deal of information, which is recorded on the ID-code label stuck on the beam. From the moment a salesman has agreed to ship, it can be traced. The new thing is that the information concerns beams, not packages or items. Moreover, the salesman now has more opportunity to give instructions to production. Therefore, it is possible for the system to give options for scheduling transport.

ERP systems in one form or another are widely used in Finnish sawmills today. Usually, the system includes raw material procurement, production management, inventory management, shipments and sales phases, with document management and financial management. All packet labels include bar codes, so the log information can be tracked and inventories managed. And they can also be used for controlling payments, recording insolvency concerns and unpaid bills.

While ERP systems focus on the management of the company, the modern e-commerce tendency requires efficient data transfer among business associates. This data transfer consists of various business documents. The objectives are more effective and faster data transfer, less manual work, fewer mistakes and simpler processes. The implementation of IT frees up money and time, and provides more effective processes and better customer service.

EDI is common among larger companies and their suppliers, customers, and marketing channel members, but they are relatively cumbersome, expensive and time-consuming, so SMEs tend to avoid them. Instead, the sawmill industry has worked hard to develop standards for internet-based communication, with standardization giving flexibility. Different types of documents can be stored at dedicated websites, from where they are automatically downloaded to be used by business parties. While big enterprises have to deal with thousands of messages every day, more standardized messages can bring significant savings. The second natural step is to transfer that information with as little human intervention as possible directly into companies' ERP systems. According to our informants, leading sawmills are now at this stage.

CASE STUDY Steel industry

The mill is a relatively large European specialized steel producer and the workshop is one of the largest in Finland. The specific focus of the case is on steel processing, ie the hardening and marketing of steel plates and components.

The supply chain has evolved from a supply relationship between the mill and its parent company. A trustful relationship has existed between the mill, workshop and logistic provider for only about 10 years. After the individual steel plates and components have been hardened by the workshop, they are further processed by the mill and then sold on to customers.

Development of IT-based coordination mechanisms

In the beginning, no IT systems were used to coordinate activities in the supply chain. Telephone calls and occasional fax messages and meetings were the only ways to coordinate business besides daily mails. Then IT adoption started with internal applications. At first, various internal applications, from material resource planning (MRP) systems to office software, were acquired to manage materials flow in the mill. As stated, telephone and fax were the most important means to connect to other party when face-to-face interaction did not occur. Already at that time, the early 1990s, the mill had a number of IT systems, which had been in use since the first punch card systems were acquired in the 1960s.

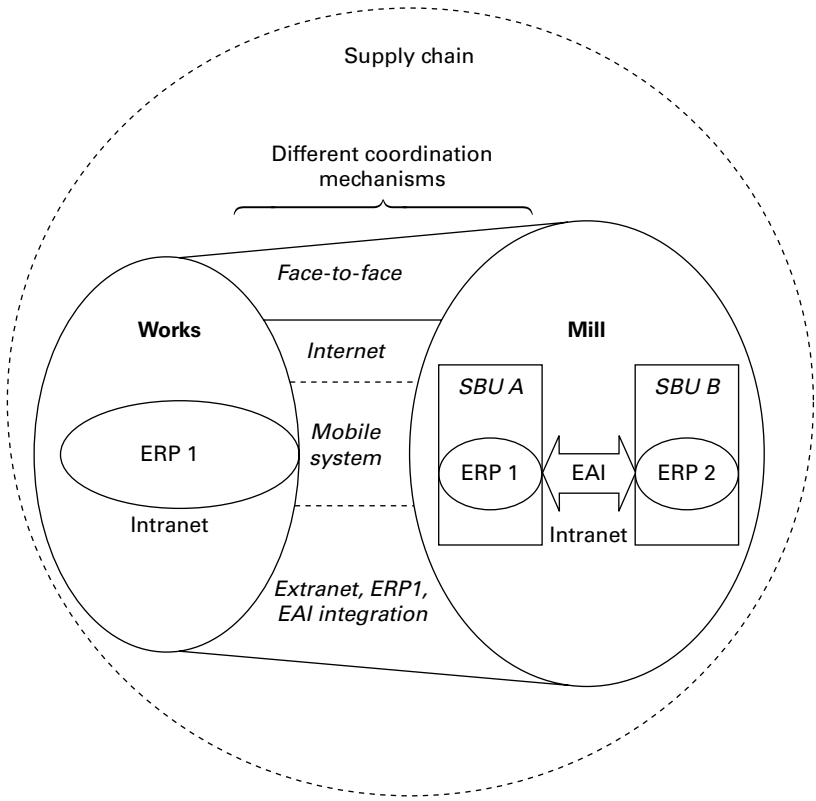
In the mid-1990s the company began to use IT more effectively, with e-mail being used in the supply chain to take care of routine communications. During the 1990s and 2000s the mill has invested heavily in various IT applications and solutions, including electronic marketplaces, point-to-point connections with customers and suppliers, and different software applications. The workshop, because of scarce resources, has invested only in some applications and those investments are carefully planned, but there is currently little integration.

The first issue that was solved with IT concerned order taking. Nowadays, the mill sends all orders over the internet. This makes business easier, eliminates errors and radically reduces costs. Use of the internet for order taking was made possible by the extension of MRP into small-scale ERP systems from the workshop side. This solution can be labelled as an extranet type of solution since it is secured and not available over the public internet. At the same time the mill has connected separate ERP systems to give a more coherent view of processes. The internet is still used for traditional e-mailing. However, currently billing is done physically owing to legal restrictions and the third-party logistic service provider is contacted by traditional means (ie fax, phone and e-mails).

A new step in coordination with the help of IT was gained when a mobile system using personal digital assistants (PDA) and mobile phones as terminals to log into the wireless internet (Wi-Fi) was introduced. Extensions of systems to the wireless world have helped the organizations in the chains to gain further efficiencies. First, steel hardness reports that were traditionally paper-based were digitized, eliminating the time it took to send reports from workshop to mill. Second, both the workshop and mill have an up-to-date view of the hardening

capacity available when employees send reports using wireless devices. This means that the mill sales people can more easily fill the capacity available from the workshop. Overall adoption of this simple system provided considerable benefits to both parties of the chain with limited costs (Salo, 2009). Figure 14.2 depicts the different types of IT applications that were adopted over time to manage coordination problems in the core supply chain between the mill and the workshop (Salo 2006). Missing from Figure 14.2 are third parties such as logistic providers and other suppliers to the mill and workshop.

FIGURE 14.2 IT applications employed for coordination in the mill–workshop supply chain



Conclusions

Companies now work with many different types of supply chains and networks. Increasing pressure by competitors and globalization of business environment have caused managers to look for innovation and value from different places. Adoption and usage of IT within the supply chain in order to make supply chains more transparent is an obvious source of value and competitive advantage. Both sawmills and steel industries are adopting and using different types of IT, and the degree to which IT is used and for what purposes vary. At first sight it seems that the sawmill industry is lagging behind the steel industry, but this might be due to the selection of cases. It can be seen that in practice both industries are heavily adopting and using different types of mobile systems, RFID systems and laser-based systems to improve manufacturing and inter-organizational processes to coordinate interaction. Based on this, we can agree that IT, alongside specialization and outsourcing, is a key precondition for networking of organizations.

Our researches showed that the focus of the supply chain is turning towards more direct sawmill–industrial end-user relationships. The bigger sawmills are increasingly emphasizing short-term agreements, selection of market areas according to business cycles and price competition through customer orientation. In both industries it is clear that SMEs emphasize longer agreements as well as long-term and tighter supply chains including a win–win attitude, frequent interaction and open information sharing. This means that IT will play an increasingly important role in tightly structured supply chains and networks. Both industries' SMEs seem to be starting collaborative planning with their customers, aiming to avoid useless operations. For managers, we have provided new ways to think about the adoption and usage of IT to coordinate joint activities. These findings relate to particular industries, but there is clear overlap with other process industries such as chemical and paper.

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15 Delivering sustainability through supply chain management

KIRSTIE MCINTYRE
Hewlett-Packard

Introduction

Supply chains span industry groups, cross industry boundaries, have a wide geographical spread and are an excellent vehicle for improving the environmental, social and economic performance of companies and industry sectors over the long term. Supply chain management functions are analysed for their potential impacts on the performance of a company. Practical examples from many industry sectors show the steps that can be taken to improve sustainability for the environment, for society and for the business. Specifically, the European Waste Electrical and Electronic Equipment (WEEE) Directive is having a significant and long-reaching effect on the supply chain. From purchasing decisions to reverse logistics, the whole supply chain is being reshaped by this environmental law.

Background

Sustainability has traditionally been a concept that is difficult to sell to senior management because it describes a state in the future that has never been experienced, rather than a specific process or methodology of how to get there. Theoretically, the concept makes sense, but translating it into actionable steps has proved a significant stumbling block for organizations (Preston, 2001). The concept of sustainability or sustainable development has been around for a while, but is a recent customer requirement and one that many companies

are still grappling with. Sustainability is a difficult concept to grasp in an industrial context, as shown by the definition (DETR, 2000):

Sustainable development is:

- social progress that recognizes the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources;
- maintenance of high and stable levels of economic growth and employment.

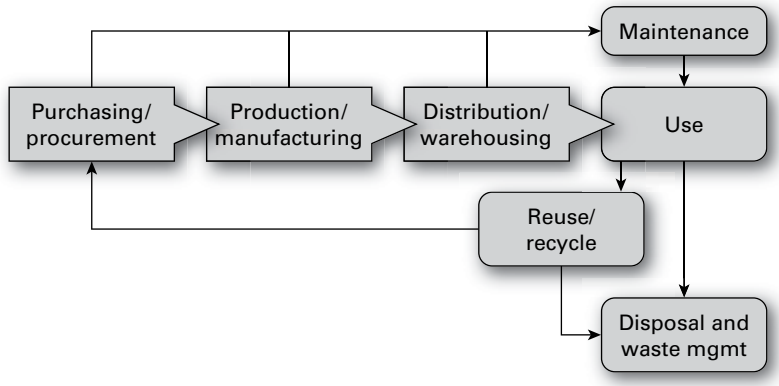
When a company considers what the above elements mean, it seems impossible to continue to do business and be sustainable. But sustainability is not just about being altruistic about the environment and workers' rights. It is also about ensuring the long-term viability of a business model and company. Shareholders, customers, suppliers and employees all need to see a future in their businesses. The functions that the supply chain organization manages are an ideal place for a company to begin putting together the actionable steps and investments that will demonstrate positive progress towards sustainable development.

Waste electrical and electronic equipment is one of the priority waste streams identified by the European Commission alongside batteries, tyres, vehicles and packaging. The directive has been written as part of the 'producer responsibility' set of laws, which demonstrates a shift in focus from process- to product-oriented environmental legislation. In the past, environmental legislation has focused on industrial emissions and air and water quality – but, owing to increasing waste generation and reducing disposal capacity, waste is now one of the top environmental issues in Europe. EU and UK waste policies increasingly involve the private sector. Producer responsibility legislation aims to increase product recycling by making producers financially responsible for their products at end of life.

WEEE has been specifically chosen as a priority waste stream for a number of reasons. There are perceived problems with the current state of waste management. Growing quantities of WEEE mean a higher contribution of WEEE to pollutants in municipal waste streams – and underdeveloped recycling technologies and infrastructure mean that there are limited ways of dealing with this. Diverging national legislation does not support a single European market or the ease of doing business in Europe. Therefore the general objectives of the WEEE legislation are to improve waste management processes, eliminate hazardous substances, increase recycling capacity and introduce harmonizing legislation.

Supply chain management has risen high on the corporate agenda as companies recognize the potential that it offers for creating sustainable competitive advantage in an increasingly turbulent business environment. Customers' requirements are becoming more stringent and companies aim to be increasingly customer-focused – and it is often the supply chain that is able to provide the added value that customers are looking for. The 6th

FIGURE 15.1 Common supply chain factors



Business in the Environment Index of Corporate Environmental Engagement (BiE, 2002) identified the integration of environmental risk into supply chain management as a real challenge for many companies. Supply chain aspects of sustainable development resulted in the lowest management score, with 17 out of 38 industry sectors scoring below 50 per cent. There is a need to look strategically beyond the immediate environmentally driven aspects of supply chain management. With all stakeholders giving attention to the quality of management and corporate governance – demonstrated through supply chains and sustainability – this is an ideal time to look at combining the best of both disciplines. This chapter takes each of the major supply chain functions (shown in Figure 15.1) and discusses their ability to improve sustainability in terms of environmental, social and economic impacts.

Purchasing or procurement

Purchasing is often the first place that companies start to integrate environmental issues into their management processes. This is especially true for service companies. Such companies often do not have large environmental impacts themselves – but the operations that use their services are frequently the area where there is a significant scope for improvement. Environmental performance is certainly now integrated into the procurement function of many large companies, whether for services or for raw materials. These large companies affect whole supply chains and cross many industries with their requirements for improved environmental performance. Some of this is being driven by environmental management systems (ISO 14000 or EMAS) and some is being driven by consumer pressure or even market differentiation. Toyota first laid out its goal of becoming an industry leader in environmental

performance in 1992 with its Earth Charter. It is now imposing the same standards on its suppliers in its Green Supplier Guidelines – which are not so much guidelines as mandates. Toyota in North America demanded that all suppliers implement an environmental management system that conforms to ISO 14001 by the end of 2003. Suppliers must also obey a ban on 450 chemicals as well as comply with hazardous materials transport rules. Many of Toyota's suppliers welcome the tough standards as it brings them to the forefront of environmental performance in their own industries. Toyota has further environmental aspirations with long-term energy reduction and greenhouse gas and zero landfill targets (Zachary, 2001). Such strictures can apply a lot of pressure on suppliers, but Toyota's suppliers appear to have embraced the challenge and feel that they have gained from doing so. Toyota itself has improved its environmental performance by leveraging the effort of its suppliers. This seems an increasingly popular way of improving environmental and social performance, particularly by customer-facing organizations such as car manufacturers and retailers.

A growing number of European retail chains are developing their own safety initiatives by banning chemicals in their products. Many retailers are asking suppliers of own-label products to withdraw or phase out chemicals that have been put on priority lists for further research by the European Commission, national governments or environmental monitoring organizations. Fewer organizations have been successful at incorporating social issues into their procurement processes. However, with recent media attention on Nike and Gap over child-labour issues in their supply chains, the clothing retailers have taken a much more proactive approach to supplier assurance. Nike and Gap both have corporate compliance and monitoring teams who audit contract factories for fulfilment of stated aims and objectives. Many British retailers have joined the Ethical Trading Initiative (ETI), which identifies and promotes good practice in the implementation of codes of labour practice (see the ETI website, www.ethicaltrade.org). It is reasonable to expect more retailers to take these approaches to managing social impacts in their supply chain.

B&Q has been in the forefront of action in this area since the early 1990s when it realized that – as a DIY retailer – the majority of its environmental and social impacts came from its products and suppliers. The company uses both questionnaires and auditors to track environmental and social issues in its supplier base, and has decided that this approach is preferable to requiring an environment management system (B&Q, 1995). It submitted to suppliers, chemical companies and environmental groups a list of chemicals it wanted to ban in its products so that it could declare itself toxic-free by 2005. Some of the chemicals are among the 15 hazardous substances pinpointed for priority action by the Ospar convention, responsible for protecting the marine environment of the north-east Atlantic. Homebase, another DIY retailer, is going even further by planning to ban all the chemicals on the Ospar list – even though the governments that defined the list set a deadline of 2020 for ending these emissions.

Healthcare is perhaps a surprising industry sector to have embraced sustainability. However, many healthcare companies have signed up to 'Practice Greenhealth' – a procurement guideline for healthcare. Practice Greenhealth is a non-profit membership organization founded on the principles of positive environmental stewardship and best practices by organizations in the healthcare community. Its goals are to implement and encourage sustainable healthcare that is good for the environment, good for patients and staff, and good for the bottom line. This means action plans to eliminate mercury, reduce and recycle solid waste, reduce regulated and chemical waste, reduce energy and water consumption, create healing environments, and establish green purchasing policies (Practice Greenhealth, 2013).

The pressure to green the procurement function does not come only from companies; governments are also leveraging their purchasing power. The UK government has for some time produced a *Green Government Handbook*, which advises central and local departments on environmentally sound goods and services. The European Commission (2013) states that green public procurement (GPP) is defined in the communication (COM (2008) 400): 'Public procurement for a better environment' as 'a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured.' For the EU, GPP is a voluntary instrument, which means that member states and public authorities can determine the extent to which they implement it.

Public authorities are major consumers in Europe: they spend approximately €2 trillion annually, equivalent to some 19 per cent of the EU's gross domestic product. By using their purchasing power to choose goods and services with lower impacts on the environment, they can make an important contribution to sustainable consumption and production. Green purchasing is also about influencing the market. By promoting and using GPP, public authorities can provide industry with real incentives for developing green technologies and products. In some sectors, public purchasers command a large share of the market (eg public transport and construction, health services and education) and so their decisions have considerable impact.

Changing methods of public procurement are also being used to drive sustainability into goods and services purchased from the private sector. The construction sector in the UK has discovered that new procurement methods such as private finance initiatives (PFIs) and prime contracting (an MOD initiative) have long-term outlooks and responsibilities (25 years in the case of PFI), which means that designing, building and maintaining sustainable facilities become key to the successful tendering and managing of contracts.

Production or manufacturing

The primary output of today's production processes is waste. Across all industries, less than 10 per cent of everything that is extracted from the earth (by weight) becomes usable products. The remaining 90 per cent becomes waste from production (Senge, Carstedt and Porter, 2001). Resource efficiency – or doing more with less – is the first place to start in improving sustainability performances. Xerox, through its 'waste-free factories' programme, has reduced its volume of waste moved to landfill by over 75 per cent since 1993. Cornwell Parker Furniture's timber minimization programme has saved £250,000 per year and reduced waste by 20 per cent. Cornwell has also overhauled coating procedures, saving a further £180,000 per year, and cut solvent use by 21 tonnes per year. Instead of sending wood waste to landfill, a wood-fired incinerator with energy recovery has been installed. Although this cost £480,000, the reduction in landfill tax and heating fuel gives a payback period of four to five years (Envirowise, 2002). British Airways and its waste management contractor, Grundon, have created a strategic partnership to deal with waste arising from aircraft, engineering facilities and offices. The partnership means that, instead of being presented with an opaque final bill for services, BA receives a detailed breakdown of Grundon's waste-handling costs. This has enabled both parties to identify opportunities for cost savings and then share in those savings (ENDS, 2002a).

Many argue that what we need is a different way of looking at products. Firms such as Dow Chemical, Carrier and IKEA believe that higher profits will come from providing better solutions, rather than selling more units. This creates a potential alignment between what is sound economically and what is sound environmentally. A company's business model no longer requires designed-in obsolescence to push customers into buying new products. Instead, producers have an incentive to design for longevity, efficient servicing, improved functioning and product take-back. Such design maintains relationships with customers by continually ensuring that products are providing the services that people desire, at the lowest cost to the producer.

The shift from valuing 'stuff' to valuing the service that the 'stuff' provides leads to a radical change in the concept of ownership. In the future, producers may own their products for ever and, therefore, will have strong incentives to design products to be disassembled and remanufactured or recycled, whichever is more economical. Owning products for ever would represent a powerful step towards changing companies' attitudes about product discard. When the production function is considered to be a part of the supply chain, there is obviously much that can be done to improve environmental and social performance at this stage. The environmental performance of manufacturing activities has been improving now for many years, much of it driven by easy cost savings.

Social impact assessments are common for large infrastructure projects (roads, pipelines etc) but are not yet a common part of manufacturing activities. However, many companies forget that social impacts include the health

and safety of employees and neighbours, community relations, or noise and congestion abatement processes. Many of these impacts are already part of environmental management systems. Human resource management processes also play a role in identifying and improving social performance – training, fair pay, equality and diversity activities all contribute to a company's sustainability performance.

At Hewlett-Packard (HP) (2013), operations play a key part in reducing the environmental footprint and drive sustainable growth. One of the most significant environmental impacts from HP's operations is the greenhouse gas (GHG) emissions that result from energy generated to run offices, data centres, and manufacturing facilities. Other environmental impacts from operations are those associated with waste disposal, paper use, water consumption, site remediation and the use of ozone-depleting substances. Some of our manufacturing facilities have additional impacts, including waste water discharges and permitted releases of regulated substances.

HP's environmental, health and safety (EHS) management system is designed to ensure that all facilities comply with applicable regulations and meet company standards. At its core is its EHS policy. HP manufacturing operations in owned and leased space worldwide are certified to ISO 14001, the international standard for environmental management systems.

HP takes it further by establishing a goal to reduce its total GHG emissions from operations (Scope 1 and Scope 2) by 20 per cent by 2020, compared to 2010 levels. The company reached its goal to cut absolute emissions from operations to 20 per cent below 2005 levels by 2013 – two years earlier than originally committed. Greenhouse gas emissions from HP's operations account for less than 5 per cent of its total carbon footprint, including its supply chain, operations and customer use of products. However, HP believes that emissions from operations are mostly within their control and aim to take every opportunity to help tackle global climate change.

Another example, the case of Scandic Hotels, shows first that sustainable strategies and practices can be just as useful in service operations as in manufacturing and, second, that such strategies and practices can support a corporate turnaround. In the early 1990s, Scandic Hotels was turned from collapse by a new value system, embodied in the concept of sustainable development, which linked customers and employees. Through employee training programmes, environmental information systems and innovative collaborations with suppliers, Scandic was revived as a profitable corporation (Goodman, 2000).

Distribution and warehousing

Cooper, Browne and Peters (1991) maintain that the transport and storage of goods are at the centre of any logistics activity, and these are areas where a company should concentrate its efforts to reduce its environmental impacts. The authors claim that 24-hour transport is less environmentally damaging,

as fuel consumption is more efficient with less congestion, and that just-in-time operations raise fuel consumption, as smaller lorries consume more fuel per tonne of goods moved than larger vehicles. This is an important point with the exponential growth of e-commerce and home deliveries. The use of combined transport options such as containers using road and rail links is advocated for environmental improvement. To begin the improvement process, the authors suggest a three-stage approach: an environmental audit of the logistics operation, a listing of actions to reduce impacts and a priority ranking of these actions. The problem with these recommendations is that they are not stakeholder-focused, but look only at fuel consumption and economic cost. Improving the efficiency of fuel consumption will indeed reduce environmental impact, but local community issues may become more important when using large lorries in a 24-hour operation.

Supermarkets are only just beginning to take into account the miles travelled by food from its country of origin to our plates. Consumer demand for fresh fruit and vegetables all year round and the falling costs of freight transport have not provided retailers with an economic incentive to reduce the transport associated with their products. However, climate change levies may change this as transport emissions are counted as part of a company's carbon dioxide burden. Drinks manufacturer HP Bulmer has identified that the second-biggest source of carbon dioxide and other air pollutants is transport – with outbound goods accounting for some 85 per cent of its total transport emissions. Currently 100 per cent of the company's transport is by road, but it has been testing ways of putting some back on the railway. A partial switch to rail appears to be cost-neutral and results in environmental benefits, with carbon dioxide emissions per tonne-kilometre reduced by 80 per cent. Such initiatives allowed Bulmer to set a target of reducing the environmental impacts of its transport operations by 75 per cent in 2004 (ENDS, 2002b).

Transport is often viewed as an activity with a negative environmental impact, yet the transport sector represents 7 per cent of the gross domestic product (GDP) of Western Europe and employs 7 per cent of the workforce. On the other hand, the cost to society in terms of congestion, pollution and accidents has been estimated to be 5 per cent of the GDP. The energy consumption of the transport sector is one-third of all the energy consumed by EU industry, and 85 per cent of this is used by road transport. Unfortunately, the recent troubles of National Rail in the UK have done nothing to encourage goods to move from road to rail. And the sector is fragmented, very competitive and disinclined to act in concert to find solutions to its problems (Howie, 1994). Congestion is inflationary and decreases productivity through delays, stock-outs or over-stocking. So, there is a dilemma between reducing environmental impact and increasing financial cost. To some extent, this can be overcome by intermediaries such as consolidators (organizations that ship many companies' products together to maximize loading efficiencies).

Warehouse management is another key social and environmental factor in distribution. The siting of warehousing and distribution centres can be a major issue for local communities because of noise and congestion. The

energy consumption or health and safety record in a poorly managed, temperature-controlled warehouse can eclipse all the other efforts that a company may make, yet it is often an overlooked function of the supply chain. Packaging and waste management are also important processes, often based at warehouse locations, which can have far-reaching impacts on the environment. The Packaging Waste Directive (94/62/EC) and national packaging laws now include all types of packaging in aggressive recovery and recycling targets for companies using over 50 tonnes of packaging a year. Anheuser-Busch, the US food processor, is looking at both in- and outbound materials to see how suppliers can improve the company's environmental performance as well as its bottom line. Suppliers have played a major role in its packaging programme, which has resulted in a reduction of aluminium use, saving $250 million per year. The company has also worked with materials-recovery suppliers to increase recycling rates as well as the quality of collected aluminium beverage containers. It is now the world's largest recycler of used aluminium drinks containers, currently recycling 130 per cent of the amounts it ships in the United States. Overall, the company has reduced the amount of solid waste to landfill by 68 per cent since 1991, saving $19 million. Such efforts take several years, require collaboration with suppliers and need to be integrated into existing quality programmes and new business initiatives (*Purchasing*, 2001).

Use and maintenance

As many life cycle analyses have proved, it is the 'use' phase of a product or service that often creates the biggest environmental and social impact (McIntyre *et al*, 1998). It is also the use phase that many companies are recognizing as key to customer relationship management. As Volvo discovered years ago, when a company is selling cars its relationship with the customer ends at the purchase; when the company is providing customer satisfaction, the relationship just begins with the purchase. By interacting with the producer, the consumer can become a co-creator of value or, in some cases, a destroyer of value (Senge, Carstedt and Porter, 2001). Xerox found that it was not the electricity that its equipment consumed that caused the biggest environmental impact, but the consumption of paper and toner and the visits from the service engineer in a van (McIntyre, 1999). This indicated to Xerox that designing greater reliability into machines and then providing more training to customers would substantially mitigate the environmental impacts of its supply chain. Cooperating with paper and toner suppliers to reduce energy consumption at the production stage would result in greater cost savings and less environmental damage.

BASF's premise is that its products will have commercial advantage if they deliver environmental benefits as well as performing at the same level as the competition. The company examines all of its major products and processes every three years and assesses how they can be made more profitable or more

environmentally friendly or, where necessary, replaced. The company has now undertaken more than 100 eco-efficiency analyses. One example introduced plastic fuel tanks for cars as being more eco-efficient than metal ones (because they are lighter and will reduce energy use and, therefore, cost to customers). Collaborations between BASF and its customers have become increasingly important in making choices about materials (Scott, 2001).

The examples above show that product stewardship is the key issue in the use phase of products and services. It is a key issue for a number of reasons, not only environmental and social impact, but also as added value to the customer. Corporate governance, ensuring that stated policies are adhered to and maintained, is also being extended by some companies into product stewardship. It is not enough for them to have products disappear on to the next stage in the chain: they are concerned about how their products are being used.

It may be difficult for service sectors to internalize product stewardship, but in practice 'service stewardship' can be applied equally. Understanding the environmental and social impacts that occur through the lifespan of a service is the first step to a reduction of those impacts. The hotel industry, for example, has understood that laundering towels is one of its biggest impacts. Many hotels now have a green hotel charter, which asks guests to consider whether they need clean towels on a daily basis. Although it is still the customer's choice, the hotel is using its relationship with its customers to mitigate environmental impacts from detergent, water and energy consumption.

Dispose or reuse and recycle?

Other organizations have focused their environmental efforts on the other end of the supply chain with recycling issues. Equipment is returned from the customers of companies such as IBM, Nokia, BMW and Xerox (Hopfenbeck, 1993: 139–73). These companies either recondition the old equipment or reclaim the materials they are made from, reprocessing them into raw materials. Logistics is well qualified to deal with cradle-to-grave issues because of its focus on the control of materials from suppliers, through value-added processes and on to the customer. The interface between logistics and the environment is embedded in the value-adding functions it performs (Wu and Dunn, 1995). To minimize total environmental impact, it must be evaluated from the total system perspective and reverse logistics may be the answer to improving the environmental impact of the supply chain by improving material use (Giuntini, 1996).

The requirements of the WEEE Directive emphasize that industry and governments should be driving towards individual producer responsibility, away from the collective responsibility of dealing with historical WEEE waste. This means that each producer would be responsible for only its own products, not a share of all WEEE within its market category. The aim of

this is to achieve environmental benefits through encouraging innovative design and recycling technologies driven by producers. For example, Hewlett-Packard (2005) has been designing products for a number of years using the concept of extended producer responsibility. It is equally concerned about the design impacts on the cost of recycling the product at the end of its life as it is about the energy consumption and hazardous materials content. HP therefore assumes that its products will be easier and cheaper to recycle than its competitors' products and that it will be able to pass on this cost advantage to its customers.

The challenge for the supply chain is clear in this scenario. In order for HP to realize its cost advantage, it needs to recover and recycle only its own products. In these days of underdeveloped recycling infrastructure and technologies, it is difficult to see how this can happen without large amounts of manual handling to sort through piles of IT WEEE and select only HP branded products. Studies in the UK and other countries have shown that a significant proportion of WEEE returned by householders is unrecognizable or has no brand name left on it. This issue may be resolved with the advent of radio frequency identity (RFID) tagging, but this would require significant investment by producers to incorporate it into products, and by the recycling industry to invest in the sorting machinery needed to make the system efficient. However, it is only through producers being able to realize the benefits of eco-design at the end of life of products that the WEEE Directive will achieve one of its primary objectives – preventing so much electronic waste being generated in the first place.

The construction industry in the UK consumes around 6 tonnes of material per person per year and about 10 per cent of national energy consumption is used in the production and transport of construction products and materials. Some 250–300 million tonnes of material are quarried in the UK each year for use as aggregates, cement and bricks. Approximately 13 million tonnes of construction materials are delivered to site and thrown away unused every year (DETR, 2004). The construction industry produced an estimated 73 million tonnes of construction and demolition waste in 1999, representing 18 per cent of the total waste produced in the UK. Only 12–15 million tonnes of materials (less than 20 per cent) are recycled per year, as hardcore and landscaping fill. Using these materials more effectively, through reclamation and higher-grade recycling, would reduce the use of aggregates, save energy and reduce pressures on landfill sites (Vivian, 2001). For example, in 10 demonstration projects, MACE, Laing Homes, AMEC Capital, Wren & Bell, Schal, Scottish Executive, Try Construction, the Environment Agency and Carillion have all worked with CIRIA to minimize waste. Examples of waste minimization on these sites include (CIRIA, 2001):

- the recovery of 500,000 roof tiles for reuse in housing developments, saving £80,000;
- a house builder saving £600 waste disposal costs per housing unit built;

- a reduction in over-ordering by using just-in-time deliveries;
- the minimization of waste at the design stage of an office refurbishment;
- the segregation of waste on-site, saving 20 per cent on disposal costs;
- better control of waste by the use of rigorous procurement and contractual measures.

Managerial and financial sustainability

What about all the support structures around supply chains, such as financial decisions, management systems and governance? Certain preconditions are necessary before an environmentally oriented value chain can be created. These include an environmentally oriented system of corporate management, a culture that allows learning, and a top-down principle with bottom-up support. Development and change aimed at the target audience are more likely to result in the environment (or sustainability) being considered from the beginning of the process (Steger, 1996).

Much of the influence on sustainability comes from outside the firm. Many in the fund management community probably think that sustainable development has little relevance to their decision making – but what about the energy company that is ignoring the rising tide of pollution legislation, or an automotive stockist that has not considered the implications of forthcoming vehicle recycling directives (Belsom, 2001)? When the cost of emitting climate-change gases is incorporated into the tax regime through the UK climate change levy, then the economics of doing business will change. The Society of Motor Manufacturers and Traders estimates that the extra cost for each new UK car after the implementation of the End of Life Vehicle Directive will be between £115 and £300. These uncertainties reduce the earnings from companies' stock and so their performance on the stock market.

Socially responsible investment aims to influence companies to adopt policies that benefit the environment and society at large. As investors, socially responsible investment funds have a great deal of influence over the way in which a company conducts business (CIS, 2002). An EIRiS/NOP (1999) survey found that over 75 per cent of UK adults think their pension scheme should operate an ethical policy, if it can do so without reducing the level of financial return. Of these, 39 per cent said their pension should operate an ethical policy even when it might reduce the size of their final pension. The growing prominence of ethical issues is also reflected in the spectacular growth in numbers and size of available funds that apply ethical criteria. Research by the Social Investment Forum indicates that, in 1999, more than $2 trillion was invested in ethical funds in the United States, up 82 per cent from 1997 levels.

Socially responsible investment is a growing trend and there are a large number of rating organizations that assess and screen companies to provide information on their operations. These rating organizations scrutinize factors such as environmental impacts and solutions, sustainability issues, management and external focus – and companies will need to consider the strategic responses in these areas (Walker and Farnworth, 2001).

Reputation and governance of a company and its supply chain are also key issues. Shell appeared very badly when it decided to sink an ageing oil platform, Brent Spar, even though it transpired that its solution for disposal was well researched and advised. Shell was unable to recover its corporate reputation and has since attracted more unwanted attention over its operations in Nigeria. Public and pressure group perception of a product is also important in laundry detergents. Suppliers of phosphates and linear alkyl benzene sulfonate (LAS) for laundry detergents in Europe are having mixed success in their fight to gain environmental support for their products. Denmark's environmental authorities are taking such a determined stance over LAS that Procter & Gamble has decided to stop marketing detergents with the surfactant in that country. It is not good for the image of its brands for the company to be seen to be opposing local authorities, even though research indicates that LAS is more biodegradable than the alternatives (*Chemical Market Reporter*, 2001).

BP looks at the challenge of sustainable development as a business opportunity. 'There are good commercial reasons for being ahead of the pack when it comes to environmental issues', says John Browne, BP's former chief executive. Business can play a leadership role in changes, with change driven through market innovation being easiest for our society to understand. The challenge is to develop sustainable business that is compatible with the current economic reality. Dell, Sun Microsystems and Cisco Systems have all identified supply chains as strategic differentiators, using them to forecast and plan future products and services by building trusting relationships through collaboration. As supply chains evolve from linear supplier–customer links to dynamic networking organizations, all members become involved in defining the processes and contributing to the value of the finished product or service. Innovative business models and products must work financially, or it will not matter how good they are ecologically or socially.

Conclusion

This chapter has shown that the pressures to be a more sustainable company in terms of the environment, economics and social responsibility are increasing. It has also shown that many companies have already started on the long road to sustainable development, some with huge success. Sustainable development is here to stay as a customer requirement, and the processes of supply chain management are ideally placed to respond to that requirement. However,

meeting customer and market expectations, improving market access and increasing cost savings represent baseline expectations and are important simply to environmentally responsible companies remaining competitive. Control of the social and environmental aspects of supply chains will lead to better understanding of the supply chain as a whole. This in turn can lead to cost savings and better relationships between partners.

There are many challenges for the supply chain in the WEEE legislation in Europe. For some operators, little will change; for others, there will be a complete sea change. There are opportunities in data management, traceability and assurance, and in the potential development of interim sorting centres or platforms, for retailers and producers. The division of responsibility and accurate reporting is a challenge for members of specific product supply chains. Those parts of the supply chain that can respond to sustainability issues such as WEEE will generally be more proactive and able to meet changing customer requirements and market forces. By taking sustainability one step at a time – early in business planning – it is indeed possible to differentiate and innovate to create value. Supply chain management processes are an ideal place to start.

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16

Performance measurement and management in the supply chain

ALAN BRAITHWAITE
LCP Consulting

Introduction

Lord Kelvin, 1824–1907, the famed physicist and mathematician, is quoted as saying: 'If you cannot measure it, you cannot improve it.' More prosaic is the current jargon that says: 'what gets measured gets fixed'.

In the last 10 years we have moved to a world that measures, targets and analyses almost everything across business, politics and sport. In the latter, match statistics will enumerate the tackles made and missed, the offloads, yards gained and turnovers; obviously they also record the score and the winner. Detailed inspection of the numbers will generally show where the performance of both individuals and the team were superior and this can be used in training and improvement for both the winners and the losers. Knowing the weaknesses can drive better practice and performance.

Business and politics are not significantly different with the macro measures of growth, profit/surplus, employment, investment and debt being universal. Operational measures such as hospital waiting times and mortality as well as crime statistics apply in politics, while in business their parallels are measures such as stock turn, customer service, market share and brand image. We compare this year or quarter versus the last, look for trends and plan for improvements.

Measurement and reporting of KPIs (key performance indicators) is a core discipline in business for governance and accountability. It has been grounded historically in the backward-looking accounting disciplines of recording profit and solvency; with extended financial reporting timetables

and the potential to window-dress the result, it has been likened to driving down the motorway steering through the rear view mirror with a telescope. And the importance of the integrity and timeliness of such reporting is frequently drawn into question through corporate events such as Enron, WorldCom, Parmalat, Lehmans, Madoff and the Co-operative Bank. These episodes, among many, simply serve to show that it is possible to sustain false positions for long periods through the 'managed' reporting of high-level measures, notwithstanding certified audits.

The academic literature and the press are full of analysis and reports of both measurements being falsified and behaviours being modified to secure target outcomes with unpalatable side effects. Performance measurement and management is a fertile ground for driving less than desired behaviours; in short, targeting on outcomes invokes the law of unintended consequences (Merton, 1936).

In that context, this chapter aims to provide an overview of performance measurement and management in the supply chain. It introduces a number of models and perspectives on how to:

- drill down to the supply chain from corporate objectives;
- deal with the complexity of supply chain measures;
- address the challenge of putting in place balanced measures;
- integrate the measures into the business or organization so that the desired behaviours and change are secured.

Performance measurement in the supply chain is used for a variety of purposes:

- benchmarking against other organizations to establish potential for improvement;
- setting performance targets for executives that are internally consistent and drive the required change;
- unravelling the detail of input and output measures to ensure goals are correctly focused;
- monitoring progress against targets at both the input and output level.

Keeping score and benchmarking – a basic management principle

The essence of business is to generate profits and cash from satisfying customers through its investment in assets and capabilities. The conventional wisdom is that investors seek a premium return on investment that reflects the additional risk of trading with the assets. This has historically been compared with the apparent safety of a bank, albeit that such an approach might now be questioned. This introduction alone alludes to many measures –

return, risk, premiums – and their use as benchmarks for decision making by both management and investors.

Investors generally do not run the businesses in which they participate so they appoint management to do this for them with the aim of increasing returns. They, and their analysts, therefore want information on the financial health or otherwise of the business so that they can make judgements on the management and the prospects for their investments. Banks want the same information in order to assess the viability of making loans, and governments so that they can exact the tax dues that society demands.

The requirement for compilation of performance measures in terms of financial health and its disclosure is therefore vital for the stakeholders; for quoted companies there is an 'industry' of financial analysis that picks over the reported results and statements and attempts to forecast the prospects. Accounting standards bodies such as the Securities and Exchange Commission in the United States, and the Accounting Standards Authority in the UK, regulate the preparation of such company information. The trend has been to require increasing disclosure not just financially but also in respect of subjects such as corporate social responsibility (CSR).

For day-to-day management, performance measurement, reporting and management needs to come closer to the reality of serving customers and the operational demands of day-to-day decision making. In the context of both business direction and the detail of the supply chain, the task of measuring performance unpacks into many layers of detail.

Companies' supply chains are a complex system with many interfaces and dynamic interactions. The desired outcomes in terms of profit, service, stock and costs cannot be managed directly. So, for example, sales growth can be expected to drive profits but is itself dependent on factors such as customer satisfaction, brand image, enquiry generation, new-product introduction and delivery performance. At the earnings level the connection of sales growth to cost generation, stock and obsolescence makes profit an outcome rather than a direct measure that can be targeted. The linkages of strategy to operating measures are not easy to define, highly interconnected and may not be explicitly obvious.

It is a significant challenge, and capability, to set a business direction and strategy that is attainable, and then define the cascade from the strategy of the measures at each point in the chain that are appropriate and consistent with the overall desired results.

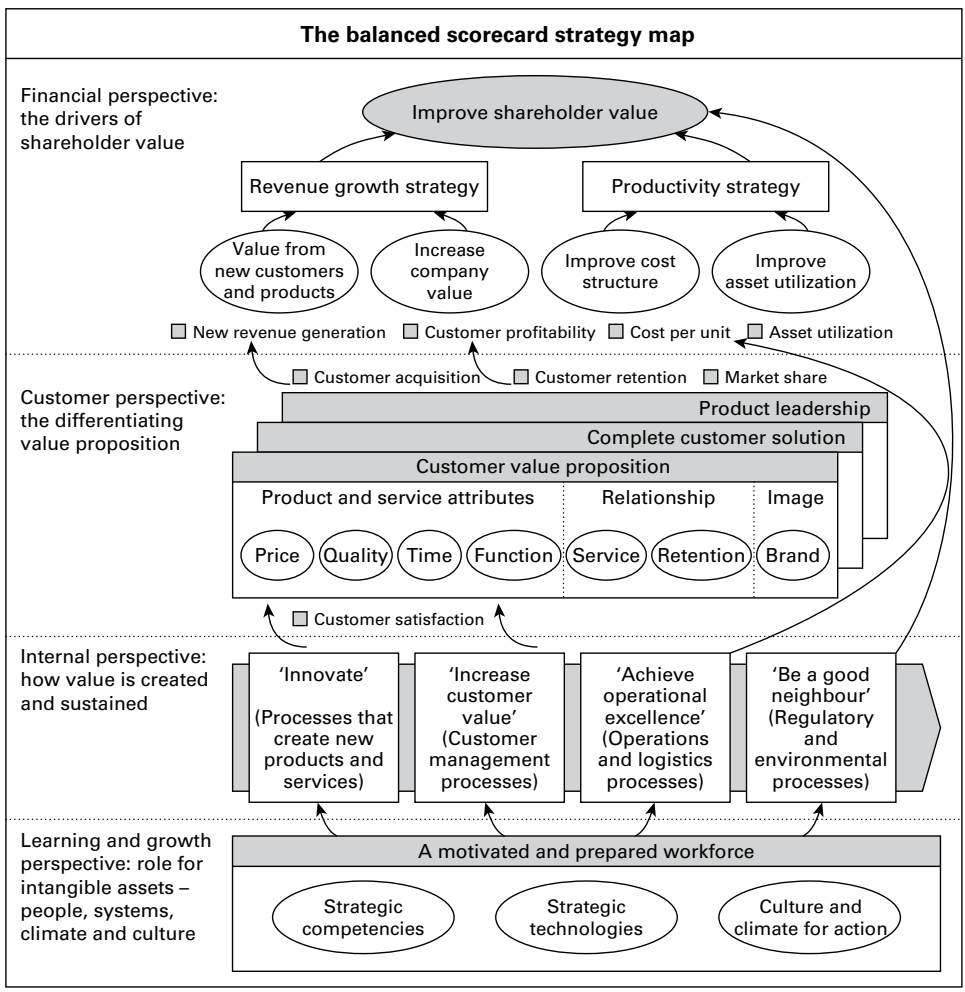
The balanced scorecard – the strategic standard for goal setting and measurement

The 'balanced scorecard' was originally proposed by Kaplan and Norton (1996a) to address this challenge of linking business strategy and direction to the setting of organizational performance objectives. The scorecard offers a

contained and comprehensive approach to addressing the strategic direction for the company and unpacking it into the management specifics and control issues; it is a reference for many Fortune 500 corporations and it fits especially well with supply chain thinking. This chapter will adopt it as the strategic reference point for performance measurement.

A balanced scorecard provides a picture of the direction of a business by making the linkage between financial measures and specific operational targets for customer satisfaction, key internal processes, costs and organizational learning and growth. The conceptual framework is captured in Kaplan and Norton's (Kaplan, 2002) diagram in Figure 16.1.

FIGURE 16.1 Kaplan and Norton's balanced scorecard framework



The balanced scorecard strategy map calls for specific goals for customer satisfaction in terms of price, time, quality, performance, service and cost as well as relationship, brand and product leadership. The key is to understand how these measures need to change to meet the strategic goals of the business. From that, the internal perspective builds from those goals to realize the results. It focuses on core competencies, processes, decisions and actions that have the greatest impact on attaining customer satisfaction. In modern terms, these are the 'killer apps' that make the customer value proposition truly compelling.

At its foundation, the balanced scorecard has the learning and growth perspective; this sets the measures for continual improvements to people, systems and processes. This is about embedding the strategic changes in operational programmes. Ultimately it is what drives the attainment of the desired financial measures, connecting 'output' measures (financial and customer satisfaction) with performance drivers (input measures), such as value proposition, internal processes, learning and growth. Every measure selected for a scorecard should be part of a chain of cause-and-effect relationships, leading to the financial objectives that represent the strategic themes for the business.

Kaplan and Norton (1992, 1996b) outline four key processes that the balanced scorecard relies on to connect short-term activities to long-term objectives:

1. Translating the vision – managers are required to translate their vision into actual measurements linked directly to the people who will realize the vision.
2. Communicating and linking – the scorecard indicates what the organization is trying to achieve for both shareholders and customers. The high-level strategy map is translated into 'business unit' scorecards and eventually 'personal scorecards' so that the individual understands how their personal goals and performance supports the overall strategy.
3. Business planning – once the performance measures for the four perspectives have been agreed, the company identifies the key drivers of the desired outcomes and defines the milestones that mark progress towards achieving their strategic goal.
4. Feedback and learning – this allows for regular performance reviews to enable continuous improvement of the strategy and its execution.

In summary, the scorecard puts strategy and vision, not control, at the centre. The measures are designed to pull people towards the overall vision. This methodology is consistent with the approach of supply chain management by helping managers overcome traditional functional silos and ultimately leads to improved decision making and problem solving.

The fundamentals of supply chain performance measurement

There are many definitions of logistics and supply chain management in circulation that try to capture the essence of the concept. A detailed academic examination of the meaning, usage and distinctions between the terms supply chain management and logistics found that they are used somewhat interchangeably (Cooper, Lambert and Pagh, 1997).

This analysis observed that recent writing suggests the supply chain management (SCM) concept goes further than some standard definitions and that it transcends firms, functions and business processes. This makes SCM more than just logistics, and positions it as a complete business operations framework covering all functions and operating over extended networks with suppliers and customers.

In this context, this author provides the description of the supply chain concept as:

> A process orientation to managing business in an integrated way that transcends the boundaries of firms and functions; leading to co-operation, through-chain business process synchronization, effective ranging and new product introduction, as well managing the entire physical logistics agenda.

The mechanism by which the network of entities – that together comprise the supply chain – works is through shared information and closely aligned processes. The vision for these networks is that they are characterized by high levels of communication and transparency, supported by synchronous operations and performance measurement and management.

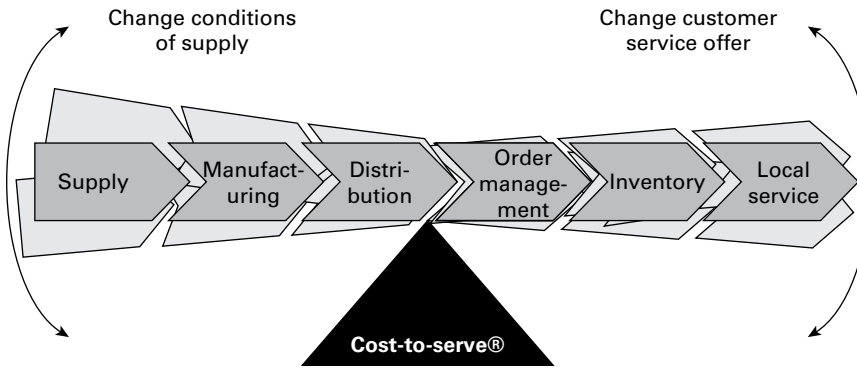
Experience of applying supply chain management (even partially) within a business is that improved visibility and synchronization leads to some or all of:

- improved customer service experience;
- reduced inventories;
- lower operating costs and reduced waste;
- improved use of fixed assets.

The ultimate benefit can be taken through improvements in a mix of profitability, shareholder value and growth or market share depending on the strategic priorities of the firm. The potential is for supply chain management thinking and practice to transform a company in terms of its overall performance. The leverage through the combination of many small (albeit radical in their conception) improvements in the operating and process architecture of a company can be remarkable.

The big idea that sits behind the supply chain concept is a move from functional management to the management of cross-business processes; the principle is that business effectiveness is enhanced by optimizing across the whole chain compared with optimizing individual functions. Experience shows that the aggregation of individual optimized functions drives

FIGURE 16.2 Balancing the supply chain



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inefficiencies and waste at their interfaces and does not give the best overall performance.

As a result, striking the right balance between optimized functional goals, and goals modified to reflect business optimization, is the core concept of SCM. It is important to note that breaking down the barriers between functions to improve supply chain integration is not a substitute for functional excellence. Companies need to secure both dimensions – retaining and improving their competence in all the functions in the supply chain as well as integrating processes to eliminate waste.

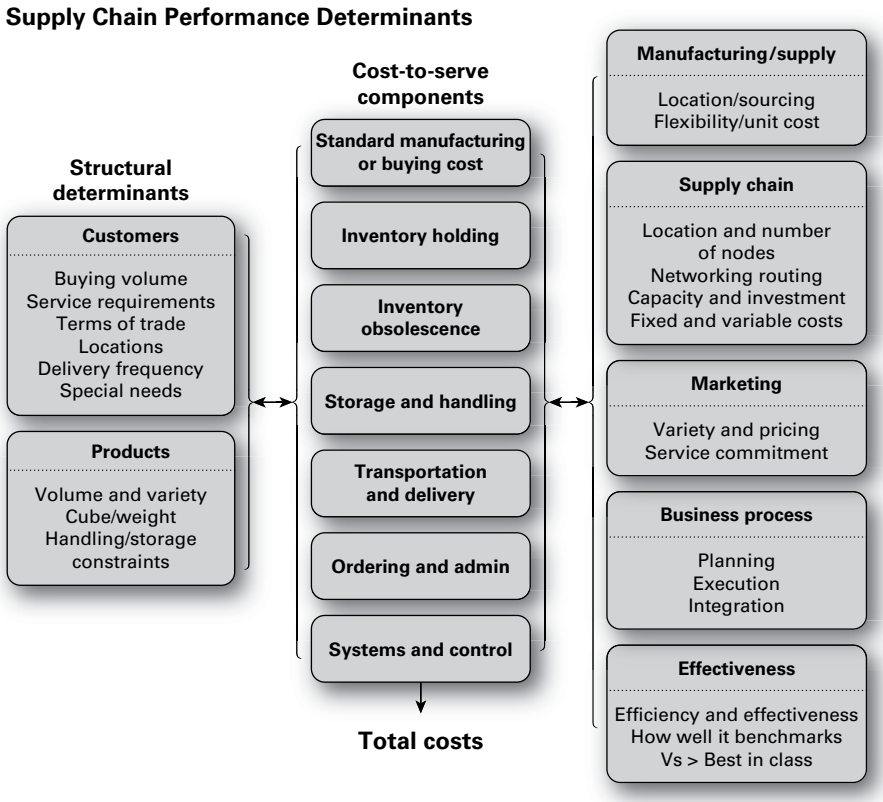
The laws of supply chain management capture the key concepts through seven maxims for excellence (Braithwaite and Wilding, 2004). Among these, the laws of lowest total cost and organizational difficulty point to the waste that is driven by inter-functional sub-optimization. The laws point to the need for a systematic functional rebalancing based on the end-to-end cost-to-serve – at least internally but preferably looking additionally inside both its customers' and suppliers' operations. This holistic approach delivers the required service at the lowest total cost. The idea is illustrated in Figure 16.2.

Performance measurement and management is a critical component of this rebalancing initiative; each function and cost component should be measured and targeted against integrated goals. Supply chain performance measurement and management is the operational microclimate of the balanced scorecard that Kaplan and Norton have given us.

Mastering the complexity of supply chain and logistics performance management

Supply chain and logistics at this detailed level is complex in its detail. The biggest challenge in setting up measurement and management programmes

FIGURE 16.3 The complexity of supply chain and logistics – viewed through determinants



SOURCE: LCP Consulting

is mastering that complexity to create an internally consistent framework of goals that reflect the true relationships of cause and effect.

The third conceptual model in this chapter looks at the drivers of cost to serve, from the perspective of its structural determinants and management determinants respectively. These determinants act on the components of cost and effectiveness to create a total supply chain outcome in terms of service, asset utilization and cost. Figure 16.3 shows the framework.

The idea of 'structural' and 'management' determinants, and the distinction between them, is important. Structural determinants relate to the 'business we are in': our products and customers. Here the choices for management are limited; if you are in the fertilizer or seeds business you have farmers and merchants as customers and deliver to farms. The characteristics of the product are well defined and the nature of demand is broadly local and national. In contrast, microchip manufacturers operate on an international scale using airfreight and with billions of dollars invested in plant. The fundamental

difference in the products is driven home by the cost per tonne of microchips being more than US $1,000,000 whereas the cost per tonne for fertilizer is typically less than $200.

Management determinants reflect the areas where management has choices to make within the constraints of the nature of the business: these are the structural determinants. There are big decisions to be made here in relation to sourcing, capacity investment and characteristics, marketing positioning and service levels, business process design and operational effectiveness.

These choices interact with each other and the structural determinants to drive the end-to-end performance and cost. Figure 16.3 makes the point that the scale and degree of interaction across the various areas of cost and performance is multivariate and complex. The challenge that emerges for performance measurement and management in the supply chain is to correctly define the driving relationships in the context of the choices that the company has made in its markets. From the definition of these relationships arise the precise specification of the measures to be used and the values to be set as goals for the individual functional managers.

The principle of 'input and output measures'

From what has been said so far it should be clear that the definition of cause and effect is important. The nature of the complexity illustrated in Figure 16.3 is such that the measures of effect are driven by the structure of the business and the key choices and designs that management make.

The implications are that the ultimate performance measures on which the stakeholders judge the business are not universally open to direct action. So, as examples of many cause and effect constructs, we cannot act directly on:

- sales revenue and the economies that go with scale without dealing with the levels of customer satisfaction that are achieved in terms of inventory availability and service turnaround;
- inventory levels in the chain without dealing with processes such as forecasting accuracy, frequency and horizon, and inventory record accuracy;
- cost-to-serve by product and customer without having designed the network for optimum sourcing and fulfilment.

These points underline the distinction between input and output measures. There is limited value in just measuring the outputs without having first identified the cause-and-effect relationships and the input measures that are likely to generate the desired change. Of course, we need to report both, so as to understand the linkage and effectiveness of operations strategies in achieving the desired results. This is consistent with the thinking of Kaplan and Norton, albeit that their published work has not addressed the levels of detail that are necessary for supply chain and logistics.

TABLE 16.1 Input and output measures in a performance improvement case

Measure	Start	Finish
INPUT MEASURES		
Forecast accuracy	Poor	Improved but less important
Manufacturing change time	8 hours	15 minutes
New product introduction	Months	Weeks
Logistics structure	3 depots	Single national site
OUTPUT MEASURES		
Sales		+10%
Customer service (OTIF)	96%	99%
Stock	12 weeks	2 weeks
Obsolescence	High	Minimal
Distribution costs	14% of turnover	9% of turnover
Manufacturing unit cost		Reduced by 20%

Table 16.1 illustrates a simple example of input and output measures in a manufacturing case study (it should be noted that the figures are illustrative only). The input measures reflect the major changes that were effected in this company; the output measures were the consequences of these actions, and illustrate the shareholder value that was created. The strategic nature of the input measures is immediately clear, as is the improvement that was attained in this business.

The story was that the company moved to a cell system of manufacturing based on the huge reduction in set-up times. This enabled inventory reductions of 80 per cent, which enabled distribution rationalization and major cost savings in logistics. The cell system was also cheaper in manufacturing as waiting times were reduced along with waste. Sales grew because the company was more responsive to customer demand and overall profits increased by 75 per cent.

All of these improvements were achieved through a long-term commitment to performance measurement, process standard adherence, and supply chain governance leading to the rebalancing of the company's supply chain. Supply chain governance is an idea that is developed later in this chapter.

Setting goals across the chain through service level agreements

The case vignette in Table 16.1 illustrates the complex interaction of supply chain variables between functions. It emphasizes again the fundamental principle of securing rebalancing for business performance improvement. The common question on performance measurement is: 'How should functional goals be set in the chain to secure the business potential?'

And there are a further series of sub-questions, which arise from this major question:

- How does a function see its role and contribution to improving the whole supply chain?
- What levels of visibility should be given, between functions, of the goals and attainment by others?
- How does a function influence the performance of other members in the chain, which can impact its own performance but are out of its direct control?
- Who sets the measures of performance across the chain?

The idea of cross-functional service level agreements (SLAs) is designed to resolve the first three of these questions. SLAs can provide a framework in which the various functions within a company and between organizations (both customers and suppliers) are measured. Each SLA defines meaningful objectives that will generate overall performance improvement.

The first big idea embedded in such SLAs is that they are not just sequential between players in the physical chain but also recognize the obligations of every member of the team to the others, whether or not they are next in line. The second big idea is that SLAs create a team environment; rather like any sport, each player knows his place in the side, the contribution that he or she makes and the dependencies with other positions. So, to use a rugby union example, the half backs and three quarters know their respective positions and the moves that they will be making; the output measures are tries scored and the percentage of tackles made on the opposition, while the input measures are adherence to plan and position, quality of individual execution of ball control and tackling, and the speed of response to moves by either team. Each member of the back line has commitments to all the others in his line and to the forwards – and not just to the player next to him. Inter-functional SLAs in the supply chain are identical in their conception.

Figure 16.4 shows the standard conceptual framework of a sequential chain at the top. Below that it also shows an example matrix of the cross-organizational SLAs that need to exist. Each box in this SLA framework should be populated with input measures as they reflect the performance obligations that the functions have to each other. The entries are not symmetrical, as the commitments of the functions in the context of the overall goals are not mutual. So, for example, the relationship between sales and marketing and production planning is that sales and marketing must produce a forecast on time and to an agreed level of accuracy, while production planning's commitment to sales and marketing is to turn that forecast into available product (plus/minus a tolerance) through the creation of timely and economic schedules. Equally, manufacturing will have commitments to the business, including sales and marketing, which relate to adherence to schedule, yield and quality performance; but in return they are entitled to expect levels of demand volatility and schedule stability within agreed tolerances from sales and marketing and demand planning.

It is important to note that the SLAs are entirely about input measures such as adherence to schedule, quality and lead time. It is changes to these measures and improvements in performance that drive value through the company's supply chain and into its output measures of profit and value.

The creation of this matrix, even in the most rudimentary form, and making it available to the entire business together with published current performance and future targets, answers the first two of the sub-questions. From this platform each function can see where it fits and how it can help to play the game.

The process of setting up the SLA matrix, populating the targets and recording the performance actually achieved is the way that the functions can start to resolve the tensions relating to the impact they may have on each other. This is an important organizational process and is a key role of supply chain management at the board level. It is this person (or small team) that sets the matrix in conjunction with the functional heads, and then monitors attainment and initiates corrective action where necessary. This is the idea of supply chain governance; the supply chain manager (director) holds the total vision for supply chain improvement for the firm in the context of the business objectives and the individual functional performances that will deliver the result. In sporting terms, he or she is the team coach.

For cross-chain balancing, it is necessary to introduce measures of cost as well as the input measures into the SLA matrix. The SLA matrix needs to be maintained as a living framework that responds to external forces, actual performance and continuous learning.

This is a full-time organizational role. If the supply chain director also has direct functional responsibility for some or all of planning, inventory, distribution and procurement, then his or her team will need to isolate the governance role within its own organization to ensure that balance and impartiality are achieved.

FIGURE 16.4 The conventional sequential supply chain relationship and the SLA matrix

Integrating the chain through SLAs




From ↓ To →	Supply	Distribution	Head office	Outlets
Supply		• Bar code compliance • Product 99+% available on time to quality within forecast tolerance and reduced order lead time • Load collection or deliver in specified time window	• Reduced lead times for supply • 99% accuracy on supply within tolerances • Faster promos and new product intros	
Distribution	• Forecast accuracy – orders inside tolerances • Clear supply contracts with lead times specified • Collect/receive to schedule with no delays		Subject to the linked dependencies, HO must invest and deliver to Outlets >95% OTIFNIE at a declining cost/case	Subject to the linked dependencies, Distn. must invest and deliver to HO and Outlets > 95% OTIFNIE at a declining cost/case
Head office	• Contract framework with accurate demand forecasts and tolerances • Visibility and collaboration on promotions and new products • Bar code specifications	• Plus 1 to max plus 2 day outlet order lead time • Actively sponsor delivery schedule changes • Actively collaborate on forecasting and replenishment through GW implant		• Stream of promotions and new products – launched without failures • Auditable performance management of Distn. with visible action on issues
Outlets		• Receive deliveries in a prompt manner • Operate to cut off time on order changes • Support in developing efficient and sustainable schedules	• Stock on hand accuracy • Order schedule compliance • Agree cut off on order changes and delivery schedules	

And work with Distn. on network changes to reduce cost

SOURCE: © LCP Consulting

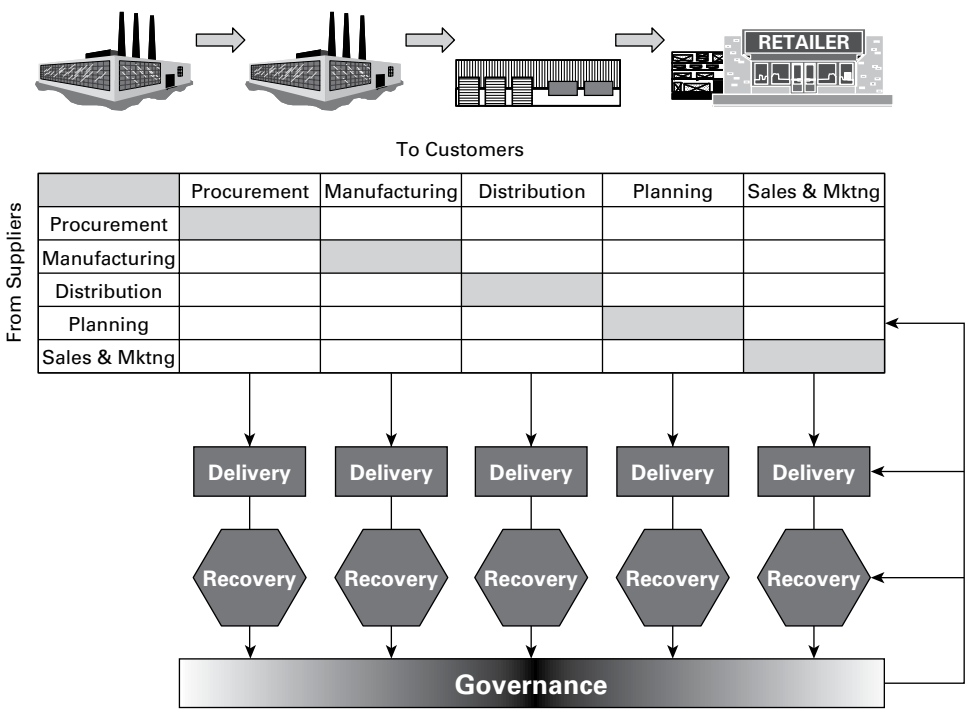
The 'delivery, recovery and governance' model

Putting the SLA matrix into action is the process and activity of tracking performance against targets and identifying opportunities for improvement: not just looking back at past performance. The focus for performance management should be the future, asking: 'What do you need to be able to do and how can you do things better?'

The 'delivery, recovery and governance' (DRG) model is a way of institutionalizing measurement across the business and is consistent with Kaplan and Norton's balanced scorecard and its requirement for learning.

Figure 16.5 is a simple representation of the DRG model designed to illustrate the working cycle in which each function measures its delivery against its SLAs in the matrix and including the cost performance goals. Reports including the identification of failures and the impact of recovery actions are produced at the functional level and then consolidated by the supply chain organization in its governance role. Recovery is an important

FIGURE 16.5 The delivery, recovery and governance model



SOURCE: © LCP Consulting

activity with the learning that comes from it. It is unrealistic to expect supply chains to run perfectly smoothly, so it is wise to have contingencies and processes that deal with such events. The governance role is to feed back to the functions the impact on overall performance and propose changes to the SLAs, delivery performance and the means of recovery.

The model is consistent with the so-called Shewhart or PDCA cycle (plan – do – check – act, known in Japan as the Deming cycle) based on the fundamental theory of continuous improvement (Deming, 1967):

1. Business understanding and strategic directions; '*plan*' the process.
2. Run the operation to try to deliver in line with the plan; '*do*' the operation and record the results.
3. Performance reporting against plan and interpretation of results; '*check*' by analysis and reporting of performance according to key business drivers.
4. Tactical and strategic realignment; '*act*' to initiate improvement efforts based on the lessons learned from experience. These experiences feed into the new plan, since PDCA is a cyclical process.

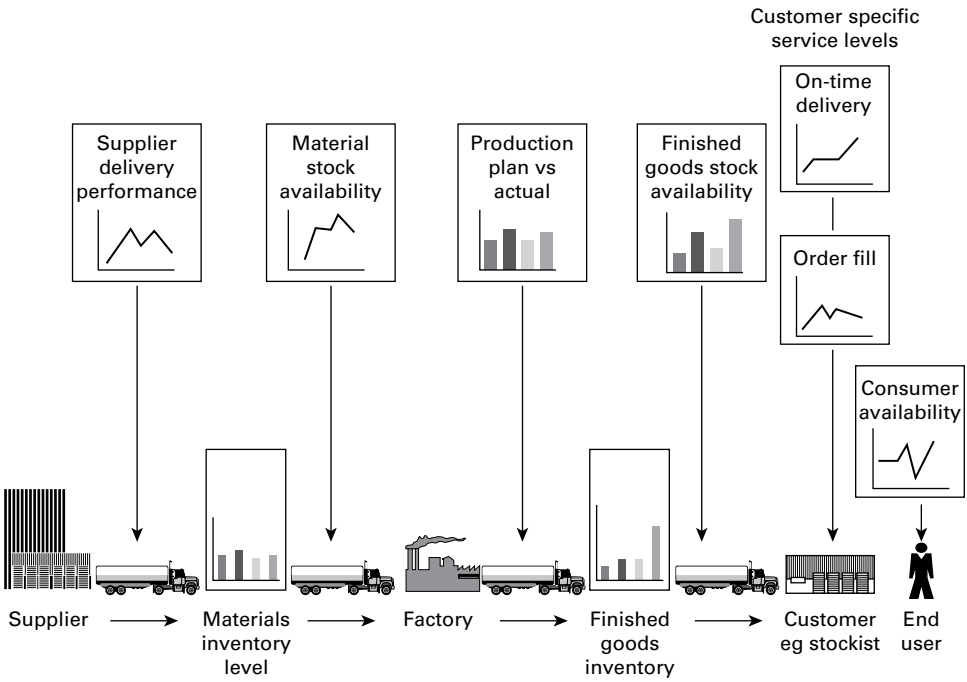
In summary, the DRG model is a way to capture the supply chain improvement vision for the firm and to record and manage progress to its attainment. It may seem daunting and potentially complex and, if this is the case, the key is to start with the simplest possible framework and build from it as the organization learns. In other words, adopt the same principles of 'plan – do – check – act' to the process of planning and measurement across the chain as are being applied to the chain itself.

The governance role as a functionally independent trustee in the organization is crucial to the DRG model and this is a difficult position to define and maintain in the organization. The person who holds the role will require vision, interpersonal skills and tenacity. The role needs the highest level of board sponsorship and the results of DRG need to be a standard part of the board agenda. It is at this point that supply chain management and corporate strategy meet and can be integrated into the balanced scorecard.

Defining the specific metrics across the chain

The input and output measures described earlier are the high-level cause-and-effect metrics for the supply chain. The input measures in the SLAs are, as has been observed, primarily about quality, compliance and time. The governance role requires these measures and the performance against them to be transparent. Cost measures also need to be added to the portfolio as functional productivity measures. In this section, the specifics of the measures that can be applied across the supply chain are unpacked and described. The specification of measures is complex and detailed, so this description should be treated as an overview rather than a complete reference.

FIGURE 16.6 Viewing supply chain metrics across the chain



The supply chain and logistics professional and the corporate governance of the chain will want to develop an overview of the chain; a useful way to think about this is as a 'dashboard' or control panel for the business. This idea is illustrated in Figure 16.6, and many executives find the preparation of such diagrams valuable in identifying their performance issues and describing them to their colleagues. Measures may need to reflect both changes over time and also performance across the range of products, customers and suppliers.

A further important point in relation to this overview is that, while supply chain rebalancing via SLAs will be one of the key drivers for competitive advantage, firms must also recognize that an equal and parallel emphasis should remain on attaining functional excellence. The goals of functional excellence, however, will be tempered at the margin through an understanding that such aims can lead to supply chain sub-optimization. The SLAs are developed over time to eliminate such potential conflicts.

Although the measures themselves are generic for most businesses, the precise situation and issues for each firm will vary based on its competitive situation, technology and product-market characteristics. It is helpful to think of a hierarchy of measures across the chain in terms of both input and output measures:

- Level one measures should provide headline metrics for the supply chain, eg orders on time in full with no invoice errors (OTIFNIE) and stock cover, all set in a balanced way that supports the vision for change.
- Level two measures should be used to provide further insight into the results of level one, eg quantity fill percentage, line fill percentage, invoice accuracy.
- Finally, level three measures should provide diagnostics for use in problem resolution and improvement processes. For example, requests for credit, clear-up rate, number of days out of stock by stock-keeping unit (SKU).

Figure 16.7 provides examples of level one and two performance metrics across a typical retail supply chain.

Figure 16.7 repays detailed study, as it starts to provide insight into the levels of detail that are involved and can be used to challenge the organization as to the connections between functions and what are the real drivers. So, for example, Figure 16.7 shows both 'on time in full' (OTIF) and 'order to delivery turnaround time' (TAT). It is immediately obvious that the longer the TAT, the higher should be the OTIF – since there is more time to get it right. But at the same time the longer the TAT, the lower should be the inventory, as the more time manufacturing has to respond to actual demand. TAT is therefore an input measure, and it is also one that management may want to change, as faster service is likely to be more competitive and create increased demand.

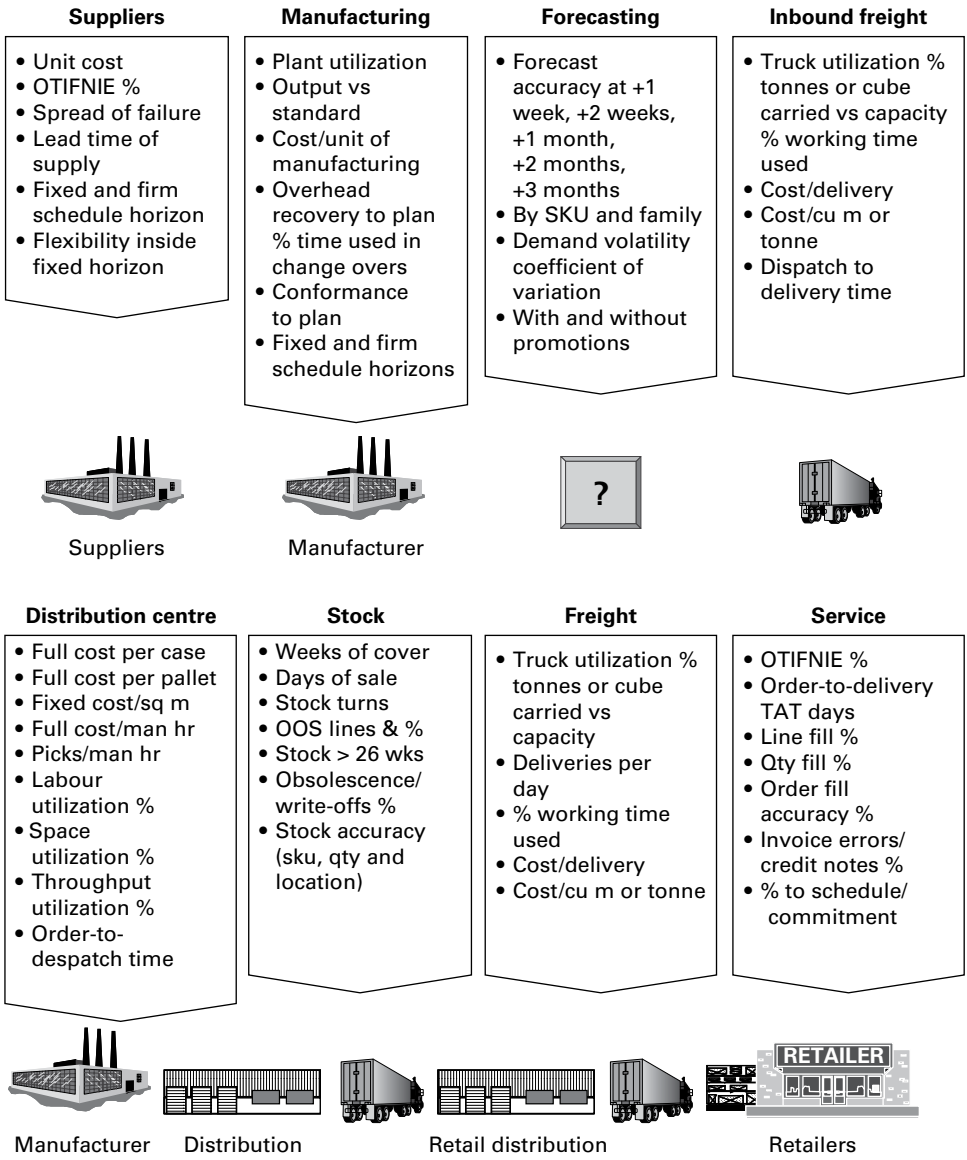
In the same vein, measures of plant, distribution centre and transportation efficiency will be influenced by customer order turnaround time, forecast accuracy and plant changeover time – all of which are input measures.

This brief introduction to the interaction of measures should be sufficient to demonstrate that Figure 16.7 is not a complete guide; rather it should be used as a prompt for thinking through the measures that are exactly relevant to the company. Having decided on the appropriate metrics to be used in the performance management framework, it is then necessary to ensure that these individual measures are set in a balanced way to provide an overall picture of supply chain performance and support the business in moving to its goals. A sample of a balanced set of objective measures for a fast-moving consumer goods company is included here in Figure 16.8.

The case behind this set of measures is that very high service performance with low levels of stock is secured by quite high levels of forecast accuracy, very short manufacturing schedule horizons and exceptional supplier performance. High levels of accuracy are also essential and the area sacrificed is that of distribution and freight utilization. Setting these measures consistently, having understood the relationships, is the key to avoiding functional conflicts that can cause sub-optimal performance. Examples of this are:

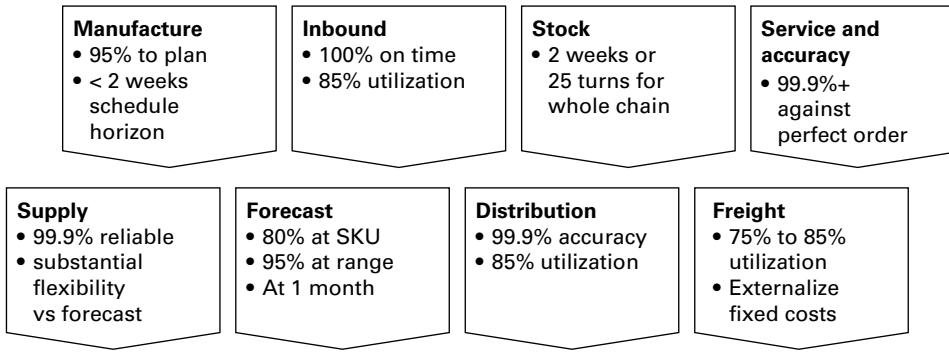
- Stock-holding targets that are set too low will disable customer service attainment and reduce the number of orders fulfilled on time in full (OTIF).

FIGURE 16.7 Sample level one/two metrics containing both input and output measures



SOURCE: LCP Consulting

FIGURE 16.8 A sample logistical balanced scorecard



SOURCE: LCP Consulting

- Freight utilization and cost targets may delay shipments, leading to increased stock and a negative impact on customer service.
- Manufacturing unit cost goals may drive up stocks and downstream distribution costs due to long production runs and infrequent line changes.

With performance metrics and the consequent balanced scorecard established, greater focus can be achieved on supply chain issues and opportunities. This also helps with benchmarking by identifying current and best practice in companies and their supply chains before using some of the Level 3 diagnostic metrics to develop an improvement programme.

Collecting and managing data

Two of the biggest barriers to a successful performance measurement and management programme are the compilation of data and its analysis and interpretation. Typically, the base data involves hundreds of thousands of transactions, many hundreds of general ledger codes, some thousands of stock-keeping units and many hundreds of customers and suppliers. All these can span a number of plants and distribution centres. Collecting and managing this data is a significant task and an area of expertise in its own right.

Measurement and reporting used to be a labour-intensive and hard-won achievement with limited potential for supplementary diagnosis and interpretation. But recent developments in mass data storage, often referred to as data warehousing, have provided a platform for achieving more detailed reporting and analytics on shorter time frames. The changes of the last five years have been revolutionary in terms of low-cost data storage capacity, ease of programming queries and graphical programmes to represent the

outputs of analysis. The skills and experience required to set up these data warehouses is being accumulated and new software environments are being launched to bring data together from different computing sources to give an end-to-end picture.

There can be no doubt that this is a critical area of capability for the future. The ability to manage supply chains of increasing complexity and at greater levels of detail will only be enabled by such systems and the expertise to derive knowledge and wisdom from them.

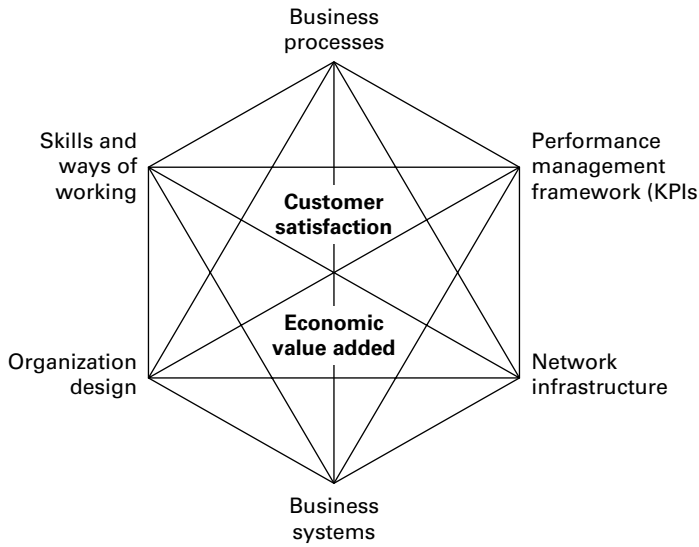
Future directions in performance measurement

The major challenge for performance measurement in the supply chain for the future rests in integrating performance management into the fabric of the organization to drive supply chain strategy development and implementation. This is 'work-in-progress' in terms of the development of a complete understanding and operational frameworks through which it can be applied. In that context, this section is just a short summary of the author's developing recent work and thinking.

The word 'integration' is overused in supply chain management, without great clarity as to its meaning and implications. The LCP strategic crystal has been used successfully to address this question by describing the elements of an integrated supply chain strategy and showing how they interact to deliver business value in terms of customer satisfaction and economic value add. Figure 16.9 shows the crystal with the key elements of:

- Business processes – the processes of generating, planning and execution instructions through the chain that, if correctly designed, will increase customer service and reduce inventories and capital applied. Business process redesign in supply chain management is focused on the principles of time compression and simplification. Business processes are crucially dependent on systems, organization and KPIs, three other points in the crystal. Business processes are key input measures and a major part of the SLAs.
- Supply chain systems – the computer information systems that are applied must serve the business processes and the organization, support the network and inform the performance measurement environment.
- The supply chain network (suppliers, plants and distribution centres) is the key to the cost performance in the chain and is enabled by the processes and systems. The organization design must align to the network to enable the lowest cost operation.
- Performance management through consistent and appropriate KPIs is central to an effective supply chain strategy, as we have seen in this

FIGURE 16.9 The strategic supply chain crystal



SOURCE: LCP Consulting

chapter. The process of performance management enables the organization and is dependent on the systems and the processes.

- Organization design is a most under-represented area of supply chain strategy. An organization that is aligned to the strategy and is served by the systems, processes and KPIs is central to realizing supply chain value. As businesses move from a functional to a process orientation, the boundaries of traditional functional power are challenged and tensions are exposed. The SLA approach can help resolve these tensions since functional control is not required under that model. However, the stewardship role is mandatory and, as discussed earlier, it must be positioned in the organization with both power and independence.
- Skills and behaviours are the final facet of the crystal and like organization design are under-represented. The skills and behaviours to move to a supply chain ethic, from function to process, are profoundly different from those that have been trained into management over many years. Skills and behaviours are connected strongly to all points in the crystal.

The picture of true supply chain integration to generate business value that emerges from the crystal is a strong one; actions on one facet will distort the crystal and generate unwanted results. Performance measurement and management is core to the overall strategic vision and the agenda for change.

As an example, a global brewer adopted a performance management framework with KPIs as its starting point in the crystal for supply chain transformation. Over a period of months it put supply chain potential on the agenda by establishing nine KPIs that it required all of its subsidiaries to report, from Asia through Europe and Africa to the Americas. It took some months for these measures to be consistently reported, but when that was achieved the company started placing the measures in the monthly main board packs. This caused everyone to sit up and take note and benchmark their performance with their peers. Immediate improvements were seen without any perceptible corporate effort, and the initiative gained credibility. The next step was expanding the measures to 14 core corporate measures and to provide help with goal setting for the subsidiaries. This goal setting for performance improvement was important because, for example, a brewer in East Africa cannot expect to target the same measures as one in Western Europe; each subsidiary would need to focus on what would give it the most immediate and greatest returns.

From this measurement exercise, which took place over about three years, each subsidiary could embark on its own blend of change around the crystal.

Conclusion

The simple case study cited above shows the potential for improvement through the development of performance management metrics across the supply chain, a key differentiator of change capability and organizational agility. Firms that develop supply chain measurement, as a core business competence associated with strategic objectives, will have a strong foundation for defining realignment internally and with both customers and suppliers.

The combined use of supply chain performance metrics, balanced scorecards, and the delivery, recovery and governance framework provide the capability to report on improvement, understand the factors that are driven by the change and identify supply chain management best practice.

In conclusion, there are six key points to hold in focus when developing a supply chain performance management framework:

1. No single measure defines supply chain performance – there are many dimensions to measure.
2. Measures can be in conflict – accentuating rather than breaking functional silo issues.
3. The need is to obtain balance throughout the supply chain and be prepared to change.
4. Measuring the overall performance at input and output levels is a key first step to making improvements.
5. This requires considerable investment of time and commitment.

6 Measurement and its interpretation is a valuable and difficult skill that organizations should develop and nurture.

Organizations that have persevered with supply chain measurement and management have experienced sustained improvements in business performance.

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Optimizing the movement of freight by road

17

ALAN MCKINNON
Kuehne Logistics University, Hamburg

Introduction

In an ideal world all trucks would run fully laden on every kilometre travelled. If this could be achieved the economic and environmental costs of road freight movement would be substantially reduced. Large potential benefits can therefore accrue to individual companies and the wider community from initiatives that improve the utilization of vehicle capacity, especially as road is by far the dominant mode of freight transport around the world.

This chapter examines the various ways in which vehicle utilization can be assessed, considers the reasons why so many trucks run empty or only partially loaded and outlines a series of measures that companies can take to attain higher levels of vehicle fill.

Assessing the utilization of vehicle fleets

Different indices can be used to measure the utilization of vehicle fleets, each giving a different impression of transport efficiency.

Tonne-kilometres per vehicle per annum

This index generally presents the trucking industry in a positive light. It is essentially a productivity indicator, measuring the average amount of work done annually by trucks. In the UK, for instance, it increased fivefold between the early 1950s and late 1990s mainly as a result of companies taking advantage of increases in maximum truck weight and running their vehicles

TABLE 17.1 Comparison vehicle productivity and utilization measures

Gross weight	Max payload (tonnes)	Annual distance traveled (km)	Average load tonnes	Productivity Tonne-kms / veh / year	% Capacity utilization Actual t-km/ max t-km
32 tonnes	20	100,000	16	1,600,000	80%
40 tonnes	26	100,000	18	1,800,000	69%

for more hours of the day. Between 1999 and 2007 this index 'plateaued' at approximately 350,000 tonne-km per vehicle per annum before dropping by 14 per cent during the 2008–09 recession (Department for Transport, 2010). This productivity measure is not only sensitive to economic conditions, it also presents a partial view of vehicle utilization. It takes no account of the proportion of the available carrying capacity actually used during the year. A vehicle with greater capacity could record higher productivity despite having inferior utilization, as illustrated in Table 17.1. This important difference between productivity and utilization is discussed in detail by Caplice and Sheffi (1994).

Weight-based loading factor

This is generally expressed as the ratio of the actual weight of goods carried to the maximum weight that could have been carried on a laden trip. When this ratio is plotted through time, a less rosy picture emerges of transport efficiency. In the UK, for example, average load factors (for trucks with gross weights over 3.5 tonnes) declined from 63 per cent in 1990 to 57 per cent in 2009 (Department for Transport, 2010). This load factor also provides an incomplete picture of vehicle utilization, however. As it is an exclusively weight-based measure it takes no account of the use of vehicle space/deck area or the proportion of vehicle-kms run empty.

Space utilization

Many low-density products fill the available vehicle space (or 'cube out') long before the maximum permitted weight is reached. In sectors characterized by low-density products, weight-based load factors tend to underestimate the true level of utilization. Where there are tight limits on the stacking height of the product, loading is usually constrained much more by the available deck area than by the cubic capacity. This deck area, for example, can be covered with pallets stacked to a height of 1.5 metres, leaving 1 metre or more of wasted space above them.

Very little research has been done on the space utilization of vehicles, and few attempts made to collect volumetric data on road freight flows. In a study conducted in the Netherlands and Sweden, Samuelsson and Tilanus (1997) asked a panel of industry experts to estimate the average utilization of trucks engaged in less-than-truckload deliveries, with reference to a series in space-related indices. This revealed that cube utilization was typically very low at around 28 per cent. On average, however, just over 80 per cent of deck area was occupied and 70 per cent of the available pallet positions filled. It was therefore mainly in the vertical dimension that space was being wasted, with average load heights reaching only 47 per cent of the maximum. A survey of 53 fleets, comprising roughly 3,500 vehicles, in the UK food supply chain in 2002 found that, on loaded trips, an average of 69 per cent of the deck area and 76 per cent of the available height was utilized, corresponding to a mean cube utilization of 52 per cent (McKinnon and Ge, 2004).

Empty running

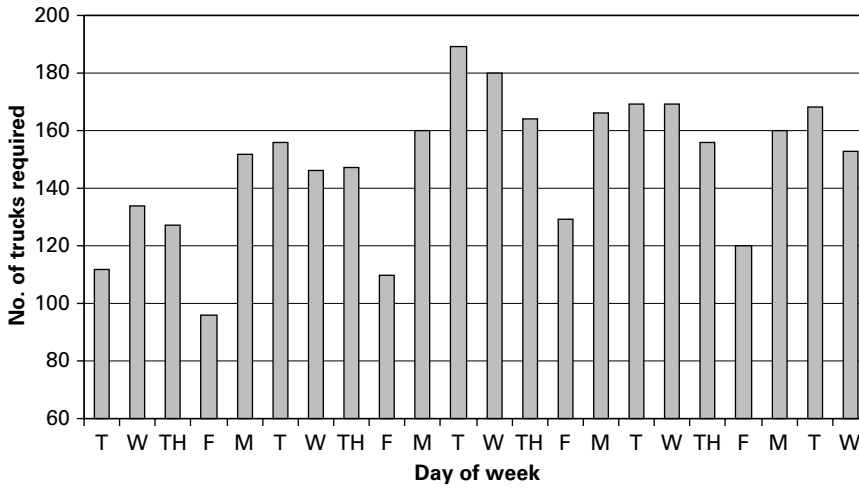
The most obvious form of vehicle under-utilization is empty running. Within the EU, the percentage of truck-kms run empty in 2010 varied between 44 per cent (Ireland) and 15 per cent (Denmark) and averaged 27 per cent across the EU27 (De Angelis, 2011). The empty running proportion tends to vary with length of haul, type of vehicle, industrial sector and the nature of the delivery operation (McKinnon, 1996). Empty running generally occurs when operators are unable to find a return load. Unlike passengers, who usually return to their starting point, most freight only travels in one direction. In Britain the empty running percentage fell from 33 per cent in 1980 to 26.8 per cent in 2004 (Department for Transport, 2005b), yielding significant economic and environmental benefits. Other things being equal, if the empty running percentage had remained at its 1980 level, road haulage costs in 2004 would have been £1.2 billion higher and an extra 1 million tonnes of CO_2 would have been emitted by trucks (McKinnon and Ge, 2006). After 2004, however, the downward trend in empty running went into reverse, rising to 28.3 per cent in 2009 (Department for Transport, 2010). Despite this reversal, a panel of 100 logistics specialists surveyed in 2008 forecast that the UK empty running percentage would drop from 27 per cent to 22 per cent between 2007 and 2020 (Piecyk and McKinnon, 2010).

Factors constraining vehicle utilization

The dominant constraints on vehicle utilization are as follows:

- *Demand fluctuations:* variability of demand over daily, weekly, monthly and seasonal cycles is one of the main causes of the under-utilization of vehicle capacity. Vehicles that are acquired with sufficient space or weight to accommodate peak loads inevitably

FIGURE 17.1 Variations in the daily demand for trucks experienced by a major distributor of metal products



spend much of their time running with excess capacity. Companies subject mainly to seasonal fluctuations can hire additional vehicles or outsource more of their transport at peak periods, allowing them to carry a regular base-load of traffic on their own vehicles during the year. For those exposed to demand volatility on a daily basis, the efficient management of transport capacity presents a much greater challenge. Figure 17.1, for example, shows fluctuations in the daily demand for trucks imposed on a major distributor of metal products over the period of one month. The average daily requirement was for 150 vehicles, but on particular days it varied between 96 and 190 vehicles. The company in question was often only informed at 4 pm on Day 1 how many vehicles would be required for deliveries by noon on Day 2. It is clearly very difficult to maintain high load factors across a vehicle fleet subject to this degree of demand variability. Such variability is common in industries characterized by just-in-time replenishment, as discussed under the next heading.

- *Just-in-time delivery:* the replenishment of supplies in smaller quantities more frequently within shorter lead times has tended to depress vehicle load factors. Companies have often been prepared to accept lower vehicle utilization and higher transport costs in return for large reductions in inventory and other productivity benefits resulting from just-in-time (JIT). By reconfiguring their inbound logistics, however, companies can mitigate the adverse effects of JIT on transport efficiency, as illustrated by Nissan car company (Energy Efficiency Best Practice Programme, 1998a).

- *Unreliability of delivery schedules:* where schedules are unreliable transport managers are naturally reluctant to arrange backhauls or more complex collection and delivery routes within which higher degrees of load consolidation can be achieved. Companies understandably prioritize outbound distribution to customers and fear that a vehicle engaged in backhauling may not be repositioned in time to handle the next delivery. Available survey evidence suggests that the probability of a delivery being delayed can be relatively high. In the course of seven transport 'key performance indicator' surveys conducted in the UK between 2002 and 2007, operational data were collected on 55,820 road journey legs in a range of freight sectors. Of these legs 26% were subject to a delay and these delays averaged 41 minutes (McKinnon *et al*, 2009). Of these delays 35% were caused mainly by traffic congestion on the road network. Most of the delays, however, occurred at the reception bays of factories, distribution centres and shops, where 'backdoor congestion' increases the average length and variability of loading and off-loading times. In other countries characterized by much longer journey length and transit times, delays of this magnitude would be unlikely to deter backloading and consolidation initiatives, particularly as the potential rewards would be much greater.
- *Vehicle size and weight restrictions:* as noted above, some loads reach the maximum weight limit before all the space in the vehicle is occupied. Conversely, some low-density loads exhaust the available space before the legal weight limit is reached. This results in under-utilization of the vehicle in terms of either volume or weight.
- *Handling requirements:* many companies sacrifice vehicle utilization for handling efficiency. For example, by using roll-cages rather than wooden pallets, supermarket chains can substantially reduce handling times and costs but at the expense of around 15–20 per cent lower space-utilization in shop delivery vehicles.
- *Incompatibility of vehicles and products:* it is clearly not possible to transport a return load of bulk liquids in a box van or to consolidate part loads of fertilizer and hanging garments. Some companies use 'cross-contamination matrices' to show which products cannot be combined on the same vehicle. The need for specialist handling and/or refrigeration can also restrict the proportion of the truck fleet that can be used for particular commodities.
- *Health and safety regulations:* the weight and dimensions of loads are partly constrained by health and safety regulations designed to ensure the welfare of employees.
- *Capacity constraints at company premises:* often the size of load is constrained by the available storage capacity at either the origin or the destination of the trip, more commonly the latter. Tanks and silos at farms or factories, for example, may not be able to hold a full

truckload, while many retailers have compressed back-storeroom areas to maximize the front-of-shop sales floor. Warehouse racking systems, particularly in the fast-moving consumer goods sector, have a standard slot height for pallets of 1.7 metres. This limits pallets to a height significantly below the vertical clearance of at least 2.4 metres in most articulated trucks.

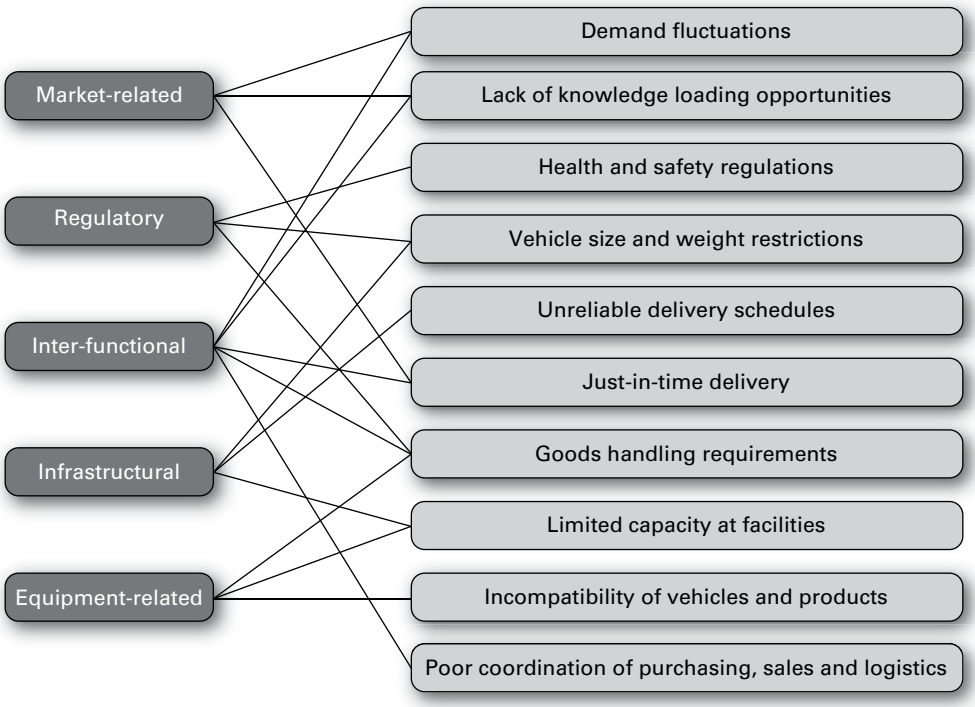
- *Lack of knowledge of backloading and load consolidation opportunities:* many of these opportunities are missed because carriers are simply unaware of them. It is hardly surprising, therefore, that roughly half the return loads carried by road in the UK are generated internally from within the same company (Lex Transfleet, 2002). Companies have traditionally relied on informal methods of finding external backloads, most commonly 'word-of-mouth'.
- *Poor coordination of the purchasing, sales and logistics functions:* opportunities for backloading are seldom discussed in the context of trade negotiations between companies. Purchasing departments typically regard inbound delivery as the responsibility of the supplier and fail to explore with logistics managers possible synergies with the transport operations of vendor companies. Sales staff, on the other hand, have a habit of making delivery commitments to customers that entail transporting part loads often at short notice.

These constraints relate to five general factors: regulatory, market-related, inter-functional, infrastructural and equipment-related. Figure 17.2 maps the links between the constraints and the five factors, recognizing that the same factor can inhibit vehicle utilization in different ways. Physical infrastructure, for example, can affect reliability, the maximum size and weight of the vehicle and storage capacity at the delivery point. This network diagram illustrates the underlying complexity of the problem.

One of the most pervasive and influential factors is the inter-functional relationship between transport and other activities such as production, procurement, inventory management, warehousing and sales. Companies often quite rationally give these other activities priority over transport efficiency. For example, inventory savings from JIT replenishment or reductions in handling costs accruing from the use of roll-cages may exceed the additional cost of running a truck only part loaded. It can also be economically justifiable to deliver small orders to important customers in an effort to secure their longer-term loyalty.

Much under-utilization of vehicle capacity, however, is not based on careful analysis of logistical cost trade-offs and explicit calculations of any related sales benefits. It is often unplanned and reflects the relatively low status given to transport within corporate hierarchies dominated by production, marketing and sales. The most that a logistics manager can do is to optimize transport within the targets and constraints set by other departments (McKinnon, 2003). This may not always be in the best interests of the company, however. Ideally the costs of reduced vehicle utilization should be

FIGURE 17.2 Fivefold classification of the constraints on vehicle utilization



quantified and objectively weighed against the benefits derived from those activities that regularly impair transport efficiency.

Measures to improve vehicle utilization

This section reviews a series of measures that companies can adopt, individually and in combination, to make better use of vehicle capacity.

Increase return loading

There are several ways in which companies can increase the level of back-loading:

- *Logistical initiatives:* it is now common for supermarket chains to backload their returning shop delivery vehicles with goods collected from suppliers' premises and destined for the retailer's distribution centre. In 2008 the collection of inbound orders from suppliers on a backhaul basis constituted approximately 6 per cent of the distance

run by the shop delivery fleets of seven major food retailers in the UK (IGD, 2008). Some companies, such as Tesco, also operate an 'onward delivery' system where a supplier's vehicle offloads goods at the retailer's distribution centre and backloads with supplies destined for one of its shops. This shop delivery is made on the way back to the factory, usually with minimal deviation from the direct route.

- *Use of freight procurement services:* load-matching agencies have existed for several decades providing road hauliers with a 'clearing house' service for potential backloads. They have relied on market knowledge, personal networking and the telephone to broker deals between shippers and carriers. With the advent of the internet, a new generation of freight exchanges emerged, providing web-enabled tendering, online auctions and bulletin boards for road haulage services (Lewis, 2002). This made it easier to match loads with available vehicle capacity across much larger 'communities' of shippers and carriers on both a short- and medium-term basis. One online freight exchange estimated that companies using its procurement services were able to cut their transport costs by an average of 8 per cent by increasing 'carrier's asset utilization while protecting their margins' (Mansell, 2006: 27). More sophisticated online procurement options are now available, involving the bundling of several companies' freight demands prior to the auction and the use of algorithms to improve the match between shippers' road freight demands and the available trucking capacity. Web-enabled tendering of large shippers' freight demands over periods of 3–12 months appears to have had a greater impact on the efficiency of road freight operations than short-term load matching on a day-to-day basis. It has proved difficult for freight exchanges operating in this sector of the online market to generate the critical volume of vehicle movements needed to create a healthy supply of backloading opportunities (McKinnon and Ge, 2006).
- *Installation of vehicle tracking systems:* advances in information and communication technology (ICT) and telematics are facilitating the backloading of trucks (Department for Transport, 2003). They can support collaborative initiatives where the participating companies and their logistics service providers operate from a common ICT platform (Cardiff University, 2008). This makes it much easier to find backloading and load consolidation opportunities and to coordinate the activities of the various fleets. Also, by making transport operations more 'visible', telematics can give both shippers and carriers greater confidence in delivery schedules, helping to overcome one of the traditional obstacles to backloading.
- *Reverse logistics:* an increasing proportion of products is travelling back along the supply chain for repair, reuse, recycling or remanufacture. The growth in the recovery of waste packaging and

life-expired product is partly the result of government regulations and directives. This has created new opportunities for backloading in many industrial and retail sectors (Cherrett *et al*, 2012).

Statistical evidence that 25–30 per cent of truck-kms are run empty can give the impression that there is huge inefficiency in road haulage and enormous potential for increasing backloading. A retrospective analysis of just under 9,000 road deliveries in the British food supply chain over a period of 48 hours, however, revealed relatively few opportunities for backloading after allowance was made for a series of operational constraints (McKinnon and Ge, 2006). It may not be possible to extrapolate this result to other sectors and countries, though it does cast doubt on claims that empty running can be drastically reduced.

Maximize the available carrying capacity

Very few loads simultaneously reach vehicle weight and volume limits. Most fill out the vehicle space before the weight limit is reached or vice versa. Increasing the weight limit or the physical dimensions of the vehicle can, therefore, result in greater consolidation of loads.

Maximum vehicle weight: within the EU, trucks engaged in cross-border transport have a weight limit of 40 tonnes. For domestic road haulage within member states, weight limits vary from 40 to 60 tonnes. In 2001 the UK government decided to increase the maximum weight of a six-axle truck from 41 to 44 tonnes, following a study suggesting that the resulting consolidation of loads in heavier vehicles could benefit both the economy and the environment. An impact study conducted three years after the implementation of this measure confirmed that significant savings in vehicle-kms, cost and emissions have been achieved, with the greatest benefits enjoyed by industrial sectors producing and distributing dense products, such as coal, drinks, petroleum products and timber (McKinnon, 2005).

Maximum vehicle size: it is generally acknowledged that the average density and 'stackability' of freight are declining. Table 17.2 lists the major reasons for these trends. Many road freight operators therefore have greater need for extra cube than for higher weight limits. Truck dimensions are constrained by the geometry of road layouts, bridge and tunnel heights, and loading. Where the transport infrastructure permits, operators can gain additional cube vertically by increasing vehicle height and, if necessary, inserting an extra deck. In the UK, where most roads have height clearances of 5 metres (mainly to accommodate double-deck buses), there are around 7,000–8,000 high-cube trailers, the vast majority of which have a second deck (McKinnon, 2011a). One major UK retailer demonstrated the benefits of double-decking by comparing operating parameters for deliveries using a double-deck vehicle and two single-deck vehicles with similar capacity. Unit delivery costs, vehicle-kms and CO_2 emissions were all around 48 per cent lower (Department for Transport, 2005a).

TABLE 17.2 Reasons for the declining density and 'stackability' of road freight

1. **Change in the nature of the products:** Many consumer products have become lighter through time, as plastic and other synthetic materials have increasingly replaced metal, wood and leather.
2. **Increase in packaging:** As packaging is relatively light, increases in the ratio of packaging volume to product volume reduces the average density of freight consignments.
3. **Greater use of unitized handling equipment:** This handling equipment takes up space in the vehicle and reduces the average weight / volume ratio for the overall payload.
4. **Declining rigidity:** In some sectors the increasing fragility of the product and weakening of packaging material is limiting the height to which it can be stacked. In the food and drink industry, for instance, cans have become thinner and rigid cardboard, plastic, or even wooden boxes been replaced by cardboard trays, which offer little vertical support.
5. **Order-picking of palletized loads at an earlier stage in the supply chain:** The mixed pallet-loads that this produces tend to be lower, have an irregular profile and offer less opportunity for stacking.
6. **Tightening health and safety regulations:** These regulations have restricted the height to which pallets can be stacked to minimize the risk of injury to operatives during loading and unloading.

In most countries, height clearances over the road network limit the opportunity for double-decking, making lengthening of the vehicle the only practical option. In some countries, such as Sweden, Finland, the Netherlands, South Africa and Australia, and in some US states, vehicle length and weight limits have been relaxed to allow companies to run so-called 'longer and heavier vehicles' (LHVs), typically 25 metres or more in length and with maximum gross weights in excess of 50 tonnes. In recent years, there has been much debate in Europe, both at an EU level and within individual countries, most notably the UK and Germany, on whether LHVs should be permitted. It is generally acknowledged that the resulting consolidation of loads can cut vehicle-kms, fuel consumption and exhaust emissions, though concern has been expressed about possible displacement of freight to LHVs from other less environmentally damaging modes, particularly rail, and the possibility that the consequent cost savings might generate more freight movement. The numerous studies of LHVs have been reviewed by the OECD/ITF (2010), McKinnon (2011b, 2012) and Steer Davies Gleave (2013). The first of these reviews, which provides a global perspective, concluded that: 'Higher capacity vehicles have been operated extensively for a variety of freight tasks in some areas of the world without adverse impacts. The evidence available indicates significant safety, sustainability and productivity improvements' (OECD/ITF, 2010: 10).

Vehicles can be redesigned in other ways to permit greater load consolidation. The compartmentalization of trucks has enabled grocery retailers and their contractors to combine the movement of products at different temperatures on a single journey.

It is also possible to increase the maximum carrying capacity of a truck within legal restrictions on gross weight, by reducing the weight of the empty vehicle (or 'tare' weight). Use of lighter materials (such as aluminium, plastic or carbon fibre) and fittings can substantially cut the tare weight. One of the 'technology goals' of the 21st Century Truck Partnership (2013) in the United States is to develop 'lightweight material and manufacturing processes that lead to a 10 per cent reduction in tare weight for a 15,500 kg tractor/trailer combination and establish a long-term stretch goal of reducing combined vehicle weight by 20 per cent' (2013: 78). Existing trucks already have widely varying tare weights. For example, a survey of trucking operations in Germany revealed that the average empty weight of trucks with a maximum 40 tonne gross weight was 14 tonnes, but the minimum only 11 tonnes (Leonardi and Baumgartner, 2004). The main performance indicator used in this study, the 'efficiency of vehicle usage' (E), made allowance for differences in the vehicle tare weights:

$$E = \text{tonne-kms} / [(\text{vehicle tare weight} + \text{load weight})] \times \text{distance travelled}$$

If the lightest truck were used and fully laden, a theoretically optimal E value of 0.725 could be achieved. The best practice operator in the survey had an average E value of 0.56, while across the entire sample the mean value was only 0.36. There was therefore considerable scope for efficiency improvement, with much of the potential gain coming from the use of lighter vehicles.

Use more space-efficient handling systems and packaging

The efficiency with which the cubic capacity of a vehicle is used partly depends on the nature of the packaging and handling equipment. Companies must reconcile the desire to maximize vehicle fill with the need to protect products from damage in transit and to minimize handling costs. The following examples illustrate the effects that handling/packaging changes can have on the transport operation:

- *Choice of loading method:* a large mail order company managed to improve vehicle cube utilization and cut vehicle-kms by 6 per cent by loading parcels loose rather than in bags.
- *Pallet dimensions:* standardizing on a more efficient size and shape of pallet in the European grocery supply chain could cut transport costs by the equivalent of 0.25 per cent of sales revenue (AT Kearney, 1997).
- *Stacking height:* if pallet loads made full use of the 'vehicle inner heights' the European grocery distribution system would have

required 15 per cent fewer trucks (AT Kearney, 1997). Often the maximum height of these loads, however, is constrained by the slot height in warehouse racking systems (typically 1.7 metres) while articulated trailers commonly have internal heights of 2.4 metres.

- *Use of slip sheets:* the use of these sheets, rather than wooden pallets, can increase the available payload and cubic capacity of a 40-tonne articulated truck in Europe by, respectively, 3 per cent and 16 per cent (ECR Europe, 2000).
- *Shape and dimensions of product packaging:* if cans of food were square, rather than round, space utilization in vehicles, warehouses and shop shelves could be raised by 20 per cent (Buckley and Hoyle, 2005).

Employ software planning tools

A wide range of software tools are available to help companies optimize the use of vehicle capacity. Computerized vehicle routing and scheduling (CVRS) software helps companies to optimize the use of vehicle assets with respect to various metrics, including distance travelled, driving time, vehicle loading and cost (Department for Transport, 2007). It is difficult to estimate the average gain in transport efficiency from the use of CVRS as this depends on the complexity and variability of the delivery operation and the standard attained by the previous system of manual route and load planning. Higher-level modelling tools have also been developed to optimize freight transport networks (rather than the multiple drop delivery rounds to which CVRS packages are normally applied). They are now widely used by large retailers, which have integrated their systems of primary (factory to distribution centre) and secondary (distribution centre to shop) distribution and by the logistical 'control towers' of major manufacturers, in both cases with the objective of maximizing truck utilization across extensive transport networks (Ortec, 2013). Other software packages can help optimize 'load building' within trucks and containers, taking account of the dimensions of individual consignments and positioning them to maximize cube fill (Douglas, 2008).

Adopt more transport-efficient order cycles

The nature of the order-fulfilment process can have a significant impact on the efficiency of the transport operation. There are ways in which this process can be modified to allow firms to increase the degree of load consolidation and hence improve transport efficiency:

Nominated day delivery system (NDDS)

Firms operating this system achieve much higher levels of transport efficiency by encouraging customers to adhere to an ordering and delivery timetable. Customers are informed that a vehicle will be visiting their area on a

'nominated' day and that to receive a delivery on that day they must submit their order a certain period in advance. The advertised order lead time is thus conditional on the customer complying with the order schedule. By concentrating deliveries in particular areas on particular days, suppliers can achieve higher levels of load consolidation, drop density and vehicle utilization. Some sales managers oppose this system, however, on the grounds that it will weaken their company's competitive position and probably result in sales losses in excess of the transport cost savings. The experience of many businesses that have applied NDDS contradicts this view.

Abandoning the monthly payment cycle

Many companies invoice their customers at the end of each month, giving them an incentive to order at the start of the month and thereby obtain a longer period of interest-free credit. This can induce wide monthly fluctuations in freight-traffic levels, making it difficult for firms to manage their vehicle capacity efficiently. Relaxing the monthly payment cycle and moving to a system of 'rolling credit', where customers are still granted the same payment terms but from the date of the order rather than the start of the month, suppliers could significantly improve the average utilization of logistics assets. This, however, 'would require a fundamental change in corporate culture and a relaxation of long-established traditions in sales and finance departments' (McKinnon, 2004).

Collaborate with other users and providers of transport services

There is a limit to how much any individual company can do to improve the utilization of vehicle capacity. To reach high levels of utilization it is often necessary to collaborate with other companies. This collaboration can be two dimensional: horizontal and vertical collaboration, as set out below.

Horizontal collaboration

This occurs where companies at the same level in a supply chain combine their freight transport demands to increase average consignment size or create additional backloading opportunities. The need for such collaboration is well illustrated by an analysis undertaken by a large British fast-moving consumer goods manufacturer (FMCG). It was concerned about the effects of JIT pressures in the retail supply chain on the efficiency of delivery operations. The company estimated that to be able to provide daily delivery of full truckloads to a retailer's distribution centre it would need to supply the centre with approximately 750,000 cases annually. As Britain's main supermarket and grocery wholesale chains have a total of roughly 70 distribution centres, this would require an annual distribution throughput of approximately 50 million cases. Only a small group of very large FMCG manufacturers have annual sales volumes as large as this. To maintain

full-load deliveries on a daily basis, other manufacturers would have to combine their loads.

More and more examples are emerging of companies sharing transport capacity. Kelloggs and Kimberly-Clark, for example, firms with similarly low density products and complementary transport demands, have jointly saved around 430,000 vehicle-kms per annum by coordinating their transport (Anon, 2008). A collaboration between United Biscuits and Nestlé has been more radical, as these companies are direct competitors in the biscuit/confectionery market. They nevertheless took the view that they '*compete on the shop shelf and not in the back of a lorry*' and have been able to achieve transport savings of around 280,000 vehicle-kms per annum mainly through eliminating empty journey legs (Hastings and Wright, 2009).

An attempt was made in 2010 in the UK to assess the potential efficiency gains from 'multi-lateral' horizontal collaboration among a group of 27 manufacturers, retailers and wholesalers in the FMCG sector. This so-called Starfish project involved analysing one month of these companies' UK transport data to measure opportunities for backloading and load consolidation within a series of operational constraints (Palmer and McKinnon, 2011). Various scenarios were constructed comprising different types of regional and urban consolidation and an intermodal option. The most basic scenario, in which part loads would be combined locally within existing facilities yielded cost and CO_2 savings of 4–5 per cent. Channelling less than truckload (LTL) flows through new consolidation centres in regionally optimized locations cut transport costs by 12 per cent and CO_2 emissions by 19 per cent. Even greater cost savings were achieved in an actual horizontal collaboration exercise, undertaken in France in association with an EU-funded research project called CO_3. The four FMCG companies involved (Mars, United Biscuits, Saupiquet and Wrigley) enjoyed distribution cost savings of between 29 per cent and 32 per cent (Guinouet, Jordans and Cruijssen, 2012).

Logistics service providers (LSPs) play a key role in the 'bundling' of individual companies' LTL flows into full truckloads. Many LSPs operate 'primary consolidation centres' at which manufacturers can consolidate their orders for onward delivery to retailers' distribution centres in full loads. It has been estimated that the number of 'shared supplier consolidation centres' in the UK grocery supply chain increased from 11 in 1998 to over 100 in 2003 (Potter *et al*, 2003). Multi-company load consolidation also occurs at the secondary distribution level (between distribution centre and shop), often in and around urban areas. Numerous studies and trials have been conducted in different parts of the world to assess the costs and benefits of urban freight consolidation. Although many urban consolidation schemes have failed, viable consolidation-centre operations now exist in the Netherlands (Binnenstad service) (van Rooijena and Quak, 2010) and the UK, where they handle retail supplies and construction materials (Allen *et al*, 2011).

Vertical collaboration

This involves collective action by trading partners at different levels in a supply chain, often with the assistance of LSPs. It can help to ease the first two constraints on vehicle utilization listed earlier, namely demand fluctuations and JIT pressures. In the United States, the term *collaborative transportation management* (CTM) has been used to describe the sharing of information and coordination of transport planning between manufacturers, retailers and carriers to cut delivery costs while improving service quality (Murphy, 2003). This is an extension of collaborative planning, forecasting and replenishment (CPFR), which has focused on the management of inventory across the supply chain. As Browning and White (2000: 3) explain: 'CTM... re-engineers the whole process so that the carrier is now part of the larger, more focused buyer/seller team'. By giving carriers an 'extended planning horizon' some have been able to increase the utilization of their regional truck fleets in the United States by between 10 and 42 per cent, mainly as a result of improved backloading (Esper and Williams, 2003).

Another initiative relating to the management of product flow through the vertical channel is *vendor-managed inventory* (VMI). This gives suppliers control over the replenishment process, enabling them to phase the movement of products in a way that makes more efficient use of vehicle capacity. Simulation modelling has been used to demonstrate the potential transport benefits of VMI over a 'traditional supply chain' (Disney, Potter and Gardner, 2003). Sometimes it is also necessary to increase storage capacity at the customer's premises to accommodate the delivery of supplies in full truckloads. This applies particularly to the movement of bulk commodities in process industries.

Conclusion

Transport optimization is the term now being widely used in business circles to describe efforts to maximize vehicle utilization. It is partly a reaction to the JIT trend that has swept through manufacturing and retailing over the past 30 years. In the headlong rush to cut inventory, many companies were prepared to sacrifice transport efficiency. Now that low-inventory strategies are firmly in place, attention is shifting to freight transport operations to see what can be done to improve their efficiency. This is being reinforced by mounting concern about fuel costs, driver shortages, traffic congestion and the environmental impact of logistical activity, particularly on climate change.

Transport will inevitably be optimized within a range of constraints. This chapter has examined these constraints and the series of measures that companies can take to ease or overcome them. If properly implemented these measures can yield a combination of economic and environmental benefits and help to make logistics more sustainable in the longer term.

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Retail logistics

18

JOHN FERNIE
Heriot-Watt University

Introduction

The principles behind logistics and supply chain management are not new. Managing elements of the supply chain has been encapsulated within organizations for centuries. Decisions such as where to hold stock, in what quantities and how it is distributed have been part of the 'trade-off' analysis that is at the heart of logistics management. It is only in the last 10 to 15 years, however, that logistics has achieved prominence in companies' boardrooms, primarily because of the impact that the application of supply chain techniques can have on a company's competitive position and profitability. Retailers have been at the forefront of applying best practice principles to their businesses, with UK grocery retailers being acknowledged as innovators in logistics management. This chapter discusses:

- the evolution of the logistics concept;
- QR/ECR and managing supply chain relationships;
- the application of supply chain concepts in different international markets;
- future trends, including the impact of e-commerce upon logistics networks.

The evolution of the logistics concept

The roots of supply chain management as a discipline are often attributed to the management guru Peter Drucker and his seminal article in *Fortune* magazine in 1962. At this time he was discussing distribution as one of the key areas of business, where major efficiency gains could be achieved and costs saved. Then, and through the next two decades, the supply chain was still viewed as a series of disparate functions. Thus logistics management was depicted as two separate schools of thought, one dealing with materials management (industrial markets), the other with physical distribution management

(consumer goods markets). In terms of the marketing function, research has focused upon buyer–seller relationships and the shift away from adversarial relationships to those built upon trust: see the work of the IMP group, for example (Ford *et al*, 2011). At the same time, a body of literature was developing, mainly in the UK, on the transformation of retail logistics from a manufacturer-driven to a retail-controlled system (McKinnon, 1989; Fernie, 1990; Fernie and Sparks, 1998). (See also Fernie, Sparks and McKinnon (2010) for a review of the development of retail logistics in the UK.)

In both industrial and consumer markets, several key themes began to emerge:

- the shift from a push to a pull, ie a demand-driven supply chain;
- the customer is gaining more power in the marketing channel;
- the role of information systems to gain better control of the supply chain;
- the elimination of unnecessary inventory in the supply chain;
- the focusing upon core capabilities and increasing the likelihood of outsourcing non-core activities to specialists.

To achieve maximum effectiveness of supply chains, it is imperative that integration takes place by 'the linking together of previously separated activities within a single system' (Slack *et al*, 1998: 303). This means that companies have had to review their internal organization to eliminate duplication and ensure that total costs can be reduced rather than allow separate functions (including marketing) to control their costs in a sub-optimal manner. Similarly, supply chain integration can be achieved by establishing ongoing relationships with trading partners along the supply chain.

Throughout the 1970s and 1980s, attention in industrial marketing focused upon the changes promulgated by the processes involved in improving efficiencies in manufacturing. Total quality management, business process re-engineering and continuous improvement brought Japanese business thinking to Western manufacturing operations. The implementation of these practices was popularized by Womack, Jones and Roos's (1990) book on the machine that changed the world. Not surprisingly, much of the literature on buyer–seller relationships focused upon the car-manufacturing sector.

During the 1990s, this focus on lean production was challenged in the United States and in the UK because of an over-reliance on efficiency measures rather than innovative responses. Harrison, Christopher and Van Hoek (1999) have therefore developed an agile supply chain model that is highly responsive to market demand. Agility as a concept was developed in the United States in response to the Japanese success in lean production. Agility plays to US strengths of entrepreneurship and information systems technology. Harrison, Christopher and Van Hoek (1999) argue that the improvements in the use of information technology to capture 'real time' data mean less reliance on forecasts and the creation of a virtual supply chain between trading partners. By sharing information, process integration will take place between partners

who focus upon their core competences. The final link in the agile supply chain is the network where a confederation of partners structure, coordinate and manage relationships to meet customer needs.

Both approaches have their proponents. There is, however, no reason why supply systems may not be a combination of both lean and agile approaches, with each used when most appropriate, the so-called 'leagile' approach (Mason-Jones, Naylor and Towill, 2000; Naylor, Naim and Berry, 1999; Towill and Christopher, 2002). Table 18.1 provides a summary comparison of lean, agile and leagile supply chains (Agarawal, Shanker and Tiwari, 2006). It can be seen that they have value in particular circumstances.

TABLE 18.1 Comparison of lean, agile and leagile supply chains

Distinguishing attributes	Lean supply chain	Agile supply chain	Leagile supply chain
Market demand	Predictable	Volatile	Volatile and unpredictable
Product variety	Low	High	Medium
Product life cycle	Long	Short	Short
Customer drivers	Cost	Lead time and availability	Service level
Profit margin	Low	High	Moderate
Dominant costs	Physical costs	Marketability costs	Both
Stock-out penalties	Long-term contractual	Immediate and volatile	No place for stock-out
Purchasing policy	Buy goods	Assign capacity	Vendor-managed inventory
Information enrichment	Highly desirable	Obligatory	Essential
Forecast mechanism	Algorithmic	Consultative	Both/either
Typical products	Commodities	Fashion goods	Product as per customer demand

TABLE 18.1 *continued*

Distinguishing attributes	Lean supply chain	Agile supply chain	Leagile supply chain
Lead time compression	Essential	Essential	Desirable
Eliminate muda (waste)	Essential	Desirable	Arbitrary
Rapid reconfiguration	Desirable	Essential	Essential
Robustness	Arbitrary	Essential	Desirable
Quality	Market qualifier	Market qualifier	Market qualifier
Cost	Market winner	Market qualifier	Market winner
Lead time	Market qualifier	Market qualifier	Market qualifier
Service level	Market qualifier	Marker winner	Market winner

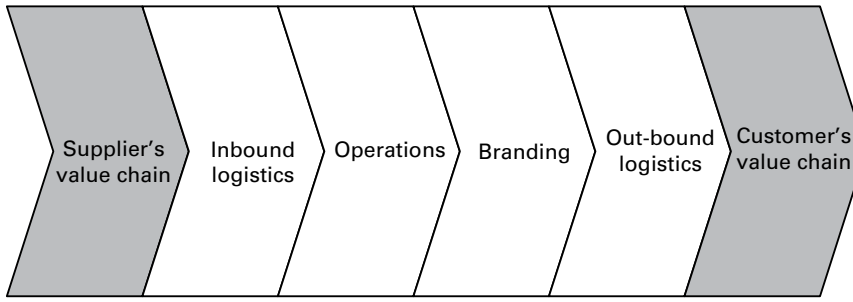
SOURCE: Agarawal, Shanker and Tiwari, 2006, p 212

From this background, to the evolution of supply chain management, it is clear that SCM draws upon a range of disciplines with regard to theoretical development. Initially, much of the research was geared towards the development of algorithms and spatial allocation models for the determination of the least-cost locations for warehouses and optimal delivery routes to distribute to final customers. The disciplines of geography, economics, operational research and mathematics provided solutions to management problems.

Logistics and competitive strategy in retailing

Many of the current ideas on supply chain management and competitive advantage have their roots in the work of Porter (1985) who introduced the concept of the value chain in relation to competitive advantage. These ideas have been further developed by academics such as Martin Christopher in the UK (see Christopher and Peck, 1997). In essence, we have a supply chain model as depicted in Figure 18.1 whereby, at each stage of the chain, value is added to the product through manufacturing, branding, packaging, display at the store and so on. At the same time, at each stage cost is added in terms

FIGURE 18.1 The extended value chain



of production costs, branding costs and overall logistics costs. The trick for companies is to manage this chain to create value for the customer at an acceptable cost. The managing of this so-called 'pipeline' has been a key challenge for logistics professionals in the 1990s, especially with the realization that the reduction of time not only reduced costs but gave competitive advantage.

According to Christopher and Peck there are three dimensions to time-based competition that must be managed effectively if an organization is going to be responsive to market changes. These are:

- *time to market:* the speed at bringing a business opportunity to market;
- *time to serve:* the speed at meeting a customer's order;
- *time to react:* the speed at adjusting output to volatile responses in demand.

They use these principles to develop strategies for lead-time management. By understanding the lead times of the integrated web of suppliers necessary to manufacture a product they argue that a 'pipeline map' can be drawn to represent each stage in the supply chain process from raw materials to customer. In these maps it is useful to differentiate between 'horizontal' and 'vertical' time: *horizontal time* is time spent on processes such as manufacture, assembly, in-transit or order processing; *vertical time* is the time when nothing is happening, no value is added but only cost and products/materials are standing as inventory.

It was in fashion markets that the notion of 'time-based competition' had most significance, in view of the short time-window for changing styles. In addition, the prominent trend in the last 20 years has been to source products offshore, usually in low-cost Pacific Rim nations, which lengthened the physical supply chain pipeline. These factors combined to illustrate the trade-offs that have to be made in supply chain management and on how to develop closer working relationships with supply chain partners. Christopher and Peck have used the example of The Limited in the United States to

illustrate accelerating 'time to market'. The company revolutionized the apparel supply chain philosophy in the United States by designing, ordering and receiving products from South-East Asia to stores in a matter of weeks rather than the months of its competitors. New lines were test-marketed in trial stores, orders communicated by electronic data interchange (EDI) to suppliers, which also benefited from CAD/CAM technology in modifying designs. The products, already labelled and priced, were consolidated in Hong Kong where chartered 747s air freighted the goods to Columbus, Ohio, for onward dispatch to stores. The higher freight costs were easily compensated for by lower markdowns and higher inventory turns per annum.

Along with The Limited, another catalyst for much of the initiatives in lead-time reduction came from work undertaken by Kurt Salmon Associates (KSA) in the United States in the mid-1980s. KSA were commissioned by US garment suppliers to investigate how they could compete with Far East suppliers. The results were revealing in that the supply chains were long (one year three months from loom to store), badly coordinated and inefficient (Christopher and Peck, 1998). The concept of quick response was therefore initiated in order to reduce lead times and improve coordination across the apparel supply chain. In Europe, quick response principles have been applied across the clothing retail sector. Supply base rationalization has been a feature of the last decade as companies have dramatically reduced the number of suppliers and have worked much closer with the remaining suppliers to ensure more responsiveness to the marketplace.

The resource-based perspective builds upon Porter's models by focusing upon the various resources within the firm that will allow it to compete effectively. Resources, capabilities and core competences are key concepts in this theory. As a supply chain perspective to competitive advantage increases the resource base within which decisions are taken, this theory links to transaction cost analysis and network theory. Thus, firms have to make choices on the degree of vertical integration in their business, to 'make or buy' in production and the extent of outsourcing required in logistical support services. Building upon Williamson's (1979) seminal work, Cox (1996) has developed a contractual theory of the firm by revising his ideas on high-asset specificity and 'sunk costs' to the notion of core competences' within the firm. Therefore, a company with core skills in either logistics or production would have internal contracts within the firm. Complementary skills of medium-asset specificity would be outsourced on a partnership basis, and low-asset specificity skills would be outsourced on an 'arm's-length' contract basis.

The nature of the multiplicity of relationships has created the so-called network organization. In order to be responsive to market changes and to have an agile supply chain, flexibility is essential. Extending the resource-based theory, the network perspective assumes that firms depend on resources controlled by other firms and can gain access to these resources only by interacting with these firms, forming value chain partnerships and, subsequently, networks. Network theory focuses on creating partnerships based on trust, cross-functional teamwork and inter-organizational cooperation.

In industrial markets, especially the automobile and high-technology sectors, a complex web of relationships has been formed. This has led Christopher and Peck to claim 'that there is a strong case for arguing that individual companies no longer compete with other stand-alone companies, but rather, that supply chain now competes against supply chain' (1997: 22). Tiers of suppliers have been created to manufacture specific component parts, and other supplier associations have been formed to coordinate supply chain activities. In these businesses the trend has been to buy rather than make, and to outsource non-core activities.

Benetton, which has been hailed as the archetypal example of a network organization, is bucking the trend by increasing vertical integration and ownership of assets in the supply chain (Camuffo, Romano and Vinelli, 2001). While it is retaining its network structure, it is refining the network from product design through to distribution to its stores. Benetton and Zara are the most quoted examples of companies embracing time-based competition, but their business models are relatively unique (Tokatli, 2008; Lopez and Fan, 2009; Fernie and Perry, 2011; Bhardwaj and Fairhurst, 2010). They have a high degree of vertical integration compared with their fast-fashion competitors (H&M, Top Shop, Primark, New Look) that do not own factories but deal with hundreds of suppliers around the globe.

Zara broke the traditional four-seasons collections and 'slow' fashion that dominated the high street. By the 1990s it had invested heavily in an information and logistics infrastructure that allowed it to respond quickly to the latest fashion trends (Ferdows, Lewis and Machura, 2004). New ideas and fashion trends were evaluated so that around 11,000 items were selected from 30,000 designs. These were then produced in-house with the labour-intensive finishing stages being contracted to nearby Spanish and Portuguese suppliers. Lead times were three to six weeks and stores received product twice a week from its 500,000-square-metre distribution centre based at its headquarters at La Coruna. More importantly, store managers monitored sales through hand-held monitors so that the correct quantities of stock could be allocated across the store portfolio. This meant that Zara offered a wider range yet a lower inventory than its competitors. It played upon the notion of freshness and originality, thereby creating a feeling of exclusivity. It is not surprising, therefore, that customers visited Zara's stores more frequently than the competition.

The success of Zara and its business model built up expectations that the drift to offshore sourcing could be reversed and create a revival of production in industrialized economies. Tokatli (2008) claims that these hopes were overestimated in that by the early 2000s Zara had already produced more than half of its products away from its traditional Iberian base – and that this has intensified with the globalization of its store network. Furthermore, Tokatli questions the moral stance of domestic production in that sewing workers in Galicia and Portugal were earning less than the average industrial wage.

Quick response (QR) and efficient consumer response (ECR)

The notion of time-based competition through just-in-time (JIT) and quick response (QR) principles was given further credence in the fast-moving consumer goods (FMCG) sector with the advent of efficient consumer response (ECR). It was stated in the previous section that QR was initiated in the fashion supply chain to reduce time to market, especially in the United States where it was viewed as a survival strategy to compete against low-cost imports. In response to this situation, the US textiles, apparel and retail industries formed VICS (Voluntary Interindustry Commerce Standards Association) in 1986 as their joint effort to streamline the supply chain and make a significant contribution in getting the in-vogue style at the right time in the right place with increased variety and inexpensive prices. With the basic fashion category, relatively steady demand is a feature of the market, therefore the US concept of QR places much focus on the relationship between retailers and the apparel manufacturers.

QR implementation, however, has been patchy – as evidenced from studies undertaken in the last decade. Birtwistle, Siddiqui and Fiorito (2003) in a study of quick response implementation in UK clothing retailing noted the slow progress made towards external integration of the textile supply chain, with most gains being made in the introduction of technologies and internal processes. Even in the United States, the financial benefits of QR implementation are inconclusive. Brown and Buttross (2008) measured the financial performance of companies who had adopted QR compared to those who had not. They found that adopters did not achieve significantly better results on profitability, cost-efficiency or inventory levels than non-adopters, and cited increased transport costs, carrying of more lines and corporate culture issues pertaining to collaboration as possible reasons for this outcome.

Having established many of the QR goals, VICS has implemented a CPFR (collaborative planning, forecasting and replenishment) programme to synchronize market fluctuations and the supply chain in a more real-time fashion. Through establishing firm contracts among supply chain members, and allowing them to share key information, CPFR makes the forecasting, production and replenishment cycle ever closer to the actual demands in the marketplace (VICS, 1998). While the US practices have played a leading role in the QR and SCM initiatives in the apparel industry, much of the success is in the basic fashion segment, where the manufacturing phase is normally the first to be transferred offshore. In this sense, the philosophy of QR as the survival strategy of fashion manufacturing in the industrial economies has not been realized. While the US apparel industry mainly competes on a cost basis in the basic fashion segment, other countries have adopted a different approach. For example, Japanese firms have forged their success on bridge fashion with flexible specialization in a subcontracting network of process specialists in the industrial districts (Sanchi) led by the 'apparel firms' with

design and marketing expertise. This is more akin to the Benetton model discussed earlier. Overall QR initiatives have had limited application within the domestic apparel industry, with most success in the basic clothing sector supplying department stores. Even in this segment QR has been mainly implemented with offshore suppliers in Korea and China.

Perry, Fernie and Towers (2011) show how QR initiatives have been implemented between firms in the Sri Lankan garment industry and US and EU retailers. With the trend to offshore sourcing, fashion buyers have sought out markets with plentiful cheap labour resources to manufacture labour-intensive components of garment production. The relatively remote location of Sri Lanka to Europe and US markets has led to the country focusing on high quality, casual garments with relatively long product life cycles. Furthermore, the Sri Lankan government's 'Garments without Guilt' initiative ensures that suppliers meet strong CSR codes of manufacturing. The research findings show that trading relationships of 10–20 years were common and that the full packaged suppliers have dedicated product development centres where buyers could come and work alongside the production team in order to speed up the product development process and reduce lead times. By collaborating with buyers during product development, or by integrating design and product development into the sourcing task, suppliers could reduce uncertainty as well as lead times, thereby reducing the likelihood of order changes or cancellations further down the line.

ECR arrived on the scene in the early 1990s, when Kurt Salmon Associates produced another supply chain report, Efficient Consumer Response, in 1993 in response to another appeal by a US industry sector to evaluate its efficiency in the face of growing competition to its traditional sector. Similar trends were discerned from their earlier work in the apparel sector: excessive inventories, long uncoordinated supply chains (104 days from picking line to store purchase), and an estimated potential saving of $30 billion, 10.8 per cent of sales turnover.

ECR initiatives have never been fully embraced in the US compared with Europe. A European Executive Board was initially created in 1994 with the support of European-wide associations representing different elements of the supply chain: AIM, the European Brands Association; CIES, the Food Business Forum; EAN International, the International Article Numbering Association; and Eurocommerce, the European organization for the retail and wholesale trade.

It was in 1994 that initial European studies were carried out to establish the extent of supply chain inefficiencies, and to formulate initiatives to improve supply chain performance (see Table 18.2). ECR Europe defines ECR as 'a global movement in the grocery industry focusing on the total supply chain – suppliers, manufacturers, wholesalers and retailers, working close together to fulfil the changing demand of the grocery consumer better, faster and at less cost'.

One of the early studies carried out by Coopers & Lybrand (1996) identified 14 improvement areas whereby ECR principles could be implemented.

TABLE 18.2 Comparison of scope and savings from supply chain studies

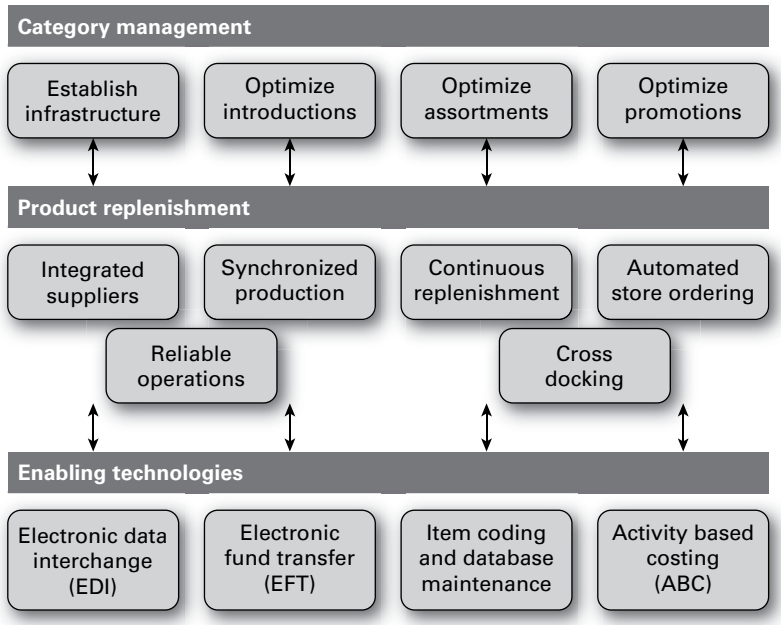
Supply chain study	Scope of study	Estimated savings
Kurt Salmon Associates (1993)	US dry grocery sector.	**1** 10.8% of sales turnover (2.3% financial, 8.5% cost). **2** Total supply chain $30bn, warehouse supplier dry sector $10bn. **3** Supply chain cut by 41% from 104 days to 61 days.
Coca-Cola Supply Chain Collaboration (1994)	**1** 127 European companies. **2** Focused on cost reduction from end of manufacturer's line. **3** Small proportion of category management.	**1** 2.3%–3.4% percentage points of sales turnover (60% to retailers, 40% to manufacturer).
ECR Europe (1996/7)	**1** 15 value chain analysis studies (10 European manufacturers, 5 retailers). **2** 15 product categories. **3** 7 distribution channels.	**1** 5.7% percentage points of sales turnover (4.8% operating costs, 0.9% inventory cost). **2** Total supply chain saving of $21bn. **3** UK savings £2bn

SOURCE: Fiddis, 1997

These were categorized into three broad areas of product replenishment, category management and enabling technologies (see Figure 18.2). Most of these improvement areas had received management action in the past; the problem was how to view the concepts as an integrated set rather than individual action areas.

As the ECR Europe movement began to gather momentum, the emphasis on much of the work conducted by the organization tended to shift from the supply-side technologies (product replenishment) to demand-driven initiatives (category management). This is reflected in the early ECR project reports, which dealt with efficient replenishment and efficient unit loads. While the supply side is still important, as reflected in projects on transport optimization and unit loads identification and tracking, the majority of recent projects have focused upon consumer value, efficient promotion tactics, efficient product introductions and collaboration in customer-specific marketing.

FIGURE 18.2 ECR improvement concepts

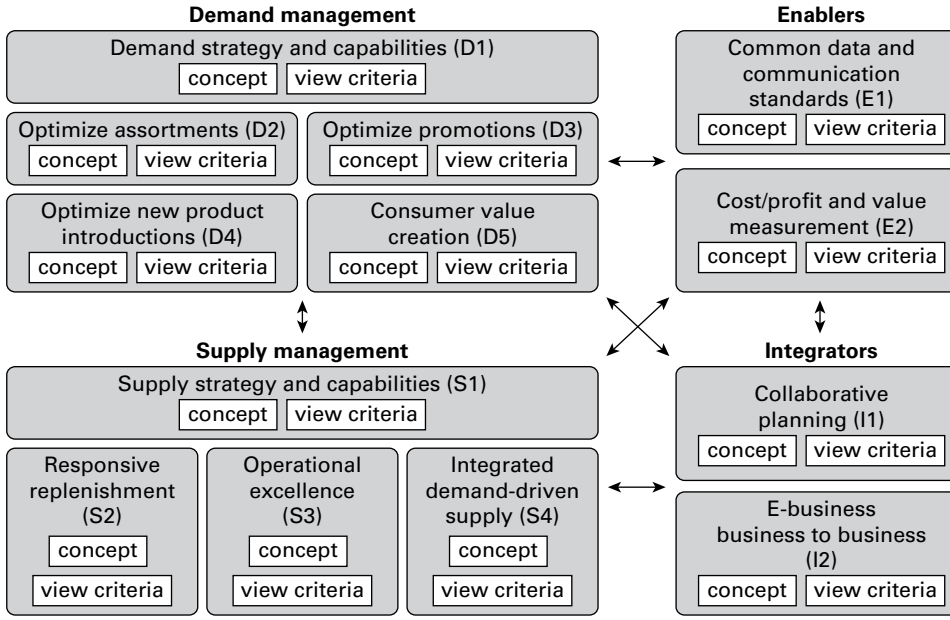


Commensurate with this change in emphasis has been the topics under discussion at the annual ECR Europe conference. At its inception in Geneva in 1996, the concept was being developed and efficient replenishment initiatives were prominent on the agenda. Subsequent conferences have tended to emphasize demand-driven initiatives and emerging issues such as e-commerce and m-commerce, new technologies, on-shelf availability, and product and packaging waste.

It can be argued that the early work focused upon improving *efficiencies* within the supply chain, and later collaborations have stressed the *effectiveness* of the supply chain. Thus, the focus now is on how to achieve profitable growth, as there is little point in delivering products efficiently if they are the wrong assortment, displayed in the wrong part of the store!

After the exceptional success of ECR Europe's annual conferences in the late 1990s to early 2000s, a series of initiatives were promulgated that encouraged much greater international collaboration. ECR movements began to share best practice principles, most notably by bringing together the different versions of the United States, Europe, Latin America and Asia scorecards to form a global scorecard. The scorecard was used to assess the performance of trading relationships. These relationships were measured under four categories – demand management, supply management, enablers and integrators (see Figure 18.3). Comparing Figures 18.2 and 18.3 shows how ECR has developed to accommodate changes in the market environment. It is not surprising that the Global Commerce Initiative (GCI) has been the instigator of the

FIGURE 18.3 ECR concepts



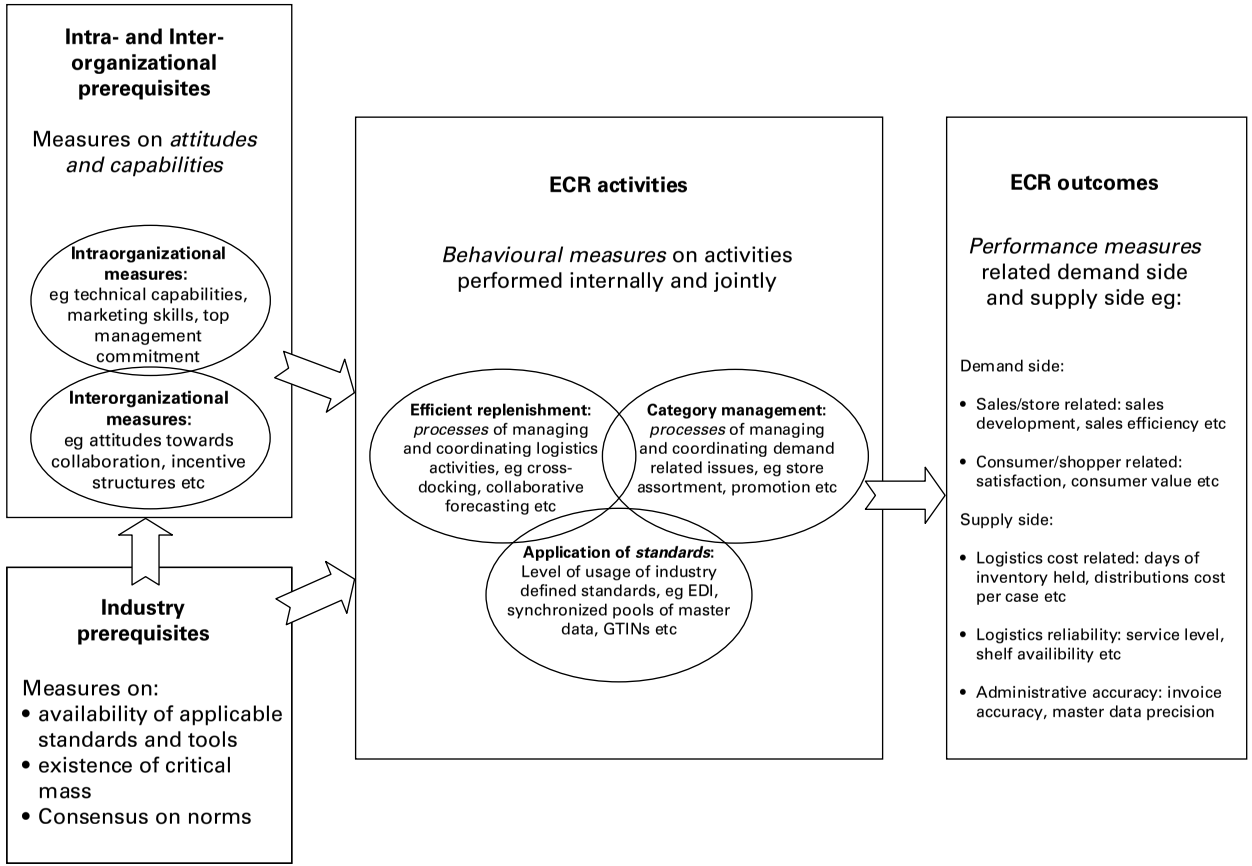
SOURCE: www.ecr-sa.co.za

Global Scorecard in that one of its key objectives is to advocate the promulgation of common data and communications standards, including those pertaining to global web exchanges. The GCI has merged with CIES and the Global CEO Forum to create the Consumer Goods Forum.

Aastrup *et al* (2008) have proposed a model that integrates the prerequisites for success to ECR activities and outcomes (see Figure 18.4). The prerequisites are either industry level or specific company-based. The industry-level prerequisites include the availability of applicable standards and tools, the existence of critical mass within the sector and consensus on norms. Firm-specific prerequisites include attitudes towards the ECR concept, degree of collaboration necessary to share information and agreement on how costs/benefits are realized. Furthermore the capability of companies to develop ECR initiatives is important, for example, top management commitment to ECR and the technical capabilities to carry out such initiatives.

On performing ECR activities, outcomes and performance measures can be evaluated through demand and supply-related indicators. Demand-related factors are grouped into sales/store variables and consumer/shopping measures. The latter is strongly focused on consumer satisfaction, the former on 'hard' data such as category sales, sales per square metre, direct product profitability (DPP) or activity-based costing (ABC) indicators. Supply-related measures can be classified into three areas: logistics costs,

FIGURE 18.4 Structures of measures in efficient consumer response



SOURCE: Aastrup *et al*, 2008

logistics reliability (service levels, on-shelf availability) and administrative accuracy (invoice accuracy and master data precision).

Differences in distribution 'culture' in international markets

ECR initiatives launched throughout the 1990s have done much to promote the spirit of collaboration. Organizations are having to change to accommodate and embrace ECR, and to dispel inherent rivalries that have built up over decades of confrontation. The UK has been in the vanguard of implementing ECR, with Tesco and Sainsbury claiming to have saved hundreds of millions of pounds in the late 1990s and 2000s. The rate of adoption of ECR initiatives has varied between companies within international markets. Table 18.2 shows that the Kurt Salmon report hoped that supply chain time from picking line to consumer would be reduced from 104 to 61 days in the United States. A comparative study of European markets by GEA (1994) showed that all of the major countries hold much less stock within the supply chain. Indeed, the UK figure was around 25 days at this time. Mitchell (1997) argues that few of the largest European retailers (mainly German and French companies) have proven to be ECR enthusiasts. Many of those French and German retailers are privately owned or franchise operations, and they tend to be volume and price-driven in their strategic positioning. By contrast, UK and Dutch firms are essentially publicly quoted, margin-driven retailers who have had a more constructive approach to supplier relations. Whilst accepting that there are key differences in European markets, in general there are differences between the United States and Europe with regard to trading conditions. Mitchell (1997: 14) states that:

- The US grocery retail trade is fragmented, not concentrated as in parts of Europe.
- US private-label development is poorly developed compared with many European countries.
- The balance of power in the manufacturer–retailer relationship is very different in the US compared with Europe.
- The trade structure is different in that wholesalers play a more important role in the US.
- Trade practices such as forward buying were more deeply rooted in the US than Europe.
- Trade promotional deals and the use of coupons in consumer promotions are unique to the US.
- Legislation, especially anti-trust legislation, can inhibit supply chain collaboration.

While legislation has imposed controls on US retailers in terms of pricing and competition policy, there are significantly fewer controls on location, planning and store-choice issues. This has resulted in US retailers being able to operate profitably on much lower sales per square metre ratios than the higher-priced, fixed costs associated with the more 'controlled' markets of Europe.

Fernie (1994, 1995), cites the following factors to explain these variations in supply chain networks:

- the extent of retail power;
- the penetration of store brands in the market;
- the degree of supply chain control;
- types of trading format;
- geographical spread of stores;
- relative logistics costs;
- level of IT development;
- relative sophistication of the distribution industry.

Of these eight factors, they can be classified into those of a relationship nature, the first three, and operational factors.

A major feature of retail change in Europe has been the consolidation of retail activity into fewer, large corporations in national markets. Many grocery retailers in Europe were small, privately owned family companies 30 years ago, and they were dwarfed by their multinational branded suppliers. This is no longer the case. Some may remain privately owned, but along with their PLC counterparts they are now international companies that have grown in economic power to challenge their international branded suppliers. Although the largest companies are predominantly German and French in origin, a high degree of concentration also exists in the Netherlands and the UK. Indeed, the series of investigations by the Competition Commission throughout the 2000s into the operation of multiple retail grocery companies in the UK illustrates this shift in power from manufacturer to retailer.

An indication of the growth of these European retailers has been the way in which they have been able to dictate where and when suppliers will deliver products to specific sites. Increasingly, the product has been of the distributor label category. This is of particular significance in the UK, where grocery chains have followed the Marks & Spencer strategy of premium value-added brands that compete directly with manufacturers' brands.

The implications of these changes in power relationships between retailers and their suppliers have been that manufacturers have been either abdicating or losing their responsibility for controlling the supply chain. In the UK, the transition from a supplier-driven system to one of retail control is complete compared with some other parts of Europe. Most grocery retailers in the UK have not only centralized over 90 per cent of their products through regional distribution centres, but have also created primary consolidation

centres further back up the supply chain to minimize inventory held between factory and store. The implementation of factory gate pricing and integration of primary and secondary networks has reinforced the trend to retail supply chain control. Although this degree of control is less evident in other European markets and in the United States, the spate of merger activity in the late 1990s and 2000s, and the expansion of retail giants (Wal-Mart, Carrefour, Tesco) with their formats into new geographical markets, is leading to internationalization of logistics practice.

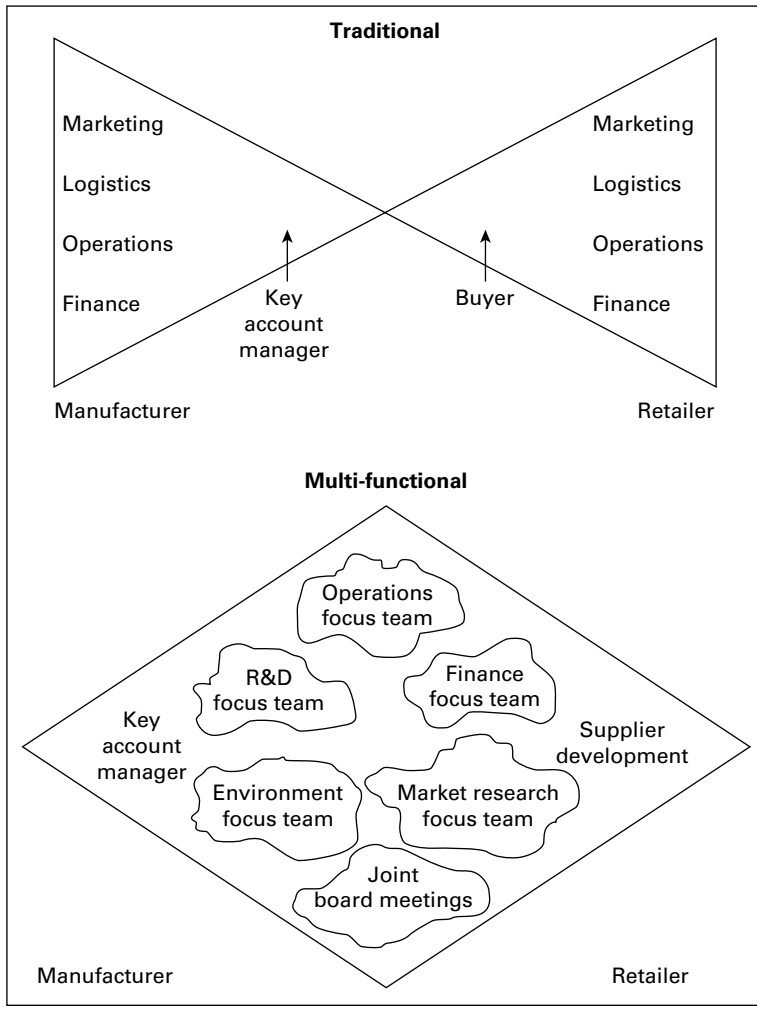
Despite these shifts in the power balance, it is generally accepted that, to apply ECR principles, the greatest challenge for European retailers is the breaking down of cultural barriers within organizations to move from a confrontational culture to one of collaboration. Organizations will change from a traditional functional 'internal' structure to that of a multifunctional 'external' structure. The changing organizational forms are shown in Figure 18.5, which depicts the traditional 'bow tie' and the new cross-functional team approach. To achieve the significant supply chain savings mooted in ECR reports, companies are having to change their attitudes, although the politics and inherent rivalries built up over the decades will take years for this cultural revolution to take place.

Of the operational factors identified by Fernie (1994), the nature of trading format has been a key driver in shaping the type of logistics support to stores. For example, in the UK the predominant trading format had been the superstore in both food and specialist household products and appliances. This has led to the development of large regional distribution centres (RDCs) for the centralization of stock from suppliers. In the grocery sector, supermarket operations introduced composite warehousing and trucking whereby products of various temperature ranges can be stored in one warehouse and transported in one vehicle. This has been possible because of the scale of the logistics operation, namely large RDCs supplying large superstores. Further upstream, primary consolidation centres have been created to minimize inventory held between factory and store. The implementation of factory gate pricing further reinforces the trend to retail supply chain control.

The size and spread of stores will therefore determine the form of logistical support to retail outlets. Geography also is an important consideration in terms of the physical distances products have to be moved in countries such as the UK, the Netherlands and Belgium compared with the United States and, to a lesser extent, France and Spain. Centralization of distribution into RDCs was more appropriate to urbanized environments where stores could be replenished regularly. By contrast, in France and Spain some hypermarket operators have few widely dispersed stores often making it more cost-effective to hold stock in store rather than at an RDC. Indeed one of the problems Wal-Mart faced on entering Germany was its implementation of a centralized RDC operation, when the number of stores served and the geographical distance covered did not warrant such a logistical strategy.

The question of a trade-off of costs within the logistics mix is therefore appropriate at a country level. Labour costs permeate most aspects of the

FIGURE 18.5 Transformation of the interface between manufacturer and retailer



SOURCE: Fiddis, 1997

logistics mix – transport, warehousing, inventory and administration costs. Not surprisingly, dependence on automation and mechanization increases as labour costs rise (the Scandinavian countries have been in the vanguard of innovation here because of high labour costs). Similarly, it can be argued that UK retailers, especially grocery retailers, have been innovators in ECR principles because of high inventory costs, mainly as a result of high interest rates in the 1970s and 1980s. This also is true of land and property costs. In Japan, the United States and the Benelux countries, the high cost of retail

property acts as an incentive to maximize sales space and minimize the carrying of stock in store. In France and the United States the relatively lower land costs leads to the development of rudimentary warehousing to house forward buy and promotional stock.

One area of collaboration that is often overlooked is that between retailer and professional logistics contractors. Historically, the provision of third-party services to retailers varied markedly from country to country. In the UK, where centralization of distribution occurred early, a major market was created for third-party providers to manage RDCs. In the rest of Europe, less enthusiasm for 'contracting out' was initially shown, with a tendency for companies to retain warehousing 'in-house' and possibly contract out the transport. Financial conventions differ by country, and in Germany, for example, strong balance sheets were viewed more positively compared with the UK; also, the opportunity cost of capital (investing in logistics infrastructure compared with retailing assets) may result in retaining rather than outsourcing these functions.

In recent years, however, the role of logistics service providers has been enhanced. This can be attributed to the internationalization of retail and transport businesses and the need for greater coordination of supply chain activities. The supply chain is now more complex than before. Retailers are optimizing traffic loads to minimize empty running and are backhauling from suppliers and recovering packaging waste from recycling centres. As efficient replenishment initiatives are implemented, consolidation of loads is required within the primary distribution network. Logistics service providers (LSPs) are better placed to manage some of these initiatives than manufacturers or retailers. Furthermore, the internationalization of retail business has stretched existing supply chains, and third-party providers can bring expertise to these new market areas. Some British companies utilized British logistics companies as they opened stores in new markets. Similarly, the world's largest retailer (Wal-Mart) utilized the expertise of a British logistics company (Tibbet & Britten) to provide logistical support to stores acquired in Canada. Now many British companies, including Tibbet & Britten, have become part of global LSPs that provide consolidation of loads sourced in international markets in addition to distribution services to stores.

The internationalization of logistics practices

The gist of our discussion on differences in logistics cultures was to show that implementation of best practice principles has been applied differentially in various geographical markets. Nevertheless, the impetus for internationalization of logistics practice has been achieved through the formal and informal transfer of 'know-how' between companies and countries. ECR Europe conferences, their sponsoring organizations, and national trade associations have all promoted best practice principles for application by member companies. Many of the conferences initiated by these organizations

have included field visits to state-of-the-art distribution centres to illustrate the operational aspects of elements of ECR. At a more formal level, companies transfer 'know-how' within subsidiaries of their own.

The expansion of the retail giants with their 'big box' formats into new geographical markets is leading to internationalization of logistics practice. The approach to knowledge transfer is largely dependent upon the different models of globalized retail operations utilized by these mega groups. Wrigley (2002) classified these retailers into two groups: one following the 'aggressively industrial' model, the other the 'intelligently federal' model (see Table 18.3). In the former model, to which Wal-Mart and to a lesser extent Tesco can be classified, the focus is upon economies of scale in purchasing and strong implementation of the corporate culture and management practices. Hence, Tesco's implementation of centralized distribution in Ireland, the incorporation of a chilled 'composite' facility and the use of best practice ECR principles developed in the UK. In developing markets such as in Eastern Europe and Asia, Tesco has had to instil discipline with regard to quality assurance for a very fragmented supplier base. Development programmes for a large number of small suppliers were necessary prior to the implementation of centralized distribution in these markets. Wal-Mart, however, is the best example of the aggressively industrial model. In Europe, for example, it tried to integrate buying across the acquired chains in

TABLE 18.3 Alternative corporate models of globalized retail operation

'Aggressively industrial'	versus	'Intelligently federal'
Low format adaptation	–	Multiple/flexible formats
Lack of partnerships/alliances in emerging markets	–	Partnerships/alliances in emerging markets
Focus on economies of scale in purchasing, marketing, logistics	–	Focus on back-end integration, accessing economies of skills as much as scale, and best practice knowledge transfer
Centralized bureaucracy, export of key management & corporate culture from core	–	Absorb, utilize/transfer, best local management acquired
The global **'category killer'** model	–	The ***umbrella organization/ corporate parent*** model

SOURCE: Wrigley, 2002

Germany and the UK. The problem here for Wal-Mart was its size in the German market. It did not bring in sufficient volumes to warrant significant discounts from suppliers to justify central distribution (Fernie *et al*, 2006). Clearly Wal-Mart had intended to acquire further stores in Germany to achieve such scale economies but its acquisition efforts came to nothing. The initial two acquired chains had a widely dispersed store network leading to high transport costs from the two distribution centres. Eventually, after eight years without breaking even, Wal-Mart withdrew from Germany selling to Metro in 2006.

In the UK, Wal-Mart's impact on Asda's logistics has been mainly in enhancing IT infrastructure and reconfiguring its distribution network to supply the increase in non-food lines. Its plan to create 20 supercentres by 2005 was realized with 50 per cent of their space devoted to non-food (general merchandise, clothing, electrical appliances, etc). Furthermore, existing stores have released more space for such lines because of enhanced IT systems. Wal-Mart has revolutionized Asda's electronic point of sale (EPOS) and stock data systems in Project Breakthrough, which commenced in 2000 and was rolled out to stores, depots and finally Asda House by late 2002. The incorporation of Wal-Mart's retail link system has allowed greater coordination of information from till to supplier, reducing costs and enhancing product availability.

Ahold, by contrast, adheres to the intelligently federal model. It has transformed logistics practices through its relationships in retail alliances and through synergies developed with its web of subsidiaries. In the United States, for example, it has retained the local store names post-acquisition and adopted best practice across subsidiaries. Furthermore, it shares distribution facilities for its own label and non-grocery lines.

The future

Clearly, there has been a transformation of logistics within retailing during the last 25 years. Centralization, new technologies, both in materials handling and information handling, ECR and the implementation of best practice principles have resulted in logistics becoming a key management function within retailing. But, what of the future? Are we about to experience evolution or revolution of retail logistics? Throughout the 2000s the ECR movement has focused upon areas such as shelf availability and a sustainable supply chain. Many of the initiatives discussed in this chapter should enhance product availability: for example, collaboration and technological improvements. Similarly, methods to reduce the carbon footprint include a better integration of networks to minimize empty running of vehicles and the construction of state-of-the-art 'carbon neutral' distribution facilities. The main areas that will continue to provide key challenges for logisticians will be the nature of international sourcing and the scale of international retail networks, in addition to managing e-fulfilment in an ever-growing online market. If the

Chinese and Indian markets continue to grow and develop, the increased costs will lead to a gradual shift to sourcing markets closer to areas of consumption. Furthermore, the collapse of a garment manufacturing facility in Bangladesh in 2013, which supplied leading international retailers, highlights the challenges of sustaining an efficient global supply chain when issues pertaining to corporate social responsibility are overlooked.

The biggest challenge facing retailers is how to respond to the market opportunities offered by e-commerce. Innovation in the ordering process has led to the order 'any time, any place' mentality and retailers have responded through offering a plethora of delivery (and returns) options for customers. This means that retailers offer tighter time windows for delivery, provide click and collect choices (the customer incurs the transport costs!) and a range of collection/return points (mainly convenience stores). Some pure players such as Asos offer free delivery as the cost is viewed as a marketing rather than a logistics cost.

Although there has been much discussion on the relative merits of fulfilment models, the picking centre model will be the long-term solution to online grocery fulfilment. The problem is that the economics of order fulfilment and delivery is so poor in the short run that most companies have abandoned this approach or gone bankrupt: for example, Webvan in the United States. In the UK in the early 2000s Asda closed two picking centres in London, and Sainsbury developed a hybrid model. So why has the so-called least-efficient fulfilment model proven successful? The answer is simple. You need to create market demand before you invest in costly infrastructure. There is a break-even point where sales volumes justify investment in picking centres. Tesco reached this point in 2006 when it opened its first dot.com facility in Croydon, and by 2013–14 it had opened six other sites all supporting the densely populated south-east of England where volume and order density was high. By contrast Wal-Mart is at the very early stage of online innovation, partly because of the different nature of the US market to the UK; indeed, Asda, which lags far behind Tesco's operation in the UK, offers Wal-Mart its best business practice on e-commerce. Nevertheless, the world's largest retailer has announced plans in 2013 to make up lost ground. It intends to use its 4,000 plus stores in the United States as order fulfilment centres and is trialling a locker collection in 12 stores to offer a 'click and collect' option. More radically it is considering the use of store shoppers as a delivery mechanism whereby shoppers would deliver to web customers in return for discounts on their purchases (*Retail Week*, 12 April 2013).

Regardless of the fulfilment model used, the 'last mile' problem is far from being resolved. Customers prefer narrow time slots for attended delivery; retailers prefer to utilize their transport assets around the clock. The unattended delivery option has been trialled but not proven to be commercially viable. It is likely that, for the foreseeable future, collection and delivery points strategically located in or around transport terminals, petrol stations and convenience stores offer the best prospects of commercial viability. Collect +, a joint venture between delivery company Yodel and payments

group PayPoint, was established in 2009. It utilizes a network of more than 5,250 convenience stores and petrol stations to which orders from retailers can be delivered, returned to and tracked. This has proved popular with pure e-tailers, such as Asos and multi-channel retailers. These initiatives appear to strike a reasonable balance between the conflicting demands of customer convenience, delivery efficiency and security. This has been the approach adopted by Amazon to combat the 'last mile' problem with its Amazon lockers appearing in shopping centres and convenience stores in the United States and in the UK in the early 2010s. Asda has also announced in 2012 that it is trialling lockers at railway stations to target the working commuter. Waitrose also plans to implement temperature-controlled lockers both in store and in remote locations by 2014. This 'click and collect' approach has become extremely popular with UK consumers and has been embraced by retailers from all sectors, albeit through pick-up at a local store rather than at third-party locations. Indeed in late 2013 Argos, the UK's long-standing multi-channel retailer, announced a pilot scheme to allow eBay merchants to collect goods from their stores.

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Internet traders can increase profitability by reshaping their supply chains

19

ROBERT DUNCAN
B & C Business Services

Internet trading is set to continue growing globally

In recent years the focus has been on growth in the United States and Europe. However, while growth continues in these significant economies, other parts of the world are beginning to adopt the route to market. In a recent study (Forrester, 2013a), the retailers surveyed experienced a 28 per cent growth in sales in 2012 over 2011. In the United States, online retail sales grew by 12.6 per cent in 2010 to reach $176 billion. With an expected 10 per cent compound annual growth rate (CAGR), Forrester predicts e-commerce in the United States will reach $279 billion by 2015 (Forrester, 2011a). In Europe (Forrester, 2011c), between 2009 and 2010 online retail sales grew by 18 per cent. By 2017, it is estimated (Forrester, 2013b) that Europeans will spend more than €191 billion on online retail products. The online retail growth will continue to outpace offline growth and most European countries will exhibit double-digit growth. However, Latin America is set to also enjoy significant growth rates in online retail sales (Forrester, 2011b). Brazil's already large market is set to grow by a CAGR of 18 per cent over the next five years. In addition, Mexico's online retail marketplace, starting from a small base, is expected to grow by a CAGR of 19 per cent.

Customer satisfaction with e-commerce continues to rise

The early rapid growth in volume led to dissatisfied customers, press reports that many internet traders did not fully understand their order fulfilment costs, and transport service providers complaining that their customers tend to be cost- rather than service-driven. This led them to suggest that their customers do not fully understand the complexity of home delivery – or business to consumer (B2C) operations – and consequently the added value that they provide. This background has been created by internet traders trying to operate effectively while utilizing traditional distribution methods and networks. There has been a tendency to concentrate too much effort on websites, and not pay enough attention to the business processes needed to integrate order capture with other business systems and order fulfilment.

Dissatisfaction in the mind of the customer can be created in a number of ways. Late delivery, picking and dispatching incorrect products, goods damaged in transit, difficulties with returning goods, poorly handled financial transactions and bad-tempered delivery people are just a few. It is generally accepted that because the placing of an order via the internet is extremely quick, simple – and in many cases pleasurable – the expectation in the mind of the customer is that all aspects of the transaction will be of a similar nature. Customer expectation has been heightened. The ordering process was slick and customers, not unreasonably, expect the rest of the process to be undertaken with the same efficiency. Under these circumstances, it is more likely that the customer will not be fully satisfied unless particular steps are taken to ensure that the level of service provided meets the heightened level of expectations. It is all too easy to undo the excellent work done by the website in winning the customer – and the order – by inadequate business processes and order fulfilment procedures. However, recent research (ForeSee, 2013) has indicated that things are getting better with regard to customer satisfaction. On the American Customer Satisfaction Index (ACSI) 100-point scale, e-commerce scored 81.1 in 2012 up from 80.1 in 2011. There is still considerable room for improvement, but it should be noted that in 2001 the level of satisfaction was only 74.3 on the ACSI 100-point scale.

Integration of business processes has not always received enough attention

Many organizations are now realizing – often too late – that they should have paid as much attention to their internal business processes – their order fulfilment resources and systems, and the integration of these processes and systems with those of their suppliers and order fulfilment services – as they did to their customer-facing website. The need is for a seamless, end-to-end

'order-to-cash' process incorporating the website, the accounting systems of the business and the delivery mechanism. The accounting needs should embrace, as a minimum, accounts payable, accounts receivable, inventory, purchase orders, invoicing and credit control.

In many organizations, when internet trading is added to the traditional market offering, the delivery mechanisms cannot cope with the requirement for a large number of small orders that require, to all intents and purposes, instant shipping. They may historically have been shipping relatively large orders to a few intermediate supply chain points with a two- to three-day lead time. The business processes – and perhaps more importantly the business systems that are required to manage a large number of small orders – are different from those required to manage the traditional business. The potential for making mistakes is high when an organization attempts to manage the internet business in the same way as the traditional business. And all the effort and resources that went into winning the business are wasted by losing that business due to the inadequate processes and systems to support order fulfilment. New entrants to the market can benefit from learning from the errors made by the pioneers of only a few years ago.

Moving away from traditional supply chains adds complexity but provides an opportunity for profit

The situation is made even more complex by the fact that the rise in internet trading has provided the potential to restructure traditional distribution networks, supply chains and product flows. Much of the thinking to date relates to the traditional ways of moving products from manufacturers to customers. In the B2C area this has reflected traditional mail-ordering concepts as typified by those organizations selling products such as books and music CDs. In simple terms, rather than ordering from a catalogue received in the mail and posting an order back to suppliers, customers are placing their order via the internet. Their products are delivered to them in much the same way as they were with traditional mail order. The key differences are that the ordering process has been shortened and the manufacturers' order capture and processing costs have been reduced. Food retailers offering home-delivery services typically rely on the order that has been received via the internet being printed in the branch nearest to the customer, picked from the shelves in that branch and delivered, by a branch-based vehicle to the home of the customer. Recent growth in this area has resulted in the establishment of specialized home delivery picking facilities. This is only economically viable in areas of high population density and significant market penetration by the retailer.

Internet trading has enabled improved supply chains

Recent supply chain trends have reflected changes made possible by the internet as a means of communicating between buyers and sellers. When the simple scenario described above is related to books, for example, it no longer requires a supply chain involving the printer and publisher, an intermediate stockholding location and an organization to promote the offer, capture the order and execute the delivery. Potential customers can place their orders using either their own PC at home or a terminal in the branch of a high-street book retailer that is specifically provided by the retailer for browsing and order capture. The order is then transmitted to the relevant publisher – not an intermediate stockholding point – for picking, packing and shipping directly to the customer.

Books and CDs lend themselves ideally to this type of trade as, apart from some minor exceptions, they can easily be shipped across borders and do not require particular shipping conditions in terms of temperature control. The situation for foodstuffs is very different. A single customer order may be relatively heavy, consist of a number of different-size cartons and bottles, require a range of temperature regimes and need to be delivered within a tightly defined time frame. As volumes increase, the industry is beginning to introduce home-delivery picking and delivery depots located away from the prime retail sites. Such facilities enable the use of sophisticated warehouse techniques, made possible by the automatic entry of customer orders into the warehouse system. The advantages created by customers ordering over the internet include more effective picking operations in a depot rather than a branch, improved product availability through monitoring the particular purchasing patterns of internet shoppers, lower delivery costs as the increased volumes allow sophisticated routing and scheduling techniques, and less congestion in the branches.

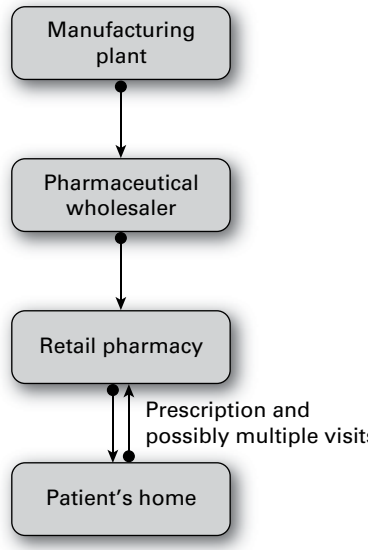
The monitoring of individuals' consumption patterns – and the retailers' websites both prompting and reminding their regular customers of those patterns as they go through the ordering process – could further extend the concept.

Such changes could be introduced into other market sectors

The two examples above – books and CDs – suggest modifications of current practices and adjustment to supply chains that result from the ability to place orders over the internet. The concepts could be used by other manufacturers not currently fully embracing the potential of electronically capturing orders and shipping customer orders directly to them. Figure 19.1 shows a general supply chain for the distribution of prescription drugs from a manufacturer to a patient.

The main characteristic is the use of wholesalers and retailers to make the delivery to the patient once a doctor has prescribed the particular drug. In

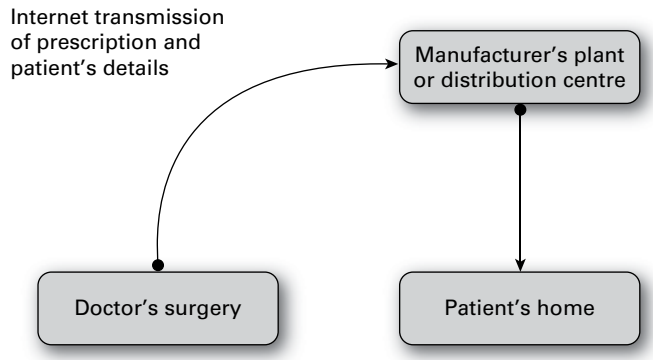
FIGURE 19.1 A typical pharmaceutical manufacturer's distribution network



the case of hospitalized patients, there is usually another stockholding point in the hospital's pharmacy, between the manufacturer and the patient. Large hospitals using large amounts of particular drugs receive deliveries directly from the manufacturers, but these are the exception rather than the rule. The level of service provided is extremely high, with wholesalers making multiple deliveries per day to retailers to ensure that particular drugs – from the plethora potentially available – are delivered to the patients as soon as possible. However, patients often have to return to the pharmacy for either all or part of their requirements once they have presented their prescription. Owing to the nature of the products, the flows are highly regulated, and some form of control is obviously necessary. However, a more streamlined approach could be envisaged using the internet as the means of communication. Figure 19.2 illustrates a possible use of the internet to facilitate the order fulfilment of prescription drugs.

The scenario starts with the doctor prescribing the drugs in an electronic format and sending details via the internet to the manufacturer once the consultation with the patient has finished. The manufacturer simply picks, packs and ships the products to the patient's home. The shipping process would utilize the best means available to suit the characteristics of the product. Small and light packets of tablets, for example, could be shipped using conventional postal services; more sophisticated products requiring careful handling may use specialist express parcels services. A less radical version of the concept may result in the wholesalers providing the home-delivery service on a regional basis. In each case, the distribution supply chain is simplified

FIGURE 19.2 A possible pharmaceutical manufacturer's distribution network



and the patient does not have to go to the retail outlet, sometimes more than once, to obtain his or her medication. This is particularly advantageous for elderly and infirm patients.

Many retail pharmacists have introduced a prescription collection and delivery service, but their aim is not to simplify the supply chain, but to maintain the status quo. The change to the supply chain outlined not only provides an improved service to customers and a reduction in the complexity of the manufacturers' supply chains, but also helps overcome some of the issues associated with the parallel importing of pharmaceuticals. Pharmaceuticals are sold at varying prices around the world, so traders can buy cheaply in some areas, ship the products to areas of high selling prices and make a profit. Pharmaceutical companies experience lower sales in those areas with high selling prices, reduced profit levels – and, therefore, potentially lower research budgets. The proposed supply chain change gives pharmaceutical companies greater control through disintermediation, with less buying and selling of product by third parties, and less cross-border movements. The use of RFID technology, effectively electronically 'tagging' products, will also assist with the control of pharmaceuticals from the manufacturing plant to the point of use by the patient. This will increase service levels, reduce costs and sustain pharmaceutical research and development in the future.

The concept can also be applied in the B2B context

The B2B area also provides opportunities to restructure traditional supply chains. For many years, supply chain organizations have exchanged information electronically regarding production schedules, raw material and component stock levels, and forecast levels of demand and production capacity. Suppliers and buyers, particularly in the automotive sector, have practised just-in-time techniques relying on electronic communication. They have developed and introduced order fulfilment techniques, reshaping the structure

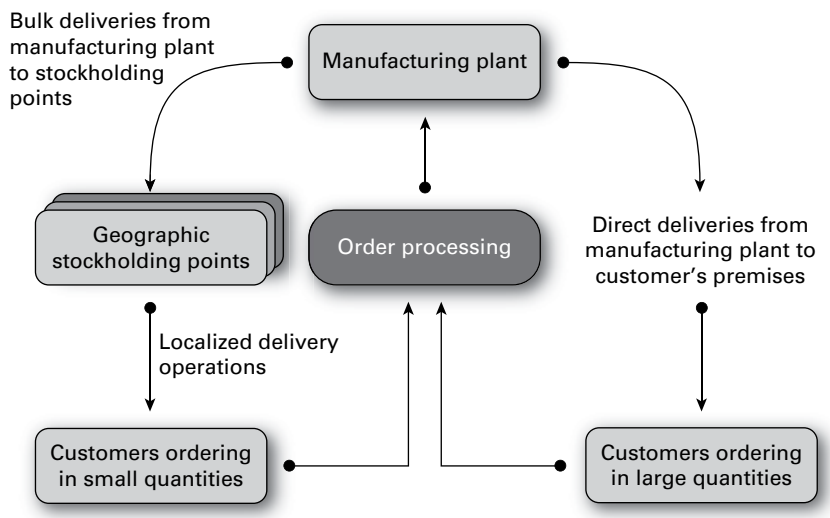
of the distribution supply chains, enabling minimal inventories to be maintained through line-side delivery and rapid communication.

Other organizations have centralized their storage operations as a result of being able to communicate rapidly and fulfil orders using efficient transport services. The emergence of cost-effective and reliable, high-speed transport services has played an important role in achieving the ambitions of those players embarking upon an internet trading journey. The systems used by such organizations enable their customers to track their own shipments. This is essential in the early stages of using a changed network to give customers – both internal and external to the organization – the confidence that the remote operation will provide the required levels of service. More importantly, the systems enable carriers themselves to be proactive on the rare occasion that some corrective action is needed.

The impact will not be as large in all industry sectors

The reshaping of the supply chain as a result of internet trading and the emergence of reliable and cost-effective rapid-transport service providers will not affect all industry sectors to the same extent. While communications may improve – a worthwhile end in itself – it is difficult to envisage the network for bulk building supplies (such as sand, ballast and cement) changing significantly. The biggest impact is likely to be in the order fulfilment of those products that are relatively high in value and easily transported. The B2B environment is more stable than B2C, with a more defined customer base and a better understanding of demand patterns. The traditional distribution supply chain of an industrial company is shown in Figure 19.3. It is characterized

FIGURE 19.3 A traditional industrial supplier's distribution network



by the direct delivery of large orders from factory to customer and the use of distributors, agents or wholesalers for the delivery of small orders to customers on a geographic basis.

The internet can capture and process orders more cheaply and quickly, so manufacturers are beginning to consider reducing the number of middlemen that they use to fulfil customers' orders. Companies that supply consumables to other companies for use in their manufacturing can provide monitoring devices that send material usage statistics to them, via the internet, triggering automatic replenishment orders. Once a history of usage has been established, order fulfilment can be achieved more cost-effectively, with better planning to minimize the effects of peaks in demand. The customer does not need to maintain a purchasing function to place orders, and the supplier does not need to incur the costs of an order processing department – a 'win–win' scenario.

There is likely to be an increase in centralized operations

The biggest changes in order fulfilment infrastructure as a result of internet trading are likely to be in the area of centralized operations. Establishing a small number of order fulfilment centres – with associated software to integrate the website ordering process with the organization's business systems – is likely to be more cost-effective than the establishment of a larger number of local operations. Although transport costs are likely to increase as a result, they will be more than offset by lower order processing costs, inventory-related costs and warehouse facility costs. At constant volume, increased margins will be attainable or lower prices can be charged to increase market share and enhance profitability.

In Europe, organizations that typically operated on a national basis are establishing more regionalized operations. Products that are of relatively high value and easily transported tend to support larger regions than those that have low value and require specific transport resources. For example, companies with spare-part operations tend to centralize activities, as field engineers and customers can communicate with a central point via the internet, and inventory control is much simpler with a central stock than several stockholding locations. The enlarged membership of the EU has resulted in many organizations revisiting their infrastructure and designing regionalized structures.

As the infrastructures change and the traditional role of intermediaries declines a new group of internet traders is emerging, offering purchasing function services. In general terms, they negotiate prices with a range of suppliers and offer, over the internet, a one-stop service for the products of those suppliers to their customers. Once they have taken an order from a customer it is converted to an order with a supplier. That supplier then fulfils the order in the conventional manner. The benefits of this scenario are that the customers obtain better prices, the suppliers do not have the costs of the customer-facing activities, and the internet trader makes money by providing

an added-value service to both customer and supplier without stocking and handling the products.

The challenge is becoming greater

The growth in internet trading has not been accompanied by tales of delighted customers or order fulfilment processes to match the heightened customer expectation. Early experience suggested that organizations were not particularly good at integrating their website order-capturing activities with their internal business systems and those of their order fulfilment service provider. And many organizations did not realize the potential of the internet for streamlining their supply chains. Changing business processes and introducing the necessary systems to trade over the internet provided a challenge within existing business relationships and infrastructures. The challenge is being made all the more difficult as business relationships and the physical infrastructure within which those relationships operate are changing.

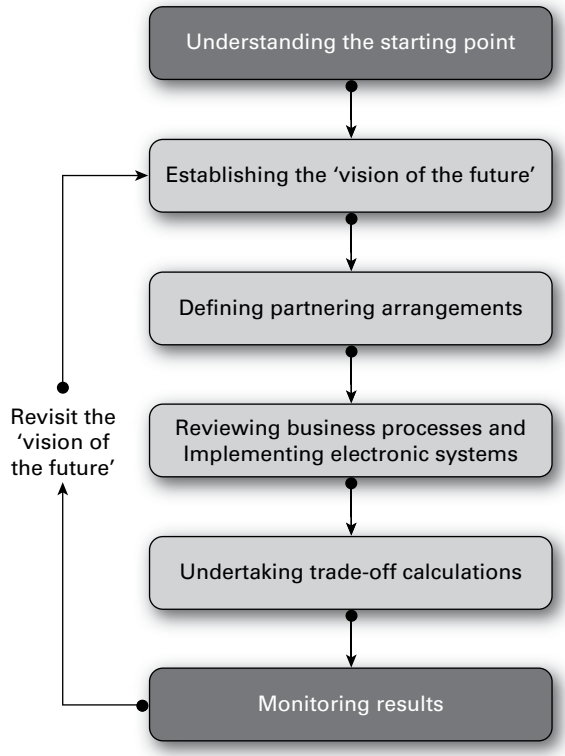
How can internet traders take advantage of opportunities?

In this ever-changing world not all of the potential internet-driven changes to the supply chain will be appropriate for all internet traders. Even within an industry sector, patterns will emerge, but the same solution may not be suitable for all of the players in that sector. There are, however, four activities that all internet traders can complete as a starting point for optimizing their benefits:

1. *The establishment of a vision of the future:* 'Where are we going and what is it going to be like when we get there?'
2. *The definition of the partnering arrangements needed for success:* 'Who is going to help us get to where we are going and how are we going to manage them?'
3. *The reviewing of their business processes and electronic systems:* 'Can our processes and systems enable us to achieve our long-term objectives?'
4. *The undertaking of trade-off calculations:* 'What options are open to us and how much will they cost?'

These four activities form the key steps of an overall route to success outlined in Figure 19.4.

FIGURE 19.4 A route to success



The establishment of a vision of the future

It is perhaps a little obvious to say that an organization must be able to define the direction in which it intends to go. This vision of the future is not a loose collection of statements amounting to little more than a wish list. It is, however, several statements describing – in quantifiable terms – the nature of the business at some point in the future. That point will vary depending upon the nature of the marketplace in which the organization is operating. In the high-tech sector, the foreseeable future may be only a few months, or a year at the most. In traditional industry sectors that do not expect a significant percentage of their business ever to be undertaken over the internet, the vision may take several years to come to fruition.

The statements should cover the total volume of business both in terms of value and in physical terms, the share that is undertaken over the internet, the size of both the customer and the supplier bases, the profitability of the internet business, the costs associated with order fulfilment, and the delivery profile in terms of order numbers and the amount in each order size band appropriate to the business. Any individual organization will have many

other metrics particular to its industry sector and product range. The key issue is that they should be measurable. They will be used to establish key performance indicators (KPIs) for the business. These KPIs will be monitored, and the organization can establish the extent to which it is achieving its vision and reaping the rewards from the changes it has made.

The definition of the partnering arrangements needed for success

Organizations wanting to trade over the internet, with a few exceptions, are unlikely to have all of the required skills in-house to establish the website effectively, integrate it with their business systems and manage the order fulfilment activities. Partners are, therefore, essential for the vast majority of organizations. Although recent industry consolidation has resulted in a reduced number of potential partners, internet traders must select a partner that both provides the level of service required cost-effectively and 'fits' culturally with their own organization. A number of options are available to potential electronic traders:

- *A single 'one-stop shop' able to deliver the website, integration with a commerce platform and order fulfilment*. This gives the advantages of a single point of contact for the management team, and an organization that manages all of the difficult interfaces. Until recently, such organizations have been few and far between. This made selecting partners and a successful outcome something of a lottery – with service providers often developing a formula that worked for their original customer, and being reluctant to change it to meet the needs of new entrants. Such is the pace of change that this does not provide as large a barrier to progress as it did a few years ago. The investment in IT by a number of major value-adding order fulfilment contractors is now beginning to manifest itself, and they have the skills, resources, hardware and software that allow them to offer a single end-to-end service. The second wave of internet commerce in 2004 saw an increase in the demand for hosted or outsourced e-commerce solutions (Forrester, 2005). Vendors, including internet service providers, have responded with a range of offerings addressing the supply chain in either its entirety or its component parts.
- *Partnerships with a number of specialist service providers to source all of the services that they require*. To achieve this successfully, project management and outsourcing management skills need to be in abundance in the organization. While the individual elements of website design, systems integration and order fulfilment may be readily available in the market, the required in-house skills of project and outsourcing management may not. With a trend to more outsourced resources, this issue will gain in significance for many organizations.

- *An organization that has already done all the hard work, but is not in competition with the market entrant*. It is likely that potential partners are traditional 'bricks and mortar' traders that have extended their offering to include an electronic commerce element. Perhaps niche players could partner with major players in their own industry to provide a wider offering to the major players' customers. In the past, small niche players would not have attempted to partner the major industry players, as they would have regarded them as competitors – and unequal partners.

Thus, there are many ways of developing a partnership. An organization that expects a rapid growth in volume over a short period may favour an added-value service provider, as it could overwhelm a traditional business that currently has only a small part of its business handled by the internet. Organizations that are hoping to move into new markets and/or geographies are likely to favour the added-value service provider. Organizations that see a relatively slow but steady growth may favour managing the situation themselves or partnering with an organization that has already made the leap to internet trading.

Reviewing business processes and electronic systems

When reviewing in-house systems, internet traders should include both electronic software systems and the business processes. In terms of the electronic software, the simplest questions include:

- Can our systems cope with a significant increase in transactional volume?
- Can our systems interface with modern websites?
- Can our systems interface with those of our suppliers of both goods and services?
- Can our systems enable us to deliver the required level of customer service?

A few years ago, some of these questions would have sent shivers down the spines of would-be internet traders. Thankfully, modern systems do not generally present significant difficulties with interfacing, and extra capacity is no longer the hugely expensive item that it was in the past. However, the critical area for most organizations is not the software systems and supporting hardware networks, but their business processes. Will any of the order processing, credit checking, inventory allocation, manufacturing, warehousing, shipping, invoicing and cash collection processes within the overall order-to-cash process negatively affect the requirements of the internet business?

If an organization is a true middleman and does not expect to hold stock, but converts a sales order from a customer into a purchase order for a supplier, its internal processes will need to be able to cope with this. It may be necessary to have a different process for internet trade from that used for conventional

business in organizations handling both routes to market. The questions needing to be answered under these circumstances include:

- Who will design the required processes to ensure that all customers' requirements are met?
- What will be the impact of those new processes on existing processes and the consequent risk to our traditional business?
- Will we achieve the predicted levels of economies of scale employing two or more order-to-cash processes?

These questions will be easier to answer if a clear understanding of the business direction has been established. When the internet business is seen to grow steadily but will never be a significant part of the business, the duplicated process route may be the easiest way of dealing with matters. Alternatively, if the internet business is expected to grow rapidly and both the conventional and the internet trades become significant elements of the total business, a single process route would have merit.

Trade-off calculations

Analyses of the overall network and the options available to achieve the required levels of customer service are essential. To undertake the trade-off calculations associated with changing supply chains and distribution networks in order to select the best route to market for any individual internet entrepreneur, a full knowledge of the current and potential operating costs is needed. Again, the importance of a vision of the future can readily be appreciated. While having that vision is important, understanding the starting point is also extremely important. Key questions to be answered include:

- What volumes are being dispatched?
- What levels of service are being achieved?
- What costs are being incurred?
- Do we feel that we are obtaining value for money from the resources being employed?

The vision will be able to provide answers to the questions about future volumes and expected margins. The internet trader must then define a number of options for delivering the future volumes within the required customer service level constraints. They are likely to be network models with decentralized or centralized, direct delivery or delivery via distributors, and stockless or inventory-holding themes. A number of evaluation criteria – in addition to those that are strictly cost-related – will be required to establish the most appropriate solution for each particular trader. While industry sectors may find similar solutions, an individual organization in that sector will be driven by its vision of the future and its culture in achieving that goal.

Opportunity waiting to be exploited

Internet trading is here to stay and, if recent experience is any guide, volumes are set to grow significantly in the very near future. Given the growth predictions, suppliers to both the consumer and the business markets have a tremendous opportunity. New market entrants are setting out on the journey against a background of heightened customer expectation and a legacy of changes needed to meet those expectations. The winners will be those organizations that take the opportunity afforded by the internet to change the manner in which they capture and fulfil their customers' orders.

To date, many traders have implemented an internet 'front end' to their existing business processes. Consequently, the initial limited volumes have been treated in the same way as their mainstream volumes. Those customers ordering via the internet have different customer service level needs and expectations from most traditional customers – hence the levels of disappointment expressed in the early years of internet trading.

The internet allows for different trading relationships and physical networks to be established. Those traders that develop a vision of the future incorporating the available potential – enter into partnering arrangements to enhance their internal skill base, review their business processes to meet their customers' needs, implement electronic systems to support those new business processes, and undertake the trade-off calculations to identify the most appropriate ways of meeting all of their customers' needs – will reap the benefits. Newcomers can learn from those organizations that are acknowledged industry leaders – and can advance quickly up the learning curve.

The opportunity is real. The winners will be those that grasp the opportunity by using the internet as a means of gaining competitive advantage, rather than continue to use it as a bolt-on extra to existing traditional operating methods.

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Time as a trade barrier

20

HILDEGUNN KYVIK NORDÅS
OECD

Introduction

It is no coincidence that cities and industrial clusters are located around good harbours or other nodes in transport networks. Easy access to food, industrial inputs and markets goes a long way in explaining the location of economic activities. One would, however, expect that with improved transport and communication technology, economic activity would become more evenly spread across the globe. This has not happened. Geographical clustering of economic activities has actually increased while the world's most peripheral countries have become increasingly economically remote.[1] This paradox is first due to the fact that as transport, communication and other trade costs come down, more is traded and trade costs remain as important as ever for location of production.[2] Thus, manufacturers increasingly outsource non-core activities to outside suppliers, who sometimes are expected to deliver their goods or services several times per day – and only minutes of delay on each delivery is tolerated. Timely delivery has also become a decisive competitive factor for suppliers to modern retailers. One example is fast fashion, where new collections designed on the basis of observed consumer behaviour are introduced at frequent intervals. This requires that suppliers are located close to the market. Higher production costs in such locations can be sustained by better prices for products that match the hottest fashion fads.[3]

Second, remote areas become relatively more economically remote when infrastructure and logistics are improved in central areas. Better roads will encourage investment in bigger trucks that cannot economically service remote areas; better ports encourage investment in larger and faster vessels that bypass smaller ports and so on. For many developing countries this means that integration into world markets requires a long leap forward as far as availability and quality of transport and other logistics services are concerned.

This chapter studies how time for exports and imports affects who trades what with whom and how much is traded. These are two distinct questions,

as the decision to enter a new export market is different from the decision to expand in an existing market. Or, seen from the importers' point of view, the decision to look for a new supplier in a different country is different from extending a contract with an existing supplier.[4] A manufacturer or retailer in search of a new supplier will look for ability to deliver the agreed quality on time most of the time. A manufacturer with the ambition to join an international supply chain will have to invest in supply chain management and quality control systems, sometimes involving hefty expenses in information and communication technology (ICT). Such investments at the firm level will, however, pay off only if infrastructure, transport and logistics services can support just-in-time delivery.

Time and global value chains

The idea that time constitutes a trade barrier in its own right is relatively new in the academic trade literature. The seminal contribution was Hummels (2001) who argued that time to market has two distinct effects on trade. First, it is a determinant of whether or not a manufacturer will enter a particular foreign market. An increase in shipping time of one day was found to reduce by 1.5 per cent the probability that a country will export manufactures to the United States. Second, time affects the volume of trade, in a similar way as tariffs and transport costs, once a market entry is made. The tariff equivalent per day in transit was estimated at 0.8 per cent for imports to the United States. Hummels arrived at this figure by comparing airfreight rates to ocean freight rates for similar products on similar routes and estimating the trade-off between money and time saved by using ocean and airfreight respectively.

According to Oceanschedules.com, the journey from Shanghai in China to Long Beach in California takes between 12 and 48 days depending on the carrier, which corresponds to a tariff rate of between 11 and 34 per cent. This compares to an average tariff rate on US imports of about 3.4 per cent (WTO, 2013). Clearly time in transit adds vastly more to trade costs than do tariffs. Some time for transit is, of course, inevitable, but as we shall see, time for exports and imports vary substantially across countries even when only the domestic leg of the journey is taken into account. And such differences matter not only for trade volumes, but also for what kind of products are traded.

The idea that just-in-time practices can create entry barriers has also been discussed in the industrial relations literature for some time. A particularly interesting approach is the so-called O-ring theory proposed by Kremer (1993). He models production as a sequence of essential tasks and operations. This means that if one task, operation or input is missing, the product cannot be finalized and it generates no revenue. The missing task or input will consequently nullify the value of all the tasks and inputs that have been performed in previous production stages. A less extreme version of the theory assigns a quality to the final product and assumes that in order for the final product to have the desired quality all inputs must have the minimum

required quality. Examples of this abound. A producer of upmarket clothing with high-quality fabric and elaborate designs would not choose low-quality thread, zippers or buttons. Likewise, upmarket car producers would not dream of fitting a $100,000 car with a $50 radio or a plastic dashboard. By the same token, there is no point in using high-quality fabric for a bright-orange T-shirt made to last for the few months that bright orange is in fashion. Consequently, an optimal strategy for an assembler will be to choose the same quality of all inputs.

Adapted to just-in-time production processes, the O-ring theory implies that if just-in-time is introduced at one stage of the production process, it is optimal to synchronize the entire supply chain in order for it to operate smoothly. The chain is only as strong as its weakest link and therefore all links should have the same strength. When just-in-time technology is introduced, delayed delivery of a component can hold up the entire production and cause costs that are much higher than the market price of the delayed component. Therefore, no discount can compensate the customer for unreliable delivery time, and firms with high variability of lead time will not be shortlisted for contracts that require just-in-time delivery.

Turning to case studies and anecdotal evidence, fast fashion comes to mind. Two examples are American Apparel and Zara. American Apparel is a vertically integrated clothing firm with production facilities in Los Angeles, where it employs 7,500 of its 12,000-strong global workforce. It is the largest sewn products facility in the United States, and the average wage paid to sewers is $12 per hour. The company also has a distribution centre in Canada and offers two-days airfreight to Europe. It markets itself as a socially responsible company, which appears to be a successful competitive factor in addition to the speedy response to consumer tastes.[5] In Europe, Zara, a Spanish vertically integrated fashion clothing firm has rapidly gained market share based on the fast-fashion concept. It takes two weeks for a skirt to get from Zara's design team in Spain to a Zara store almost anywhere in the world. Clothing is largely manufactured in Spain and Portugal at higher production costs than rivals that produce in China, India or other low-wage countries. Nevertheless, the company claims that higher labour costs are more than compensated for by higher productivity, lower distribution costs and greater flexibility.[6]

An example of the opportunities that efficient logistics services can open for developing countries is the recent entry of African countries, notably Kenya, in the European market for cut flowers. A chill chain from the farm gate to the final customer, and efficient airline services, are preconditions for this trade. At first, flowers were transported by passenger flights, creating linkages between the tourism and the floriculture sectors. As export volume grew, dedicated cargo flights have become commercially viable. However, south-bound flights run almost empty due to lack of demand for time-sensitive imports in Kenya. This could become a constraint on future expansion in floriculture as competition increases and margins decline. Recent developments towards direct imports by retailers are also a challenge to Kenyan

exporters because this would shift more of the logistical activities to exporters, including packaging and testing.[7]

Lead time and time variability

There are three concepts related to time that need to be considered when discussing time as a trade barrier: lead time, time variability and just-in-time. Lead time is the amount of time between the placement of an order and the receipt of the goods ordered, while time variability is measured by the (statistical) variation in lead time. Just-in-time refers to a way of organizing production, where inbound as well as outbound inventories are kept to the bare minimum and inputs arrive in the factory at the point where they enter the production process. Lead time and its variability are determined on the supply side, while just-in-time is a requirement on the demand side.

Lead time depends on the nature of the product, for example whether it is made to order or if it is from the shelf. It also depends on planning and supply chain management, logistics services and, of course, distance between customers and suppliers. Long lead time does not need to be a problem if time variability is low and demand is stable.[8] However, if there is uncertainty about future demand, long lead time is costly even when the customer knows exactly when the merchandise will arrive. If future demand has been underestimated, running out of stock has costs in terms of foregone sales and the possibility of losing customers. If future demand has been overestimated, excess supply must be sold at a discount.

The significance of lead time and time variability also depends on the number of varieties of the product in question, since separate stocks will be required for each variety. Thus, for products for which product differentiation is important, lead time is likely to have a strong impact on the choice of suppliers. Fast fashion is a good example of this, since each item comes in a number of sizes and colours. Finally, it is important to notice that competitiveness – as far as timeliness is concerned – is not a static concept. When a critical mass of suppliers is able to deliver just-in-time and the customer finds it safe to reduce inbound inventories to a couple of days – or in some cases even a couple of hours' supply – those who are not able to deliver just-in-time will no longer be invited to bid on contracts. Therefore, it is time *relative to competitors* that matters for market entry.

The World Bank has since 2004 conducted an annual survey of freight forwarders in most of its member countries on freight time and costs from the factory gate until the cargo is loaded on a ship, including administrative procedures such as acquiring an export or import license, customs clearance and inspection of goods. Table 20.1 presents regional averages and the top and bottom countries ranked by time for exports from the 2013 survey. Time for exports vary between 6 and 81 days, with Denmark, Estonia, Singapore and the United States sharing the top rank, and Kazakhstan having the longest time for exports. Singapore ranks on top on time for imports

TABLE 20.1 Time for exports and imports, 2013

	Time for export (days)	Time for import (days)
East Asia & Pacific	21	22
Europe & Central Asia	25	26
Latin America & Caribbean	17	19
Middle East & North Africa	20	24
OECD: High income	11	10
South Asia	33	34
Sub-Saharan Africa	31	38
Denmark	6	5
Estonia	6	5
Singapore	6	4
United States	6	5
Kazakhstan	81	69
South Sudan	55	130

NOTE: Among OECD countries Mexico is included in Latin America & Caribbean; the Czech Republic, Hungary, Poland and the Slovak Republic are included in Europe and Central Asia.

SOURCE: World Bank

with four days only, while South Sudan has the longest time for imports at as much as 130 days.

The ability of local firms to enter time-sensitive supply chains depends not only on time for exports. Time for imports is equally important since imported parts and components are essential inputs in manufactured exports. In 2009, imported value added accounted for 27 per cent of gross export value on average in the 56 countries included in the WTO/OECD Trade in Value Added database, ranking from 3 per cent in Chile to 59 per cent in Cambodia. The sector with the highest foreign value-added content is electrical

and optical instruments, where the average was 38 per cent, ranking from 5 per cent in Chile to more than 60 per cent in Cambodia, Vietnam, the Czech Republic, Ireland and Singapore.[9]

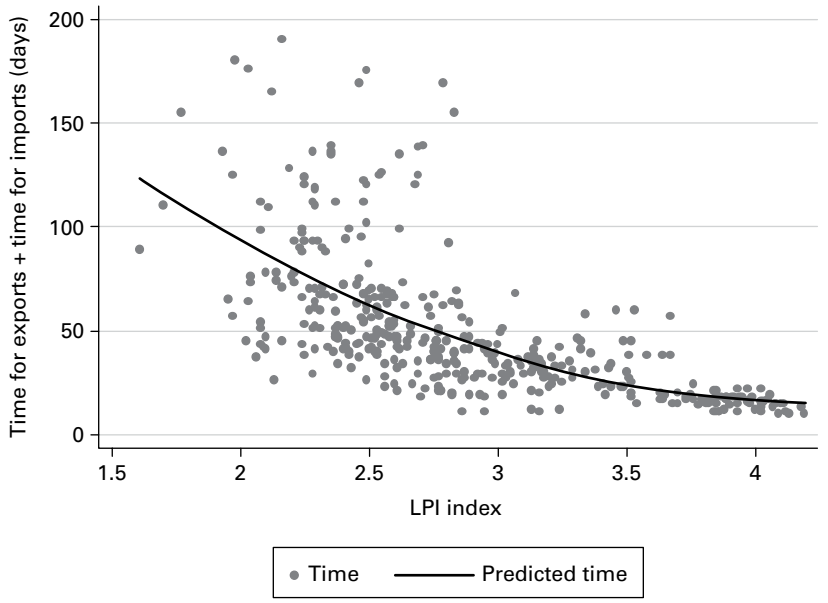
Depending on at what point in the production cycle the administrative procedures related to exports can start, and whether or not the necessary permits and documents are specific to each shipment or are given to an exporting or importing company for a defined time period, the time for exports and time for imports could overlap to various degrees. In a worst-case scenario, the administrative procedures are repeated for each shipment and the procedures for imports start when an order is received, whereas procedures for exports only start when the goods are finished. If so, a South Sudanese business that needs to import intermediate inputs would have a lead time of more than six months due to time for imports and exports alone.

Logistics and time for exports and imports

The time it takes to trade across borders is of course not given by nature, but is a function of a number of factors such as the quality of infrastructure and infrastructure management, the competitiveness of the transport and communications sector, and the administrative procedures related to customs and other border-crossing procedures. We tested the relationship between time for exports and imports and a number of indicators of transport, logistics and communication performance. Among the relevant factors for which comparable data across countries are available, the World Bank's Logistics Performance Index (LPI) turned out to be the most strongly related to time for trade. The LPI index takes values between 1 and 5; 5 representing the best performance. In Figure 20.1 this is plotted against the time it takes for exports plus the time it takes for imports. The chart demonstrates that the better the logistics connectivity, the shorter time for getting goods across the border. We also see that the variation in time for trade among countries is much smaller for the high performers on the LPI index than for those with a low index, suggesting that a low LPI index is symptomatic for wider problems related to getting goods across a border.

Another factor found to be strongly related to the time for exports and imports was internet access, which facilitates effective and rapid customs clearance over secured internet portals. The quality of ports and the burden of customs procedures as measured by the World Economic Forum (WEF) indices were also important. Finally, rich countries tend to have better infrastructure and better institutions, which affect the efficiency at ports as well as the inland transport leg of the journey from exporter to destination. Thus, countries tend to have shorter time for exports and imports the richer they are.

FIGURE 20.1 Time (days) for trade and logistics performance



Time and who trades what with whom

This section estimates the sensitivity of time for exports and imports to international trade flows, using the gravity model. The estimates are made for intermediate inputs as classified in UN statistics under broad economic categories (BEC) to highlight the relevance of time in international supply chains. The sectors chosen for the analysis are processed industrial suppliers (BEC category 22), parts and components of capital goods (BEC category 42) and parts and accessories of transport equipment (BEC category 53). The results are compared to those for total merchandise imports.

The data assembled for this analysis consists of a panel of 152 countries covering the period 2006 to 2012. Data on time for exports and imports is from the World Bank's Doing Business survey for the years 2006–12. Trade data are from the UN Comtrade database, the geographical indicators routinely included in gravity regressions are from CEPII,[10] and data for gross domestic product (GDP) are from the World Bank Development Indicators.

The gravity model simply states that trade between two countries is proportional to the product of their GDP, which captures the impact of market size, and inversely proportional to bilateral trade costs. Formally the model can be written as follows:

1) $$T_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3}$$

Subscripts *i* and *j* signify the country pair, T trade flows between them, Y their income (GDP) and D trade costs, which in turn are assumed to be proportional to geographical, cultural and institutional distance. The parameters α_1 and α_2 are expected to be positive while α_3 is expected to be negative. Until quite recently this equation was habitually log-linearized and estimated using ordinary least squares (OLS). Recent literature has revealed, however, a number of problems with simple OLS estimation, and has suggested alternative estimation techniques. The regressions below apply the Poisson pseudo-maximum likelihood (PPML) estimator, a methodology suggested by Santos Silva and Tenreyro (2006, 2014). It solves problems of heteroschedasticity in bilateral trade data and provides efficient estimates of the coefficients. The regression equation is as follows:

$$2) \qquad M_{ijt} = \exp(\alpha_0 + \alpha_1 \ln Y_{it} + \alpha_2 \ln Y_{jt} - bd_{ij} - \alpha_3 txm_{ijt} + \gamma_t + \varepsilon_{ijt})$$

The first three terms are a constant, and importer and exporter GDP. The fourth term is a vector of geographical bilateral variables (distance, common border, common language and common colonial past). The fifth term is the one of particular interest; a constructed bilateral variable summing time for export in the exporting country and time for imports in the importing country, and finally a dummy that captures time trends and an error term.

The PPML estimator does not distinguish between market entry (the extensive margin) and expansion of existing trade flows (the intensive margin). As noted, decisions on the extensive and intensive margins can be distinct. Entry barriers are related to fixed or sunk costs that firms incur up-front before they enter a contract with a foreign customer or supplier, a contract that usually specifies the time of delivery and required time regularity. In order to meet these requirements, investments in better supply chain management tools are often necessary. In addition, fixed costs can be related to setting up a distribution network, establishing after-sales services, learning about and complying with product standards in the foreign market etc. The possibility that time for exports and imports may also reflect entry barriers is explored by estimating a probit function where the left-hand side variable is whether or not a country pair trades.

Santos Silva and Tenreyro (2006) showed that the Poisson pseudo-maximum likelihood estimator (PPML) yields unbiased and effective results and allows the inclusion of zero trade flows. The zero-inflated Poisson technique (zip) preserves the benefits of PPML, but allows for distinguishing between the intensive and the extensive margin. It does so by distinguishing 'true zeros' from zeros that are explained by the same mechanisms as the positive trade flows. The 'true zeros' in this setting would be those where trade flows are zero because time costs are too high relative to the market in the importing country, whereas the 'false zeros' are country pairs that happen not to trade with each other at a particular point in time because, among all possible

trading partners, there may be some randomness in which partners are actually chosen, given that firms do not have resources to establish trade links with all potentially profitable markets.

The distinction between the extensive and intensive margin using *zip* can be made without the need for an identifying variable, which has proved to be difficult when applying Heckman regressions, a commonly used methodology for distinguishing between the extensive and intensive margin. The *zip* technique starts with fitting a constant-only model, predicting whether a country pair is in the group of 'true zeros', using a probit model. It next fits the full model starting with the fitted constant only model and adding the Poisson count model.[11] The estimated probit function reads as follows:

$$3) \qquad \rho_{ijt} = \Phi(v_0 + v_1 \ln Y_{jt} + v_2 \ln Y_{ti} + \varphi_t - vd_{ij} - v_3 txm_{ijt} + \eta_{ijt})$$

The results for both the Poisson and the probit regressions are reported in Table 20.2. Note that the probit regressions report the probability that trade will *not* take place (ie the probability of zero).

TABLE 20.2 Regression results using zero-inflated Poisson

Poisson	Total trade	BEC 22	BEC 42	BEC 53
Ln distance	–0.452***	–0.557***	–0.426***	–0.518***
	(0.020)	(0.020)	(0.041)	(0.027)
Ln reporter GDP	0.795***	0.734***	0.724***	0.828***
	(0.014)	(0.011)	(0.026)	(0.016)
Ln partner GDP	0.797***	0.790***	0.888***	0.985***
	(0.011)	(0.011)	(0.019)	(0.015)
Common language	0.192***	0.209***	0.408***	–0.230***
	(0.046)	(0.042)	(0.096)	(0.063)
Common border	0.759***	0.745***	0.383**	0.975***
	(0.063)	(0.060)	(0.149)	(0.089)
Common colonial history	0.971***	0.694***	1.792***	0.373***
	(0.097)	(0.086)	(0.199)	(0.131)

TABLE 20.2 *continued*

Poisson	Total trade	BEC 22	BEC 42	BEC 53
Ln time	–0.088*	–0.072	–0.310***	–0.524***
	(0.045)	(0.046)	(0.107)	(0.065)
Probit				
Ln distance	0	0.088***	0.100***	0.182***
	(0.006)	(0.006)	(0.006)	(0.007)
Ln reporter GDP	–0.270***	–0.282***	–0.281***	–0.245***
	(0.002)	(0.002)	(0.002)	(0.002)
Ln partner GDP	–0.113***	–0.221***	–0.257***	–0.331***
	(0.002)	(0.002)	(0.002)	(0.003)
Common language	–0.382***	–0.451***	–0.434***	–0.428***
	(0.014)	(0.014)	(0.014)	(0.014)
Common border	–0.259***	–0.299***	–0.463***	–0.526***
	(0.035)	(0.037)	(0.038)	(0.038)
Common colonial history	–0.033**	–0.145***	–0.081***	–0.126***
	(0.016)	(0.017)	(0.017)	(0.018)
Ln time	0.657***	0.682***	0.731***	0.716***
	(0.010)	(0.010)	(0.010)	(0.010)
N	129080	129080	129080	129080
Number of zero	43779	55761	64127	75168

NOTE: Robust standard errors in parentheses. ***, ** and * signify statistical significance at a 1, 5 and 10% level respectively.

It is first noted that almost 70 per cent of the country pairs included in the database trade with each other. But this share diminishes when we look at particular sectors, as should be expected (see the last two rows in Table 20.2). About two-fifths of the country pairs do not trade processed industrial supplies (BEC 22), about half do not trade parts and components of capital goods (BEC 42), while more than half do not trade parts and accessories of transport equipment (BEC 53).

The standard gravity variables take the expected signs and similar values as in previous studies that have used the PPML estimator. Thus, countries with a high GDP trade more and have a larger number of trading partners; and country pairs with a common border, common language or common colonial history trade more with each other. For immediate neighbours and countries that share a common language there is a strong tendency for the share of trade in intermediate goods to be higher than for trade on average (ie total trade in the table). Next-door neighbours tend to trade more than twice as much with each other than other country pairs (everything else equal), and, for parts and components of transport equipment, country pairs sharing a common border trade 2.7 times as much with each other.

Turning to the variable of interest, time for exports and imports, it has a strong effect both on the probability that two countries will not trade with each other and the trade volumes given that a trade relationship has been established. The probability that countries will trade with each other can be interpreted as a measure of trade diversification. A country will have fewer trading partners the longer it takes to export and import goods. The estimation result suggests that a 10 per cent longer time for exports and imports reduces the probability to trade by about 2 percentage points. As an illustration, this means that if we compare two countries of similar and about average level of GDP and centrality, the country with a 10 per cent longer time for exports and imports would have three fewer trading partners in our sample of 152 countries.[12]

Having established a trade relationship, time for trade does not have a very significant impact on trade values on average for total trade. A likely explanation is that countries with a long lead time export products that are not very time sensitive, or they export to countries where just-in-time production and fast retailing are not very common, or both. The sectors in which just-in-time is the most widespread, parts and components of capital goods and motor vehicles (BEC 42 and 53) in contrast, a 10 per cent reduction in lead time would on average lead to an increase in trade value of 3 and 5 per cent respectively for the two sectors. These are typically dynamic sectors with opportunities for firms in developing countries to join global value chains, and to benefit from higher export prices and technology transfers from the lead firms in the value chain.[13]

To summarize the results, countries with short lead time, which are also countries that score well on logistics performance, tend to trade parts and components of sophisticated manufactured goods with each other, while countries with long lead times have fewer trading partners with which they trade less time-sensitive products. The total trade volumes of the latter are,

however, not systematically lower than countries with short lead time. Time for trade, in other words, strongly affects who trades what with whom, but not necessarily total trade volumes.

Policy implications and conclusions

This chapter has shown that lengthy time for exports and imports can be a substantial obstacle to entering export markets for entrepreneurs in developing countries. At the same time, products for which developing countries have comparative advantage are becoming increasingly time sensitive due to consumer demand for new and differentiated products, lean retailing and just-in-time production technologies. Importantly, it is lead time and time variability relative to competitors rather than absolute time for exports that matter for market entry as well as trade volumes. Therefore, developing countries with long and variable lead times need to shorten their lead times and reduce time variability faster than their competitors, if further marginalization in time-sensitive products is to be avoided.

Lead time and time variability depend on the smooth operation of a number of services within a broadly defined logistic services sector. In addition, a well-functioning customs service and other public services related to trade are needed. These activities form a logistics chain where the speed of material flow is determined by the slowest activity. Therefore, policy reforms need to start with identifying the bottleneck in the supply chain and take steps to opening these.

Where customs and related procedures constitute a bottleneck, trade facilitation can have a large impact on trade flows. OECD work has documented benefits and costs of trade facilitation in developing countries. This work has emphasized that more efficient and modern customs' services tend to stimulate trade as well as enhancing customs revenue. Therefore, the expenses related to trade facilitation, including investment in information technology, are quickly paid back when reforms are successfully implemented (Moise, Orliac and Minor, 2011; Moise and Sorescu, 2013). In countries where time-costs-related customs procedures constitute a bottleneck, trade facilitation can remove barriers to entry and induce a leap forward in terms of exports of time-sensitive goods. Furthermore, trade facilitation can in that case trigger a demand-driven expansion of logistics services in the private sector, initiating a virtuous circle and keeping up the momentum in the reform process.

If logistics services represent the weakest link in the chain, trade facilitation alone will not make much of a dent in lead time and its variability. In such cases, reforms in the transport and logistics sector are needed in addition. In low-income countries, this often involves commercialization and privatization of the transport sector, combined with regulation in order to ensure that a public monopoly is not replaced by a private monopoly. Opening up to trade and foreign investment in transport and logistics services could

bring needed capital and expertise and thus contribute to better services. As noted, such reforms can help local manufacturers' ability to at least maintain and possibly expand and upgrade the quality of their exports. Such benefits must be factored in when considering reforms in the transport and logistics services sector.

In cases when the entire logistics chain is weak, as is often the case in low-income countries, a reform package including trade facilitation and measures that stimulate the development of a diversified logistics services market is needed. These measures should aim at making the best use of existing infrastructure and institutional capacity, but this is not always enough. In many cases costly investments in infrastructure are also needed. Many of the initiatives that have been discussed under the aid for trade agenda relate to improving export capacity through better infrastructure and technology transfer, and could support a reform and investment package.

Upgrading infrastructure can take a long time. When resources are limited and the logistics chain very weak, scarce resources could be invested in special economic zones as a first step. The special economic zones in South-East Asia and China have, for instance, contributed to creating a critical mass of skills and services inputs for the electronics sector (Kimura and Ando, 2005). Nevertheless, examples abound of unsuccessful special economic zones. When zones are special mainly due to tax holidays and few regulatory restrictions they often end up becoming export-processing enclaves at best. What is needed is well-located special economic zones, which are special in the sense that they have good infrastructure and related services.

The dynamics between trade and lead time and time variability may constitute either a virtuous or vicious circle. In the former case, shorter lead time triggers new trade flows, generating additional demand for transport and logistics services and stronger pressure for reforms, which further shorten lead time and so on. In the latter case, poor trade performance yields low demand for effective transport and logistics services, and resistance to reform from the transport and logistics sector may go unchallenged. Nevertheless, the costs of doing nothing can be huge in a situation when short lead time and reliable delivery on time are becoming increasingly important, also in industries for which developing countries have a comparative advantage. The findings in this chapter show that doing nothing, while others reform, would leave firms in the non-reforming country at an increasing competitive disadvantage.

While individual governments can shorten the time for exports and imports considerably by streamlining customs procedures, clamping down on cartels at ports, and liberalizing transport and logistics services unilaterally, cross-border cooperation is also important. For example, most of the countries in which it takes more than two months to export, import, or both, are land-locked low- or middle-income countries. Their performance clearly depends on the time and cost of transit through neighbouring countries. In addition, effective customs procedures in any country depend to some

extent on the quality and timeliness of processing the necessary documents at both ends of a trade transaction.

An important step towards international cooperation in this area was taken at the Bali WTO Ministerial Conference in December 2013, where an agreement on trade facilitation was reached. To quote the WTO website, the purpose of the trade facilitation agreement is 'further expediting the movement, release and clearance of goods, including goods in transit'. A successful ratification and implementation of the agreement will clearly reduce time for exports and imports and thereby create a better environment for entrepreneurs to invest in becoming suppliers of more sophisticated but time-sensitive parts and components within international value chains. All countries would gain from this agreement, particularly when combined with domestic reforms. The countries where its implementation would make the largest immediate difference are those with considerable industrial capacity, which have long time for exports and imports. Among the countries that fit this description best are Russia, Ukraine, South Africa, Venezuela and Kenya.

Notes

1. Duranton and Storper (2005) document that while transport costs have gone down over the past century, total trade costs have gone up due to more transport-intensive ways of organizing production.
2. World trade increased from 24% to 62% of world GDP from 1960 to 2012 according to the World Bank's World Development Indicators.
3. See Evans and Harrigan (2005) for a study on US trade in textiles and clothing.
4. See Hummels and Klenow (2005) for a discussion and empirical evidence.
5. See http://www.americanapparel.net/mission/workers.html, accessed 28.11.2013.
6. See http://www.inditex.com/en accessed 28.11.2013.
7. See http://www.kenyaflowercouncil.org/index.php. See also Nordås, Pinali and Geloso Grosso (2006) and Nordås (2008) for a discussion.
8. If demand was known months in advance, orders could be placed months in advance as well, and lead time would not matter much.
9. The trade in value-added database can be found at http://stats.oecd.org. It contains information on various dimensions on trade in value-added for 54 developed and developing countries. It covers global trade disaggregated into 18 sectors for the years 1995, 2000, 2005, 2008 and 2009.
10. http://www.cepii.fr/francgraph/bdd/distances.htm.
11. The Vuong test showed that *zip* estimates are preferred over PPML in all sectors. The regressions were subsequently run using robust standard errors, which cannot be combined with the Vuong test.
12. Hausman *et al* (2005) and Djankov *et al* (2010) have similar results for the intensive margin of trade (trade volumes) although they do not take into account country pairs that do not trade with each other.
13. See for instance Nordås and Kim (2013) for a recent analysis.

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Learning from humanitarian supply chains

21

ROLANDO TOMASINI AND LUK VAN WASSENHOVE
Insead

Introduction

In a globalized economy business networks have become more interconnected, with companies extending their supply chains over multiple time zones. The global expansion of these business networks has brought about many more options when selecting the actors that will be part of a supply chain. Suppliers and consumers come from different continents and the list of manufacturing hubs keeps shifting and expanding to several locations, eg China, Mexico and Bulgaria. Transportation providers have had to rethink their geographic footprint and allocation of resources in order to be well coordinated with the company's activities. This means being able to integrate suppliers in the different locations, receive their raw materials and distribute the goods to a number of sites where the product will be sold.

The multiplicity and diversity of actors in the global supply chain equal multiple risks for the network. For example, any disruptions in the material, information or financial flow in one area of the world can have immediate repercussion in the supply chain throughout different time zones. These events could be anything from a simple delay in a process, to a major disaster such as a hurricane that closes an airport or an earthquake or flood that destroys a manufacturing plant or a warehouse. Regardless of the nature of the disruption, dealing with the repercussions and learning to plan for them is a constant concern for supply chain managers. Lessons for these types of challenges to the supply chain can come from different sources and sectors. In this chapter we focus on examples from companies learning from the processes of humanitarian agencies.

Disasters are challenging learning settings

Humanitarian organizations are driven by unpredictable events, constantly moving from one setting to another to attend the needs of affected populations all over the world. The speed at which they move is as irregular as the event occurrence. The magnitude of their involvement will also vary, depending on the impact the event had on the population, the number of actors engaged in the response and the local coping mechanisms. Combined, this makes humanitarian operations fairly complex learning labs for companies to acquire or develop new knowledge. To illustrate this point, we consider below the example of the events in Lebanon in 2006.

Lebanese–Israeli crisis of 2006[1]

On 12 July 2006, the Lebanese guerrilla group Hezbollah captured two Israeli soldiers patrolling the Lebanese–Israeli border. Later that day, Hezbollah's leader, Hassan Nasrallah, appeared in a broadcast TV announcement to confirm the capture of the soldiers and state his terms for their release. He threatened to escalate the violence if a prisoner exchange was not negotiated with the Israelis.

The Lebanese population expected a reaction from the Israelis as in the past,[2] in the form of low-intensity bombings or riots. Instead, the Israeli Air Force (IAF) started a large-scale bombing campaign of major bridges in the southern suburb of Beirut, a Hezbollah stronghold,[3] on the same evening.

On 13 July, the IAF proceeded with the bombing of Beirut International Airport, the only operational airport in Lebanon, in addition to a couple of unused airfields in northern Lebanon and the Bekaa Valley in the east. The Beirut port was also targeted, along with several commercial and tourist ports. Severe damage put the airport out of operation, while the Beirut port was paralysed and brought to a halt.[4]

Frightened by the massive bombings of populated areas, many people from southern Beirut or southern Lebanon fled their homes and took refuge in empty schools and public buildings. These families were in need of everything, from water and food to medicines and baby supplies. While people fled their homes in south Lebanon in the first days of the conflict, days later those who hesitated were unable to leave. With the fierce fighting between Hezbollah and the Israelis there was no way in or out of the battlefield.

Residents of southern border villages left to go to cities in the south such as Tyre and Saida, others to Beirut and other parts of the country. Residents of Beirut's southern suburb also had to leave their homes, fearing strikes on the area. Those who could afford it left the country to go to mainly Syria and Jordan, until the access roads were targeted and blocked. Tourists from neighbouring countries left Lebanon by land as soon as the hostilities started. Other foreigners, conscious that they could be targeted as well, had to wait for their country's evacuation plans, which started on 20 July.

The attacks continued. On 30 July the main eastern crossing into Syria linking Beirut to Damascus was targeted again and the road was put out of action. The remaining northern crossings into Syria were also targeted, blocking all access into the country. International humanitarian aid was blocked at the borders until a safe passage through the humanitarian corridor was negotiated with the Israelis. The negotiations to access the country were primarily channelled through the United Nations Joint Logistics Center (UNJLC),[5] an inter-agency coordination platform working in close collaboration with all the aid agencies.

The war officially lasted until 14 August, two days after the United Nations Security Council issued resolution 1701 calling for a permanent ceasefire. Although there was a clear call to lift the blockade, Israel kept its siege on Lebanon until 9 September. Trucks were able to enter from Syria and circulate within Lebanon, but ships were still forbidden to dock at ports, and civilian planes were only allowed to land in or depart from Lebanon after stopping in Jordan. Upon re-establishing peace, official figures issued by the Lebanese government estimated the number of internally displaced people to be 947,184 at the peak of the war, and at least 30,000 destroyed houses.[6] Ninety-five bridges all over Lebanon were destroyed, mainly in the south of the country. Civilian casualty figures vary between 850 to 1,190 dead,[7] and 4,409 injured[8] at the end of the war.

The case of Lebanon illustrates the complexity that humanitarian agencies face when trying to set up a relief operation. For natural crises the security constraints may be lower and coordination among the actors easier. However, the relief operation remains a challenging setting where limited resources and priorities are constantly revisited to update planning and operations.

Humanitarians and their supply chains are different

The humanitarian sector, unlike the business sector, focuses on developing capabilities to respond to high-impact events with unpredictable resources. Organizations such as the International Federation of the Red Cross (IFRC),[9] World Food Program (WFP),[10] United Nations Children's Fund (UNICEF),[11] CARE,[12] World Vision International (WVI),[13] among others in a long list, have a specific mandate to raise funds, recruit and train staff, set up agreements with business and governments, and develop relationships with communities to respond to natural and political disasters affecting communities. This mandate is an exceptional licence to focus on saving human lives by mitigating the impact of disasters and facilitating the return to normality.

The way these humanitarian organizations implement their mandate varies, given their primary focus areas (eg food distribution, water sanitation, medical support, education and childcare) and their geographical priorities. However, the process of accessing the beneficiaries and delivering the aid

remains the same. It comes down to developing a supply chain that is agile enough to adjust to changes in the types of goods and quantities required, and adaptable enough to react to changing conditions (eg security) and new actors (eg different non-government organizations (NGOs), the military, or government).

Even though the focus areas and priorities may be different, humanitarian organizations and private companies at the core may share similar operational concerns. For humanitarian organizations, logistics (and the functions related to supply chain management) represents approximately 80 per cent of the activities. Humanitarian managers debate similar issues to private companies about how to negotiate the best supplier agreements, where to position warehouses, whom to choose as transport provider, how to improve delivery, and what investment is required to stay competitive. For example, over the past years the IFRC has undergone a restructuring exercise to decentralize their supply chain, with regional logistics units (RLUs) in Panama, Dubai and Kuala Lumpur.[14] The new structure was designed to improve their regional response capacity by reducing lead times and costs. The regional focus enables them to take advantage of local warehouse and transport providers, develop better relations with partners in the region (including donors, suppliers and governments), and forecast supply and demand more accurately.

In contrast to commercial supply chains, humanitarian supply chains are usually established without a precedent. They do not respond to pre-existing or constant demand. Humanitarian organizations are responsible for reacting as quickly as possible, usually with little or no anticipation. As they establish their presence and become operational, they start to focus on the reduction of cost. For example, following a major disaster air transportation is used, incurring high costs, while humanitarian staff on the ground look for alternatives in the local markets and options for ground transport that could help lower the cost of the operation as it unfolds.

Finding ways to lower the cost can be a challenging task, as was experienced by the humanitarian organizations while preparing for the return of millions of refugees to south Sudan.[15] In 2005 a peace agreement was signed between the government of Sudan in the north and the Sudanese People Liberation Movement (SPLM) in the south, ending a 21-year civil war that had devastated most of the infrastructure in the south. Bridges, roads, rail and airports were destroyed, making land transport impossible. Under those conditions air transport was the only, and most expensive, option. However, it was unsustainable considering the size of the southern region, the distances to reach it and the number of people expected to return that would need humanitarian aid. The agencies engaged in a long exercise to design a distribution network from scratch, using funds from government donors and the expertise of private companies, eg to repair roads.

Another contrasting point is the motivation that brings the different actors together. Commercial supply chains are primarily held together by the profit incentives that the different organizations share. Humanitarian

supply chains lack that incentive and yet they manage to bring together different actors and coordinate the interaction in a system where there is no formal command and control structure. Several coordination mechanisms have been institutionalized in the humanitarian sector for complex emergencies. One example is UNJLC, whose mandate is to consolidate the information from the different organizations involved, de-bottleneck and negotiate on behalf of the humanitarian community with the authorities, and assist in the allocation and consolidation of resources in light of changing priorities. Since 2005 it has been operating in Sudan, coordinating the pipeline for non-food items (eg blankets, mattresses, cooking kits, soap) to beneficiaries. The pipeline is an inter-agency project that balances the core competencies and local capacity of different agencies operating in Sudan. During its initial setup UNICEF was responsible for the procurement of goods, WFP served as the consignee for in-kind donations, and CARE assumed responsibility for warehousing and transportation to the refugee camps, where an implementing NGO would be assigned to do the last-mile distribution.

Companies interested in getting involved with humanitarian organizations are immediately faced with the complexity of the sector and are forced to define how they will add value with their participation, and what motivates them. Over the past decade we have seen a number of examples of companies establishing close collaborations with the humanitarian sector to provide support for relief operations. In this chapter we review examples of companies that invested in developing relationships with the humanitarian sector as part of their corporate social responsibility programmes, getting exposed to the numerous lessons from disaster management.

Corporations moving in to help find that they can also learn

For decades companies were mere suppliers of goods and services to humanitarian organizations, but since 2000 there has been a major shift towards deeper and closer relations that include partnerships.[16] The trend has been welcomed and encouraged by many humanitarian organizations, including the UN itself, who have dedicated resources and reviewed policies in order to facilitate the contact and interoperability with their new commercial partners.[17]

Initially motivated by the will to contribute with their core competencies and capacity to a greater good, several companies from the transport and logistics sector have developed over the past decade a series of corporate social responsibility (CSR) initiatives and partnerships with the humanitarians. These partnerships were designed to support the humanitarian agencies to fulfil their mandate, giving them access to the companies' know-how, resources, global presence and network. Over time these companies have also realized that the humanitarians have complementary skills that would

be valuable to their own organizations, and some have begun to invest in capturing that learning for their commercial practice.

Two major examples in the sector are the partnership between TNT and WFP, also known as Moving the World, and the Humanitarian and Emergency Logistics Program (HELP) set up by Agility.

Moving the World[18]

As a leader in the industry, TNT was conscious of the consequences of globalization and the responsibility it inherited as a major player in the global economy. Since 1946 TNT has expanded through takeovers and acquisitions from its Dutch roots in the public mail service to a global company present in 63 countries with over 160,000 employees and operating its own airplanes. In 2002, CEO Peter Bakker expressed his concern to a team of senior executives when he decided to develop a global CSR programme. He had recently learned that every five seconds a child dies from hunger and that logistics could help to alleviate that figure, especially in emergency situations. His call went out to the team of executives explaining that: 'It's not enough to be socially responsible within our company. We should strive for social leadership outside our business. If through our business we can help improve people's living conditions, it is our responsibility to do so.'

Following a six-month selection process, Bakker and the team of executives decided to partner with WFP for an initial period of five years to form Moving the World. The choice of partner was made on several bases that confirmed the complementary fit between the two leading organizations. As a global provider of mail, express and logistics services, TNT wanted to make sure its partner would have similar appreciation and interest in its capabilities and global presence. WFP fitted the bill as the largest humanitarian organization that provides 'food aid to an average of 90 million people, including 56 million hungry children, in more than 80 countries every year'.[19]

To define projects and goals for Moving the World, TNT and WFP teams made a visit to WFP's Tanzania operations. They visited emergency operations and noted the logistics challenges. The observations led to a series of discussions in which both partners agreed to collaborate in the areas of emergency relief, joint supply chain, transparency and accountability, employee volunteering and the school feeding programme.

Between 2002 and 2007 Moving the World mobilized staff globally from both organizations to participate in fundraising campaigns, secondments and volunteer opportunities, and support for disaster relief operations. Among these activities is support for the relief operations of the Indian Ocean tsunami, where TNT contributed with its local staff, offices and equipment, helping WFP to become operational quickly. Similarly, in 2008 during the Myanmar floods, TNT facilitated access to the country through its local network while WFP struggled to overcome the bureaucratic challenges imposed by the government. During these operations, and a long list of many more, field staff from both organizations worked very closely

towards the same goal, borrowing equipment, tapping into each other's expertise and developing new contacts.

Throughout the five years over which the partnership evolved, with $38 million invested by TNT in the different projects and an additional $9 million raised by employees, lessons from each project were reshaping the collaboration guidelines. Following an independent evaluation of the first five years, both organizations decided to renew their engagement indeterminately.[20] To facilitate the collaboration they reorganized the partnership into four pillars: awareness and fundraising, transport for goods, hands-on support for disasters, and knowledge transfer for best practices. These four categories were more representative of the value exchanged between both organizations and the activities involved. Inherent in this new structure is the idea that TNT could also learn and benefit from WFP's knowledge. Throughout the partnership history, 70 TNT specialists have been seconded to WFP to contribute and acquire new experiences and best practices.

Agility: humanitarian and emergency logistics programme[21]

The notion of risk and vulnerability is one that Agility knows well and seeks to master. This is reflected in its history, strategy and CSR programme. Agility was founded in 1979 in Kuwait as the Public Warehousing Company (PWC Logistics). In 1997 it was privatized and became publicly traded, marking the beginning of eight years of expansion. Through a series of acquisitions the company became the largest logistics provider in the Middle East and a global industry player. In 2006 the company rebranded itself as Agility to represent 550 offices in 100 countries and 32,000 employees.

Agility's presence in the industry is unique in different aspects. It is the world's eighth-largest logistics company and the only global top-10 industry player with roots outside of Western Europe or the United States. Among the top players it is also the main one focusing on emerging markets, a strategy that has exposed it to a series of risks and social issues that it aims to address through its CSR programme. Chairman and CEO Tarek Sultan explained his vision of the company by saying:

> We work in difficult countries in challenging situations; therefore we need to be ready to add value in tough places, whether it be on commercial terms or not. We understand risk, and we have an appetite and knowledge to thrive on it and do business. When you are sitting in Kuwait, you have Iraq to one side and Saudi Arabia to the other. The minute something happens, you see, you listen... you are used to working with difficult, uncertain and constantly changing conditions. When you are sitting in Kuwait, you understand that everything can change overnight and affect not only your business but people around you.[22]

Aware of the opportunity to help and the responsibility his company has in the areas where it is present, in 2005 Sultan hired Mariam Al-Foudery to design and implement a global CSR programme. From her discussions with managers and knowledge of the company and humanitarian sector she pointed out the potential that Agility had to contribute, with its logistics

competencies and capacity. These could be used towards disaster relief or employee volunteer programmes. The focus on disaster relief was seen as fitting with the company presence and experience in emerging markets, and a natural fit for local staff willing to volunteer their knowledge and time.

The test for Agility's CSR plans came in 2006 when the Lebanese crisis erupted, affecting 120 of its employees, destroying the warehouses of several clients and disrupting all commercial activity in the country. Sultan immediately agreed with Al-Foudery to create a team to address the crisis. Accompanied by experienced logisticians, she joined the humanitarian agencies at the Syrian–Lebanese border to define how Agility could help.

Security constraints in Lebanon discussed earlier had blocked all access to the country and forced humanitarian agencies to hold all aid at the border until access was safe. The challenge for the humanitarian agencies became how to stock all this aid safely and efficiently, so that it could be moved into Lebanon with the shortest possible delay when the situation improved. Through their network of contacts with commercial suppliers in the region, Al-Foudery and her team identified warehouses and transport operators in the region. They listed them in a database, visited them and evaluated them using Agility's standards for capacity and quality. They also engaged in the negotiations to review the contracts and ensure the necessary flexibility needed by the agencies in terms of payment schedules, responsibilities and insurance. Over two weeks the Agility team helped the humanitarians to develop a warehouse–transport network, enabling the agencies to focus on other pressing tasks.

The Lebanese experience validated that Agility had a role to play in disaster relief, and that lessons could be learned from it. The next steps were to design a programme that would enable Agility to systematically engage in these types of activities while producing value for the humanitarian organizations. Upon return to the headquarters, Al-Foudery and the rest of the team discussed lessons learned from the experience to structure the humanitarian and emergency logistics programme (HELP).

HELP became the platform for Agility to provide support to humanitarian agencies responding to natural disasters in countries where the company is present. The programme has been successful: 'approximately 15% of the company's global workforce volunteered for a total of 168 community projects in 62 branch offices in 45 countries around the world, reaching about 396,000 people on the ground with some type of service activity involving disaster relief, education, food, and/or health'.[23]

The value of cross-sector learning

The commitment from companies like TNT and Agility to support activities of the humanitarian world requires significant investment in terms of money, skills and time. The value of this investment is hard to quantify, especially with indicators that are shared by both parties. For example, the companies

can quantify the value of the media exposure they received from their support to the humanitarian agencies, but that figure is added value to the company and not to humanitarian organizations. On the opposite side of the argument, the humanitarian agencies could quantify the value of the transport services they received pro bono, but these savings would only reflect the benefits to the humanitarian organization, leaving out of the equation the private company.

One area in which they both agree to have reciprocity in the creation of value is *learning*. Through their interaction both sectors confirm that they have gained a new perspective on their capabilities. Staff from TNT and Agility have been seconded on missions to humanitarian operations where they put their skills to use in a completely different context. Secondments provide a unique opportunity for the private sector managers to develop skills and competencies essential and important to the survival of their organization.[24] The seconded managers, confident of their knowledge, are faced with experiences and demands that test the limits of their skills in a different setting. Through these experiences the employees are able to see new applications of their knowledge and diversify their application with a fresh view on their capabilities.

The interaction has a similar impact on the humanitarian staff working with the private partner. A great percentage of the learning for humanitarian workers is experiential, from one relief operation to another, and informal. Through the interaction with the private sector, the humanitarian workers benchmark their knowledge and identify gaps in their skills that they can set as targets for their professional development. In some cases, the companies have made their training sessions and agreements available to staff from their humanitarian partners, helping them to address those gaps and acquire new tools.

However, learning is not without challenges. As seconded managers become active in the disaster relief operations, they participate in the processes and routines that make up the know-how of the humanitarian organization. Through this process, informal learning takes place through the daily exchanges and division of labour.[25]

For the most part, learning remains at the interpersonal level first. Even though informal learning is highly effective,[26] the fullest value of the learning experience cannot be attributed to the interaction until it is captured at the organizational level. The challenge is how to capture the knowledge that resides in the individuals and use it in the process to create added value for the company seconding them. Private companies could benefit from that knowledge to develop new products and services, or simply to better manage their relations in some regions or with certain stakeholders.

Lessons for companies

Humanitarian organizations are established to meet needs in settings and conditions very different from the private sector. They are also driven by a

different set of values, objectives and funding mechanisms. However, these differences are a source of numerous lessons that can be adapted and transferred to the private sector.

In this chapter, we have focused on the lessons that can be learned from the humanitarian supply chain through long-term CSR programmes. As the examples cited show, the humanitarian supply chain can offer lessons to companies operating in global markets to help them prepare for high-impact low-probability events affecting their operations.

Acquiring these lessons can be difficult, as they will be found in areas where it is challenging to operate and where risks such as security can be very high. They also require a serious investment from the companies, who should consider the secondment as a learning opportunity for their staff. This starts with the senior leaders clearly communicating their motivation for the CSR programme, making it a company-wide priority, and financing their commitment. Companies who succeed at this have used it not just as a CSR initiative, but rather as a component in the learning path of their managers, often high potentials, to whom they feel the need to provide an experience that broadens their individual understanding of the application of their skills. This is done most effectively when the individuals see it as a match between their own personal values and motivation, and that of the corporate citizenship and values of their employer.

Finally, the lessons from the humanitarian sector extend beyond the personal level, and should be lifted to the organizational level. Capturing the richness of these experiences for the organizations, from the individuals, is an additional investment that the company needs to make in order to be receptive to the new ideas, provide the means for staff to transfer them into the company and build upon those lessons internally.

Notes

1. Excerpt from INSEAD Case Study No 09/2008-5495: Humanitarian response to the 2006 Lebanese/Israeli conflict
2. A similar event took place 10 days earlier in Gaza and led to a full military operation by the Israelis who were refusing to negotiate based on the no-negotiation with terrorist organizations policy
3. Beirut's southern suburb is home of the Hezbollah headquarters and television station
4. Except for the evacuation of foreigners, no ships were allowed to dock at the ports in the early days of the war
5. www.unjlc.org
6. Numbers published on the Higher Relief Council website, www.lebanonundersiege.com
7. Respective sources: Israeli and Lebanese governments
8. Source: Lebanese government
9. www.ifrc.org

10 www.wfp.org
11 www.unicef.org
12 www.care.org
13 www.wvi.org
14 INSEAD Case Study No 2009-5590: Yogyakarta earthquake: the IFRC's first experience with the decentralized supply chain
15 INSEAD Case Study No 06/2008-5363: Moving the World-UNJLC: Transport optimization for South Sudan
16 Binder, A and Witte, JM (2007) Business engagement in humanitarian relief: key trends and policy implications. HPG background paper, June, Overseas Development Institute
17 Tomasini, R (2012) Informal learning framework for secondments: logistics lessons from disaster relief operations. Hanken School of Economics, Helsinki
18 Section inspired by INSEAD Case Study No 03/2004-5194: TNT–WFP Moving the World: Learning to dance
19 Source: www.wfp.org
20 INSEAD Case Study No 03/2009-5596: TNT/WFP partnership: Moving the World five years on: when the music changes, so does the dance
21 Section inspired by INSEAD Case Study No 03/2009-5559: Agility: a global logistics company and local humanitarian partner
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Global sourcing and supply

22

ALAN BRAITHWAITE
LCP Consulting

Background

Global sourcing and supply is now a central part of many companies' business strategies. It has proved essential to sustaining competitiveness and maintaining net margins. Indeed, global sourcing and supply is probably both the biggest economic trend of the past 20 years and a key ingredient for corporate survival.

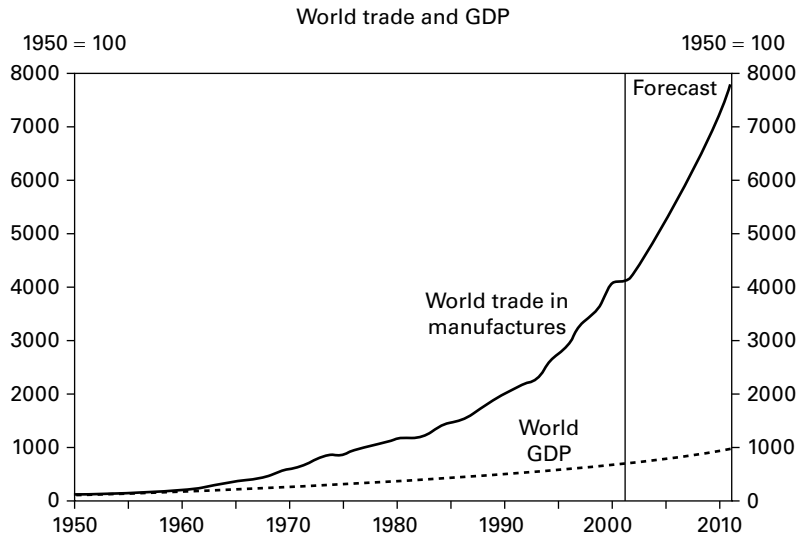
The adoption of low-cost sourcing and supply areas has displayed an exponential trend, which despite the economic turmoil that began in 2007 is forecast to continue over the longer term. However, the dynamics of this new type of operation are only just being understood and have not been documented extensively. Global sourcing implies long-distance supply chains, multiple interactions and extended lead times. As companies move to increase their share of global sourcing beyond the current entry levels, there will be major implications for how these extended chains are managed; security of supply, demand responsiveness and product life-cycle management all take on greater significance.

Global sourcing is an established fact of business life and is a dominant market-driven trend. But the challenge for every individual corporation is to implement it in a way that secures a sustainable advantage. This means organizing to manage risk alongside commercial and competitive advantage. All of the principles of supply chain management still apply; the specifics of global sustainability have many additional dimensions that are not experienced in more conventional local chains.

Growth in global trade

The expansion of global trade in manufactured goods has been one of the most pronounced and remarkable economic trends of the past 40 years.

FIGURE 22.1 Growth in global trade in manufactures



SOURCE: WTO/OEF

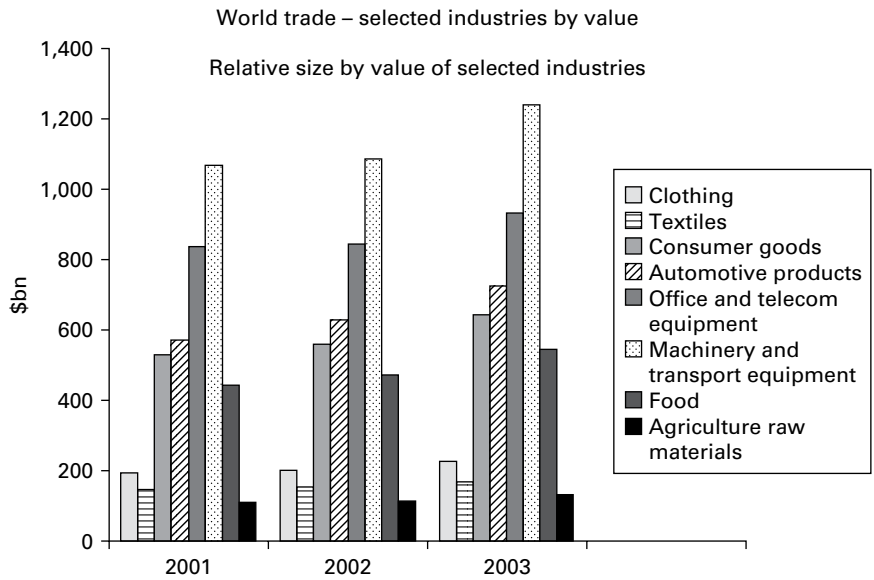
It has both fuelled and enabled the growth in gross domestic product (GDP) of most developed countries: exporting jobs to countries with large pools of increasingly skilled and low-cost labour. The capacity of the labour pool in developed countries is being released to higher value or essentially local activities and the service sector. The scale of this shift is shown in Figure 22.1.

Despite recent economic problems, the long-term trend of growth in global trade shows no sign of abating. It has been reinforced by the reduction in tariff barriers and the expansion of low-cost international logistics in the form of container freight. Moreover, there is no correlation between growth and the absolute scale of imports and exports, meaning that there is opportunity for global trade and economic benefit to both mature and emerging economies. If we set aside the natural tensions of self-interest that have been evident in recent world trade negotiations, it is clear that there are enormous benefits for buyers and sellers alike.

China has been describing its GDP growth as 8–9 per cent per year, but on the whole this is felt to be an underestimate. It refers to itself with pride as the 'factory to the world'. No one can ignore this trade potential, and global sourcing is now a matter of board strategy for all businesses in developed economies.

Statements in relation to planned increases in this trend are a regular feature of annual reports and analyst briefings. Wal-Mart, the world's largest retailer, made the trend to direct international sourcing a key feature of its 2002 annual report, saying: 'We also are making exciting strides in... global

FIGURE 22.2 Global trade growth by product category



SOURCE: WTO, 2004

procurement. Last year we assumed responsibility of global procurement from a third party. This allowed us to better coordinate the entire global supply chain from product development to delivery. In addition, our global procurement program allows us to share our buying power and merchandise network with all our operations throughout the world.'

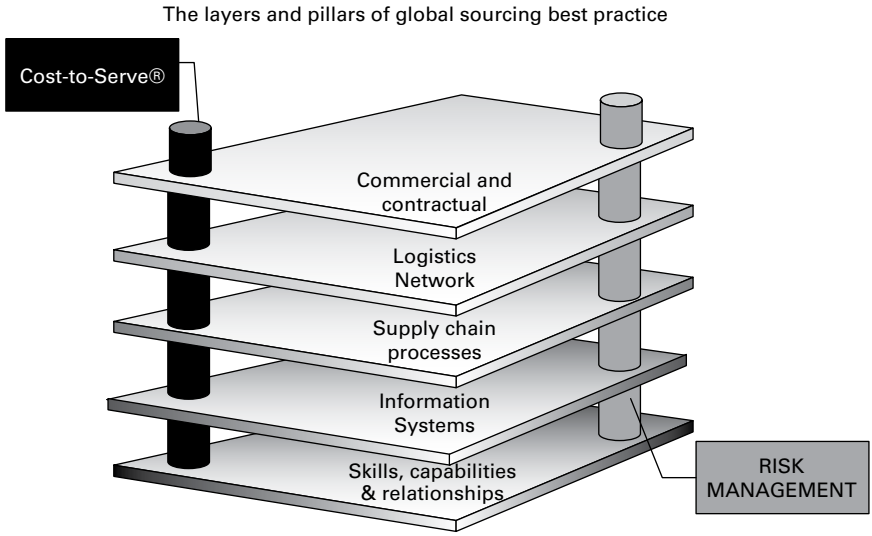
Dyson closed its entire manufacturing in the UK and moved to Asia as a key element of its entry strategy for the US market. New origins for the garment trade are Turkey and Morocco, where companies can still leverage low-cost labour, but without full Far East sacrifices on lead time and flexibility.

Figure 22.2 shows the critical contribution of the automotive industry, engineering and electronics to globalization. In reality, companies like Wal-Mart are only catching up and this will likely be at the expense of both importers and local manufacturers.

The World Trade Organization (WTO, 2005) predicts that global supply is the future. Indeed, it is an irreversible trend since capacity is leaving developed markets because it cannot compete with low-cost imports. This global sourcing dimension of strategy is now a cornerstone of companies' plans to generate value for customers and shareholders alike. Few can envisage a sustainable future without an increasing level of global supply.

Given this landscape of major change, this chapter brings together some key dimensions of the practice of global sourcing. It reviews the 'layer and pillar' model (Figure 22.3), which proved useful as a means to describe the

FIGURE 22.3 The layers and pillars of global sourcing



SOURCE: © LCP Consulting, 2005

multifaceted nature of global supply chain management. In global sourcing, supply chain management must address all of the layers. Best practice is bound together by a requirement to understand and manage through a structured approach to risk and through the total 'Cost-to-Serve' (a registered mark of LCP Consulting), which is a supply chain costing methodology that can quickly capture the true logistics cost drivers and identify activities that are intrinsically uneconomic.

Global sourcing as a way to change business strategy

The central role of global sourcing in transforming business strategies can be understood by comparing the relative wage rates in regions of the world. Because of difficulties with exact comparisons, these figures are indicative rather than definitive. For skilled labour per hour in Germany the cost is $18 to $25; in the Czech Republic it is $3–5; in the United States it is $9–15; in Asia and India it is often less than $1. The cost of support services, construction, capital investment and management are in proportion, which means that the cost of an equivalent article made in an emerging economy can be as little as half of that sourced locally.

Traders have been taking advantage of this arbitrage potential for many years and have used their local relationships, buying skills and logistics

know-how to make a margin. That margin was their return for taking risk, including quality, financing and marketing. The ultimate price differentials were reduced to 10 to 20 per cent to the end customer.

The surge in growth of global trade is the result of more companies going into markets to deal direct – cutting out the middleman. The effect of this has been to increase margins and also to increase the buyer's risk. The business strategy has been to plough back the margin benefit into lower prices, which in turn has increased volumes and market share. The trick has been – and will be – to exploit the elasticity of demand by just enough to get more volume than the margin that has been conceded. Getting this right makes both sales and profits grow.

Across industry as a whole, the trend has been for lower real prices as value is passed on to customers. The open question is the extent to which this trend is now played out. The next step in global sourcing will involve another doubling of activity levels and this will require improved levels of control and integration. The skills of supply chain management will become increasingly central.

Identifying and selecting sources

The practice of sourcing depends on the commodity and product. For example, chemicals display different supply characteristics from clothing, which in turn is different from micro-electronics. Entering a new sourcing arrangement is a moment of risk and there are many factors to be considered. These include the following:

- *Quality is a key issue*. Vendors are increasingly able to deliver to quality – but this ability cannot be taken for granted. The implications of a long-distance quality failure are much greater than a local one, as the problem may not be discovered soon enough to avoid serious disruption. Increasingly, companies are insisting on more comprehensive quality control at vendors, alongside detailed specification and engineering integration.
- *Ethical supply*. The marketing and PR impacts of the use of child labour and the environmental conditions surrounding production are now important for consumers. Media disclosures can damage the brand with consumers, and shake investor confidence. Increasingly, companies are conducting regular audits and inspections of their sources to make sure that they do not get surprises and damage to their reputations.
- *Patent protection*. The leaking of design and technology advantage has become a common experience. Companies have outsourced to places where respect for patents and know-how is rather less than the standard they would expect. Often designs, ideas and products reappear through different channels and can erode markets and price

levels. This risk requires a very careful approach to ensure that key differentiators are protected and that contractual guarantees that can be enforced are obtained.

- *Operational excellence*. Vendors' capabilities can vary widely and it is crucial to understand the extent they will be able to perform to expectation. For example, late new product introductions can significantly impact the buying and marketing organization, and there is evidence of share price erosion when international chains fail.

These points require a higher level of due diligence and ongoing management than many might expect. Dealing across cultural boundaries is a major part of this challenge – and the word 'yes' in many languages cannot be taken as an unequivocal agreement.

Commercial models

Global trade is by definition more remote than buying locally. A problem with local supply can prompt a whole range of quite simple actions, including refusing to pay and taking legal action. With global sourcing and supply these actions are more difficult, since the goods may already have been paid for, and legal action is less likely to be successful. Commercial models are, therefore, a key part of supply chain design. These are about the point of payment for the various activities along the chain, where the risk is taken, and the margin that is taken or conceded for that risk and credit period. These terms can vary enormously by both sector and companies' preferences. Traditionally traders took title to the goods at the side of the ship and paid with a currency instrument (letter of credit) that was guaranteed by a bank and cross-guaranteed by the buyer. Then they organized their own freight and paid any duties and tariffs at the destination. This model is often called FOB (free on board) and has been adopted by retailers who are progressively replacing their traders and agents.

Another common option is CIF (cost of goods plus insurance and freight), where the vendor charges for the cost of goods plus the insurance and freight to get them to the final destination. Any duties and taxes in this model are for the buyer to arrange to pay when the goods arrive in the origin country. DDP is the most equivalent option to local supply. It stands for delivered duty paid and it is where the vendor takes total responsibility for all costs until the product is delivered. Financing is invariably part of this package.

These are the most common of many models that are referred to as IncoTerms. The precise selection of the right IncoTerm is a critical decision for the specific trade on extended supply chains, with many hidden risks and the requirement for extended financing. It will be influenced by a whole range of factors, including the buyers' balance sheet, the vendors' financial capacity, the risk in the trade, and the relative cost of financing and operating the chain under the different models.

International logistics

The importance of international logistics cannot be overemphasized. The flexibility of container freight to make efficient, shared capacity available to many users has been a huge driver of global trade. But with scale in global trade have come new issues that require new approaches.

Even with container freight, traditional methods of managing international logistics can involve as many as 10 to 12 hand-offs in movement and documents. If just one or two of these fail, with no effective way of putting it right, the unreliability of global logistics becomes the reality that is often a subject of comment and complaint.

With scale and growth, inbound management at the destination now requires central coordination. Correspondingly, management at the origin also needs to be controlled to ensure the right flow at the destination, and to enable the buyer to take advantage of the scale of its activities. The management of documentation, customs clearance and compliance can also benefit from a single centralized administrative and forwarding set-up.

Finally, the question of security against terrorism is now a major concern in international trade. There are onerous requirements for certification of cargoes, especially into the United States, under the CT-PAT scheme (Customs and Trade – Partnership against Terrorism). Failure to comply can lead to cargoes being refused carriage or blocked for lengthy inspection and clearance.

The result of these factors is that major buyers are tending to appoint a global 'lead logistics service provider' (LLP). These are often offshoots of the container shipping lines or international freight forwarders who have extended their services, and are especially appropriate where a buyer is maintaining many trading relationships. In companies where there are a smaller number of very large trading relationships, the tendency is to adopt an in-house forwarder.

In all circumstances, the operational need is for integrated management of many remote origins, providing information visibility, certification and the capability to respond to factors in the supply chain.

Flow management

Flow management and control is often executed, but seldom planned, by the LLP. Someone, generally the buyer, has to make the planning, forecasting and ordering decisions. The key feature of global sourcing is that chains become extended, with longer lead times and less agility to respond to changes in the actual marketplace. This needs improved forecast accuracy and more integrated supply chain planning. The consequences of poor planning are a combination of service failures and increased cost from emergency deliveries and associated expediting.

Global best practice is to introduce a sales and operations planning process, part of which is to identify the products whose demand characteristics make them particularly vulnerable during extended lead times. With these products there is generally the potential to implement supply chain strategy options such as postponement, capacity booking or switch sourcing:

- *Postponement* is where the product is made and shipped in a generic form so that it can go into a number of different final products. The generic parts are then localized in the final market to meet real customer orders (Hewlett-Packard and Dell are renowned for using this approach).
- *Capacity booking* is where a vendor is 'booked' to provide capacity on a fixed cycle; the exact mix of product to be made is decided at the last minute. This reduces lead times and ensures that the product made is the one that is most needed.
- *Switch sourcing* is where the initial quantity is made in the lowest-cost source and if demand forecasts are exceeded any patterns or moulds are flown to higher-cost sources where the product can be made and shipped with much shorter lead time.

Organization design

The organization of global sourcing is a major issue, with companies that have global sourcing creating organizations in their main origins, which they now feel are 'disconnected' from the core organization at the destination. The dilemma seems to be whether the offices in the origins are buying functions, logistics functions, technical functions – or some combination of these. Each of these relates to different functions in the parent organization – and ownership and control appears to become an issue. Furthermore, the relationship of the origin offices and capabilities with the main organization is inevitably challenged by distance, communications, systems issues and – most of all – goals and key performance indicators (KPIs).

It is clear that the next stage of maturity in global sourcing and supply will require a greater definition of the organizational lines and responsibilities than exists in many businesses today. This will most likely be based on team-based structures working on categories, technologies and product life-cycle projects as appropriate; it will be fully integrated with the core business at the right points and work actively to overcome the barriers of geography and culture.

Information technology

Extended chains require information technology that can manage the long-distance 'purchase to pay' cycle, and all the steps along the way. The key is

to make available a single version of the order and its status to every point along the chain. It must allow the appropriate people and organizations to make amendments, update status and provide a history of events. This is beyond enterprise resource planning (ERP) as the various players along the chain (such as vendors, service providers, and Customs & Excise) all have many relationships with other parties. They also have particular information needs that will not fit with the customers' ERP systems – and the attributes of the data are rather different from that in conventional ERP systems. The data architecture needs to be able to handle consignments, waybills, containers, tariffs, providers, VAT and duty as well as orders, stock-keeping units (SKUs), vendors and locations.

Data interchange between systems is essential to provide the visibility needed for flow control. Internet technology has provided the ideal platform on which many-to-many relationships can be maintained. It is low cost and provides widely based connectivity. However, every major shipper then needs a single reference point for its international trade, and this is unlikely to be the main ERP system. Some of the major shippers and forwarders have invested heavily in such event management systems and the associated connectivity. The early versions of these systems have added considerable value and the new generation is expected to provide another step change.

However, the systems world is full of tensions as providers compete to promote their systems and lock in their clients. It is unwise to expect that the international technology (IT) world of global trade is an open and transparent one. There are many barriers, including the operational excellence (or lack of it) with which the technology is fed.

Operational excellence

With as many as 12 operational hand-offs in the extended international supply chain, there is much that can go wrong – so operational excellence is critical to a smooth supply chain. Typical issues that must be done with excellence are:

- product labelling and bar coding – right code, right box, right quantity;
- invoicing – right product, right cost, right consignee;
- customs – right classifications;
- advanced shipping notices for right product;
- schedule and date required compliance;
- container packing accuracy;
- handling quality.

Surveys have shown very high levels of non-compliance and operational variability in global supply. Quite simply, the origin participants do not

understand the requirements for supply chain management by their customers and, therefore, often do not comply. The use of an LLP can be combined with more proactive vendor management to make sure that due dates and data quality are achieved – and to impose charges when standards are missed. Case material has demonstrated the downstream value of upstream excellence. The cost is tiny in relation to the value, and the barriers to excellence are more about culture and understanding than deliberate obstruction.

Risk management

Risk management should be continuous for buyers. There is much to be concerned about, for example:

- the basics of vendor viability;
- sudden and unadvised changes in priorities by vendors and service providers;
- quality and timelines issues;
- introduction of unauthorized materials or child labour;
- loss/leakage of technical know-how and patents;
- sudden and unexpected duty and quota constraints as a result of political and economic pressures;
- currency variations;
- sudden and unforecasted changes in customer demand.

A lot of these would apply to local supply as well, but their scale and impacts would generally be less. The combination of culture, language, distance and complexity conspires to make a formal risk management process with regular checks essential. This requirement will expand further as global sourcing moves into its next phase of growth.

Critical success factors

The measures to manage global chains and mitigate risk require six capabilities. These capabilities form the critical success factors:

- *Total acquisition cost management:* the ability to analyse and predict the total cost-to-serve from the source of supply to its final point of sale. The capability in this analysis is not simply to build up the logistics costs from freight, inventory holding, duty, applicable customs regimes and so on. It is more important to analyse and build into costing the risk of markdown and lost sales through a market–risk–cost profile. This analysis identifies products that should never be traded on a long lead time, or that should be the subject of a

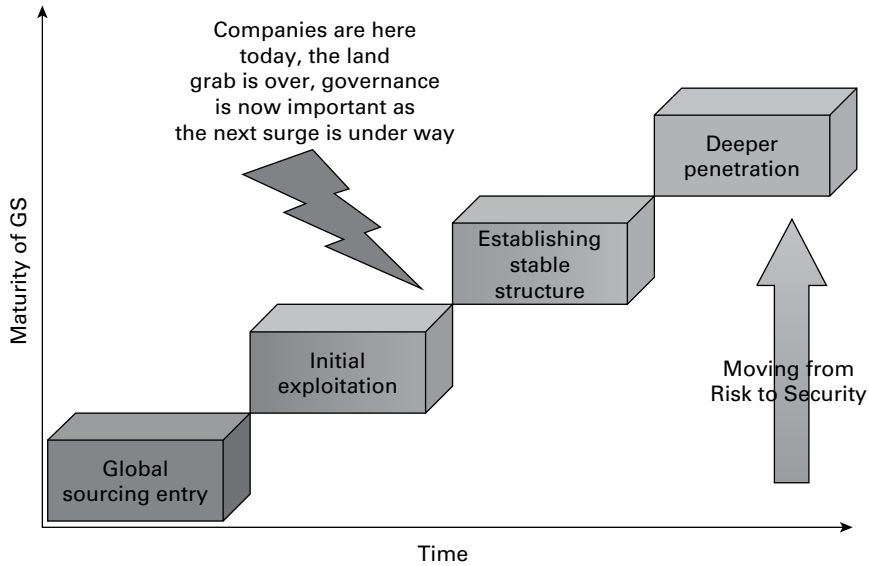
postponement strategy. It is also likely to show that there are some products where actions to reduce lead time and increase flexibility will justify a higher initial purchasing cost.

- *One-touch information flow:* to avoid double entry, duplication, mistakes and inconsistency as the same transaction moves through the many points of contact in the chain. Accuracy of information is a precondition of proactive management. This capability is systems enabled – and it is critical to have the widest view of the total chain on one information platform with the ability to recognize inconsistencies.
- *Total product identification and compliance:* to ensure fast accurate product and handling unit identification that feeds the 'one-touch information' requirement. The use of bar codes and radio frequency identification (RFID) to the correct standards is the enabling technology.
- *Real-time routing through dynamic visibility:* the capability to see through the chain, know what is coming, and test for events that have not happened as planned; to interpret the implications of failures in a proactive way and make decisions to minimize their impact. This is the 'traffic control' of global supply chain, and it must be managed transparently and with the cooperation of all the parties in the chain.
- *Vendor development:* the capability to understand and improve the long-term performance of vendors in terms of cycle times, timeliness, quality and accuracy. Based on historical performance of the chain, it is possible to identify improvement programmes to develop supplier reliability. The ultimate goal is to issue orders and schedules on shorter lead times, reflecting real demand or more accurate forecasts. Understanding the underlying performance of vendors and their category of products in the marketplace is the starting point for this.
- *Information platform to provide consistent and timely information:* the capability to put in place, operate and maintain a full supply chain visibility solution. All of the above capabilities are anchored by the operational skill to secure and maintain the information backbone, with the diverse data structures that are needed by each supply chain function.

Global sourcing – sustaining the trend

It is clear that first movers to global sourcing have gained a competitive advantage. Often these were traders who had an intimate knowledge of a supply market in terms of the vendors and their capabilities – as well as the logistics to get the product to the market. They committed to stock risk and

FIGURE 22.4 Maturity development of global sourcing



knew where to dispose of product if the original channel did not work. For this they earned a respectable margin for the risks they took.

In the context of the explosion of global sourcing and the further potential, the conclusion is that the 'land grab' is over. Figure 22.4 suggests that we are moving from initial exploitation to putting in place stable structures that can handle the next phase of growth. This will be essential as companies become more dependent on long-distance supply chains with all the risks and issues that we have identified.

The increased penetration of global sourcing will make its management a core skill and capability. This chapter has attempted to provide an initial view of the emerging landscape and issues.

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International road and rail freight transport activity

23

JACQUES LEONARDI, ALLAN WOODBURN, JULIAN ALLEN AND MICHAEL BROWNE

University of Westminster

Introduction

International road and rail freight transport activity is a strongly growing economic field where existing structures and rules concerning goods transport are mainly driven by developments at the national or European level, such as the introduction of new social or environmental legislation, or by global trends, for example adopting new technologies or developing new vehicles. Little attention has been paid to the specific problems and trends governing cross-border, international traffic by land.

This chapter first establishes the recent trends in international trade volumes, which are the main drivers for freight transport growth. It then aims to identify the ways in which this trade growth has impacted on road and rail freight transport activity at the international level, and considers the factors influencing the future direction of international land-based transport.

The 'international' focus is on cross-border road and rail transport, rather than on comparisons of trends and prospects across a range of different countries. In talking about international freight transport it is important to be aware of the diversity of trip types included, and the impact that the attributes of the trip can have on its organization and cost. The definition of international freight transport, as opposed to national, is that the origin and destination of the trip are located in different countries. For the European road statistics, international transport also includes all those trips with origin

and destination within a national state, but performed by vehicles registered in another country (EC, 2013).

As far as possible, experience from around the world is identified and discussed, although the main focus is on cross-border flows between countries in Europe, Asia and North America since these three regions are where the majority of land-based international transport takes place. While the assessment is evidence-led where possible, there are limitations relating to differing definitions and measurement units, both spatially and temporally, and inadequate data relating to cross-border freight transport activity.

The structure of the chapter is as follows. The next section deals with recent trends in international trade activity since this is a driving force in the development of international transport. This is followed by three sections presenting a more detailed discussion of road and rail, within which aspects such as infrastructure issues, policy and regulation, and operations are assessed. Future perspectives are discussed in the concluding section.

Recent international trade activity and transport: economic factors and trends

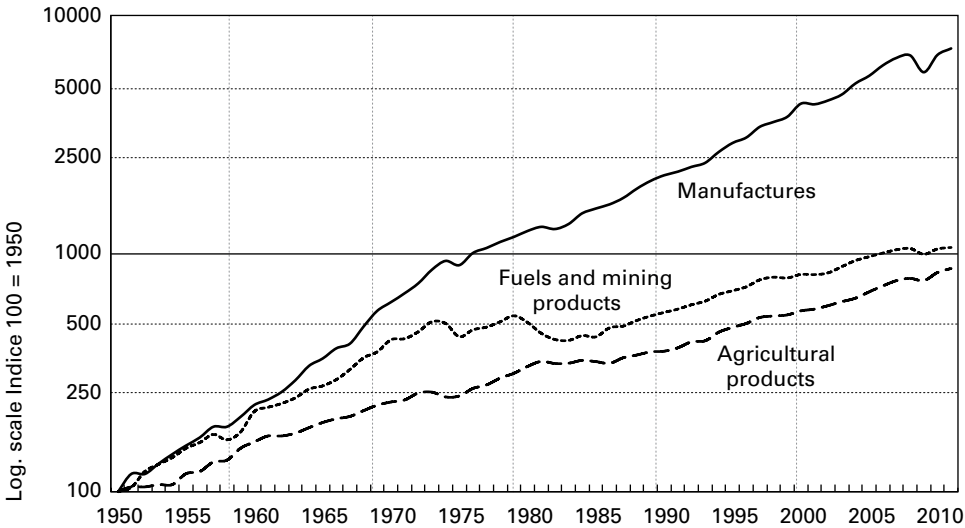
The World Trade Organization (WTO) provides the most comprehensive data on trade volumes and trends. This section highlights some of the main aspects of world trade that determines freight transport activity and mode choice. Figure 23.1 reveals the long-term growth in international trade volumes in all product categories, but most notably in manufactures.

In general, the value of trade has grown faster than the increase in gross domestic product (GDP) over the period since 1950; between 2000 and 2011 trade growth was about twice the GDP increase (WTO, 2012). In terms of the value of products the top six flows between world regions involve just three regions – Europe, Asia and North America – with trade within and between these regions accounting for three-quarters of world trade value. Internal European flows alone make up almost one-third of all international trade. Six of the top-10 countries involved in international trade are European, with two each from North America and Asia.

Table 23.1 shows the average annual growth in trade to and from each of the world regions for the 2005–11 period. Globally, the value of goods exported between regions increased by an average of 11 per cent per annum, and the values of imports grew by 19 per cent. This trend is very similar to the period 2000–06 with respectively 11 per cent and 17 per cent annual average world growth in values of goods exported and imported between regions.

North America and Europe recorded lower than average growth, and those regions less involved in international trade experienced higher than average growth rates, but remain in their total value of traded goods relatively insignificant in comparison to Europe, Asia and North America.

FIGURE 23.1 World merchandise trade volume by major product group, 1950–2011



SOURCE: WTO, 2012

TABLE 23.1 Annual growth (percentage change) in value of world merchandise trade by region, 2005–11

Exports	Regions	Imports
20	CIS	30
20	Middle East	18
16	South and Central America	25
16	Africa	19
13	Asia	23
11	World	19
9	North America	15
8	Europe	17

SOURCE: adapted from WTO, 2012

International road and rail transport movements were greatly influenced by the introduction of regional trading blocs. The two most significant trading blocks are the European Union (EU) and the North American Free Trade Agreement (NAFTA). The EU has expanded and has removed internal trade barriers while developing unified trade agreements for extra-EU trade. The world share of global merchandise trade by value accounted for by EU countries between 2005 and 2011 reduced from 43 per cent to 37 per cent. Of this, two-thirds was traded internally between EU countries (WTO, 2012). By contrast, trade between NAFTA countries (Canada, Mexico and the United States) comprised just over 40 per cent of the total merchandise trade of those countries.

In their own right, road and rail modes are mainly dealing with intra-regional flows, given that two of the three main inter-regional flows (Asia–North America and Europe–North America) are not possible by land-based routes, so maritime transport dominates. For the third (Asia to/from Europe), land transport is possible though currently very limited, with the majority of goods again being moved by sea. Considerable use is made of road and rail as feeder modes for these inter-regional maritime services, connecting with inland flow origins and destinations and, in some cases, acting as land bridges. As noted by Kopp (2006): 'there is widespread agreement that the reduction in long-distance transport and communications costs has been an important determinant of today's globalisation'.

Trade costs can be influenced by different factors, described by Deardorff (2005). Trade costs (especially transport costs) can be important and reduce the amount of international trade by making it unprofitable. This is a problem that is often faced by landlocked, developing countries, which as a result of their geographical disadvantage face 'specific challenges in their attempts to integrate into the global trading system, mainly because goods coming from or going to a landlocked country are subject to additional trade barriers such as lengthy border-crossing procedures' (UNCTAD, 2007).

The costs of transporting goods from one international location to another (the resource cost of transportation) is probably the most important cost of trade for most products. This cost varies with distance, weight and bulk density of the product, and its handling requirements in transit. Other costs of international trade include insurance (which is related to size and value), financing (which varies depending on the elapsed time between production and receipt of payment) and financial fees (resulting from trading across national borders and often using more than one currency) (Deardorff, 2005).

Time is another important factor in the cost of international trade (Deardorff, 2005). Time is required to transport the good from its origin to its destination, as well as to load and unload it, and to process the goods and the vehicle through customs clearance and border crossings. Given that it takes time to carry out international transport of goods, it is necessary for companies to hold stock. This stockholding incurs several costs in terms of warehousing costs, interest payments, and depreciation costs associated with physical deterioration or change in consumer tastes. In trying to minimize

these time-related costs, it is important to choose the fastest possible means of transport.

Hummels (2001) has noted that time delays and the variability of transit times are of greater concern to shippers than direct transport costs, as they affect companies' ability to meet agreed delivery schedules and therefore necessitate large stockholding. The author has used the costs of different modes of transport to infer the costs of time from the amount that firms are prepared to pay to reduce it. His results suggest that a one-day delay in shipping leads to an average cost equivalent to a 0.8 per cent tariff.

Trade costs are high. Broadly defined trade costs include all costs incurred in getting a good to a final user, other than the cost of producing the good itself. An estimate of the 'representative' tax equivalent of trade costs for industrialized countries is 170 per cent of the 'original' value. This estimate includes 74 per cent international trade costs (which includes 21 per cent transport costs and 44 per cent border-related trade barriers) and 55 per cent local distribution costs. The international transport costs comprise direct freight transport costs as well as a 9 per cent tax equivalent of the time value of goods (Anderson and van Wincoop, 2004).

Traditionally for international goods movement, air transport has been used for products that are time sensitive and valuable, and sea has been used for lower-value products that are less time sensitive. However, ever-longer international road and rail transport options are becoming viable as a result of infrastructure improvements and international agreements. These land-based modes are likely to increase their modal share of international goods movements as they offer services that are cheaper (but slower) than air-freight and faster (but more expensive) than sea.

However, the quantity of goods transported internationally by land modes is still very small in comparison with domestic road and rail freight movements.

Recent trends in international freight transport volumes by road and rail

European Union (EU)

For EU member states the proportion of total road tonne-kilometres (tkm) for international road haulage increased from 28 per cent in 2000 to 33 per cent in 2011. This represents an increase of 32 per cent in absolute terms over this period, compared to an increase of only 7 per cent in absolute terms for national haulage in the EU (see Table 23.2) (European Commission, 2013).

International road haulage represents widely varying proportions of total tonne-kms by road for hauliers from different EU member states, ranging from less than 10 per cent for islands such as Cyprus and Great Britain, to more than 80 per cent in the case of Lithuania, Luxembourg, Slovenia

TABLE 23.2 National and international road haulage in the EU-27, 2000–11

Year	2000	2005	2011	% of total in 2011	% change 2000–11
National haulage	1089	1229	1169	67	7.3
International haulage	430	565	566	33	3.2
Total haulage	1519	1794	1735	100	14.2

SOURCE: adapted from European Commission, 2013

and Slovakia (European Commission, 2013). Polish hauliers are by far the most active in international road freight transport (19 per cent of the EU total in 2009), followed by those from Germany, Spain and the Netherlands. Due to Germany's central position in Europe, 25 per cent of total international road transport in the EU in 2009 was performed on German roads (Eurostat, 2012).

There was a 4 per cent increase in total rail freight tonne-kms in the EU-27 between 2000 and 2011 (European Commission, 2013). The share of international rail freight is high in Europe compared to international road freight, accounting for 37 per cent of total rail freight tonne-kms in the EU-27 in 2010. The share of international rail freight transport in EU member states is closely linked to their geographical position within Europe. In 2005 international rail freight transport accounted for 93 per cent of total rail freight transport in Estonia, about 80 per cent in the Netherlands and Latvia, around 65 per cent in Belgium and in Greece, and above 50 per cent in Slovenia, Luxembourg and Hungary (Eurostat, 2007).

North America

The North American Transport Statistics Database (NATSD) contains detailed and consistent time series data relating to intra-North American trade by transport mode (NATSD, 2013). Table 23.3 summarizes the road and rail freight flows between the United States and Canada and Mexico in 2011. These two modes are dominant for exports from the United States, where 62–77 per cent of tonnage is by road or rail, whereas water transport and, in the case of Canada, pipeline, are important modes for imports to the United States.

In 2002, international road freight accounted for just 2 per cent of total road freight lifted to, from and within the United States. The corresponding figure for international rail was 6 per cent (measured in tonnes lifted – freight

TABLE 23.3 US trade with Canada and Mexico by road and rail, in million (mio) tonnes, for 2011

Exports from United States			Imports to United States	
Mode share (%)	Tonnes (mio)		Tonnes (mio)	Mode share (%)
		Canada		
51	58	Road	48	19
26	29	Rail	62	24
		Mexico		
40	50	Road	32	28
22	27	Rail	10	9

SOURCE: adapted from NATSD, 2013

delivered to a port will be counted as national rather than international for road and rail movements). In combination, road and rail represented 32 per cent of international tonnes lifted to and from the United States (imports and exports combined) (Office of Freight Management and Operations, 2007).

Europe to/from Asia

Travel distances between Europe and Asia are generally far shorter by land than they are by sea. This is especially true if the origin and/or destination are inland. Rail services from China to Europe via Central Asia can take approximately 20 days, whereas this takes approximately six weeks by sea. It has been estimated that travelling from Europe to Asia by road would take approximately two weeks (ECMT, 2006; Wolters, 2013). Transport times of 15 days are reported for trains carrying containers travelling on the 10,800 km (6,750 miles) route from Chongqing in south-west China to Duisburg in Germany (Nurshayeva, 2013).

At present, the major trans-Asia land routes are rail routes, including the Trans-Siberian, the TRACECA corridor, and the southern route via Turkey and Iran. Road routes can be preferable to rail routes in Asia in terms of the denser coverage they provide to larger towns. In addition, the physical terrain in the south of the continent is often better suited to road than rail.

China is currently developing a countrywide network of road and rail infrastructure with connections to Kazakhstan, Mongolia and Russia. The reopening of the border crossings between China and Kazakhstan for commercial trade has resulted in the recommencing of long-distance freight flows by road and rail between Asia and Europe. In 2013, Kazakhstan handled 16.5 million tonnes of rail cargo crossing the border from China.

However, despite several new route openings and global logistics providers developing innovative rail services between Asia and Europe, volumes of intercontinental freight flows by land remain small at present. These land routes are mostly used for the transport of commodities such as coal, agricultural products, iron and oil, and bulk goods. Only very limited quantities of containerized cargo is transported on these land routes. (The Chamber of Commerce of the United States, 2006)

International road freight transport: recent developments and challenges

Infrastructure developments

The basic infrastructure for international road transport is available, but 'missing links' constrain route choice. In addition, insufficient capacity on some corridors and the poor quality of infrastructure add to the cost and time of road transport. There is also a general lack of infrastructure facilities such as inland container depots, particularly at border crossings, to support the consolidation and distribution of goods and trans-shipment between road and rail services (UNESCAP, 2003).

The International E-road Network in Europe (E-road = a European road-numbering system) provides a geographical picture of the road routes followed by the traffic arteries defined in the European Agreement on Main International Traffic Arteries (AGR) signed at Geneva in November 1975 (UNECE, 2007). The AGR was extended in 2000 to include the E-road network for the then new UNECE member countries in the Caucasus and Central Asia. This resulted in the international road network in these countries, which extend right up to the borders with China, also being ascribed 'E' numbers. As well as establishing a coherent road network, the AGR sets in place minimum technical requirements to which E-roads should be constructed.

Asia also has a dense road network that links major cities, especially in the southern part of the continent (including India, Pakistan and the South-East Asian peninsula). The planned Asian Highway Network aims to provide road transport infrastructure linkages to and through the region. It is already a network of 141,000 kilometres of standardized roadways joining 32 Asian countries with linkages to Europe.

One of the leading European infrastructure policies is the Trans-European Transport Network 'TEN-T', established in 1993, which involves transport

infrastructure projects to help put in place high-quality trans-European transport networks. It is intended to overcome problems associated with missing transport links and existing bottlenecks. In 2007, discussions commenced on modifications to the major TEN-T axes to neighbouring countries. This involves TEN-T being expanded to include the EU's neighbours, towards the Commonwealth of Independent States (CIS) and Central Asian countries along key transport corridors (ECMT, 2006).

Whilst the construction and improvement of road infrastructure is important in the development of international road freight, there are additional factors necessary in order to create a successful and efficient road network. This includes standardization and harmonization of many other factors besides the quality of the road construction, such as traffic regulations, vehicle regulations and traffic technologies. Specific factors that need to be taken into account in standardizing and harmonizing the road network include:

- the systems adopted for traffic management (including the policies and technology used);
- border-crossing arrangements and dwell-time caused by customs policies;
- road signage and information including traffic conditions and roadworks;
- truck-stop facilities (including eating and resting locations and services for drivers);
- emergency operations – calling a single number, minimum guarantee response time, etc;
- repair, maintenance and emergency vehicle services (in case of vehicle breakdowns);
- disaster management systems (fire brigades, etc).

Several conventions concerning international road transport can help in the standardization and harmonization of international road networks. These include the Convention on Road Traffic that helps to harmonize road traffic rules; the Convention on Road Signs and Signals, which has produced a large set of common signs and signals to use; and the TIR Convention that allows trucks loaded with goods to cross several borders without customs controls and without payment of duties or taxes.

Policy/regulation

Agreements between countries in international road freight transport

International road freight operations by definition involve goods vehicles moving between two or more countries as part of a delivery or collection.

Some international trips can involve the vehicle or goods passing through (ie transiting) many different countries in order to get from the point of collection to the point of delivery. Different countries tend to have developed varying national rules governing goods vehicles, goods movement and driver regulations. In order to overcome the main differences, it was necessary to develop conventions that govern international road freight operations, the so-called 'harmonization'. The international community has, over the years, adopted several international legal instruments that contain provisions intended to assist international road freight operations, including gaining access to seaports via transit traffic through neighbouring countries.

The four main legal instruments addressing transit traffic and customs transit are (UNCTAD, 2007):

- Convention and Statute on Freedom of Transit, 1921 (entry into force 31 October 1922; 50 parties);
- General Agreement on Tariffs and Trade (GATT), 1947, now part of GATT 1994 (provisional entry into force 1 January 1948; 150 members of the World Trade Organization);
- Convention on Transit Trade of Land-Locked States, 1965 (entry into force 9 June 1967; 38 states parties);
- United Nations Convention on the Law of the Sea, 1982 (entry into force 16 November 1994; 155 states parties).

In addition, the General Agreement on Trade in Services (GATS) extends the GATT's principles of freer and fairer trade in goods to services as well, which includes freight companies looking to do business abroad (Latrille, 2007).

International legal instruments are complementary to regional, corridor and bilateral transport and transit agreements and are often referred to in such agreements on transport as well as in those on infrastructure, storage and general trade terms (UNCTAD, 2007). Several regional cooperation organizations have established transit and/or transport agreements. Many countries have traditionally entered into bilateral agreements on particular aspects of cooperation. In road transport, such agreements have often been needed to allow a transport operator in one country to carry out bilateral transport operations, third-country transport operations or transit transport operations through another country.

A transit corridor agreement is an agreement concerning a designated route between two or more countries along which the corridor countries have agreed to apply specified procedures. These agreements tend to be very focused on the corridor and transit issues, such as infrastructure, customs, border crossings and vehicles. An example of this type of arrangement is the Walvis Bay Corridor Group that was established in 2000. This comprises public and private stakeholders along four transport corridors in southern Africa, all connecting with the port of Walvis Bay in Namibia.

Liberalization of international road freight transport

The European Union provides an example of liberalization of international road freight transport movements between member states. The Treaty of Rome provided for the establishment of a common transport policy, based on principles of free market economics, which was intended to remove obstacles to free competition between transport operators from different countries. Multilateral Community authorizations were introduced in 1969, which gradually replaced bilateral agreements between countries. The establishment of the Single European Market was the catalyst for full liberalization in international road freight, with the removal of these multilateral authorizations and the introduction of European Community licences. Full liberalization of international road freight was completed by 1998. Operators based in a member state only need to comply with two requirements to be able to carry goods between any EU countries: 1) to be recognized as a professional road transport operator; 2) holding a European Community licence. To be recognized as a professional operator it is necessary to meet three qualitative criteria: good repute, financial standing and professional competence. Any operator who meets these requirements, and who meets any other national market access regulations, obtains a Community licence. This then allows them to carry out international transport operations in the entire geographical area of the EU (ECMT, 2005).

The European Commission has put in place harmonized social regulations to ensure that full liberalization does not lead to competition distortions brought about by national differences in factors such as labour rates. These regulations cover issues such as working hours, driving time and rest periods for drivers, periodic technical inspection of motor vehicles and their trailers.

Research has indicated that deregulation had a large positive effect on the growth of international trucking and that the EU liberalization was not leading to a shift in the demand for international road freight towards low-wage countries (Lafontaine and Malaguzzi, 2009). However, there is an ongoing controversial debate about the policy design, the modalities and rules of road freight liberalization, since between many countries the cross-border traffic is still facing elementary operative problems due to diverse dysfunctions at the infrastructure, technology, security and policy compliance levels (Snitbhan *et al*, 2004).

Operations

Coping with growth in international road freight transport

Growth in world trade together with road and rail infrastructure improvements have made the possibility of land-based international freight solutions easier over time. One way in which logistics service providers can enter into foreign markets is through the establishment of operating centres in other countries

and gradually increasing their networks. Other firms prefer mergers, takeovers or strategic trading alliances with operators based in other European countries as a means of becoming more international.

The growing internationalization of business has forced companies providing logistics services to consider their own strategies to meet these new needs. Service providers need to determine the extent to which they can meet all the service requirements of a European business or whether they can realistically only meet part of those needs. There is a potential mismatch between the logistics demands of European companies and the ability of any service provider to meet these demands. This often results in disappointment when a manufacturer decides to rationalize their logistics network and seeks to reduce the number of service providers. In many cases the manufacturer finds that there are few logistics service providers that wish to take on the commitment of handling all their European activities.

Providers of logistics services need to be concerned with two dimensions to their activities in the first instance: geographical scope and range of services. A consideration of these two dimensions highlights how challenging it really is for the logistics service company to be able to provide 'one-stop shopping' for a customer. Some companies already provide what can be described as European services, in the sense that they are the long-distance links in a network used by manufacturing companies. This provision of services is evident in the case of airlines, shipping lines, freight forwarders and integrators. It is clearly at the level of local and national distribution that internationalization of service provision has been slowest to develop.

A broad range of logistics activities can be found. Freight transport and warehousing services have been widely available for many decades, together with documentation services to support the flow of products. In recent years, logistics service providers have begun to offer a wider range of services, such as final assembly of products, inventory management, product and package labelling, product tracking and tracing along the supply chain, order planning and processing, and reverse logistics systems (which tackle the collection and recovery of end-of-life products and used packaging in the supply chain).

The very different nature of global markets means that logistics providers wishing to provide for a growing demand for international services adapt their approaches for different markets. International transport companies engaged in cross-border work already understand that strategies may need to be tailored to the particular country of operation. Clearly the most ambitious strategy is to provide a truly integrated, global service, but this in turns demands a high level of command of logistics and freight distribution (Rodrigue, 2012). Several major logistics service providers are working towards achieving this, but this is remaining a challenging goal (Carbone and Stone, 2005). The foundations for the multi-domestic strategy appear to lie in the successful duplication of domestic services in other countries. The original services are, of course, adapted as required.

Tackling crime against road freight

International road freight drivers are prone to criminal attacks on their vehicles and the goods they carry as well as attacks on themselves. The fact that such operations are taking place in foreign countries, and sometimes in isolated locations, makes drivers more prone to such attacks than in domestic operations. The main findings of a study investigating assaults on international road freight drivers in 2005–06 included that (IRU, 2008; Crass, 2007):

- 17 per cent of all drivers interviewed have suffered an attack during the five-year period;
- 30 per cent of attacked drivers have been attacked more than once;
- 21 per cent of drivers were physically assaulted;
- 60 per cent of the attacks targeted the vehicle and its load, whilst the remaining 40 per cent were related to the theft of the driver's personal belongings.

Preventative measures to reduce crime and theft problems are challenging since only few success stories have been reported on this security issue within the road transport network.

Factors influencing recent trends in international rail freight transport

Infrastructure

The most critical physical requirement to allow cross-border rail freight traffic is an active network connection. In some countries, rail networks are domestic in nature, and cross-border links have either never been constructed or have ceased operation. For example, in Latin America, links that previously existed between Colombia and Venezuela, and between Guatemala and El Salvador, are no longer present (ECLAC, 2003). In Europe, the various national railway networks are relatively well interconnected, although the quality of the international links can often be substandard compared to domestic corridors. Where a physical cross-border connection does exist, one of the biggest infrastructure constraints for international rail flows is the historical decision made by different countries to adopt a different track gauge (ie the distance between the two rails) when constructing their rail system. Two main gauges exist, metric (1,000 millimetres) and standard (1,435 millimetres), but there are others in certain parts of the world. Where different gauges are found, time and cost are added to the rail cross-border transfer since the goods themselves need to be transferred between rail wagons, or the wagons need to have their axles changed for onward transport on the other gauge.

Examples where gauge differences exist at international borders include:

- Southern Brazil is metric gauge whereas Uruguay and Argentina have standard gauge networks; only the link to Bolivia is compatible with Brazil (ECLAC, 2003).
- France has standard gauge track, but traditional routes in Spain and Portugal have different gauges, 1,672 millimetre in Spain and 1,664 millimetre in Portugal; new high-speed lines on the Iberian peninsula are being constructed to the standard gauge (European Commission, 2005), but freight generally will have to continue using the traditional routes where the difference in gauge will persist for the foreseeable future.
- In Asia, at least five different track gauges exist, ranging from metric in much of South-East Asia up to 1,676 millimetre in the Indian subcontinent; China has generally adopted standard gauge track, while Russia has a broader 1,520 millimetre gauge.

Another infrastructure-related issue is that of differing voltages on electrified lines, which has traditionally required a change of locomotive at border crossings. This tends not to be an obstacle as significant as track gauge differences, though, since a locomotive change can be completed in a shorter period of time than regauging the wagons on an entire train. In many cases, diesel locomotives are used for cross-border services (even where systems are electrified) and multi-voltage electric locomotives have been introduced to operate internationally.

A number of initiatives have been developed to try to better integrate domestic rail networks to provide higher quality long-distance corridors, notably in Europe (RailNetEurope, 2009). Elsewhere, political alliances and/or disputes have had an influence on the continued use of existing cross-border infrastructure or the provision of new routes. For example, the break-up of the Soviet Union and subsequent unrest in much of the Caucasus region led to many of the rail routes linking Russia, Armenia, Georgia and Azerbaijan being abandoned and international rail freight volumes declining (Jackson, 2008). New links within this region are now proposed, together with external routes to Turkey and Iran, which may eventually form part of strategic long-distance international corridors planned for the Asian continent. New routes are also planned within South-East Asia, linking China to Thailand, Singapore and the Indian subcontinent (Briginshaw, 2007). Should the range of schemes currently proposed or under construction come to fruition, rail network connectivity across Asia will be significantly enhanced, opening up further an array of new international journey opportunities (UNESCAP, 2009).

Policy/regulation

In many parts of the world, railways are viewed as the responsibility of the public sector. Over time, though, many countries have initiated a process of

TABLE 23.4 Institutional rail policy differences between North America and Europe

	North America	Europe
Rail policy orientation	Competition	Regulation
Rail competition	Parallel rail	On-rail
Infrastructure control	Operator	Regulator
Infrastructure funding	Private	Public

SOURCE: Posner, 2008

liberalization. Most noticeably, this occurred first in North America, but has also now taken place elsewhere, including Australia, Asia, South America and Europe. There has been no standard method of liberalization, but competition between rail freight companies is now prevalent in many countries. As Table 23.4 shows, there are considerable differences in the processes implemented in North America and Europe. As a consequence, there remains a much greater role for the public sector in European rail provision. This may also result from the fragmented nature of the European market, rather than the more integrated North American situation where there are only three countries in a large land mass. Public policy remains an important issue regardless of the nature of the market.

The European Union sees the growth of international rail freight activity as a political objective – for economic, environmental and social reasons. Over the last decade, it has agreed a series of railway packages aimed at liberalizing the rail freight market, particularly concerning cross-border traffic.

Another issue in cross-border rail traffic is the differing working regulations of state railway companies, which can lead to the need to change drivers at the border crossing and hence delays. This negatively affects transit times, especially when several borders are crossed in a single journey, such as journeys from Germany to Italy that transit Austria or Switzerland. Since 2010, some European rail operators have created services that run without locomotive or driver changes at border crossings, reducing the total travel time substantially.

Operations

There are various ways in which rail freight operations are being influenced by the internationalization of transport activity. Three of these show the range of effects:

- geographical expansion of operators;
- new international services provided by cooperation between operators;
- land-bridge corridors.

With the liberalization of access to provide services over rail networks in different parts of the world, formerly domestic rail freight operators have started to become more international in nature. An early example in the 1990s was the expansion of Wisconsin Central – a US railroad company that is now part of Canadian National – into New Zealand, Canada, the United Kingdom and Australia, often through the purchase of rail freight operations being privatized by governments. America Latina Logistica (ALL), a private Brazilian operator, has expanded its operations across the border into northern Argentina (Kolodziejski, 2005). Recently, the German operator DB Schenker realized a significant growth in other EU countries.

In addition to rail operators expanding their own territorial coverage, there have been developments in international services provided through cooperation between infrastructure and/or service operators, where two or more rail freight companies are responsible for the transit from origin to destination. For example, RZD, the Russian public rail company, has been developing partnerships with a number of neighbouring countries, not least with the setting-up of the Eurasia Rail Logistics joint venture, which also includes Germany, Poland and Belarus (Lukov, 2008). Partnerships and service quality initiatives have been developed in Europe, building on an international Freight Quality Charter that was implemented in 2003 (CER, 2005). The charter focuses mainly on train punctuality and the implementation of quality contracts between railways and customers.

The third example can develop either as a result of one operator's expansion or the cooperation between a number of operators, demonstrating rail's abilities in providing a land-based link in international supply chains dominated by shipping, primarily for containers. The US land bridge – where containers shipped across the Pacific from Asia are moved across to the East Coast – is well-established, with international containers accounting for the majority of the 15 million (approximately) intermodal units moved by rail from the west to east of the United States (Briginshaw, 2007). The growth in traffic between Asia and North America has led to rapid land-bridge growth for North American operators, such as Union Pacific, BNSF Railway, Canadian Pacific and Canadian National (Lustig, 2006). In South-East Asia, there has been growth on the land-bridge route between Malaysia and Thailand, in competition with feeder ships. A similar land-bridge proposal is now being developed in Saudi Arabia, linking the Red Sea and the Gulf, which will allow traffic from the key Jeddah Islamic Port on the Red Sea to move more directly to the Gulf region (Jackson, 2005).

More innovatively, plans are emerging for new long-distance services taking advantage of the network improvements and regulatory freedoms outlined earlier. For example, container train services from China to Europe were tested in 2008, marking the start of a concerted effort by rail companies to

gain a share of the market for freight transport between the Far East and the European Union (Trans-Eurasia-Logistics, 2009). Regular rail container services have started operation on this route by 2013.

Concluding remarks

With developments to remove bottlenecks, combined with operational improvements, there is scope for considerable increases in the efficiency of international road and rail freight in many regions. Many past forecasts of improvements in transport technology and operations have been overtaken by events and, in some cases, rather than transport becoming easier and faster, it has become more complex and occasionally slower. Within the next 15 years, there seems to be limited opportunity to increase the speed of either shipping or airfreight. There is a potential in rail freight, in particular, for shorter transit times and possibly reduced costs. Road freight times may not have the scope to be reduced to the same extent as rail freight, but there are still many opportunities to improve road operations and thereby improve both the economic and environmental performance of road freight transport over long distances.

As noted in the introduction to this chapter, international road and rail freight transport is extremely diverse. Thus the developments that have implications for short-distance road freight are very different from those that affect international long-distance rail. It is evident from this review that there remain many opportunities to improve the efficiency and to reduce the environmental impact of both international road and rail freight transport. Many of these developments require government intervention in the form of changes in policy and regulation or improvements to infrastructure. This is a complex area when considered within one country – when it concerns international developments it is, of course, even more complicated.

However, it is important when considering the developments that will happen in the next 15 years to note the growing role played in international transport of the major logistics companies. The consolidation and integration tendencies that are ongoing means that single companies are now able to provide truly integrated services in a way that was not possible a few years ago. At the same time, it is important for policy makers and regulators to take note of these developments, in order to maximize the opportunities for more efficient international road and rail freight transport, and in order to ensure that developments meet the growing environmental constraints.

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24 Developments in Western European strategies

MICHAEL BROWNE, JULIAN ALLEN AND ALLAN WOODBURN

University of Westminster

Introduction

Several political initiatives have taken place since 1990 that have had major implications for logistics services throughout Western Europe:

- Border controls and customs arrangements within the EU were lifted following the creation of the Single European Market (SEM) under the Treaty of Maastricht in January 1993.
- On 1 January 1999, the euro was launched as an electronic currency and became legal tender on 1 January 2002. It has been implemented in 17 of the 28 EU member states and these states represent the 'eurozone' (Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain). The European Central Bank is responsible for the monetary policy within the eurozone.
- New member states have joined the European Union (EU). Austria, Finland and Sweden joined on 1 January 1995, increasing the number of Member States to 15. Ten more countries joined on 1 May 2004 taking the total to 25. These countries were: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. These 10 members increased the surface area of the EU by one-quarter and its population by one-fifth. Bulgaria

and Romania joined in 2007, taking the total to 27 countries. Croatia joined in 2013, taking current membership to 28 countries, and a combined population of 500 million people.

Central to the logic of creating the European Union free from unnecessary trading restrictions has been the desire to encourage the development of European companies able to compete on a global basis. It is often claimed that fragmented national economies within Europe have resulted in too many small companies in certain key industrial sectors. Dismantling barriers to trade and opening up new market opportunities allows companies to grow and become more competitive. Inevitably this is also likely to result in the relocation of certain economic activities as some companies become larger and others fail. The collapse of communism in the former Soviet Union and the countries of Central and Eastern Europe, and the subsequent reorientation of these countries towards the free market, has also opened up new avenues of trade that extend beyond the borders of the EU.

This chapter addresses the ways in which company business strategies and manufacturing and retailing operations have been developing within Europe during this time of political, economic and geographical change, and the effect that this is having on the demand for logistics services. The extent to which logistics providers have been meeting these needs is also discussed. These developments, as well as the similarities and differences in suitable logistics strategies for different European countries, are illustrated by reference to the European grocery industry. The impacts of these emerging logistics services on freight transport patterns and activity levels within Europe are discussed, together with the policy initiatives and responses being generated at the national and European levels. Finally, future European logistics strategies are considered, and the question of whether logistics service providers are able to match their customers' requirements is examined.

Changes in the demand for logistics services

An enlarged and more integrated Europe has influenced the demand for logistics services. Indeed, markets for goods and services in Europe have become much less fragmented over the past 10 years and, at the same time, for many companies there has been a discernible shift away from a mainly national approach to a more unified European strategy. In general, companies increasingly regard the EU as their home market rather than having their trading horizons restricted to a single country. This in turn has important implications for logistics services. For example, increased trade between member states creates new demands for logistics services such as transport and warehousing. However, the transition to a European pattern of operation has not been as smooth as many commentators expected and in some cases the benefits have been slow to emerge.

Market developments and retailer/manufacturer strategies

Increasing market integration enables large companies to pursue a number of strategies designed to take advantage of their size. The scope to concentrate production at a small number of carefully selected locations is one that has a special importance within Europe. Until recently the strategy followed by many companies has been based on production for separate national markets. The requirement to produce product variants for different markets, the complexity of border-crossing formalities and the added costs of international trade transactions led, typically, to a rather fragmented approach to production. Although for many companies the changes in strategy have been part of a broader response to growing global opportunities and increased international competition, the abolition of border controls and the simplification of trading procedures has undoubtedly encouraged plant and warehouse rationalization.

Since the business ambitions of many companies are not confined to the existing EU, the scope for inventory rationalization has grown as Europe has become ever more commercially integrated. Dismantling trade barriers allowed firms to reduce the number of warehouses within their logistics systems, which in turn has had important longer-term implications for transport patterns. Instead of looking at Europe on a country by county basis, firms have been able to consider more natural market demand patterns and adapt their warehousing accordingly. Significantly, these developments are not confined to the EU – many firms have already adopted a very wide-definition Europe in developing their logistics strategies. For example, Bosch-Siemens (manufacturers of domestic appliances with its head office in Munich) took its first steps in cross-market distribution more than 20 years ago by rationalizing its Scandinavian warehousing operations and consolidating stocks for Finland, Norway and Sweden in one regional centre located between Stockholm and Malmö, distributing to other Scandinavian countries from that single location (O'Laughlin, Cooper & Cabocel, 1993). There are many examples of this type of initiative as companies have changed their traditional views about the best way to serve markets. In the 1990s the sports equipment firm Nike adopted a completely centralized strategy for storage within its European supply chain, despite increasing diversity of sourcing and continued demands for fast response to customer requirements (Kemp, 1997). Geest, the prepared-food company (which was subsequently taken over by Bakkavor in 2005), announced plans to consolidate production in 2001, with dressed salads being produced at one rather than two sites (European Logistics Management, 2001). The trend to centralization has taken a firm hold on management thinking and many companies are still seeking further opportunities to reduce the number of stockholding points. Whether these initiatives can be justified against a background of pressure to develop more sustainable logistics strategies remains to be seen.

Many large companies now take a supply chain view when considering new ways to: 1) integrate their own operations; and 2) then seek to extend this integration to their supply chain partners. Growing integration has profound implications for the role of external service providers, since in many cases the physical flow of materials is one of the first areas of change when a supply chain view becomes more clearly developed. When companies start the process of considering the supply chain as a whole then it often becomes evident that there is scope to rationalize the number of service providers – in much the same way as it may become possible to reduce the number of stockholding points.

In their drive to maintain and increase profit levels retailers and manufacturers are trying to achieve more with less – this is epitomized for many companies by the application of the just-in-time (JIT) philosophy. A JIT approach emphasizes the reliance on logistics partners. But service providers need to be able to match the increasingly demanding expectations of their customers not just in terms of speed but in terms of reliability, service monitoring and consignment tracking. Only by doing this will the benefits of a JIT approach really become apparent.

The survey of logistics costs carried out by the European Logistics Association (ELA) and AT Kearney Logistics every five years has indicated that costs as a proportion of sales fell by approximately 50 per cent for Western European companies between 1987 and 2003. This was achieved at the same time that customer service levels were rising (ELA and AT Kearney, 2004). However, the annual Establish Davis database of logistics costs (a web survey that allows firms to benchmark their logistics costs and services) indicates that logistics costs as a proportion of sales have not fallen further since 2003. Instead they rose from approximately 8 per cent in 2003 to 10 per cent in 2007, before falling back to 8 per cent in 2013 (Establish Davis, 2013). The importance of the various categories of logistics costs in the 2013 Establish Davis database is shown in Table 24.1. This shows that transportation accounts for the greatest proportion of logistics costs, followed by inventory carrying and warehousing.

Market concentration has been occurring in the vast majority of European retail and manufacturing markets in recent years. In grocery retailing, for example, the market share of the top five national retailers in many European countries including Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Norway, Sweden, Switzerland and the UK is in excess of 60 per cent (Mintel, 2008). However, it is important to recognize that the degree of market concentration varies significantly between industries in any one country, and that the general degree of market concentration varies from one country to another.

Limitations on European integration

Despite growing similarities, there are still many differences between European countries; retailing is a case in point. The retail format used in

TABLE 24.1 Importance of the various categories of logistics costs in 2013

Categories of logistics cost	Proportion of total logistics costs
Transportation	44%
Inventory carrying	25%
Warehousing	24%
Customer service	4%
Administration	3%
Total logistics costs	100%

SOURCE: calculated from Establish Davis (2013)

different European markets varies significantly between countries, with very large stores playing the biggest role in some countries (eg hypermarkets selling food and non-food in France and out-of-town supermarkets in the UK) and small food stores and traditional grocers far more common in others (such as Spain and Italy). As a result of these different retail formats, the total number of stores operated by retailers vary between European countries; for example in 2010 there were approximately 96,000 grocery stores in Italy compared with only 68,000 in the UK (Verdict Research, 2011). In addition, patterns of consumption also vary widely between European countries for a range of cultural, demographic and economic reasons. If one argues that we are now operating within an integrated European marketplace, this ignores the special distinguishing features of Europe and, in particular: market complexity, market size, maturity of the market, density of population spread, number of separate nation states, and many languages. It must be acknowledged that in many cases these factors have acted as a brake on the introduction of European-wide supply chains and logistics systems to serve them.

However, many companies will continue to strengthen their European initiatives, resulting in further examples of corporations making dramatic changes to their European logistics networks – this in turn places new demands on logistics managers and logistics services. We need to be aware that there are often conflicting tensions within large organizations and, in some instances, initiatives to implement changes at a European scale will be overtaken by the desire to have in place a framework allowing global coordination of supply chains. Changing priorities can make it difficult to determine the most appropriate way to develop logistics management structures and this in turn has implications for the relationship with service providers.

Eastern Europe and distribution centre locations

Alongside the move towards centralization noted earlier has been a move eastwards within European manufacturing and distribution. As Lenders (2005) notes, an increasing number of manufacturers have relocated from Western Europe towards Eastern Europe. Since most raw material shipments are arriving at ports in Western Europe the logistics flows that follow from this change in strategy are potentially important. In turn, there is a strong expectation that European distribution functions will also move eastwards from their present concentration in the Netherlands. This has led some to predict a new location for distribution 'hot spots' within Central and Eastern Europe. While it would be wrong to exaggerate the speed of this trend, it is nevertheless clear that this type of development reinforces the need for a more Europe-wide approach to the selection of European logistics services. In addition, from a policy perspective it poses some major challenges for existing European transport infrastructure (see below).

Market structure of logistics service providers

Recent changes in the demand for logistics services in Europe poses a problem for logistics service providers as they are working with a range of companies all moving at different speeds towards what may well be rather varied objectives. Out of this challenge comes the advantage for the bigger organization that can match these requirements across and within different markets.

Company size and response to international opportunities

As we have noted, European deregulation, the abolition of internal frontiers and harmonization of fiscal and technical standards and the introduction of the euro have all helped to boost trade within an enlarged EU and made it simpler for all logistics service providers to participate in that activity. Many factors influence the response of logistics companies to these opportunities. Among the most important are:

- company culture and background (for example, the size of the company and their ability to absorb the financial and management consequences of rapid change);
- customer profile (industry, speed of reaction to European opportunities);
- customer culture (for example, the customers of the logistics service provider could either purchase services at the European level or purely on a national basis).

Company size is likely to have a special significance in determining the response to the opportunities created by an enlarged EU. For example, in the case of larger logistics providers there is the opportunity to continue to internationalize their activities in order to provide full national distribution services in more than one country. For smaller companies, the impact of an enlarged EU are far more limited and it is clear that, for example, the road freight industry has a preponderance of small companies. Many small companies operate at a local level serving local industry and expect to go on working in this way. Although these smaller companies predominate in terms of numbers within the third-party sector it is the larger companies that dominate the market in terms of the total vehicle fleet and, therefore, capacity. In the United Kingdom in 2013, for example, 7 per cent of goods vehicle operators control 56 per cent of the vehicles – and this is a trend that can be identified, albeit in some cases to a lesser degree, right across the EU (VOSA, 2013).

Internationalization among larger carriers

One way in which logistics service providers can enter into foreign markets is through the establishment of operating centres in other countries and gradually increasing their networks. However, rather than follow this evolutionary and somewhat slow route to growth in foreign markets, some firms prefer the prospect of mergers, takeovers or strategic trading alliances with operators based in other European countries as a means of becoming more international.

The growing internationalization of business has forced companies providing logistics services to consider their own strategies to meet these new needs. Service providers need to determine the extent to which they can meet all the service requirements of a European business or whether they can realistically only meet part of those needs. In many cases there remains at present a potential mismatch between the logistics demands of European companies and the ability of any single service provider to meet these demands. This often results in disappointment when a manufacturer decides to rationalize their logistics network and seeks to reduce the number of service providers they deal with at a European level. In many cases the manufacturer finds that there are few logistics service providers that wish to take on the commitment of handling all their European activities.

Providers of logistics services need to be concerned with two dimensions to their activities in the first instance: geographical scope and range of services. A consideration of these two dimensions highlights how challenging it really is for the logistics service company to be able to provide 'one-stop shopping' for a European company. Some companies already provide what can be described as European services in the sense that they are the long-distance links in a network used by manufacturing companies. This provision of services is evident in the case of airlines, shipping lines, freight forwarders and integrators. It is clearly at the level of local and national distribution that Europeanization of service provision has been slowest to develop.

A broad range of logistics activities can be provided by logistics service providers. Freight transport and warehousing services have been widely available for many decades, together with documentation services to support the flow of these products (eg delivery and customs documentation). However, in recent years, logistics service providers have begun to offer an ever-expanding range of services such as final assembly of products, inventory management, product and package labelling, product tracking and tracing along the supply chain, order planning and processing, and reverse logistics systems (which tackle the collection and recovery of end-of-life products and used packaging in the supply chain).

Despite a period of uncertainty about the benefits of scale for logistics service providers, there have been some important developments in the last few years. Larger logistics service providers have grown mainly through merger and acquisition and appear to be committed to developing more European and global capabilities. The box below provides details of the ways in which three major logistics service providers have expanded their services and geographical coverage in the last 10 years through organic growth, mergers and acquisitions, and alliances.

Deutsche Post DHL

Deutsche Post DHL is the former state department responsible for German postal services. In 1995 it became a private company owned by government, and was partly privatized in 2000 with 31 per cent of stock made available. Since becoming a private company, Deutsche Post DHL has pursued a strategy of extending its geographical coverage in the mail and express sectors as well as expanding the range of logistics services offered.

The aim of the company has been to become an international player capable of offering an extensive range of mail, express and logistics services, and thereby providing one-stop shopping for national and international customers. It has integrated these newly acquired businesses. This has been a significant task and involved the integration of the companies' internal structures, products, brands, sales and IT systems.

Most of this growth has been achieved through acquisitions. Over a five-year period it spent billions of dollars purchasing other businesses (Harnischfeger, 2002). Companies that were either wholly or partly acquired include many express companies with national and global networks, such as DHL (global), Securicor Distribution (UK), and Ducros (global), and forwarders and distribution companies such as Danzas (Europe's largest ground forwarder), ASG (Nordic countries), AEI (global

forwarding) and Nedlloyd ETD (European coverage). The major acquisition was that of Exel plc, which Deutsche Post DHL acquired in 2005 for €5.5 billion, making it the largest logistics provider of airfreight, ocean freight and contract logistics in the world.

The combination of the two companies has created a group with approximately 475,000 employees, operating in 220 countries, with approximately €55 billion in annual sales in 2012 (Deutsche Post DHL, 2013). The operational merger of DHL Logistics and Exel took some time to complete. The enlarged logistics unit operates under the DHL brand and uses DHL's red and yellow colours. Since the merger, DHL operates with two logistics sub-brands: DHL Exel Supply Chain and DHL Global Forwarding (Deutsche Post, 2005).

Exel had itself been involved in a major merger with Ocean Group in May 2000, creating the largest logistics service provider in the UK and one of the largest in the world. The merger was viewed as highly appropriate, bringing together the contract logistics capabilities of Exel Logistics with the freight-forwarding strengths of Ocean Group. Both of these companies had been active in the acquisition market over recent years, which had led to the presence of Exel Logistics in several European countries, and to Ocean's services in both Europe and America. Bringing together these two companies into one expanded the range of services offered as well as the geographical coverage (Datamonitor, 2002).

As part of its 'Strategy 2015' Deutsche Post DHL is ensuring clear corporate and operational structures, increased cooperation and mobility within the entire company and the integrated solutions for customers. This strategy is based on a two-pillar company structure of Deutsche Post (mail) and DHL (logistics) as well as closer links between the DHL business units (Deutsche Post DHL, 2011).

Kuehne and Nagel

Kuehne and Nagel is a major logistics service provider. It has more than 63,000 employees based at approximately 1,000 locations in more than 100 countries (Kuehne and Nagel, 2013). Traditionally the company was a significant presence in the sea and airfreight markets. Recently it has been expanding its contract logistics expertise through acquisition.

An alliance was reached with SembCorp Logistics of Singapore. This helped to increase Kuehne and Nagel's presence in Asia. The acquisition in 2001 of USCO, a large logistics service provider in the United States,

helped to increase the company's strengths, with warehousing and distribution becoming part of Kuehne and Nagel's service offering (King, 2002).

The company examined how best to improve its trucking capability in Europe. This could be achieved either by acquisition or by alliance with existing carriers. It opted for the acquisition route. The acquisition of the overseas logistics division of French group CAT in January 2004 facilitated the expansion of forwarding activities in France as well as in Mexico and Belgium (Kuehne and Nagel, 2004).

In October 2005, Kuehne and Nagel acquired the contract logistics group ACR Logistics (formerly HaysLogistics), headquartered in Paris (France) for €440 million. ACR Logistics was a major contract logistics provider in Europe. The acquisition – which was the largest in Kuehne and Nagel's history – promoted it to among the top few global providers in this business sector. The takeover increased the number of employees in the logistics group by 15,000. Logistics services offered by ACR included supply chain management, distribution and transport management, factory support (eg pre-assembly), and value-added services (eg call centre management, repair management), as well as managing approximately 7 million square metres of warehouse space (Kuehne and Nagel, 2009).

In September 2013 Kuehne and Nagel agreed to merge its rail freight division with the wagon leasing and rail transport group VTG to create 'Europe's largest private rail logistics provider'. The new company (to be called VTG Rail Logistics) will have 270 employees across 12 countries and the partners foresee that the geographical scope and range of services offered will enable them to access new markets and customers (*Railway Gazette*, 2013).

TNT

TNT Express is a global provider of express services. The company employs about 68,000 people and serves over 200 countries. For 2012 the company reported sales of €7.3 billion (TNT, 2013). The company announced in December 2005 that it would increase its strategic focus on its core competency of providing mail and express network services. The company believed that it had competitive advantage and growth opportunities in these markets.

As a result of industry consolidation, TNT decided to sell its logistics business to Apollo Management (which was renamed as CEVA Logistics) and its freight management business to Geodis in 2006. TNT believed that

the focus on its delivery networks and leaving the logistics market would allow simplification of the organization. It retained a limited amount of the logistics activities that fitted its core network strategy.

Also in 2006, TNT announced the acquisition of ARC India Limited (which operated under the trade name Speedage Express Cargo Services until it was rebranded as TNT in 2008), one of the leading road express companies in India. In the same year it also acquired the national road transport and freight business of the Hoau Group in China. These acquisitions were part of TNT's 'Focus on Networks' strategy to become a leading provider of express deliveries in the emerging markets in Asia (TNT, 2009a).

In 2007 TNT acquired Expresso Mercúrio, the market leader in the Brazilian domestic express market. In 2009 TNT signed an agreement to acquire Expresso Araçatuba Transportes e Logística (to build on its pan-Brazilian network) and also acquired LIT Cargo (a leading express delivery company in Chile). These acquisitions have helped TNT to develop its South American Road Network (SARN), linking services in Chile to Brazil and Argentina, which links 30 cities over 3,000 kilometres (TNT, 2009b). In 2010, TNT N.V. announced its intention to split into two independent companies, an express and a mail company.

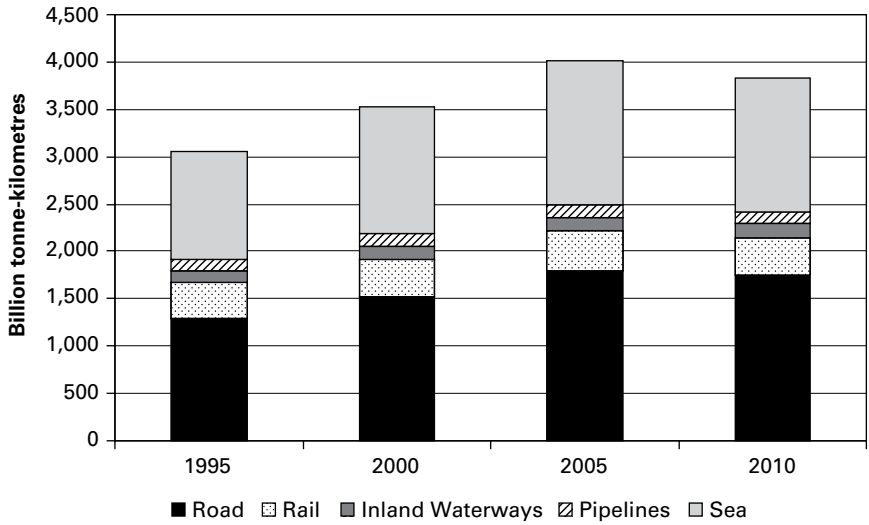
In 2012, United Parcel Service (UPS) announced that it intended to purchase TNT Express. However, the deal fell through when the European Commission refused permission for the deal under the EU Merger Regulation in January 2013. The Commission ruled that the takeover would restrict competition in 15 member states for the express delivery of small packages to another European country by reducing the number of significant players to only two or three (European Commission, 2013a).

Transportation in Europe

European freight activity

The changing demand for logistics services in Europe outlined in the previous sections has had a significant impact on transportation patterns and activity within Europe. Until the onset of the recession that commenced in 2008, Europe's economic growth had gone hand in hand with a growing flow of goods. The growth in freight transport in Western European countries between 1995 and 2010 is shown in Figure 24.1. During this same period

FIGURE 24.1 Growth in freight transport in Western Europe (EU-27; billion tonne-kilometres)



SOURCE: European Commission, 2013b

there has been an ongoing shift towards road transport within and between Western European countries when measured in terms of tonne-kilometres performed (see Table 24.2). These data relate to the 27 member states of the European Union (ie excluding Croatia). Although there are some important differences between individual countries, it is evident that road freight and short-sea shipping dominate the inland movement of goods within Europe, and that the importance of both modes increased substantially in absolute terms between the mid-1990s and the onset of the economic recession in 2008. Road freight activity has also increased in relative terms (ie market share) over the entire period to 2010. Inland waterways and pipeline have generally retained their small market share over the 15-year period, while rail has lost market share, though the decline has slowed in the last decade.

There is also an integration effect: for example, the EU countries trade four times more foodstuffs than other countries with identical production and consumption levels – and this has important implications for logistics demands. As already discussed, the prospect of a Europe free from internal borders spurred many companies to review and then reconfigure their logistics systems. This has resulted in a rationalization of both production and stockholding sites among some large companies operating across Europe, thereby increasing the demand for national and, especially, international

TABLE 24.2 Trends in market share of freight transport modes (EU-27; proportion of tonne-kilometres)

	1995	2000	2005	2010
Road	42%	43%	45%	46%
Rail	13%	11%	10%	10%
Inland Waterways	4%	4%	3%	4%
Pipelines	4%	4%	3%	3%
Sea	38%	38%	38%	37%
Total	100%	100%	100%	100%

SOURCE: European Commission, 2013b

transport services. At the same time there has been a trend to reduce stock levels by managing production much more carefully and implementing just-in-time (JIT) production techniques. Both these developments lead to an increase in the consumption of transport services within the supply chain. This can occur as a result of either increasing trip length (as is the case with the concentration of production and storage) or greater frequency of deliveries (as occurs in a JIT system). In addition, there is greater pressure on transport services to achieve high levels of reliability.

Many developments in modern logistics tend to increase road transport (see Table 24.3). Growth in international trade and sourcing as well as the relevance of new business strategies make policies aimed at reducing road transport difficult to implement. It is still not clear whether the concentration of production and warehousing will in fact open up new opportunities for rail and inland shipping – although in theory this should happen.

At the same time as this growth in road freight activity across Europe that occurred up until the onset of the economic recession in 2008, most countries also experienced significant growth in car traffic, resulting in increasingly congested inter-urban road networks. Traffic levels have persisted at an urban level in many European towns and cities despite the recession, due to ever-increasing urban populations and workforces. Freight transport costs and operational efficiency are adversely affected by road congestion, which occurs on many key European transport routes and especially in urban areas.

TABLE 24.3 Developments in logistics and the impact on transport and traffic

Main development	Impact on transport and traffic
Modal shift towards road	More road vehicle trips
Spatial concentration of production and warehousing	Longer distances, increase in transport volumes on key routes
Adoption of JIT in manufacturing	Smaller shipments, faster transport (road), decrease in load factors
Adoption of quick response and ECR in retail distribution	Smaller shipments, faster transport (road), decrease in load factors
Wider geographical sourcing of supplies	Raw materials and components transported over greater distances
Wider geographical distribution of finished product	Finished products transported over greater distances
Supply chain integration	Decrease in number of suppliers and transport providers, increased road transport in the case of more outsourcing
Decrease in order cycle time	Demand-driven flows lead to increased number of trips, decrease in transport efficiency
Increase in assortments	Smaller shipments, increased number of trips
Reverse logistics	Additional transport of waste materials and end-of-life products
Retail market concentration	Fewer, larger out-of-town stores; encouraging the use of car journeys for shopping

SOURCE: adapted from NEA quoted in Dutch National Spatial Planning Agency, 1997; and Technical University of Berlin, 2001

Policy measures affecting logistics and transport in Europe

European Commission White Paper on Transport

The European Commission White Paper on Transport published in 2011 identified the importance of mobility for economic growth and the quality of life of citizens. To achieve such mobility a need for further completion of the internal market for transport is identified in order to address existing bottlenecks and other barriers. The White Paper goes on to note that although transport enables economic growth and job creation it must be environmentally sustainable; new challenges noted include the increasing scarcity of oil in future decades, together with the EU commitment to greenhouse gas emission reductions (European Commission, 2011). The 2011 White Paper therefore identifies both old and new transport challenges in the EU, and asserts that these will need to be addressed through a combination of: 1) new transport infrastructure requirements; 2) the use of traffic and logistics management and information systems to ensure more efficient use of existing infrastructure; and 3) new vehicle technologies to improve energy-efficiency performance and increase the use of sustainable fuels and propulsion systems. The White Paper lists 10 goals for a competitive and resource-efficient transport system (European Commission, 2011):

1. Halve the use of 'conventionally fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030.
2. Low-carbon sustainable fuels in aviation to reach 40 per cent by 2050; also by 2050 reduce EU CO_2 emissions from maritime bunker fuels by 40 per cent.
3. 30 per cent of road freight over 300 kilometres should shift to other modes such as rail or waterborne transport by 2030, and more than 50 per cent by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.
4. By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all member states. By 2050 the majority of medium-distance passenger transport should go by rail.
5. A fully functional and EU-wide multimodal TEN-T [Trans-European] 'core network' by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.
6. By 2050, connect all core network airports to the rail network, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight and, where possible, inland waterway system.
7. Deployment of the modernized air traffic management infrastructure (SESAR) in Europe by 2020 and completion of the European

Common Aviation Area. Deployment of equivalent land and waterborne transport management systems. Deployment of the European Global Navigation Satellite System (Galileo).

8. By 2020, establish the framework for a European multimodal transport information, management and payment system.
9. By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport.
10. Move towards full application of 'user pays' and 'polluter pays' principles, and private sector engagement to eliminate distortions (including harmful subsidies), generate revenues and ensure financing for future transport investments.

The White Paper proposes a wide range of initiatives related to freight and logistics. The most important of these are described in the following sections.

Policies encouraging the use of rail, inland waterway and short-sea shipping

The European Commission hopes to achieve higher freight mode shares for non-road modes through a combination of measures to achieve two key objectives: regulated competition between modes and the integration of modes for successful intermodality. The measures essentially seek to ensure that the different modes of transport account for their true costs and compete on an equal basis, while investment is made in the infrastructure to support rail and waterborne traffic to ensure that the capacity exists to increase their share of the freight transport market.

The White Paper argues that transport charges and taxes must be restructured in the direction of wider application of the 'polluter-pays' and 'user-pays' principle. Such an approach would help to ensure that transport costs reflect the infrastructural and external costs. This internalization of externalities, together with the elimination of tax distortions and unjustified subsidies, and free competition will help to establish a level playing field between modes, thereby aligning market choices with sustainability needs. The European Commission's proposal to amend the so-called 'Eurovignette Directive' intends to ensure a higher proportion of internalization of costs imposed by heavy goods vehicles on the road network (road-user charging is discussed in more detail in the next section). In addition, to encourage intermodal transport the White Paper intends to create the necessary framework to permit the tracing of goods in real time, ensure intermodal liability and promote clean freight transport (European Commission, 2011).

At the international level, the European Union is continuing to implement its Trans-European Network (TEN-T) programme (European Commission, 2013c). TEN-T originated in the 1990s but the number of key projects was added to as the European Union expanded, increasing from 15 to 30 in 2003. The policy was refocused in 2013 and is now based on nine major long-distance corridors (eg North Sea–Mediterranean, Rhine–Danube,

Baltic–Adriatic) that form the core network (European Commission, 2013d). There are two north–south corridors, three east–west corridors and four diagonal corridors. Each corridor includes at least three transport modes, three countries and two cross-border links. The core network has a heavy emphasis on rail, inland waterway, sea and cross-border connections, with a limited focus on road schemes. It is due for completion by 2030 and includes links to 94 ports and 38 airports, an additional 15,000 kilometres of high-speed rail lines and 35 upgraded cross-border links. While not all of the planned improvements are focused on freight transport, completion of the TEN-T core network is expected to have a major impact on freight flows at the European scale. Just over 10 per cent (ie €26.3 billion out of a projected total of €250 billion) of the network funding in 2014–20 will come directly from the European Union, with the rest from national governments and the private sector.

Significant capacity exists in the seas around Europe and this can be exploited subject to sufficient port capacity being available. The European Union has therefore promoted the concept of 'motorways of the sea', which is a component of TEN-T (European Commission, 2006) and focuses primarily on the movement of freight. Four corridors have been identified for the development of projects that aim to:

- develop more efficient, more cost-effective and less polluting freight transport;
- reduce road congestion at major bottlenecks across Europe;
- provide better quality, more reliable connections for Europe's peripheral regions;
- assist in making Europe's economy stronger and more sustainable.

The four corridors are the Baltic Sea, western Europe (Atlantic Ocean–North Sea/Irish Sea), south-western Europe (western Mediterranean Sea), and south-eastern Europe (Adriatic, Ionian and eastern Mediterranean Seas). It is intended that these sea corridors link with other modes of transport, particularly non-road ones, to encourage intermodal flows that make use of the appropriate transport mode for the appropriate stage of a journey.

Particular issues exist for rail freight operations, which have been slow to adapt to the Single European Market. As a result, policies have been developed to encourage rail freight to become more competitive. These include open and non-discriminatory access to infrastructure for rail freight service providers so as to stimulate competition, transparent pricing regimes, interoperability between national transport networks, the development of priority rail freight corridors and quality assurance standards for freight services. Since railway privatization in Great Britain in the mid-1990s, rail freight's mode share of the total road and rail market increased from 8 per cent in 1994 to 11 per cent in 2010, representing an absolute increase in rail volumes of around 45 per cent (Department for Transport, 2012). Many factors have led to this increase, though the development of competition between an

increasing number of operators is one important contributory factor. This British experience contrasts sharply with that in many other Western European countries, where liberalization of the rail network has tended to be much slower.

Other policy measures affecting road freight transport

There are two other policy measures that could have a significant impact on road-based freight and logistics services in EU member states, and may also affect the location of logistics and other industrial activities: namely road user charging for goods vehicles, and the strategy for near-zero-emission urban logistics by 2030:

- *Time or distance-based road-user charging for goods vehicles.* Several EU countries have already implemented these charging schemes in place of annual licence fees for lorries. These schemes aim to relate the charge to the usage of the vehicle, and therefore better reflect the costs that they impose when using roads. Switzerland currently uses a distance-based road-user charge. In 2005 a new toll system was introduced on the 12,000 kilometres of German autobahn for all trucks with a maximum weight of 12 tonnes and above. This toll system, called LKW-Maut, is a governmental tax for trucks based on the distance driven in kilometres, number of axles and the emission category of the truck. The tax is levied for all trucks using German autobahns, whether they are full or empty. In August 2012, 1,135 kilometres of four-lane federal roads that connect to the motorway network were also added to the toll system. Toll booths on the highways are not used in the scheme, instead the scheme uses several methods: on-board units, manual payment terminals and via the internet. In the eight years it has been operational the LKW-Maut has collected €30 billion and the operating costs of the system are approximately 10 per cent of the toll income. Approximately three-quarters of all the tolled mileage was carried out by Euro V and EEV class 1 vehicles in the year to the end of April 2012, thereby helping to reduce the emissions associated with older vehicles (TollCollect, 2013). In 2011 an automated toll system was introduced for goods vehicles of 12 tonnes or more crossing the border between Austria and Germany. After a consultation in 2002 the British government planned to introduce a distance-based lorry road-user charge by 2008 that would ensure that lorry operators from overseas pay their fair share towards the cost of using UK roads (HM Treasury, 2002). However, the UK government announced in July 2005 that it would not proceed with the introduction of this lorry road-user charging scheme. National road pricing for cars and goods vehicles is now unlikely to be introduced before 2015. Belgium, Denmark, Luxembourg, the Netherlands and Sweden have in place a common time-based system of user charges for goods vehicles over 12 tonnes gross weight. This is referred to as the 'Eurovignette' system. This

system requires hauliers to pay a specified amount to use motorways of the participating member states for a given time period (ie a day, a week, a month or a year). Each participating country is responsible for all aspects related to the payment of the Eurovignette on its own territory. The Eurovignette system has followed the rules specified in the European Commission's Directive on road user infrastructure charging for heavy goods vehicles. The 2011 White Paper specifies that further action on the Eurovignette system is planned by the European Commission, which includes examining 'the gradual phasing in of a mandatory harmonized internalization system for commercial vehicles on the entire European inter-urban road network' (European Commission, 2011).

- *The strategy for near-'zero-emission urban logistics' by 2030.* In its 2011 White Paper, the European Commission has outlined its strategy to achieve near-'zero-emission urban logistics' (European Commission, 2011). This will involve producing best practice guidelines and regulations to better manage and monitor urban freight goods flows and associated transport activity. Possible actions to achieve this target could include: the use of urban consolidation centres and other means of improving load consolidation, rethinking the size of vehicles used in urban centres, improved used of the kerbside and other delivery space, retiming of delivery activity to the off-peak, various regulatory limitations on time and space, the increased use of low-emission road vehicles, integrated land use and transport planning, improved rail and river access to stimulate the use of non-road modes, knowledge transfer and the sharing of business practices, improved provision of traffic and other information, greater public–private partnership working, and revised vehicle technology standards.

Opportunities and pressures for logistics providers in a new Europe

It is evident that many multinational companies are rationalizing the number of logistics service providers they deal with across Europe – in much the same way as they have rationalized their production and warehousing operations (there is, of course, a link between these developments). This, together with the growth in intra-European trade, is leading to greater demand for transport and logistics services. Political changes have opened up new geographical markets, both for production and consumption. Devising and implementing the right logistics strategies lies at the heart of successfully capitalizing on these commercial opportunities available in Europe. Many of these changes are of significance to logistics service providers, especially those concerned with international markets.

The very different nature of European markets means that logistics providers wishing to provide for this growing demand for European services adopt suitable and appropriate approaches for different markets. International transport companies engaged in cross-border European work already understand that strategies may need to be tailored to the particular country of operation.

Naturally, what is right for one company will not be right for all. In particular there are important differences between the sort of strategies and initiatives that need to be devised by larger companies and those of smaller ones.

Strategies for larger logistics service providers

In deciding how to take advantage of the new European opportunities, logistics service providers need to be clear about which of the following strategies they wish to adopt:

- Strategy A (pan-Europeans) – providing a Europe-wide service offering distribution both within and between a number of European countries.
- Strategy B (multi-domestics) – providing national services that are in several European countries.
- Strategy C (Eurolinkers) – providing a network (or part of a network) of mainly international services between major European markets.

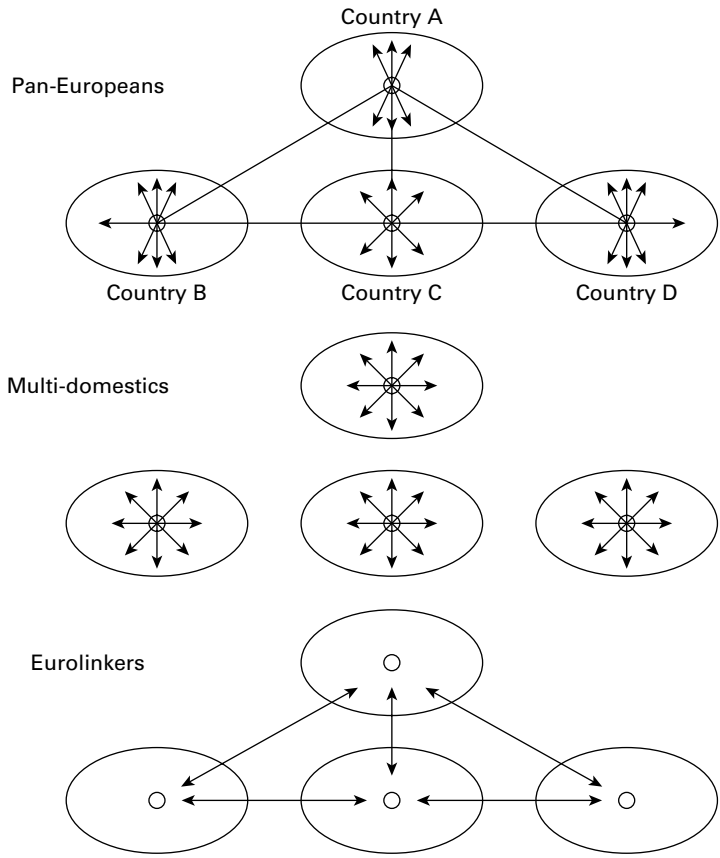
The network implications of each strategy are illustrated in Figure 24.2.

Clearly the most ambitious strategy is the first – to provide a truly pan-European service. Several major logistics service providers are working towards achieving this, but it is a challenging goal. It should be noted that as a result of the last two economic recessions some major logistics service providers have begun to reduce either the range of services they offer or their geographical coverage (Manners-Bell, 2013). The foundations for the multi-domestic strategy appear to lie in the successful duplication of domestic services in other countries. The original services are, of course, adapted as required.

Strategies for small- and medium-sized service providers

The smallest logistics service providers tend to operate either at a local level or work for a few companies. The scope for these companies to develop strategies to take advantage of European opportunities will be rather limited. For medium-sized companies, and especially those already operating in the international marketplace, there are undoubtedly ways in which they can develop initiatives to take advantage of the growing opportunities in the EU. However, it is evident that many multinationals are seeking to rationalize the number of logistics providers that they deal with across Europe and, therefore, in response to this, medium-sized providers should find ways to

FIGURE 24.2 Network implications of each strategy



SOURCE: Browne and Allen (1994)

tie their operations into those of their customers so that they become a vital part of their customers' distribution operation.

Concluding remarks

Cost-effective systems of goods distribution are often argued to be an essential prerequisite for competing in international markets and for delivering a good standard of living at a national level. Efficient distribution of goods and services influences market diversity, consumer choice, jobs and prosperity. Logistics can be viewed as critical to economic success in manufacturing, retailing and service industries in Europe. In addition, the scope for improved logistics strategies to promote higher service levels and reduced costs is also

being pursued in public sectors such as health and defence. Logistics contributes to economic growth by: 1) extending market reach thereby giving firms access to a wider range of raw materials and supplies and providing access to a wider market; 2) reducing waste – concepts such as just-in-time have a significant impact on reducing stock held within supply chains.

Logistics management and supply chain strategies play a critical role in the competitiveness of firms. Indeed it has been argued that increasingly competition is between supply chains rather than between individual enterprises. Within logistics management the role of transport is an important one and is frequently the aspect of logistics affected by policy interventions (for example deregulation of transport markets or decisions about infrastructure expenditure).

A number of logistics developments have tended to increase the consumption of transport services within the supply chain. This can occur as a result of either increasing trip length (as is the case with the concentration of production and storage locations) or greater frequency of deliveries (as can occur in a JIT system). However, there are also many positive logistics initiatives that have taken place that combine both environmental and commercial benefits. Clearly companies at the leading edge already enjoy the benefits of this and contribute to sustainability. There would be much to be gained by improving the efficiency of companies that are not at the forefront of these initiatives. Therefore, ways need to be found to encourage more companies operating in Europe to use logistics approaches and to ensure that those approaches that contribute to sustainability become more widely disseminated.

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25 Recent development of e-tailing and its logistics in China

JAMES J WANG
University of Hong Kong

Introduction

The burgeoning development in China's e-commerce industry for the past decade has driven the exponential growth in the express delivery industry. With the proliferation of online C2C (consumer to consumer) and B2C (business to consumer) markets, it has triggered the rapid expansion of the logistics demand side. In 2013, the express business generated by online shopping was approximately 70 per cent of the total express parcels volume (Xu, 2014). Even though the powerful market demand has attracted various large service providers to gain part of this market, the currently fragmented logistics networks are still insufficient to meet the ever-growing needs and requirements from the e-tailers and the millions of online shoppers. In the response to this fragmentation, some B2C e-tailers started to develop their own logistics infrastructure and accelerate the vertical integration of their service. The interactions between the two industries, e-tail and logistics, have exhibited many new characteristics and forms as a result of the impacts from the constant evolution in technology, the understanding of the stakeholders, the market demand, as well as the associated government policy amendments.

This chapter will attempt to assess such rapid development from the perspective of the interactions between e-tailers and the logistics supply networks. Moreover, the author will provide analysis on the trajectory of the Chinese e-commerce logistics (refers mostly to B2C in this chapter) and the main challenges that this industry is facing in China.

Marketplace-based and chain-based e-tailers

In China in 2003, Alibaba started a C2C platform, Taobao, which is similar to eBay, their US-based counterpart. Shortly after one year, Taobao became one of the largest online shopping platforms that include both C2C and B2C. In 2006, the online population in China reached 100 million and approximately 9 million people would go to online shops on a daily basis. TMall was separated from Taobao in 2008, and has been serving exclusively for B2C ever since. According to a report published by the McKinsey Global Institute (MGI), e-tailing in China produced over $190 billion in total sales in 2012 (Dobbs *et al*, 2013). It is likely that China's e-commerce will become the world's largest by 2015. Having occupied more than 60 per cent of this huge B2C online market, Taobao is undoubtedly the dominant player in the Chinese e-tailing industry.

The transformation to adopt B2C as its main business model helped Taobao achieved massive success in terms of its scale and daily sales volume, which has far surpassed its peers such as eBay. But from the standpoint of model, Taobao has maintained a very similar operational structure as eBay, which is based on an internet platform, and expands its markets and attracts more users due to the low costs of obtaining a virtual retail store. Such modal is analogic to those physical department stores that would grow through leasing out the low-priced retailing space. Taobao places the prominence on improving its operational services, the security in transactions, the convenience in purchasing, as well as the user-friendly information interface. However, by doing so, they lack the focus on building the logistics network that supports the explosive purchasing activities.

On the other hand, Jingdong (360Buy, or JD for short), the second largest e-tailer in China, chooses a different development path to grow its online business. Founded first in 1998 as a small retail store in the Zhongguancun area of Beijing, JD dabbled in the e-tailing industry five years later; 2007 marks the cornerstone for its thriving online sale business, by which time JD had built up three fulfilment centres of its own in three metropolitan cities, Beijing, Shanghai and Guangzhou, including 50,000 square metres of storage warehouse. A year later, it established the entire sell-to-deliver chain for all of its 3C (computer, communication and consumer electronic goods) products.

JD's development course is consistent with another major e-tailer, Amazon. Although they differ in the products they sell, both companies are chain-based that integrate the online shops with their own logistics support as the backbone. These companies have managed to control the entire process of logistics through their self-operated network, thereby reducing the total costs of the supply chain, which essentially provides the foundation for price competition. Moreover, such vertical logistics management system has also dramatically improved the quality of the delivery services. In terms of the

development strategy, both e-tailers placed substantial emphasis on building the physical logistics network and enhancing the O2O (online-to-offline) system.

However, this model requires extensive initial investment to establish the infrastructure for a hierarchical distribution network. It was nevertheless expected that profits and the scale effects would start to offset the costs once the operation reaches a certain threshold. As of 2014, the business practices that Amazon experienced in the past decade, and that JD did in the last five years, have all validated this profit accumulation process.

Boosting express logistics services

Posting a compound of 120 per cent annual growth since 2003, China's e-tailing industry is continuously going on an upward trend (Dobbs *et al*, 2013). Since online shopping can only be realized through physical delivery, the booming business incentivizes investors and entrepreneurs to fiercely compete for a part of the express delivery service market. The growth of this industry is unprecedented. Based on the statistical reports published by the State Post Bureau, the total revenue of the express delivery grew from 24 billion RMB in 2005 to 254.8 billion RMB in 2013, which is more than a 1,000 per cent increase (State Post Bureau, 2013). In terms of quantity, the number of express packages or parcels also rose from 1.5 billion pieces in 2008 to 9.2 billion in 2013, with more than 100 per cent average yearly growth rate. While over two-thirds of the 9.2 billion packages are generated by e-tailers, it is evident that the development of e-commerce is also shaping up the framework of the express industry.

Between the above-mentioned two e-tailer types, the Taobao mode is more indigenous and is the catalyst to a number of domestic express delivery companies that are dedicated to servicing e-tailers. For instance, the 'Four Tong One Da' firms (STO, YTO, ZTO, Best Express and Yunda) were all originally set up in the geographical locations that have easy access to Zhejiang Province near Shanghai, which is the main product source for Taobao at its initial stage. Basically, there are three elements of Taobao that have equipped these express delivery companies with the 'Chinese' character. First, Taobao itself does not own any logistics network. Second, Taobao started the market infiltration through intercity or regional C2C small parcel express delivery. The cost for delivering these packages is relatively high through the well-established logistics companies such as Shunfeng (SF). In this case, those small- to medium-sized delivery enterprises (SME) that started off by serving B2B and struggled to survive began to offer Taobao market sellers a route to their customers. Last but not least, the majority of the registered sellers on Taobao are highly dependent on the utilization of pay on arrival (POV) (see the chapter on China in the previous edition of this book), using a third-party payment service such as Alipay ('Zhifubao') in order to complete the transactions. While credit card is still not the main

payment means for consumers in China, it is in this sense that the web payment tool enables the online business owners to retrieve faster cash flow than through physical retailing, as well as to stimulate the outsourcing in delivery logistics. According to some statistics, the e-tailing business comprises approximately 60 per cent to 80 per cent of the entire B2C business for these private companies, most of which adopt the franchise model for expansion in order to achieve high geographical coverage (Guangfa Securities, 2012).

Such a network model (the Taobao model) meets the need to deliver quickly and requires much less capital investment to scale up. However, the lack of hierarchical management control also leads to low quality of services and high complaint rate. This disparity becomes even more outstanding when compared to many vertically integrated companies such as Shunfeng and FedEx. Table 25.1 describes the characteristics for the two types of carrier companies, integrated and franchise.

TABLE 25.1 The organizational structures and market positions of the two main types

	Self-running	Franchise
Representatives	*EMS, SF, ZJS*	*STO, YTO, ZTO, Best Express, Yunda*
Advantages	Direct management, controllable quality service, reliable branding, high-end customers	Low start-up capital cost, fast in expansion, competitive pricing, various value-added services
Shortcomings	High human capital costs, high infrastructure investment, high price	Chaotic management, inconsistent service standard, high complaint rate
Network coverage	SF: 90% to 92% EMS: 100% (based on China Post)	Typically 94% to 97% STO: 98%
Market position	Higher price, B2B as the main business	Lower price, B2C takes the majority
E-commerce ratio	SF: 30%	Approximately 70%

SOURCE: Guangfa Securities, 2012, and personal interview with Shunfeng Co in December 2013

Another important factor that contributes to the explosive growth of the express delivery industry and its synergy with e-tailers such as Taobao is the external environment in China with its unique context. At first, when the B2C online marketplaces just took off the ground, a national-scaled department store had not taken its shape in China. Although large home appliance or computer retailers such as Gome and Suning have already set up chain stores nationwide, the product selection only covers specific categories. Thus, the concept of Taobao gathering and aggregating numerous SME and microbusinesses to provide hundreds of millions of products' listings has completely intrigued and stimulated the desire of online shopping to the gigantic Chinese net population.

The geographic scale of China means that the individual online, often SME, retailers face a scenario where the locations of their potential customers could have a very large geographic coverage once they join Taobao or TMall. Therefore, the delivery part of the transaction would involve the extensive but possibly imbalanced inter-regional transportation. To do this on their own would be uneconomic given the pressure on pricing that e-tailing ensures. The strong market demand for lower distribution costs has driven a great number of local logistics enterprises to form partnerships and construct joint delivery models with multiple-layered firms and different regional coverage.

Challenges with the marketplace-based model

So far, the marketplace type of e-tailing has achieved massive success due to its ability to attract a significant base of small manufacturers and wholesalers through its consolidated platform. Among the merchandise that are delivered through lower-tiered 3PL (third-party logistics) companies, garments and footwear compose the majority of the products. These products are sent to various small- and medium-sized cities where the offline (bricks and mortar) retail industry is relatively underdeveloped. Customers can access a wider variety of products with a much flatter distribution network.

Nevertheless, the structural issues of this marketing model start to surface as the consumers' expectations for online shopping are growing. On the one hand, logistics companies are not responsible for the quality of the products they deliver. On the other hand, retailers feel they are not responsible for the delivery service quality of their products. While making efforts to guarantee the safety for online transactions is the priority for e-marketplace operators, they are attempting to monitor the quality of products and logistics services through certain evaluation mechanisms. Yet, the actual effectiveness of such self-initiated feedback system is still questionable. As a result, consumers gradually learn to filter and choose retailers and logistics companies based on their own experiences and the information provided by

the marketplace. However, the inconsistency in product quality and service quality still exists and is attributed to the lack of structural enhancement in terms of the integration among the marketplace, e-tailers and 3PL service companies.

To the contrary, the chain-based e-tailers including JD and Amazon are able to monitor and ensure the performance of their merchandise sources and therefore obtain the quality control of the entire sale channels and delivery services through their self-built logistics network. A further step for this type of e-tailers after constructing a basic logistics network is horizontal expansion, which means to augment the merchandise categories. In the meantime, they will also extend the scope of their self-operated logistics service. In regards to the areas that are not covered by their own service, it is necessary to select and cooperate with reliable 3PL partners to conform to their service criteria. Another example of the chain-based e-tailer is Yihaodian (YHD), who has grown substantially in the last few years. It positioned itself as a high-end, chain-based and department-store-style online enterprise. It has deployed an integrated supply chain, which encompasses the integration from procurement, online sale and products delivery. This model provides more control over the growth uncertainty and inconsistency in product quality.

To be more specific, chain-based e-tailers strategically build the storage warehouses and distribution centres according to the market demand in which their main consumer groups are presumably located. For instance, JD has built seven first-class fulfilment centres that cover all the main consumer regions in China, with an average investment for each centre estimated at 600 to 800 million RMB. It further plans to build 25 smaller fulfilment centres in medium-sized cities. As for Amazon, 15 storage and distribution centres are in operation and more warehousing expansion is under way. YHD has set up seven large fulfilment centres across China, and it is also planning to increase the number of urban supply and delivery sites in more than 40 cities.

Such distribution allocation strategy enables e-tailers to set up the storage capacity and inventory in accordance with the local purchasing power in each area, which resembles the traditional type of national chain stores. In this sense, these regional fulfilment centres can ensure they deliver the products within a certain time frame so long as they are equipped with advanced information and delivery systems. In other words, these e-tailers are the online version of chain stores such as Wal-Mart, Gome or Suning. The one-stop online website has replaced the physical retail chain stores. However, the logistics networks that support the sales do share some similarities. In fact, Wal-Mart held 51 per cent share of YHD back in 2012 and started to offer direct B2C services on YHD in 2014. By doing so, the actual supermarkets of Wal-Mart and its subsidiary, Trust-Mart, can provide space for merchandise display and, as well, try out self-pickup locations to serve online customers. Moreover, they can share the storage capacity and the procurement sources in order to reduce costs. To Wal-Mart, taking a stock

share in YHD created more than just their online sale channel; it turned a potential powerful rival into a cooperative partner.

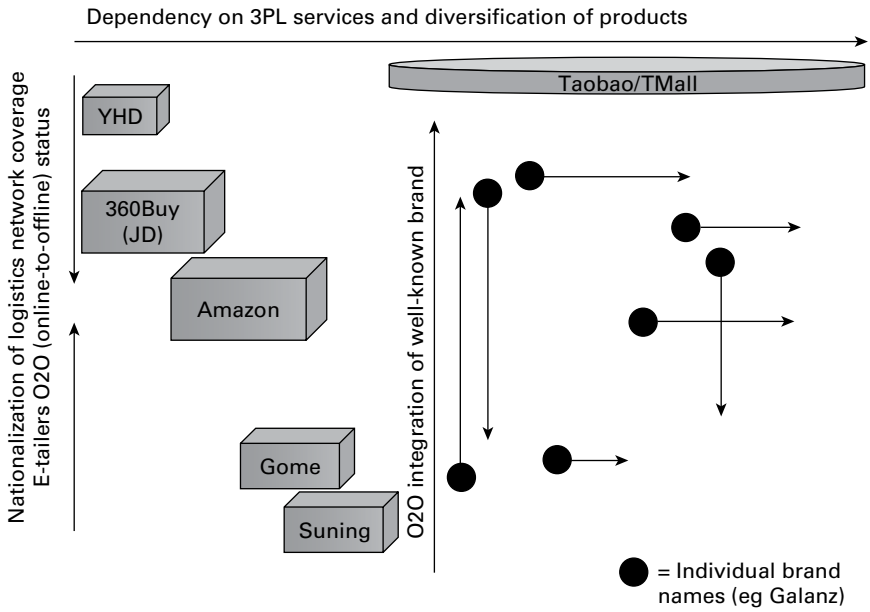
In regard to the areas that are either not fully covered by fulfilment centres on a reasonable time or cost basis, or generate insufficient demand, a clear-cut strategy is adopted by the chain-based e-tailers. They have developed several different price points for the same product, available as links online so that consumers can choose which carrier they would like to use for delivery, including 3PL and the other e-tailers. In this case, these integrated e-tailer websites function as those of Taobao and TMall, but are also distinct from them by having the identical merchandise on offer as opposed to using multiple sources.

Compared to this model, the limitations of the marketplace e-tailers is becoming inevitable: as the demand is predicted to keep growing, as well as the purchasing power of the Chinese middle-class population, the lack of quality control in the marketplace and its associated logistics support will hinder development and possibly become the Achilles' heel. Alibaba Group, the owner and founder of Taobao and TMall, has realized its weaknesses and hence started making some strategic moves to maintain and enhance its competitiveness. In 2013, Alibaba founded a consortium to build an advanced nationwide China smart logistics network (CSN) in order to support the ever-growing online shopping market. The consortium, which includes business partners from retail, real estate, logistics and express delivery industries, formed a new company called Cainiao Network Technology to carry out the infrastructure with an initial investment of US$16.3 billion in the next 8–10 years. In addition, Alibaba also invested in Haier, one of the biggest home appliance manufacturers in China, and its subsidiary logistics company 'Ririshun'. Bolstered by Haier's well-established logistics infrastructure that extends into small- and medium-sized cities with storage and stores, Alibaba formulated its physical logistics network and is able to follow up with the post-sale delivery and installation services for its e-commerce. On top of this, Alibaba is constructing its own manufacturing facilities and products in order to compete with other marketplace e-tailers.

Although the second and third measures mentioned above have the foreseeable potential to be effective, it is still doubtful that the CSN plan could achieve the success it intends. First of all, the companies in the consortium have different goals and needs due to the nature of their business and their positions in the supply chain. Second, the chain-based enterprises have already established their own courier grid. Therefore, this new CSN would be perceived more as a threat than an opportunity. Lastly, the groups that can possibly benefit the most from the CSN are those online SMEs and Taobao with their own production lines. However, no other player but Taobao has the ability or capital to build the CSN.

Nevertheless, the evolutional changes and development these e-tailers have experienced, depict a clear trajectory for the Chinese e-tailer industry, which is the convergence of the two models. Figure 25.1 demonstrates this convergent trend. On the one hand, chain-based e-tailers are expanding

FIGURE 25.1 The developing trend for e-tailers and retailers



horizontally to capture more diversity in products. On the other hand, Taobao and TMall are trying to integrate their vertical supply chain system to improve the quality of the final delivery.

As for those retailers who already have nationwide store fronts, their strategy is to bring the product catalogue from offline to online (O2O) and, consequently, to create a seamless O2O shopping experience for the consumers. For Gome and Suning, as they implement this network change, their physical store fronts and storage warehouses may need to be restructured and reorganized in order to reduce operational costs and keep the pricing level consistent with both online and offline distribution channels. Hence those reduced-sized store fronts would function just as the showroom for their products.

In regard to other individual brands, their option is either to cooperate with those e-tailers and set up virtual stores through their websites, or start their own online shops. The latter is more challenging since it requires intense investment in human capital for website operation, advanced inventory information system, internet commercial and advertising, and, most importantly, a trustworthy 3PL service provider if they don't have their own. They are competing against the influence and high consumer access of Taobao and TMall website portals, which could well outshine these brands' own websites and affect the visitor volume and hence the sales turnover. For instance, the world's largest microwave oven manufacturer, Galanz,

signed an agreement with TMall to produce TMall-customized products through the Cainiao CSN. It is unclear yet as to which type of e-tailers would be more beneficial to these well-established brands, but the logistics delivery service would definitely be one of the most concerned elements for O2O cooperation.

As far as we are concerned, the chain-based e-tailers seem to be on a more steady and solid track, in spite of the intensive capital investment at the early stage. Notwithstanding the broad coverage in terms of geographic boundaries, Taobao and TMall are facing a seemingly insurmountable dilemma: if they sell the self-produced merchandise through their logistics network, it is hardly advantageous to compete with the well-positioned e-tailers who have partnered with brand manufacturers in the medium- and high-end market; on the other hand, if they allow those SME operating in their marketplace to share their delivery system, it would imply a fatal strike to those 3PL firms that reply on serving Taobao and TMall. One possible solution would be to acquire these companies and merge them with Taobao's own logistics network. If such a network were dedicated to serve only Taobao's self-operating business, the rest of the online merchants on Taobao would remain as a cheap shopping mall, which is mainly composed of the lower-end products or second-hand C2C market. This form of sales could compete against other e-tailers through its low price, variety in goods and broader coverage, whereas the profit margin it yields would be very small.

The last-mile issues

Regardless of the discrepancy between the two development models, all the e-tailers in China would face the universal challenge of freight delivery – 'the last mile'. The last mile is defined as 'the final leg in a business-to-consumer delivery service whereby the consignment is delivered to the recipient, either at the recipient's home or at a collection point' (Gevaers, Van de Voorde and Vanelslander, 2013: 57). There are a number of barriers that can cause delays or other problems to the completion of delivery. For instance:

- time window for delivery: an appointment with the recipient is necessary when the signature or other proof of reception is required;
- installation and other issues with the products, such as return;
- delivery coverage in remote areas;
- local vehicle restriction: certain cities only permit specific types of vehicles and a specific time frame for cargo or product delivery;
- local security control: delivery may have no or limited access to certain properties such as gated residential communities or educational institutions.

Some express carriers have made efforts to resolve the first issue. They provide delivery time information to the customers and interact with them so that

they can be notified for the best available pick-up time. The problem of installation and return has not drawn enough attention yet. The most emergent issues with the last-mile delivery are concerned with freight mobility and destination accessibility. It is rather prevalent in Chinese cities, metropolitan areas in particular, to impose entry restrictions for delivery vehicles on urban roads, which are not standardized among different areas. In contrast, EMS could provide the full coverage nationwide.

The most common solution to address these issues is through the so-called 'local distribution partner' (Luodipei in Chinese, LDP), which means that one or few local courier firms will take over the last leg of delivery from the main logistics hub in urban areas and then send to the final destination. For instance, Urban 100 in Beijing is such a type of LDP, which has a background in the China Postal, the state-owned enterprise in postal services. In some other cases, LDP could also be those firms who used to run B2B business exclusively but now branch into the B2C market. In comparison to national-scale corporations like SF or Deppon, these urban logistics firms are better equipped to penetrate their local communities, such as having self-pickup points by the gates of residential blocks, service points inside college campuses and owning delivery vehicles that are not restricted for road access.

However, the service quality of these LDPs is rather inconsistent and varies among different cities. Many LDPs lack the understanding of the entire supply chain due to their own limited expertise in delivery, and may not have the management expertise to control a large number of relatively autonomous delivery drivers. Thus, other value-added services are either absent or unreliable, such as installation, exchange and return. However, it is this very context that creates vast potential for systematic service optimization. Theoretically, a successful LDP could start from specializing in servicing certain types of merchandise in one or a few cities, such as household electronic appliances or kitchenware. Once the LDP has established its reputation and brand on a local basis, it could then expand into neighbouring cities, or cooperate with some multi-regional companies to absorb bigger markets. Consequently, the LDP could become a market leader once the service is scaled up to a national level. A good example of such a type is 3PD, which is the largest provider for heavy goods and last-mile logistics in North America, and was acquired by XPO logistics in 2013. In China, the disparity in local operational environment is rather diverse. Hence, cities with matured markets would be more conducive to foster these companies. But in other cities, firms with pre-established network would have the upper hand.

At a first look, the concept of LDP seems to be more complementary to the needs of the marketplace-based e-tailers, but it might not be the exact case in reality. Although channel-based e-tailers do possess the resources and are able to fill in this segment of delivery by themselves, it could also be a more efficient and effective way to serve certain cities by cooperating with the LDPs, because of their sound local network and their knowledge of their local environment. Nevertheless, there are many reasons for such

a kind of collaboration, including the shared management concept and market position.

The force of foreign logistics providers

Before the flourishing of e-commerce in China, the domestic express industry was dominated by the state-owned EMS. Later on, a few private companies, including SF and ZJS, brought in some competition but the market size was still relatively small. While the overseas section of the express delivery market is mostly captured by the influential foreign-invested companies such as FedEx, UPS, DHL and TNT, the domestic market in China remains untapped because of the regulatory restrictions that prevent their operation. In many countries, the maturity of B2B has led to a stable market share distribution among the main players. The advanced network and high-service quality extend their dominance into the B2C market once online shopping becomes a prominent part. Unlike these countries, the rapid boom in the Chinese B2C market prompts fierce competition in the logistics segment. While the quantity of the B2C business is substantial, the product values derived are rather slim. Besides that, consumers have very high price-sensitivity to the delivery service due to the nature of their purchased goods. This causes many domestic private logistics firms, especially the 'Four Tong One Da', to further compress the profit margin. After the state lifted the barrier for foreign logistics firms to operate in the domestic express market, the intense price competition still remains the biggest roadblock. They attempt to compete in this inflated market through shareholding in some Chinese companies, but the results are still far from being promising. They may regain the competitive edge in B2C by their high-quality standard and efficient corporatized management, whereas their counterparts SF and EMS, even JD and Amazon, are already ahead with their robust delivery network. Therefore, it is still challenging for the foreign 'big four' to replicate their successful overseas business models in China.

Governmental policy support for urban logistics

The Chinese government has so far provided little intervention to the development of its e-commerce industry. From being the monopolistic player to competing against various powerful private companies, EMS has experienced drastic changes since the marketization of the industry. As a state-run company, its current market share dropped significantly from over 90 per cent prior to 2000 to roughly 10 per cent in 2012 (CICC, 2014). The internal structural problem may still be the bottleneck for EMS to cope with the

changing market. Being closely connected to government EMS still dominates most of the state administrative agency and state-owned corporatization parcel market.

In order to further develop the e-commerce sector and the corresponding express logistics industry, it is necessary to have a quality assurance system to monitor the market. China's policy makers are sending a rather positive message by formulating some supportive policies. For instance, the Ministry of Commerce has made announcements to support the expansion in B2C and C2C application, to facilitate domestic enterprises to conduct overseas e-commerce, and to enhance the construction of logistics infrastructure network. Many municipalities are formulating plans to free up the regulation of freight vehicle access in urban areas. More and more cities are expanding the broadband usage, installing public Wi-Fi hotspots, and setting up public logistics facilities, such as 24-hour self-store and pickup points. By creating a more conducive environment for the e-tailers and logistics providers, the goal is to bring more convenience to people and provide higher quality services in this information era. It is an ongoing process for public policy to keep up the pace with the fast development of online shopping. As we enter the digitalized world, e-commerce and logistics transportation are becoming indispensable to public life, even more so in the context of urbanization.

Another policy support comes from a joint announcement from the Ministry of Commerce and the Ministry of Finance at the end of 2013, which states a subsidy to set up 15 pilot public-freight villages in major cities to facilitate the freight demand generated by the rapid growth of e-commerce at national level (Office of Ministry, 2013). It is not yet clear how it may help the bottleneck of 'last mile' issues and bring sustainable benefits to the cities, since there have been cases in many cities that freight villages set up by city government tend to be too big in size and too loose in focus, very often with the property and land sale as the real motivation from the government rather than serving the logistics sector. However, the public and private partnership in this area seems to be promising in the long term, since the improvement and progress in e-commerce-based freight and logistics, whether in China or other countries, rely on the collaborations among all stakeholders along the new O2O chains and channels.

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Logistics strategies for Central and Eastern Europe

26

GRZEGORZ M AUGUSTYNIAK
Warsaw School of Economics

Introduction

The fall of communism in Central and Eastern Europe (CEE) at the turn of the 1990s began a fascinating period of systemic transition. This period of transformation has coincided with unprecedented economic integration in Europe that, on the one hand, creates enormous opportunities and advantages, but, on the other, needs great – often painful – changes. Since 2004, eight former Soviet-bloc countries have joined the European Union (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia), another two (Bulgaria and Romania) joined in 2007 and Croatia joined in 2013. The list is not complete yet as other countries strive to join in the future. Both the new members of the European Community and the candidates follow or adapt to EU standards at a turbulent time of economic cycles, including the financial crisis triggered in 2007, and intense competition resulting from globalization and the lifting of trade barriers within World Trade Organization (WTO) member countries. The scale of changes in CEE countries, with inherited gaps in infrastructure and limited access to financial resources (before joining the EU) make the implementation of logistics strategy very difficult. Many experts were even doubtful as to whether there would be significant progress in the integration of logistics networks between Western and Eastern Europe. Fortunately for the EU, and the CEE countries in particular, these sceptical forecasts did not materialize. To the contrary, the latest figures and forecasts show that the CEE region is

becoming really a 'promised land' rather than a development barrier for EU competitiveness.

The starting point for analysis of the situation in particular countries of CEE required understanding both the similarities – resulting from their common fate as Soviet satellites – and distinct differences. The most often quoted differences between them include:

- the size of the respective markets (measured by population and per capita income);
- the size of territories and their geographical configuration (determining their logistics systems);
- different starting positions for reforms (determined, for example, by ownership and industry structures, foreign indebtedness etc);
- cultural and historical differences;
- political stability;
- different ways, degrees and effectiveness of reforms implemented (from a shock-therapy approach, through evolutionary progress, to almost giving up);
- different levels of salaries, productivity, GDP per capita, and price indexes;
- degree of integration with the EU, with new EU members from CEE in a favourable position because of EU financial support for less developed regions and structural funds.

Currently, most of these elements (except the market size and membership in the EU) are no longer significantly differentiating CEE countries described in previous editions of this book. However, they are actual for non-EU neighbouring countries that, in part, should be now included in the analysis.

For these reasons, this description of logistics strategies for CEE while still focused on the new EU members (that are the most advanced in the transition process, and whose logistics strategies are the most similar) should include at least a few comments on their Eastern neighbours, which include two fast-developing emerging economies: Russia and Turkey. Such an approach is also consistent with the latest research on the CEE region, which will be divided into four groups of countries, as shown in Table 26.1

In other words, the CEE region constitutes a mosaic that despite its economic gap, inherited from the communist legacy, is in the process of integration of its logistics systems with both the EU-15 ('old' member states) and the East. In order to understand the challenge of that integration (that is still ahead of the Southern Balkans and East European countries) it is necessary to make a brief summary of the 'old' system of working practices in logistics (more extensive description of these practices was published in the previous edition of this book).

TABLE 26.1 Central and Eastern European countries division

Central and Eastern European countries			
CE-11*	**East European**	**Emerging economies**	**Southern Balkans****
• Bulgaria • Croatia • Czech Republic • Estonia • Hungary • Latvia • Lithuania • Poland • Romania • Slovakia • Slovenia	• Belarus • Moldova • Ukraine	• Turkey • Russia	• Albania • Bosnia and Herzegovina • Kosovo • FYR Macedonia • Montenegro • Serbia

* EU member countries of CEE (ie without Cyprus and Malta)
** Non-EU, post-communist countries: former Yugoslav republics and Albania

SOURCE: author's analysis

The logistics system of CEE before 1990

In centrally planned economies, knowledge of logistics and other modern management concepts and techniques was practically useless. The only exceptions were found in those companies whose export orientation exposed them to operations in the West. In other companies, monopolistic producers, whose distribution was also in the hands of monopolies, dominated the quasi-market. The government set prices for products and services (with few exceptions where higher prices were allowed) and fixed the currency exchange rates. In these circumstances, the only business goal was to exist – at the expense of the state, which covered any loss.

The only concern of logistics was to obtain scarce resources from suppliers to secure the execution of centrally set plans (which meant that the logistics in CEE had a very strong supply orientation) and to deliver goods produced to customers. This sounds similar to the tasks of logistics in the West, but with the significant difference that the logistics system was not focused on quality. None of the logistics systems' objectives (well known from the '7 Rs' definition) had to be fulfilled, and both effectiveness and customer satisfaction

could be ignored without penalty. Ineffectiveness was officially explained by 'objective reasons' – or sometimes by firing or imprisoning selected managers, employees or 'speculators'. This approach led to enormous waste and technological obsolescence of companies, which treated investments and customer service as costs to be avoided rather than sources of potential improvement and revenue.

Overall, the 1990s found CEE countries with inefficient, fragmented and out-of-date logistics systems that did not meet their requirements as they moved towards market economies. The system was generally characterized by:

- a lack of customer focus;
- the underdevelopment of a transportation and telecommunication infrastructure;
- poorly located, ineffective and obsolete industrial plants and related logistics infrastructure (especially low-standard warehouses);
- a lack of specialized, integrated logistics services;
- inadequate and poor management education, especially in logistics and quality management across all levels;
- a lack of reverse logistics systems – as there were no environmental policies for, say, the reuse and recycling of packaging and hazardous waste;
- low employee morale and job satisfaction.

The clear conclusion is that the logistics system inherited from communism was a fundamental barrier to the transformation of these economies and their subsequent competitiveness. This was supported by an analysis of the cost of logistics of these countries – which was estimated at up to 30 per cent of GDP, perhaps twice as high as typical values in the West. Thus, poor logistics was a major counterbalance for the few advantages of the region, such as:

- a low-cost and technically well-educated workforce;
- incentives for investment in selected regions;
- the relatively low cost of land acquisition;
- favourable geographical conditions (part of the EU market and its transit location);
- the size of the market and its potential, accompanied by rapid economic growth.

Apparently, logistics had a huge potential for significant improvements and savings, and successful transformation in this area was considered key to success for CEE countries and investors. The question was whether these countries are able to provide or collect resources (mostly financial and human) necessary for diminishing the gap with Western Europe, and to implement them effectively, especially when the past examples of such transition were practically non-existent.

Development of logistics in the period of transition

At the beginning of reforms, all CEE countries suffered from similar problems, though on different scales. Their major effort in the early 1990s concentrated on stabilizing the macroeconomic condition, focusing on curbing inflation (or hyperinflation, as it was in Poland), high unemployment (a term that never existed in centrally planned economies) and social security. Simultaneously removing most barriers and curbs on entrepreneurship – accompanied by privatization of government-run industries – led to the rapid, but also chaotic, development of market economies. Government efforts to gain some sort of control over these changes were made on a trial-and-error basis. In general – regardless of the many limitations, mistakes and high social costs – those CEE countries that followed more radical approaches to reforms have become leaders in the transition to market economies.

Soon, the development of market economies and the need to compete globally raised new challenges for politicians and entrepreneurs, who realized that:

- the transition into market economies means that CEE markets will gradually adopt Western patterns;
- the relaxation or abandonment of trade barriers forces these countries radically to improve their productivity;
- the major impediments to the transition will be the underdeveloped banking, telecommunication and transportation systems that are heavily dependent on the state or are hard to privatize.

Unfortunately, the shaky political situation in CEE countries (both during the creation of democratic institutions and habits, and caused by changing governments) coupled with the need to pursue tough financial policies (based on IMF guidelines) was a major obstacle in implementing reforms. These problems were magnified by the sudden fall of production and replacement of local products by imports. This created an unfavourable trade balance with the West that could not be compensated for by trade with the East, since the COMECON system no longer existed and internal ties had been broken. Lower incomes for governments and inherited indebtedness (despite substantial reductions) limited their scope for investment in logistics infrastructure. While it was not a major problem at the beginning of transition, after a few years of rapid development the state of the deteriorating – or at best very slowly improving – transport and logistics infrastructure became the major obstacle for future development. To understand better the reasons for this, it is worth considering the major factors that stimulated the rapid growth in logistics and related areas, which include:

- the rapid growth of trade;
- productivity improvements, especially in inventory management;

- deregulation and liberalization in some modes of transportation;
- development of telecommunication and information infrastructure;
- development of management education;
- accession to the EU.

Again, detailed description of the above-mentioned factors and the progress associated with the first years of EU membership of CEE countries was presented in the last edition of this book. It is worth emphasizing that the pain of transition was worth the gain of EU membership; without EU financial aid, within Structural and Investment Fund – a major driver in implementing EU Cohesion Policy – it would be impossible to lift up radically the economies of CEE, and their logistics systems in particular. Fortunately for the majority of the CEE countries, their accession to the EU coincided with a global period of economic growth that allowed them to finance the key infrastructure projects. The question was, whether the new EU member states would be able to effectively consume these funds. Apparently, with minor problems, CEE countries did their job very well and even the late entrants (Bulgaria and Romania, and now Croatia) follow the pattern of countries with underdeveloped but fast improving logistics infrastructure. It is still lagging behind Western Europe standards, but most probably, within the current EU budgetary perspective (2014–20) most of the core projects for integration of the logistics systems within the EU should be completed, provided the EU will be able to achieve financial stability within the eurozone and other member states, and that the recently observed signs of global economic recovery will be maintained.

Trends in supply chain management and their impact on CEE logistics systems

Recent studies published by the World Bank, World Economic Forum, logistics experts, consulting companies, and professional logistics institutes and associations are quite coherent in their predictions of future trends in logistics and actions to be taken in order to support growth and sustainability in the world by 2020 and 2030. In general, with the growing population, and increasing consumption, the need for further development of logistics infrastructure is inevitable. Moreover, it is quite unlikely that this development will meet the demand (PwC, 2010). It is also expected that the further growth and high levels of investments in logistics infrastructure of emerging economies will shift more logistics operations in that region and increase the flow of goods between Europe and Asia. It will then create even more pressure on CEE countries to develop their logistics infrastructure in order to facilitate that flow and to benefit from it. This general trend creates some additional challenges and determines European and global logistics strategies that should focus on:

- better harmonization and acceleration of supply chains (to lower the cost and improve the level of services);

- more dynamic development of intermodal solutions;
- wider application of information and communications technology (ICT) and innovative solutions in development of infrastructure and managing supply chains (to minimize congestion, improve safety and sustainability of logistics operations);
- stimulation of economic growth, also in rural areas, while assuring sustainability of the logistics infrastructure and operations;
- developing logistics clusters (regions) integrating industry, academia and government;
- generating knowledge and innovations in the supply chain management and education of a skilful workforce able to increase productivity of supply chains (that is now a scarce resource and major impediment for innovations' stimulated development);
- assuring sufficient financing and proper balance between the development of new and maintenance of the existing infrastructure;
- implementing proper regulatory policies to assure successful integration of sustainable transport systems.

The studies show that transport and logistics (T&L) infrastructure is still a prerequisite for an economy's success and reduces the cost of companies' operations by 11 to 21 per cent (PwC, 2010), but requires a holistic approach stimulated by wise government policies.

The CE-11 countries did a lot to radically improve their logistics infrastructure, creating logistics hubs with A-class warehouses and building thousands of kilometres of new roads. The level of investment (measured by share of GDP) is currently twice as high as in the United States and Western Europe (PwC, 2010). These efforts, even if they still did not achieve a desirable level of integration and development with Western Europe, have been already appreciated by companies that invest more and more in that region. CEE countries are also focusing on implementing recent innovations with ICT and developing adequate logistics education. Currently, the focus is on completing the transportation network, but the above-mentioned trends must be taken into consideration in order to assure that the CEE logistics system is compatible with future challenges. The alignment of the local actions is stimulated by EU polices and several pan-European projects such as the Central Europe Programme, providing expertise and solutions aimed at proper development of T&L infrastructure.

The current state and prospects of development of the logistics in CEE

The recent publications on the prospects of the CEE region point out its growing potential and rising importance in Europe. Such predictions result from the following factors:

- proximity to Western markets;
- integration with the EU;
- link with emerging economies (Russia, Turkey, Ukraine);
- facilitator of trade between Europe and Asia;
- radical improvements in logistics infrastructure;
- continuing EU financial support for infrastructure projects in the new EU budget;
- positive trends in GDP (coming out of recession);
- increase in retail sales and growing e-commerce;
- development of modern logistics centres;
- good balance between growth and risk;
- huge consumer market (around 100 million consumers);
- still relatively low cost of labour and access to skilful workforce.

CEE countries may heavily capitalize on these factors, provided that the observed process of economic recovery and investments in the infrastructure will continue. Below, there is a brief presentation of the current state of the logistics infrastructure in the CEE.

Trade and e-commerce

Retailing and wholesaling development in CEE countries and their Eastern neighbours follow the path of Western Europe, resulting in rapid growth of modern retail trade centres. While France and the UK still lead the list of countries with the largest area of commercial centres (17.0 million and 16.8 million square metres respectively), they might be soon overtaken by Russia and Turkey. Poland tops among the CE-11, offering over 10 million square metres, and is the third (after Russian and Turkey) in terms of planned new constructions. High growth dynamics is also observed in Ukraine, Slovakia, Bulgaria and Croatia. The statistics on the density of the retail centres (measured in square metres per 1,000 inhabitants) shows that several CEE countries still have potential to grow, since many of them (except topping Slovenia and Estonia) are still below the EU average (around 260 square metres). All CEE countries are flooded by global hypermarket chains that compete among themselves and with a fast-growing number of discount shopping chains. Smaller convenient shops are also entering distribution chains in order to attract local shoppers.

Significant improvements in customer service, along with better consumer legal protection (increasingly matching EU standards), encourage more sophisticated systems of delivery, often aimed at achieving just-in-time (JIT), quick response (QR) and efficient customer response (ECR). Joining the EU removed another significant obstacle that ruined many logistics strategies and lowered the attractiveness of the region: this was congestion at borders, which reduced vehicle performance by 15 per cent or more.

Among other positive changes in CEE logistics systems is the rationalization of costs, with significant improvements to stock levels and turnover, which have reduced the average costs of inventory by more than 20 per cent. The biggest improvement is in food products and other perishable items. This was achieved despite – as is typical in an emerging market – shifts of inventory from distributors and retailers to producers. Now, the producers are adopting innovative approaches to production and distribution, including flexible manufacturing and advanced management concepts.

Another phenomena in CEE is the rapid growth of e-commerce or internet trading that stimulates fast development of CEP (courier, express and parcel) services. Due to Poland's market size and rapid growth in accessibility of internet services, it is the fastest-growing market for e-commerce. The number of internet shops in the years 2006–12 grew four times, the dynamics of internet sales was higher than in traditional retails sales and the overall share of internet transactions was 4 per cent of all trade and reached already 6 per cent of GDP. According to yStats.com, the e-commerce market in CEE will rise by 20 per cent and continue to grow rapidly until 2017. Similar trends are observed in the Czech Republic, where 40 per cent of all consumers are e-customers, and in Slovenia that number has already reached 50 per cent. Hungary, Turkey and Russia are also showing the same trend. Such growth just recently tempted Amazon.com to locate huge distribution centres in Poland and the Czech Republic.

Warehousing and logistics centres

Warehousing is also a dynamically developing area offering A-class facilities in modern logistics centres. Again, the top position is kept by Poland with nearly 7.5 million square metres plus 250,000 square metres under construction. The Warsaw area is currently the largest logistics centre in CEE. Poland is then followed by the Czech Republic with around 4.5 million square metres. Such platforms not only improve services, but also create new employment opportunities. Logistics becomes a vital element of the whole economy, and the demand for logistics specialists – as a new profession in CEE – is very high. Concentration of modern warehousing space contributes to the creation of large European logistics hubs in the two above-mentioned countries. According to ProLogis Logistics Facility User Survey 2013, among 100 top locations there are more and more cities from CEE, with Prague and Central Poland close to the top 10, and one – Pan Regional Romania – already ranked at number eight. In 2018 the attractiveness of CEE locations, including Turkey, will be even higher.

As in the West, logistics centres have added activities, including final production activities outsourced by large manufacturers. These developments – along with a growing inflow of foreign investments, growth of local markets and exports – have created a basis for rapid growth in advanced logistics services. Third-party logistics services became a reality in CEE, and fourth-party/lead logistics *provider* services are also present.

It is also worth mentioning that there has been a rapid development of management and logistics education, both at university level and as a part of in-company training. This is also reflected in the growing number of professional logistics associations and clubs, and the many professional magazines popularizing logistics theory and practice. Despite that, the demand for qualified staff is still increasing.

Transport infrastructure

Seriously underdeveloped and deteriorated, today developing fast – the transport infrastructure of CEE is gradually meeting West European standards. Before the accession to the EU, the progress in construction of road and rail networks was insufficient, especially in Poland and Slovakia, while the Czech Republic and Hungary were more successful, but still out of Western standards in terms of density and technical quality. Due to the dominance of road transport in all CEE countries, major effort and resources were dedicated to the road system. However, growing demand for sustainable and intermodal transport resulted in the development of several rail corridors and the improvement of inland water transport on the River Danube. Within that project CEE countries focus on completing core TEN-T (Trans-European Network) projects aimed at removing bottlenecks in the transportation system of the EU, upgrading its infrastructure and eliminating cross-border fragmentation. The network will stimulate both passenger and intermodal freight transport. Within TEN-T, the countries of CEE are involved in five projects (see Figure 26.1):

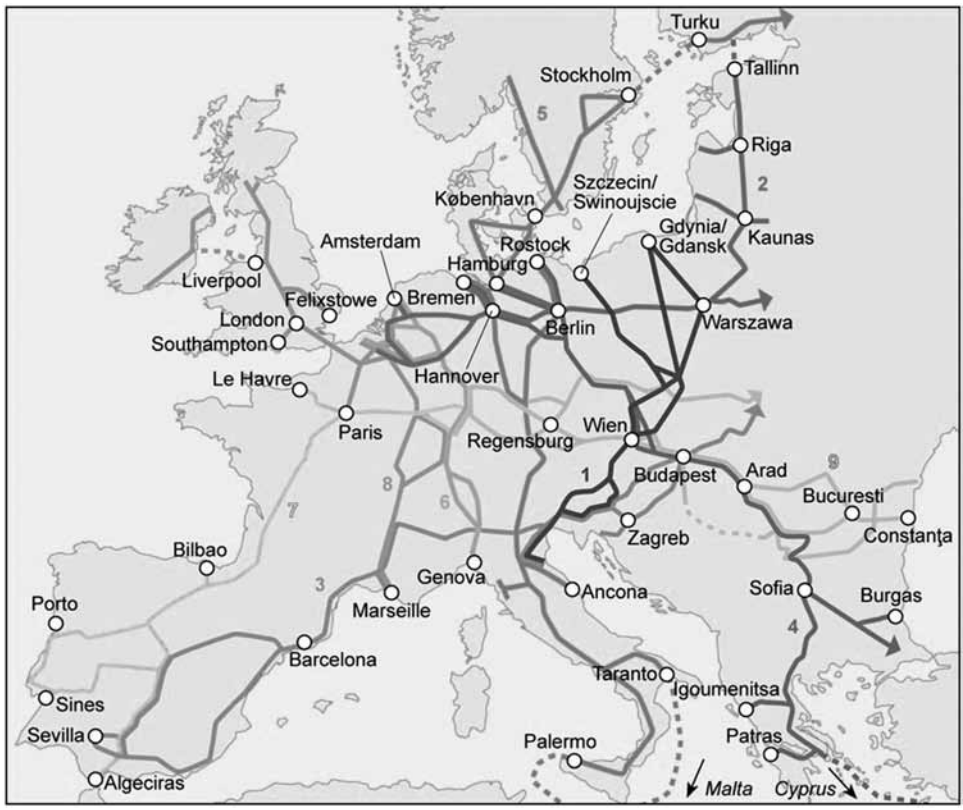
- Baltic–Adriatic corridor (1);
- the North Sea–Baltic corridor (2);
- the Mediterranean corridor (3);
- the Orient–East-Med corridor (4);
- the Rhine–Danube corridor (9).

On top of TEN-T, CEE countries are investing in express routes and key local roads to complement the major network of motorways. It is expected that by 2020 most of these roads and tracks will, hopefully, be completed. That, however, is not sufficient, and local CEE governments must contribute more to the development of regional and local transportation systems linking major cities in their respective countries.

Road transport

After decades of state monopoly, transportation became a hot topic during liberalization, with road transport being the first mode to be substantially deregulated. As a result (and also due to underdeveloped rail networks) most of the passenger traffic (80 per cent) is generated by personal cars, while transport by rail has dropped since 1990 by 40 per cent. Such a rapid

FIGURE 26.1 TEN-T network map



SOURCE: *Railway Gazette International:* **http://www.railwaygazette.com/news/policy/single-view/view/eu-transport-infrastructure-policy-to-focus-on-ten-t-corridors.html**

growth created congestion on the major roads and increased the rate of fatal accidents. However, it is worth mentioning that the current modal split is consistent with the rest of the EU. The rise was mostly the effect of limited access to passenger cars in communist times.

In freight transport, similarly to passenger, road transport dominates and the modal split for CEE reached a level of 80 per cent in 2010. Again, it is slightly higher than the EU average, but the tendencies are going in different directions: in CEE rail is still losing its share, while in the EU-15 rail is slowly expanding.

CEE carriers are leading in terms of transport performance, but like the whole sector are running business at low margins that are very vulnerable to oil price fluctuations. The introduction of toll roads (to finance the infrastructure development and increase motivation to use more sustainable modes of transport) in some countries resulted in high congestion and the

deterioration of local roads, as was recently observed in Poland. Some CEE companies are now very active on the EU cabotage market (servicing routes outside carrier's country of origin). That is why the situation on the road market may lead to its higher consolidation and further domination of global logistics companies.

Rail transport

Railways in CEE countries were subject to different privatization or commercialization processes. The ongoing separation of network management from railways operators (where state-owned companies still dominate) did not necessarily bring positive outcomes in terms of quality and cost of services, and finally did not change the dominance of road transport in both passenger and freight transport in CEE. Railways need substantial investments in the modernization of existing lines to adapt them both to the high-speed trains, higher axle load and clearance profile of cargo movement. According to Roland Berger Strategy Consultants' European rail industry survey 2013, railways are more concentrated on profitability and financial stability, rather than on quality of services, modernization of infrastructure or growth. Railway companies (with some exceptions), similarly to road transport carriers, run businesses at low one-digit margins that limit their ability for vast investments. In order to invest, network managers set high charges on track access that limits the growth and modernization possibilities for the carriers. The latter ones are now more interested in innovations, application of advanced technology solutions and developing human resources to dramatically raise the productivity and flexibility in operations. However, as of 2014, most of these actions were focused on cost-cutting rather than innovations. There are also predictions that the recast of the first EU railway package (as part of the process of establishing a single European railway area) will increase regulation instead of deregulating markets and, again, adversely affect efficiency of rail transport.

In CEE, where the density of rail track is relatively high but of low quality, without government financing (at national and local levels) companies are unable to significantly improve the competitive position of railways against road transport. It seems that in the CEE region politicians are more aware of the problem and wish to substantially increase funds for railway infrastructure development and modernization.

CEE railways are more and more active in intermodal services – so there is a major opportunity for them to compete with road transportation (or to support its transit traffic), provided there are financial resources to finance such programmes. The European Commission's investigation of the true cost of transport and its strategy of supporting 'greener' modes of transport will make a higher pressure on CEE governments to encourage more cargo and passengers on to rail. It has already resulted in a growing mass of freight carried by intermodal transport. Further investments in the intermodal networks within the TEN-T programme should substantially improve the

infrastructure provided, and the charges and quality of services will be competitive with road transport.

Air transport

Recent years, despite turbulence caused by rising fuel prices, were characterized by a high growth of airline operations both in passenger and cargo traffic in CEE. Similarly to other countries, the growth was caused by the entrance or establishment of the low-cost airlines (LCA) and expanding operations of full-service carriers. That growth has stimulated investments in the airline infrastructure (new, regional or even local airports) investment in the air traffic control systems. The CEE flag carriers, however, hardly could benefit from that rise, since due to their size they are more vulnerable to market disruptions. Former flag carriers of Bulgaria (Balkan) and Hungary (Malev) went bankrupt. The only 'old' airlines of that region that continue to operate under their names are ČSA (Czech Airlines) and LOT Polish Airlines. Both are members of the global alliances: Sky Team and Star Alliance respectively. Both carriers are also operating a relatively young fleet of leased aircraft (with LOT operating, as the first European airline, the Boeing 787 Dreamliners). Unfortunately, both of them regularly fall into financial problems. For ČSA the remedy was the sale of 44 per cent of shares to their alliance partner, Korean Air. LOT Polish Airlines were not lucky in finding a potential partner for privatization. The first choice at the beginning of the century was Swissair, but it went bankrupt. In 2012 LOT was close to making a deal with Turkish Airlines, but the deal was eventually not finalized, since the airlines are now more reluctant to takeovers and rather prefer joint ventures. For that reason the airline was forced to seek governmental subsidy of about €100 million. The lower fuel prices in 2013 and deep restructuring plan help the airline to survive, but bankruptcy is still possible. The recent idea of merging LOT Polish Airlines into holding with the profitable F Chopin Airport in Warsaw is not only doubtful from the EU law point of view, but might be also harmful for both partners. Struggles for survival similar to the LOT case is common in the whole area.

The pressure from low-cost airlines, Persian Gulf and Asian carriers offensively entering CEE markets, and domination of large European airlines, mean that the local airlines have to face even tougher competition. Moreover, drastic cuts affect the level of services of such airlines, making them less differentiated from low-cost airlines. It is possible, however, that the general economic recovery within the EU that picked up pace during 2013 may help CEE airlines to survive, since the predictions concerning air traffic growth are positive.

To the contrary, airport infrastructure in CEE regions is developing well and expands its capacity to serve passengers and cargo despite several regulatory limitations such as bans on night flights (which mostly affects carriers, not airports). More and more cities in CEE are constructing new, regional airports, as a result of recognizing their impact on the development of the local economy.

Major airports, such as Warsaw, are also upgrading their instrument landing systems in order to operate in almost any weather conditions. Along with airline and airport modernization, air traffic control has been upgraded to improve safety and services in the increasingly crowded skies of the region.

Other modes

The pipeline system is also expanding to deal with new sources of natural gas and crude oil. Conversely, there is a general decline in sea and in some regions also inland water transportation because it is not being used to its full potential. A series of investments in container and gas terminals in CEE (Baltic Sea, Black Sea and Adriatic Sea) and development of intermodal solutions is also stimulating the growth of operations. The rising costs of fuel may revitalize many projects to integrate European waterways, especially on the River Danube. There are also plans to modernize Oder river waterways to develop abandoned inland water transport in Poland.

There is continuing progress in the development of ICT infrastructure in CEE countries that makes it fairly comparable to the West. The recent efforts are now focused on providing free Wi-Fi services in the large cities and to implement intelligent transport systems (ITS). Some elements of ITS are already installed during the modernization or construction of the new roads and tracks.

Summarizing

CEE region, especially within EU member states, is undergoing a radical transformation and modernization. The gap with the West in the case of infrastructure is also diminishing, and that trend will continue. However, the observed differences are no longer a barrier in the successful integration of EU-15 with EU-13 (new member states). Most probably, major gaps in the transport networks should disappear by 2020 or 2030, stimulating further development of logistics hubs in that part of Europe and allowing for the growth of trade between Europe and emerging economies or Eurasian continent. It will also positively affect the development of companies in the region due to lower operating costs. The region should be able to attract even more foreign direct investments (FDI).

These achievements and developments in quality of logistics infrastructure and services were already reflected in the Logistics Performance Index (LPI) ranking list published by the World Bank in the 2012 edition of the report Connecting to Compete: Trade Logistics in the Global Economy. The LPI analyses countries in six components: the efficiency of customs and border management clearance; the quality of trade and transport infrastructure; the ease of arranging competitively priced shipments; services quality; timeliness of delivery; and the ability to track and trace consignments. In the ranking 155 measured countries were grouped into four clusters. Not surprisingly, all EU-15 countries (except Greece) were placed in the first cluster ('logistics friendly'), but among CE-11 countries, Poland (and emerging Turkey) were

placed in the first cluster, and the remaining ones (except for Latvia and Estonia) were placed in the second cluster ('consistent performers') with Bulgaria achieving the most significant progress. It is just one of many reports that praise that region for its achievements and future opportunities and proves that the efforts to upgrade the CEE region have already brought extremely positive results. These investments also helped many of the CEE economies to survive the 2008 financial crisis and economic slowdown, or even avoid recession, as was the case in Poland.

As compared to the last edition of this book (2010), there are more and more advantages of the current situation than disadvantages. The advantages include:

- increasing recognition and application of modern logistics solutions in both manufacturing and services;
- increasing efficiency and effectiveness of logistics systems in companies;
- rapid growth of investment in modern logistics infrastructure;
- the presence of state-of-the-art logistics solutions;
- significant progress in customer service and rapid development of the service sector;
- growth of FDI and development of businesses in the CEE;
- real perspective on creating European logistics hubs soon in Poland/Czech Republic and later in other CEE countries.

A separate group of advantages results from the EU membership of CEE countries:

- broadening the Schengen Zone and lifted border and customs barriers;
- stable financing of vital infrastructure projects from the EU funds;
- higher logistics productivity due to increasing competition and modernization;
- the possibility to introduce more sustainable solutions in logistics;
- the possibility of implementing ICT in logistics operations and infrastructure.

The disadvantages include:

- still too fragmented transport infrastructure (especially roads);
- problems with making railways and intermodal transport competitive with road transport;
- problems with acquiring properly educated and skilful staff for managing more complex and sophisticated logistics operations;
- financial instability and organizational weakness of transport companies, which affect the quality as the result of rising fuel prices and recent economic slowdown.

A full understanding of the problems and their causes is a key requirement for the design and successful implementation of logistics strategies in these countries. Despite the continuing process of assimilation of EU standards, this awareness is especially important to potential investors in the region, for whom the experience and challenges of CEE countries may still be new.

Logistics strategies in CEE countries

The description of the existing logistics system in selected CEE countries indicates that it is affected by:

- the dynamics of their economic growth and the inflow of foreign investments;
- development of the economic and political situation, mostly within the EU – the major trade partner of all CEE countries, but also by emerging economies;
- the success of CEE countries in utilizing their membership of the EU;
- global trends;
- a focus on environment protection.

Obviously, all these factors are dependent on one another but the aim is clear: the logistics system of CEE has to be aligned with the rest of the EU. Just recently we have observed positive signs that the creation of an integrated and pan-European logistics system is more a reality than just an idea. Under favourable conditions, within the next 10–15 years we may complete the process (of course still with some gaps and differences observed).

The key objectives for developing logistics strategies are determined both by the global and local challenges that exist in the region:

- further investments in the logistics infrastructure with more emphasis on sustainable transport solutions and maintenance of the existing network;
- a focus on achieving further synergy between cost reduction and customer service levels, especially in delivery times, reliability and flexibility;
- development of agile logistics systems based on wider application of ICT solutions;
- continued effort to create a favourable environment for businesses and investors;
- further development of logistics education and promotion of the logistics profession;
- development of city logistics.

Successfully meeting these challenges will be a major test for CEE members' ability to capitalize on their obvious advantages. The dark scenarios of the

EU enlargement fortunately did not materialize. The use of cohesion funds aimed at filling the gap between the 'old' and 'new' members appeared to be a success that is bringing visible results. It is also good news for the future of the CEE that we may see the potential expansion of Europe by 2050 to include the rest of the CEE countries, including Ukraine and Belarus (provided the political changes allow the integration process). It is still a fact that success in logistics investments must be coincided with important reforms of administration, education, healthcare and pension schemes. The recent economic slowdown triggered in 2008 has revealed some weakness in these areas. In such complex situations, the logistics strategy implemented by the state should:

- create a favourable climate and legal conditions (including taxation) for business development to capitalize on modernized logistics infrastructure;
- foster innovations in all areas and branches of the economy to meet the challenge of the knowledge-based economy;
- assure fair competition in the logistics market;
- continue with the process of transparency in business and administration.

This is why the logistics strategy at the macroeconomic level should focus on:

- expanding the liberalization and deregulation processes in logistics in accordance with EU regulations;
- providing or applying alternative methods of financing logistics infrastructure through public–private partnership, especially if the future EU budgets are not as generous as in the past;
- using the potential of existing and growing logistics platforms and hubs to assure that resources spent on logistics infrastructure are paying back in economic growth;
- actively supporting environmental solutions in logistics by enacting the relevant legislation and incentives for companies dealing with reverse logistics and intermodal transport systems.

At the micro level, logistics strategies should reflect global trends and focus on:

- orientation towards, harmonization and improved efficiency of supply chains;
- investment in modern management education that emphasizes the development of human resources and knowledge-based management;
- promotion of outsourcing strategies for logistics, as the development of owned operations is too expensive and risky;
- development of agile logistics in manufacturing and services;
- further investments in information technology, linked with radical changes in managing the company towards process-oriented structures;

- applying lean management methods and age management principles in the workplace to ensure the high productivity and innovations potential in the ageing societies of the CEE.

All these strategies have to be implemented simultaneously in order to bring maximum effect and significantly improve the ability of these countries to become strong and attractive partners in a united Europe, as it is forecasted today. The recent developments in the CEE show that the region is capable to be a new source of growth and competitiveness for Europe that would allow further expansion of the EU.

Conclusions

CEE countries are still at different stages of transition, but gaps are gradually diminishing. Logistics and the related infrastructure were the most neglected elements of the previous economic system, but today, due to the very large investments, they are becoming a key success factor of the region.

While we have to keep investing, we have to put more emphasis on the development of human resources capable to manage modern logistics systems. The emerging market economies inspired individualism and entrepreneurship, but the simplest ways of improving productivity in the region have been practically exhausted. Further development requires more teamwork, a holistic view of enterprise and better education. Changes must be implemented in a smart way, so that capital will be acquired and used in the most efficient and effective way. Modern logistics, along with developed management concepts, offers a variety of solutions. That is, however, a long-term process that requires wisdom, patience and consequence: three elements that quite often are scarce. The relative advantage of lower labour costs and relatively high skill of workers will not be available for ever. Actually, their role in CEE is gradually diminishing. In order to keep that advantage, we have to invest more in people.

With their markets and institutions functioning according to the same EU rules and standards but with their lower wage costs and taxes, CEE countries have become very attractive places for investment and employment. The increasing manufacturing costs of the developing Far East, the logistics costs of the long pipeline and the relative market inflexibility caused by higher inventory has persuaded many retailers and manufacturers to seriously (re)consider the CEE countries. In most countries the communist legacy is more a history rather than influencing factor on CEE economy and business practices. It is a stable region that survived relatively well the recent economic crisis and still has potential for growth. It is no longer a promise, it is a fact reflected in the opinions of those who invest in CEE and independent market reports calling CEE as equally attractive as emerging markets – smaller but less risky. In turn, it is quite likely that within the next decade major companies from CEE can expand into the established markets of the West and emerging economies.

It is quite possible that, when visiting CEE, you will experience the same feeling as when crossing borders within the Schengen Zone. You may not notice the difference.

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North American logistics

27

JEAN-PAUL RODRIGUE
Hofstra University, New York

MARKUS HESSE
University of Luxembourg

North American logistics: a regional realm

Attributes of North American logistics

Globalization induces the transport sector and supply chains to adapt to new functional and operational considerations. This is particularly the case for North America because of the geographical scale and scope of its production, distribution and consumption activities (Brooks, 2008; Rodrigue and Hesse, 2007). The economic history of North America is intricately linked with the history of its transport system, and the same applies for its geography, being reflective of the continent's long distances, heterogeneity and complex markets. While containerization has been a powerful force of homogenization in supply chain management, geography remains an important factor of differentiation, thus shaping freight distribution. The operational characteristics of freight distribution have to be reconciled with the regions in which they are taking place. Regional characteristics, ranging from basic physiography to the regulatory framework, thus have a notable influence on supply chain management practices. Modal preferences and locational behaviour of terminals and distribution activities are among issues being influenced by regions in which logistics are taking place (Hall and Hesse, 2012). Four fundamental attributes characterize North American logistics:

1 *Two major commercial orientations*. The first is longitudinal and concerns national (commodities and manufactured goods) and global distribution (mostly manufactured goods for imports and commodities for exports). The second is latitudinal and related to North American Free Trade Agreement (NAFTA) trade and a

specialization of the factors of production within the North American economy, particularly along border regions.

2. *Three maritime fronts serviced by a system of multimodal gateways*. They include the Atlantic seaboard, the Pacific Coast and, to a lesser extent, the Gulf of Mexico. These gateways, such as Los Angeles and New York, provide an interface between global and regional systems of maritime and air circulation.
3. *Long distance inland freight distribution* serviced by rail corridors controlled by large private rail operators. These corridors service and connect inland freight distribution centres such as Chicago, Kansas City or Winnipeg.
4. A system prone to *economies of scale in distribution* (corridors and distribution centres) because of the geographical extent and the relative homogeneity of the market. This has favoured the setting of high-capacity highway and rail corridors as well as vast logistic clusters.

An important commercial trend that has impacted North American logistics in recent years has been the rapid industrialization of Pacific Asia, particularly China, and the enduring growth in the consumption of foreign goods in North America and Europe. Outside the setback of the 2008–09 financial crisis, global trade has steadily been growing. Parallel to this growth, the need to reconcile spatially diverse demands for raw materials, parts and finished goods has placed additional pressures on freight distribution and logistics. The North American system of freight transport and logistics is developing as an outcome of changes in trade and industries, regional distribution of growth and the ratio of import and export in the economy. The development of a globally oriented production and distribution system has involved a greater share of long-distance international traffic handled at major gateways. The performance of the freight system bears major challenges to infrastructure, gateways and other issues internal and external to the transportation system.

A realm facing regional and global changes

Historically, the setting of national rail and highway systems has supported the emergence of a North American freight distribution market. Yet, this scale is being expanded further by NAFTA as well as by the globalization of production. Jointly, they have created an environment where the transport sector is coping to adapt to higher volumes, particularly at major gateways, as well as more stringent requirements in terms of frequency and reliability of these expanded supply chains. Among the most common factors of change in supply chain management are related to the exploitation of comparative advantages, mainly in terms of labour, information and telecommunication technologies, foreign direct investments and technology transfers (Hesse and Rodrigue, 2006). All these have helped to create a clustered and spatially diffused global economy, particularly in terms of production and consumption.

Yet, the conditions behind globalization that were supported by the setting of long-distance intermodal transportation chains have significantly changed in recent years. The current macroeconomic context is uncertain, volatile and prone to risks. The low labour cost advantage that has propelled the Chinese manufacturing are being eroded, inciting supply chain managers to consider other alternatives, many of which are much closer (eg Mexico and Latin America). The ongoing growth of trans-Pacific container flows is maturing as evidenced by container traffic at gateways such as Los Angeles/Long Beach, which has been stagnating for close to a decade.

While supply chain management remains a relatively illusive term, and that supply chains tend to be more effective when loosely integrated in a competitive environment (Bretzke, 2009), logistics deals with tangible flows that need to be functionally and operationally organized. The chapter thus addresses how freight distribution is organized in North America to fulfil capacity, time, flexibility and reliability requirements of global, continental and regional supply chains.

North American gateways

Trade synchronisms and imbalances

The emergence of China in the global manufacturing market had profound impact in terms of the volume and pricing of a wide variety of goods. There was a strong impetus, either implicit or explicit, to undertake strategies, many potentially macro-economically unsound, aimed at accelerating economic growth and the modernization of China. This strategy turned out to be highly successful in turning China into a major manufacturing centre and exporter. China also applied an export-oriented currency debasement strategy, particularly because the yuan was kept devalued compared with other currencies, particularly the US dollar (USD). For instance, the yuan was purposely debased by almost 50 per cent in comparison with the USD between 1993 and 2003. During that period, China mostly focused on the lower range of the added-value manufacturing process in addition to having low labour costs. The unfolding recession created pressures to maintain the value of the yuan in order to maintain a competitive advantage for exports, even if normally the devaluation of the USD should continue in light of the staggering trade imbalances and accumulated debt.

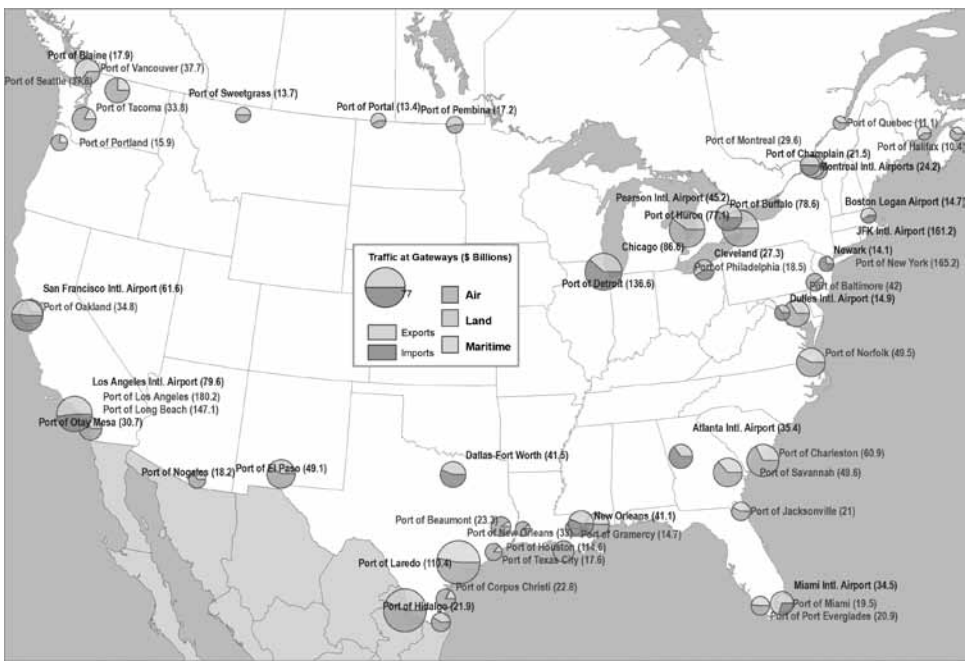
The usage of China as a privileged location in the global manufacturing system has thus been linked with low input costs (mainly labour) as well as low long-distance transport costs brought by containerization. The longer distances of shipping freight from China were positively compensated by lower input costs as well as the setting of massive economies of scale in maritime shipping through larger containerships. This explains why integration processes in North America, namely the use of Mexico as a low-cost manufacturing base, were mainly bypassed in the 2000s. Also bypassed was the

setting of regional North American supply chains in light of the dominance and efficiency of global supply chains. However, from 2005 the price of oil surged and the yuan was steadily revalued, which started to erode the comparative advantages of China in labour-intensive goods. In some sectors, the competitiveness of China has become marginal to the point that the reorientation of sourcing strategies is under way. North American supply chains may be positively impacted by such a trend, which will put a greater emphasis on NAFTA and Latin America as a comparative advantage structure. Changes in the structure and direction of freight flows in North America are to be expected with a higher level of regional orientation.

Trade gateways

Gateways remain a relatively constant component in the global space of flows. They can be seen as semi-obligatory points of passage linking global, regional and local freight distribution. Gateways come in three major categories linked with the mode of entry, whether land, maritime or air. Like other gateway systems around the world, North American gateways (see Figure 27.1), particularly maritime and air gateways, have been quite stable

FIGURE 27.1 Major North American gateways



SOURCES: RITA/BTS, Transport Canada, Economic Analysis Directorate, adapted from Statistics Canada International Trade Data

in time, implying that the dominance of gateways such as Los Angeles or New York has not much been challenged. Still, this does not prevent new gateways from emerging, capturing opportunities and consolidating their position, such as Savannah and Prince Rupert (maritime) or Laredo (land).

Land gateways have experienced the most changes, as NAFTA helped restructure commercial flows in North America. They commonly have a simple transit function with some nearby logistics and manufacturing activities, particularly when there are significant wage and regulatory differences, such as the case between the United States and Mexico. The Maquiladoras, a border region system of manufacturing activities mostly servicing North American supply chains, are interfacing with the North American transport system through a series of land gateways, mainly centred on Southern California, El Paso and Laredo. They are dominantly servicing an import function, expanded under NAFTA trade, and connected to corridors of continental freight circulation. Manufacturing tends to take place on the Mexican side and logistical activities managing this freight take place on the US side.

Trade and physical flow imbalances are clearly reflected at major US modal gateways. Almost all the gateways – land, maritime and air alike – are characterized by traffic imbalances where inbound traffic far exceeds outbound traffic. This is particularly the case for maritime gateways linked with long-distance international trade with Europe and more specifically Asia. The West Coast is notably revealing and is the most imbalanced both in the concentration and the direction of the traffic. Inbound traffic accounts for about 80 per cent of all the traffic handled by ports (a 3 for 1 ratio). The ports of Los Angeles and Long Beach handled 75 per cent of the total freight dollar value brought in through the West Coast. NAFTA land trade gateways tend to be more balanced, but still reflect a negative flow. A surge in oil and commodity prices has increased the share of ports along the Gulf Coast that are focused on energy and raw material trade.

A similar pattern is observed for air gateways, with New York, Chicago and Los Angeles being the most important. The two largest freight airports in the United States, Memphis and Louisville, are not gateways but hubs in a national airfreight system. Although they handle some international traffic, this traffic is too small to rank these hubs as major airfreight gateways. What also characterizes North American gateways is their high level of concentration in a limited number of gateway systems; a set of modal gateways within a relatively defined region that acts as a functional system linking that region to international trade. Logistical activities obviously congregate around these gateways.

The North American port system illustrates a concentration of container traffic in a limited number of ports and clusters. The share of containers handled by the five largest ports has remained unchanged for the last 20 years at around 55 per cent, underlining the cumulative advantages of capital investment in container handling facilities and access to the hinterland. The system is articulated along port clusters, representing a set of ports oriented along a coastal corridor such as Vancouver–Portland and San Francisco–Los

Angeles along the West Coast and New York/New Jersey–Hampton Roads, Charleston–Jacksonville and Palm Beach–Port Everglades along the East Coast (de Langen, 2004). All those clusters are connected to a North American land bridge and also include small but growing Canadian and Mexican components. However, inland freight distribution is challenging the relationships between many ports and their hinterlands and represents one of the most acute freight transportation problems (Notteboom and Rodrigue, 2005). Ports along the southern East Coast façade (Charleston–Jacksonville range) also anticipate higher volumes because they have additional trans-shipment capacity and uncongested hinterlands. Further, the expansion of the Panama Canal due for 2015 could expand the Gulf of Mexico ports because maritime shippers would benefit from economies of scale in addition to the untapped port capacity.

Inbound logistics

An important characteristic of North American logistics is the imbalanced traffic, a reflection of the negative trade balance that has endured in the United States since the 1990s. For instance, of the total value of trade handled in 2007 by American maritime gateways, imports accounted for a staggering 73 per cent. The structure of global trade thus impacts heavily on the operations of North American gateways that are essentially a system dealing with the intricacies of inbound logistics.

North American retailers account for a substantial share of containerized imports, mostly involving finished consumption goods bound to major inland freight distribution centres (see Figure 27.2). The largest importers, such as Wal-Mart, Home Depot, Target, Sears, Costco, Ikea and Lowe's, are all mass (Big Box) retailers relying on high-volume and low-margin goods, which are dominantly produced abroad. It is worth mentioning that about 60 per cent of all Chinese trade surplus with the United States is the outcome of American-owned firms operating in China and importing their output in the United States. Exporters show a completely different profile and thus completely different supply chains. A major category of containerized exports concerns recycled products with exporters such as America Chung Nam, Potential Industries or Cedarwood-Young. Other major exporters include forest and paper products (eg Weyerhaeuser, International Paper), agribusiness (eg Cargill) or chemicals (eg Dow, Dupont).

Two important logistical functions are linked with inbound logistics: transloading and empty container repositioning. Transloading involves the transfer from one load unit to another, which can be a complex task if the load units are significantly different. Repositioning involves making a container available for export activities once its import function has been fulfilled. If export cargo is unavailable, such as due to trade imbalances, then the container needs to be repositioned globally, which comes at a cost. There are several causes that may favour container transloading, which

FIGURE 27.2 US foreign trade by maritime containers, 2010 (in 20-foot equivalent units)

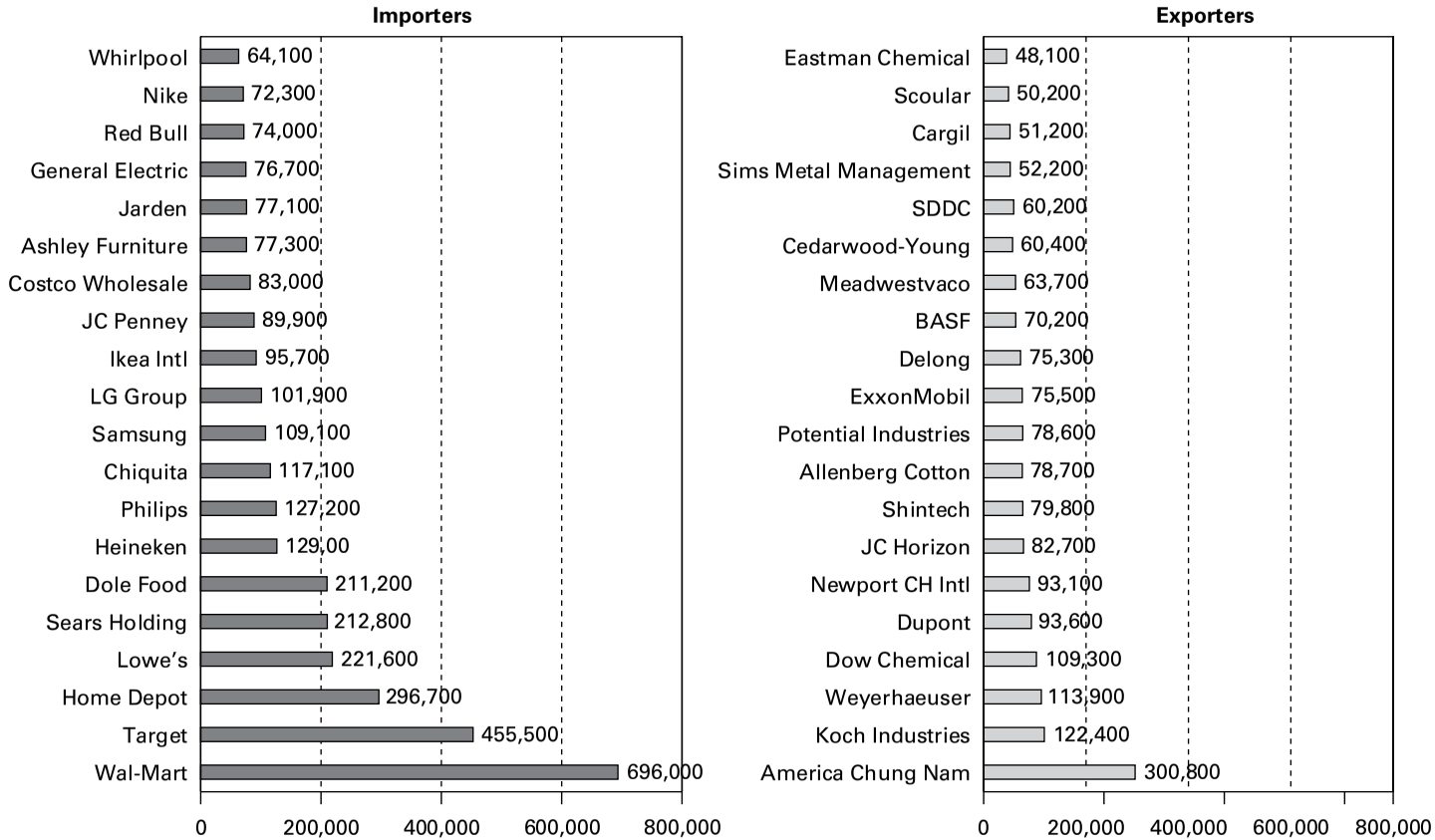


TABLE 27.1 Causes for transloading containers

Cause	Outcome
Weight compliance	Transferring the contents of heavy containers into loads meeting national or regional road weight limits. Remove the weight of the container (2.4 tons for a 20-foot equivalent unit box and 4.3 tons for a 40-foot equivalent unit box) and shift to a lighter load unit.
Palletizing	Placing loose (floor loaded) containerized cargo onto pallets. Adapting to local load units.
Demurrage	Handing back containers to owner (maritime shipping or leasing company) by transferring its contents into another load unit (eg domestic container).
Consolidation	Transferring the contents of smaller containers into larger containers (eg three maritime 40-foot containers into two 53-foot domestic containers). Cost savings (number of lifts).
Equipment availability	Making maritime containers available for exports, and domestic containers available for imports. Trade facilitation.
Supply chain management	Terminal and transloading facility as a consolidation buffer. Delay decision to route freight to better fulfil regional demands. Perform some added-value activities (packaging, labelling, final assembly, etc).

tends to take place in the vicinity of port terminals or inland (satellite) terminals (see Table 27.1):

- *Weight compliance:* simply involves shifting the contents of heavy containers into lighter loads such as domestic containers or 20-foot containers. This is particularly the case for the containerized movement of commodities.
- *Palletizing:* very common for the shipment of consumption goods. To gain shipment space in imbalanced container flows many containers are 'floor loaded' and, once arriving near consumption markets, the shipments are broken down and assembled into manageable pallets. This also gives the opportunity to adapt to local load units that involve different sizes, such as the difference between North American and European pallets. Doing such a task at the point of origin would be logistically complex.

- *Demurrage:* containers are commonly rented for a specific time period and/or the leasing contract specifies that the maritime container cannot leave the vicinity of the port (or cannot spend more than a specific amount of time inland). Transloading is thus performed to ensure that the leased container is handed back to the maritime shipping or the leasing company without additional charge.
- *Consolidation:* in cases where this is a significant market for domestic containers and the domestic load unit is larger than the maritime load unit, shipments consolidation is often performed. In North America the largest domestic load unit is 53 foot, which represents the maximum legal size of a truck load on the highway. Thus, in distribution centres in the vicinity of several major port terminals, the contents of three maritime containers are transferred into two domestic containers. This enables cost savings – as shipment costs, including terminal costs, are established in terms of loads. Rail terminals charge by the number of lifts, which means it costs the same to handle a 40-foot or a 53-foot container.
- *Equipment availability:* this often takes place in conjunction with demurrage. Transloading enables a more efficient use of both container assets (international and domestic) and can facilitate international trade by freeing transport capacity. For instance, moving maritime containers over long distances in the North American transport system can be considered a sub-optimal usage of transport equipment, particularly from the perspective of maritime shipping companies. Conversely, the global maritime shipping industry is mainly designed to handle 40-foot containers.
- *Supply chain management:* a transloading facility can act as a buffer within a supply chain, enabling shippers some room to synchronize the delivery of goods with the time requirements of their customers. This is particularly the case for long-distance trade where a shipment can be in transit for several weeks while the demand conditions at the destination may have changed.

Transloading thus offers an opportunity to delay the decision about routing freight to the final destination by using the facility as an opportunity to do last-minute adjustments in terms of which shipments should go to which markets. Transloading accounts for a substantial activity at major port terminals. For instance, more than 25 per cent of all the containerized traffic handled by the ports of Los Angeles and Long Beach is transloaded into domestic containers. In many cases transloading requires specialized equipment and a facility where it can be performed.

North American corridors and inland freight distribution

The North American lattice

Although North America has a lattice of highways connecting all the major metropolitan areas, it is the long distance rail corridors supported by an intermodal rail system that plays the most significant role in commercial flows. It accounts for close to 40 per cent of all the ton-miles transported in the United States, while in Europe this share is only 8 per cent. Rail freight in the United States has experienced a remarkable growth since deregulation in the 1980s (Staggers Act) with a 102 per cent increase in volume between 1985 and 2008.The main growth factors for rail activity in recent years have been linked with a surge in international containerized trade, particularly across the Pacific, a growth in the quantity of utility coal moving out of the Powder River basin and a growth of the Canadian and Mexican transborder trade. Intermodal and coal represent the two most important sources of income for most rail operators. The two largest North American railroads, UP and BNSF, derive a sizable share of their operating revenue from long-distance intermodal movements (landbridge) originating from the Pacific Coast. The construction and upgrade of intermodal rail terminals has been a prevalent trend to support this system of freight distribution.

A North American lattice of trade corridors where freight distribution is coordinated by major gateways (container ports) and inland freight distribution clusters (IFDC) has emerged in recent decades (see Figure 27.3). While gateways and IFDCs are significant markets, they also command distribution within the market areas they service as well as along the corridors they are connected to. They thus have a significant concentration and logistics and intermodal activities. The extent of the market area of an IFDC is mainly a function of the average length of domestic truck freight haul, which is around 550 miles (880 kilometres). About one-third of the North American trade took place within NAFTA, mainly through land gateways (ports of entry) that are gateways in the sense that they are obligatory points of transit commanding access to the United States. For truck and rail flows, virtually no intermodal activities take place at land gateways, although several distribution centres are located nearby borders and along corridors. Laredo and El Paso, Texas and the Detroit/Windsor complex are notable exceptions with the presence of significant freight distribution activities.

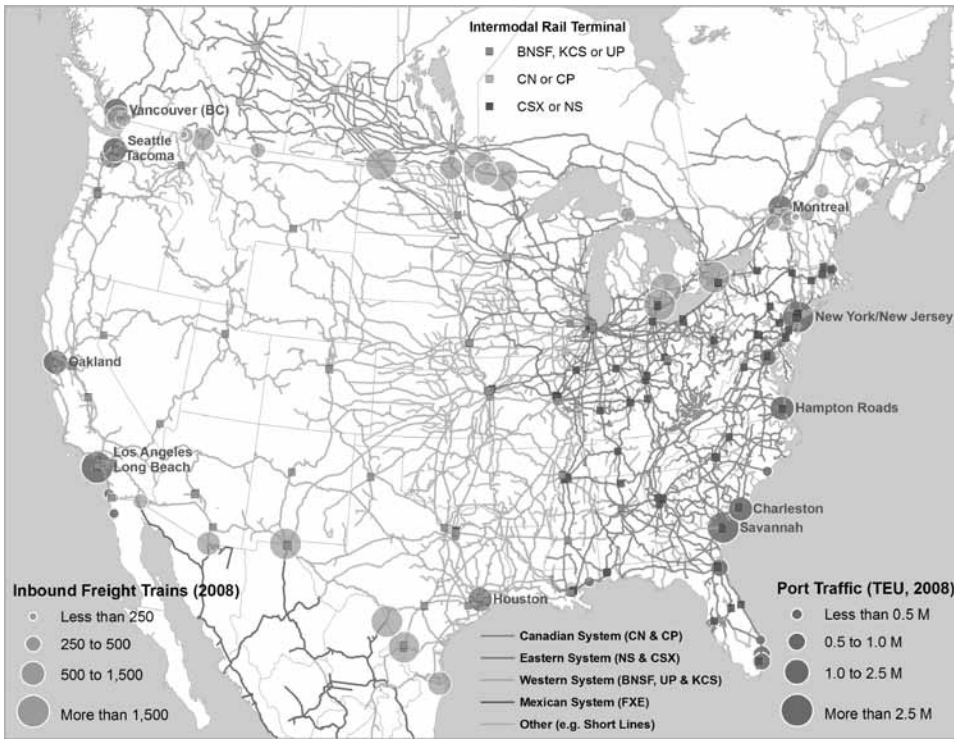
Due to congestion and lack of space for logistical activities near maritime terminals, the emergence of inland ports (such as satellite terminals) appears to be a significant trend, well developed in Europe but emerging in North America. Such a process is associated with changes in the organization of inland logistics. (Meyer and Meyer, 2013)

FIGURE 27.3 Main North American trade corridors, gateways and inland freight clusters

Rail corridors

The North American rail transport system shows a high level of geographical specialization, with large rail carriers servicing large regional markets (see Figure 27.4). Each carrier has its own facilities and thus its own markets along the segments it controls. The rail system is the outcome of substantial capital investments occurring over several decades with the accumulation of impressive infrastructure and equipment assets (Rodrigue and Hatch, 2009). However, such a characteristic created issues about continuity within the North American rail network, particularly in the United States. Mergers have improved this continuity but a limit has been reached in the network size of most rail operators. Attempts have been made to synchronize the interactions between rail operators for long-distance trade with the setting of intermodal unit trains. Often bilateral, trilateral or even quadrilateral arrangements are made between rail carriers and shipping companies to improve the intermodal interface at the major gateways or at points of interlining between major networks. Chicago is the largest interlining centre in North America, handling around 10 million 20-foot equivalent units (TEUs) per year, a location at the junction of the Eastern, Western and Canadian rail systems.

FIGURE 27.4 The North American rail transport system



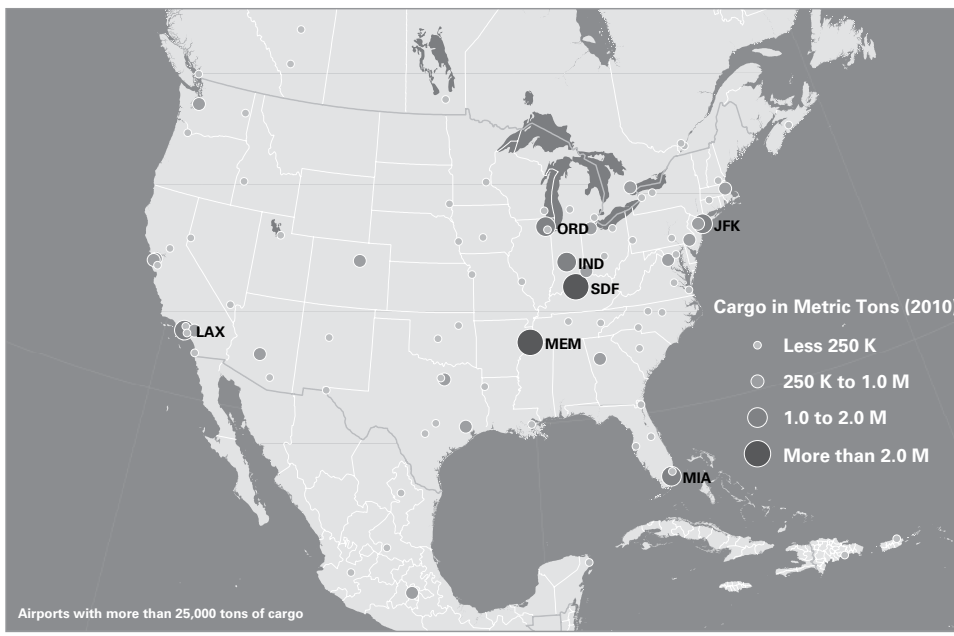
The North American system of operational intermodal rail terminals handling container on flatcar (COFC) and trailer on flatcar (TOFC) traffic accounts for about 206 facilities covering major inland markets. The great majority are intermodal terminals accessible by truck only, but about 20 of them are on-dock rail facilities enabling to directly move containers from the port to the hinterland. Most intermodal terminals are clustered around major maritime gateways (Los Angeles, New York) and intermediary locations having strong inland logistical activities and inland ports (Chicago, Memphis, Kansas City). The location of intermodal rail terminals is a balancing act between gateway location, market density, interlining and complementarity with trucking. In spite of a system controlled by only seven major operators, the great majority of inland load centres are serviced by a least two operators, which confers a level of competitiveness and offers options for regional shippers. For the Western system, most load centres are serviced by both BSNF and UP, while for the Eastern system, most load centres are serviced by both UP and CSX. A similar pattern is observed for the Canadian system with CN and CP. There are, however, a few notable exceptions serviced by only one intermodal terminal and with no nearby competitors such as for Halifax (CN), Salt Lake City (UP), Billings (BNSF), Albuquerque (BNSF), Amarillo (BNSF) and Prince Rupert (CN). On the opposite range of the spectrum several locations, particularly at the interface between regional

systems, have three or more rail operators (Detroit, Chicago, St Louis, Kansas City, Memphis, Dallas–Fort Worth, New Orleans and Atlanta). They are thus particularly prone to a more competitive inland terminal setting offering shipping options to both the east and the west coasts.

Airfreight hubs

North America is the most important region worldwide in terms of airfreight. More than half of the global volume of airfreight in ton-kilometres is performed in and between North American regions (Bowen and Slack, 2006: 41). It is also the airfreight sector that was characterized by strongest growth rates until recently. In response to the increasing demand for rapid delivery of small consignments in the courier, express and parcel services, major airfreight hubs have evolved. This applies both to established airports that are engaged in freight handling and to newly emerging hubs as well, often constructed on remote airports or on the terrain of former military air bases. It is notable that in terms of throughput the Federal Express hub in Memphis, Tennessee (MEM), and the prime hub of United Parcel Service in Louisville, Kentucky (SDF) are now considered the two biggest cargo airports in North America, followed by, LAX/Los Angeles and New York/JFK (see Figure 27.5). Both single corporations represent the two biggest air

FIGURE 27.5 Freight traffic at North American airports



SOURCE: Airports Council International, 2010

cargo corporations worldwide, with 15 million tons of cargo (Fedex) and about 10 million tons respectively (UPS), transported in 2008. Only these two have, by performing sustained growth and establishing their own network with hub locations, thus shifted the geography of airfreight in North America significantly.

Airfreight has especially contributed to the emergence of the DC cluster along the Ohio River Valley, following a corridor from Ohio and Indiana to Tennessee, which hosts an ever-growing number of warehouses, freight forwarding and air cargo facilities. The reasons for the tremendous growth of this region as a major distribution location are manifold. Besides the long tradition of the Midwest as a preferred manufacturing location (with certain distribution experience and competence), these locations are ideally suited to serve major markets both on the East Coast and in the Midwest. Columbus, Ohio, is within a 10-hour drive of 50 per cent of the North-American population. Starting from the Ohio Valley, about 60 per cent of the entire US population can be reached by overnight truck services along the corridor between northern New Jersey and Indianapolis. The region is characterized by offering access to major interstates and a freeway intersection, rail connections and intermodal terminals, and two airports, among them Rickenbacker International Airport. Large investments of single firms have also to be taken into account, triggering 'leader–follower' impact chains. Among major corporate investments were the DCs established by Emery Worldwide (Dayton, Ohio), Lowe's Home Improvement (Allen, Ohio), UPS (Louisville, Kentucky) and Federal Express (Memphis, Tennessee). It is no coincidence that this market position is spurred by airfreight carriers and integrators, since they are well suited with respect to broader structural changes in the economy.

Inland logistics

Inland freight distribution

There have been large inland terminals in North America since the development of the continental railway system in the late 19th century. Their setting was a natural process where inland terminals corresponded to large inland market areas, commonly around metropolitan areas commanding a regional manufacturing base and distribution system. Although exports were significant, particularly for agricultural goods, this system of inland terminals was mostly for domestic freight distribution. Inland distribution expanded further with the completion of the federal highway network and due to the advantages offered by the motor truck. The growth of metropolitan areas was accompanied by the establishment of associated distribution infrastructure, particularly linked to the demand of retail and manufacturing industries for transportation and warehousing services (O'Connor, 2010). Such warehouses were predominantly located in the vicinity of core urban areas. As logistics

and supply chain management evolved, further changes occurred, particularly characterized by the evolution of separate distribution networks. The related nodes (DCs) were increasingly located remote from the core metro areas and thus supported further processes of deconcentration (Hesse, 2008).

One reason behind this is the tendency of logistics chains to expand from the locales of big intersections into their hinterlands; another is the proximity of agglomerations to customers. In the course of the economy's growing demand side-orientation, distribution locations have been moving away from production and towards consumption, ie partly back towards the agglomerations. This is where clusters of distribution centres form, sometimes at single, more or less unconnected locations, sometimes planned as freight transport centres (Hesse, 2004). The locational advantage of agglomerations is less their position in an important infrastructure intersection, but rather their combination of short- and long-distance accessibility and also access to major distribution areas. Decisions on the location of new DCs are primarily based on the criteria of size and accessibility. In the past few decades, this combination of factors has brought a greater proportion of distribution uses to the areas surrounding agglomerations, as manufacturing had already done earlier. Considering the present conditions of flow-oriented economy, this movement out of the cities has become stronger because the core cities and their traffic congestion create more and more obstacles to flow-oriented distribution.

This sub- and ex-urban drift of warehousing and freight distribution that was already foreseen by Chinitz (1960) in the case of New York City was recently analysed more in depth (Bowen, 2008; Cidell, 2010). In the United States warehousing and storage employment between 1998 and 2005 grew by 383 per cent, being the highest growth rate among all transportation subsections, and the number of establishments with more than 250 employees jumped from 26 in 1998 to 520 in 2005 (Bowen, 2008). Regarding the location of such establishments, air and highway accessibility were considered most important. The degree and direction of the spatial transformations this industry experienced has also been evidenced, with a pattern of concentration along inland ports emerging in the Midwest, the Pacific Northwest and the Piedmont (Cidell, 2010). Against the background of a strong correlation between the distribution of population and the number of freight establishments (and given that highway access is almost ubiquitously provided for in US metro areas), railway accessibility turns out to be one important factor in explaining warehousing distribution patterns per capita. Also, a certain inland (Midwest) shift of the industry is related to lower salary levels compared to metros at the East and West coasts, explaining the strong performance of cities such as Memphis or Oklahoma City. This underlines again that Chicago stands out in any regard among the metro areas studied, given its role as a prime railway hub and traditional inland gateway city (see Figure 27.4). Regarding locational dynamics within metro areas, a suburban drift of distribution establishments was also observed, with locations close to central cities attracting the establishment of DCs, particularly due to accessibility advantages.

Following the increasing extent and spatial reach of freight flows in the course of globalization and intermodalism, two main categories of inland terminals have emerged in North America. The first is related to ocean trade where inland terminals are an extension of a maritime terminal located in one of the three major ranges (Atlantic, Gulf and Pacific) either as satellite terminals or more commonly as inland load centres (eg Chicago). The second category concerns inland terminals mainly connected to NAFTA trade that can act as custom pre-clearance centres. Kansas City can be considered the most advanced inland port initiative in North America as it combines intermodal rail facilities from four different rail operators, foreign trade zones and logistics parks at various locations through the metropolitan area.

The setting of large distribution centres, often part of distribution clusters, has been a dominant trend, particularly among major retailers that have set the standard in terms of inventory management of their supply chains. These intermodal facilities require a large array of equipment, which can vary based on the freight they handle. Large distribution centres tend to develop on the principle of internal economies of agglomeration (within the distribution centre). Logistics parks expand these advantages through external economies of agglomeration, implying that the concentration of distribution centres within the cluster, even if they concern different supply chains, has the potential to reduce an array of costs.

Added value in inland freight distribution

There are two major types of added value related to freight distribution. The first involves performing an activity that improves the efficiency of freight distribution. Added value thus results in benefits that are carried to the shippers or their customers, notably in terms of cheaper products delivered in a reliable and flexible way (see Table 27.2). The second is extracting a form of rent from the existing flows, notably through tolls and taxes. Added value results in financial gains for various levels of government, which can be used to fund infrastructure projects and improve competitiveness. There is however a risk of a rent seeking behavior where freight activities are targeted strictly in terms of a source of revenue. The 'added value' they generate for the rent seekers thus comes at the expense of the productivity of the supply chain.

North American logistics has particularly been impacted by the setting of foreign trade zones (FTZ), mainly at inland ports. An FTZ is an area that is considered outside the customs jurisdiction. It makes it possible to import specific categories of goods without going through custom procedures, as long as the goods remain within the FTZ. In the FTZ, the goods can be transformed (eg assembled) into other goods and then 'exported' out under a different custom category. The main advantages of FTZ are thus regulatory and financial:

- *Custom clearance:* since the FTZ is a bounded facility, the custom clearance can be done inland instead of at the port of entry and the consignment can stay in the bounded area for an unlimited amount

TABLE 27.2 Common added-value activities associated with inland freight distribution

Function	Overview
Processing	Operations on the goods. Includes sorting, packaging, testing, assembling.
Distribution	Operations on the cargo. Consolidation, deconsolidation, transloading or cross-docking. Assembling less than truckload (LTL) shipments.
Customs clearance	Releasing and/or inspecting inbound cargo. Assumed by a national customs authority.
Foreign trade zone	A sanctioned site where foreign and domestic goods are considered to be outside of the customs territory. Requires bounded transport and bounded warehousing.
Container depot	Handle containers (leased or carrier owned). Transfer custody of containers between shippers. Storing and servicing/repairing containers.

of time. It is likely that this can be done faster inland because the facility is less congested than a large gateway port. The consignees thus gets a better notice about the availability of their shipment and can plan their supply chain management accordingly.

- *Duties:* in spite of decades of trade liberalization, duties are still levied on international trade. With an FTZ, duties are not paid until the consignment is shipped out, and can be deferred further if moved to another FTZ. If a transformation (eg assembly, labelling, testing) is performed within the FTZ, this added-value activity is not subject to duties and can change the duty class of a product to a more preferential level. Commonly, duties are not levied if a product is damaged, defective or obsolete, since its commercial value is considerably reduced. Thus, by inspecting products in an FTZ, the duty will be waived for any defective products. This is particularly useful for products that have a higher propensity to be damaged or defective.
- *Settlement:* for most transactions, particularly through letters of credit, the vendor is not paid until the consignment has left a facility (FTZ and/or transport terminal). An FTZ can thus be used to delay settlement until judged suitable by the consignee and also offers the opportunity to readily remove the value of damaged or defective products from the settlement.

Corporate logistics and its role in North American freight transportation – three cases

Wal-Mart

Corporate management in logistics and distribution has become extremely important not only for the generation of freight transportation demand, but also as a driver of organizational changes and technological innovation. Integrated supply chain management has developed in response to new modes of production, in the context of globalization, and with respect to a highly competitive market environment. Supply chain management has shifted focus from maintaining inventories aimed at approximately satisfying a demand towards a comprehensive system ensuring that supply matches more closely with demand. This is mainly to be achieved through on-demand or pull- rather than push-distribution. Thus, physical flows also involve a significant amount of information flows. Hence, major inventions in information and communication technologies were the requirement for making the new logistics systems operational. This applies particularly to the management of information flows, regarding load units (being these single items, small consignments or 20- or 40-foot containers), transport vehicles, distribution centre operations or the entire inventory management of a firm.

It is hence no coincidence that contemporary logistics activities and thus freight transportation performances are increasingly driven by corporate management, rather than by infrastructure policy or the geographical conditions for moving vehicles and handling consignments. This becomes indicative once discussing the case of a single corporation that is already considered emblematic for the development of 21st-century capitalism (Lichtenstein, 2006). This is the case of Wal-Mart, the US retailer that is ranked first on the 2013 edition of the Fortune 500 list of the largest corporations (based on turnover). Being the largest retailer worldwide for some time now, Wal-Mart has achieved its position – among others factors – particularly through the development of a sophisticated distribution system that was constantly improved over time (Bonacic and Wilson, 2006; Kozak, 2013). The spatial expansion of the firm by placing new retail outlets was usually centred on a DC, in order to allow efficient supply of goods. Already a decade ago, Zook and Graham estimated that about 60 per cent of the entire US population would be living within a five-mile distance to a Wal-Mart outlet, and 96 per cent within 20 miles (Zook and Graham, 2006). As of 2013, Wal-Mart operates a network of 172 distribution centres that service its more than 4,800 retail outlets in the US (data retrieved from **www.walmart.com**). These units receive commodities from about 60,000+ suppliers (Walmart, 2009), about 80 per cent of which are located in China (Gereffi and Christian, 2009: 579). Such an extended network requires an extreme degree of control and velocity of both inventory and flows in order to avoid dead capital, given the marginal

revenues that can be achieved in the retail industry. 'Wal-Mart revolutionized the speed and efficiency of getting products to stores through its distribution centre location strategy and cross-docking techniques. All Wal-Mart stores are typically located within a day's drive of a distribution centre, and the company works closely with its suppliers to streamline deliveries' (Gereffi and Christian, 2009: 576–77).

In contrast to the majority of Wal-Mart's competitors, core distribution activities have remained under control of the company, rather than being outsourced to service providers. Wal-Mart has always been introducing new technologies from early on, particularly those technologies that allow for an efficient flow of data and materials. This policy comprises electronic data exchange (EDI) that enabled the management to track the entire data flow, satellite systems that provided control of vehicle operations, and radio frequency identity (RFID) technology that was supposed to increase inventory control through improved on-time information flow. The acceleration of average turnover allowed for not only to diminish costly inventory but to mobilize further interest rates before the account had to be settled. The massive expansion of Wal-Mart did not occur without affecting other companies, particularly competitors in the retail industry and also suppliers who had to follow the rather rigid imperative of the purchasing and supply chain management regimes of the retailer (cf. Gereffi and Christian, 2009: 577). It is noted by the authors, also referring to other studies (eg Brunn, 2006; Lichtenstein, 2006) that the particular business model pursued by Wal-Mart would be essentially driven by its extraordinary power in supply chain management.

Following a 2005 commitment to reflect both ethical and environmental standards for achieving corporate responsibility, Wal-Mart reorganized its supply and purchasing policy (Plambeck, 2007). The goal was to improve the company's overall efficiency by 100 per cent within 10 years' time. This commitment can be read as a response to wider criticism of the company's attitude against competitors, vendors and employees articulated by the public or by community organizations (Christopherson, 2007). As part of a comprehensive scorecard approach, the firm aims at improving the overall sustainability of its products and processes, emphasizing 14 focal areas within three broad categories: renewable energy, zero waste and sustainable products. One of the focal areas targets the logistics network, eg for improving the efficiency of the trucking fleet. In the meantime, these measures have helped to achieve significant improvements in operational efficiency and thus in the environmental performance as well: 'As of 2013, the company achieved an 80% increase in fleet efficiency and was named a superior environmental performer by the US Environmental Protection Agency in 2012' (Kozak, 2013: 25).

Wal-Mart is also responding to changes in consumer behaviour, particularly the tendency towards an increased practice of inner-city housing in selected urban areas (and maybe also in response to local alliances opposing plans to open massive supercentres). Due to high land costs and a lack of parking

facilities for customers, smaller stores are becoming the testing ground for new corporate strategies. Currently 54 of the so-called 'smaller-format urban stores' are operated by the firm in the US. They are located close to or within central city neighbourhoods that serve the demand of urban populations for smaller grocery, fresh food and alike, different from the usual suburban supercentre customers. The related logistical requirements for delivery are different as well, as these stores cannot be supplied by the standard 53-foot trailer, most often curbside parking is not possible, and proximity to housing confronts night-time delivery and unloading operations with specific noise requirements. Most importantly, the use of smaller retail outlets has a certain impact on the distribution network, reintroducing lower-level distribution centres (eg at regional or even at local scale), based on a changing relationship between fixed and variable costs (operating DCs versus delivery vehicles). It thus seems to challenge the ongoing trend of centralizing the network that was predominant for at least two decades.

BNSF Logistics Park, Chicago

The principle of co-location is fundamental to the operational efficiency of an inland port. Several recent logistic-zones projects in North America are capitalizing from this advantage, where the planning and setting of a new intermodal rail terminal is done concomitantly with a logistics-zone project. This partnership fundamentally acts as a filter for the commercial potential of the project, as both actors must make the decision to go ahead with their respective capital investment in terminal facilities and commercial real estate. Co-located logistics-zone projects tend to be significantly larger than conventional logistics zones that tend to be solely serviced by road. The convergence between the need for rail companies to develop large terminals to accommodate economies of scale, and the capital intensiveness of these investments, has incited partnerships with large commercial real estate developers who have the capital and expertise to develop large logistics zones. CenterPoint Properties, which was acquired in 2006 by a branch of CalPERS (California public employees' retirement fund), is a salient example of a commercial developer actively involved with several rail operators in the development and management of logistics zones. While in most cases CenterPoint will bring forward a project after a terminal development project has been announced, the trend is shifting towards a concomitant planning of the intermodal rail terminal and the logistics zone. Therefore, distribution centres operated by the freight distribution industry are increasingly part of logistic park projects co-located with intermodal rail terminals (Rodrigue *et al*, 2010).

The BNSF Logistics Park Chicago began operating in 2002 and is entirely private, the terminal constructed by the class 1 rail operator BNSF for about US $1 billion with ProLogis and CenterPoint responsible for the provision and management of distribution centres. Thus the world's largest rail company is in partnership with two of the largest promoters and managers of logistics

space. It is a suburban logistic centre taking advantage of the principle of co-location; the rail terminal and the logistics park have been constructed at the same time, which reduces drayage considerably. A wide array of freight distribution activities is present, including free trade zones. Most of the site is a reconversion of a former army munitions depot (arsenal), which account for 2,200 acres (excluding the rail terminal). The rail terminal handles the largest volume in North America and is directly linked to the most important North American rail corridor, the Los Angeles–Chicago axis. The rail lines of this corridor are either owned by BNSF or UP. The terminal is therefore modern and productive with limited dwell time and demurrage. This productivity and capacity obviously benefit the co-located activities that use such advantage in their marketing, as the site benefits from massive economies of scale and an excellent accessibility to the North American freight distribution system.

A large share of the real estate of 12 million square feet are leased, underlining that the business model is based upon revenue generation from location to amortize capital investments. The main tenants are Wal-Mart (retailer with 3.4 million square feet), DSC Logistics (third-party logistics service provider; 3PL), Georgia Pacific (the world's largest wood product manufacturer), Potlatch (forest products), Sanyo Logistics (distribution), Partners Warehouse (3PL), California Cartage (3PL) and Maersk Logistics (3PL). The presence of the maritime shipping company Maersk underlines the setting of a hinterland strategy pursued by several shippers around the world, which help better manage their containerized assets. The BNSF Logistics Park is an important component for inland distribution for imports from the West Coast and its dynamics are thus strongly linked with trans-Pacific trade. About two miles north of the site, a second component was planned with 3,600 acres that have been acquired by CenterPoint. The CenterPoint Intermodal Center, Joliet (CIC-Joliet), which is co-located with a new UP intermodal terminal, came online in 2010. Jointly with BNSF Logistics Park, CIC-Joliet creates the largest logistics centre in North America. This underlines a co-location principle that goes beyond logistic activities to include rail terminals.

CenterPoint-KCS Intermodal Center, Kansas City

With the ongoing integration of the North American economy, Kansas City has seen the emergence of a new corridor towards Mexico, often dubbed the 'NAFTA highway'. The rail operator Kansas City Southern (KCS) has been a major proponent of this corridor by establishing a Mexican subsidiary (Kansas City Southern de Mexico; KCSM) with rail terminals at the port of Lazaro Cardenas. The system is labelled KCS International Intermodal Corridor. However, the setting of this corridor requires supply chain managers to consider the Lazaro Cardenas option, thus the setting of an inland port at the end of the corridor in Kansas City to help anchor this freight. KCS and CenterPoint Properties began in 2007 building a 1,340-acre inland port labelled CenterPoint-KCS Intermodal Freight Gateway over a reconverted military

base (Richards-Gebaur). This reconversion is managed by the Kansas City Port Authority that can sell or lease the land under its jurisdiction. The developer Hunt Midwest is also involved in projects related to underground warehousing facilities.

Like many inland ports in North America it follows the landlord model where a real estate promoter seeks revenue generation through a partnership with a rail operator, building logistics activities in co-location with the rail terminal. This park is a geographically specialized inland port within the Kansas City cluster, with an orientation towards Mexican supply chains or global supply chains going through Mexico. It is thus interesting to note that the complex is labelled as a gateway to underline its status as a point of entry of global trade transiting through Mexico to an inland port deep inside the United States. The site has a foreign trade zone (FTZ) status, which supports its NAFTA-related import function. Like many commercial projects, the development of the inland port is divided in phases (five in this case) where facilities are incrementally provided to the location market. What is also particular to the project is that due to its adjacency to a major interstate highway and its proximity to Kansas City (25 kilometres south), a retailing component is planned with the sole purpose of revenue generation. However, in part due to the recession that unfolded in 2008, the project took time to attract tenants. The first lease was signed in 2013 when the US Department of Agriculture elected to relocate its animal and plant inspection facility within the logistics park. This underlines that it is often difficult to reconcile the goals and expectation of a logistics park project with commercial opportunities.

A freight and logistics policy framework

The enormous growth of freight shipments and the associated transport needs have caused a wide range of problems and conflicts that are primarily visible in metropolitan and urban regions. These problems are due both to capacity and acceptability constraints of the current distribution system, of which the former is generally accepted as a serious challenge to policy and planning. In contrast, sustainability of freight transportation is (still) subject to minor consideration, because economic interests are often ranking much higher than social or environmental goals. Yet air pollution, noise emissions and the degradation of infrastructure (roads, bridges), mainly caused by heavy-duty vehicles, happen at a certain cost for environment and society – not to mention the extraordinary demand for space at major gateway locations for warehousing, vehicle operations, trans-shipment, or the storage of empty containers.

Judging from the perspective of policy and planning, freight transport and logistics is an increasingly important issue, and it also represents a target extremely difficult to manage. This is due to the cost-sensitive character of freight transport subject to corporate management and decision making, which is different from passenger transport where decisions are mainly

made by individuals, following more than just cost-based rationalities. Freight is both an outcome and a component of highly abstract network architectures that are not necessarily open for external management: for example, for governance in the public interest or in response to local issues. Freight transport remains in private interests that seek to maximize system-wide utility. Finally, the potential degree of any planning intervention depends upon the regulatory framework that has been changing significantly over the last two or three decades, thus driving freight growth through shrinking barriers for trade and transport, falling freight rates and a highly competitive environment in the logistics service industries.

If we take a closer look at the regulatory framework and the physical operationality of the freight distribution system, the current situation appears quite contradictory, with deregulation and market liberalization on the one hand, in order to allow for accelerating freight flows – and increasing constraints due to infrastructure bottlenecks, urban density and scarce land on the other hand. As a consequence, there is a remarkable contrast between the fluidity of flows and the inertia of the physical infrastructure, even if we acknowledge the rising significance of information flow and managerial competence. Because transportation systems, particularly infrastructure and land supply, cannot accommodate the growing amount of freight traffic, the question is how the associated problems might be solved in future, with much higher transportation volumes in addition to the performance of the current systems.

To answer this question, it makes sense to look back and raise the issue of how municipalities and transportation planning authorities have tackled these problems in the past (see Banister, 2002). In general, transportation planning has long been focusing on passenger transportation and did not extensively develop plans and strategies for distribution. In many cases, distribution has been considered an undesirable land use at the local level, at least in economically prospering regions (in others, logistics firms have been welcomed for the sake of certain economic benefits such as jobs, local tax revenues, etc). Planning activities with respect to truck transport and rail freight have been undertaken only recently, compared to passenger transportation and the respective tradition of modelling, traffic counting, etc.

The strategies of policy and planning with respect to freight distribution and logistics have changed remarkably over the last four decades. With regard to the style of policy making and intervention, different stages can be distinguished. During the 1960s, freight was not particularly addressed by transportation planners, except for matters of fact such as that: 1) infrastructure had to be provided; 2) in the case of port cities, that port development in general was a major policy issue that shifted some attention to freight distribution. Planning practice in the 1970s and 1980s was likely to pay more attention to freight yet mainly followed the traditional guidance of 'predict and provide', focusing on measures that were devoted to widening and expanding the infrastructure network. Not earlier than in the 1990s, the issue of intermodality emerged as a generally accepted paradigm for policy and planning.

Whereas the deregulation of transport markets have substantially lowered the degree of government intervention, to some extent air quality policies have been introduced as new regulation tools, for example, addressing emission standards. At the end of the 1990s and early 2000s, there are substantial increases in freight-related activity at both metropolitan and national levels. As a consequence of the accelerated growth of freight transport and the rising degree of conflict, urban economists, transportation planners and the trade sector share a rising interest in freight issues. Metropolitan planning organizations and also the federal government were developing elements of a freight-related policy framework (eg developed and distributed under the auspices of the Federal Highway Administration). This happens in order to make freight and logistics more efficient and more acceptable, by integrating freight into planning schemes and frameworks and also by offering training and education capacity.

With respect to the capacity constraints and the sustainability deficiencies of the current freight system, the need for developing a balanced framework of policy and planning measures is undoubted. Different from more traditional routines of infrastructure expansion, it would comprise a comprehensive policy approach with respect to energy, climate change, infrastructure policy and modal share, within which intermodality would play a key role. It is also time for better balancing the freight sector with community demands: for example, regarding traffic generation, demand for land or neighbourhood impacts of inner-city distribution centres (cf. TRB, 2003; McKinnon, 2009). Regional examples such as the Seattle–Tacoma 'FAST Corridor', the Alameda Corridor or other initiatives in the metropolitan regions named above underline attempts to try to divert freight in a firmly established national trucking market. Although on paper these initiatives appear quite reasonable and promising, the existing distribution system takes time to adjust. So the modal shift they were designed for may take much longer than expected, whereas in the meantime road freight transport is growing further. Case studies may even provide evidence to suggest that attempts at freight planning are not that useful unless coming from the private sector, or at least in close cooperation with it. For example, the Port Inland Freight Distribution Network of the Port Authority of New York and New Jersey has also shown a rather slow start with much less traffic than expected, in spite of subsidies and incentives. Thus modal shift strategies, either planned or left to market forces, are facing substantial inertia reflecting accumulated investments, routes and management practices.

A sound strategy for policy makers will be to favour freight distribution systems that are able to cope with changes, particularly not only those that are exclusively business related. Surprisingly the issue is more of adaptability and flexibility, which reflects what freight distribution systems have become, rather than anticipation. A national freight policy should mainly be articulated first at distributing case studies, good practice and policy experience to attract business and planning communities to put freight on the agenda, to collect data and develop strategies – and only then should plans be implemented.

A second issue is to identify strategic locations where transport investment is required to ensure adequate and reliable freight transport systems. They often correspond to congestion bottlenecks. Once these high-priority locations are identified, and adjustments made to satisfy various interests, private investments should be secured by guaranteeing protection against short-sighted local Nimbyism through the rationale of national strategic importance. On the one hand, local opposition has been one of the most powerful forces that have impaired the development of transport systems, eg in California things have even gone to the extreme; their philosophy is to build absolutely nothing anywhere nearby anything, which partially explains the growing difficulties that freight distribution is having along the West Coast. On the other hand, corporate activity in logistics and distribution still lacks more sustainable and responsible modes of management that are becoming increasingly accepted in major parts of the manufacturing industry.

Energy, climate change and North American freight distribution

Energy issues, climate change and the related environmental and economic impact will clearly affect the North American freight distribution network. Because of its high reliance on trucking and airfreight to support time-based distribution, the freight distribution system is particularly vulnerable to petroleum price increases as they were already observed during 2008. Even more than this is the case in Europe. North American logistics and freight distribution operates on the assumption of low energy costs, and most investments in logistical infrastructures were made in such a context and with expectations that they would remain within a specific range. The fast development of the logistics industry in the 1990s became accelerated by the deregulation of most transport sectors, making the design of large-scale distribution networks attractive, with the effect of an increasing amount of vehicle miles travelled. This mode of rationalization was based on the assumption of very low energy prices, implying that energy considerations were limited in the planning and operation of freight distribution.

However, the long-term trend of rising oil prices and the convergence of supply, distribution and refining constraints will make an undeniable mark on the economic sustainability of the transport industry and force substantial adjustments. Among those, a shift to more energy-efficient modes can be expected, notably towards rail. As rail freight transport systems are already fairly congested, notably along long-distance east–west corridors, substantial investments will be required in rail infrastructures to ensure an efficient and low-energy-intensity inland freight distribution. This system could be complemented by coastal and fluvial barge systems, much in the line with Western Europe. A better usage of existing resources will take place, notably in terms of existing capacity and locations, inciting innovations in the management of distribution. Intense productivity pressures will be placed

on existing transport capacities, especially trucking. Location and accessibility, traditional components in costs-based assessments of transportation, will see renewed focus. Balances between modes, locations, times and costs are to be re-examined to mitigate growing mobility costs with the timely requirements of distribution. A reverse trend in logistics may take place with several customers willing to trade more time for lower costs.

Environmental changes will be of importance for future developments, since on the one hand freight transportation, particularly the operation of trucks, contributes significantly to climate change, air pollution and related damages. Data as of the early 2000s suggest that freight transportation contributes to about 8 per cent of the total greenhouse gas emissions in the US and about 9 per cent in Canada (Winebrake *et al*, 2008: 1006). According to a study commissioned by the Federal Highway Administration (FHWA), freight transportation is a major source of national NO_x and PM-10 emissions. Particularly, freight vehicles contribute approximately half of mobile source NO_x emissions and 27 per cent of all NO_x emissions at the national level. Freight transportation also accounts for 36 per cent of US mobile source PM-10 emissions (ICF-Consulting, 2005). Such emissions are usually concentrated along major truck routes and close to freight facilities, such as ports and large DCs, where neighbourhoods are thus exposed to health risks. On the other hand, freight operations will be affected by the outcomes of climate change, particularly as a consequence of changing meteorological conditions such as increases in very hot days and heat waves, increases in Arctic temperatures, rising sea levels, increases in intense precipitation events and increases in hurricane intensity, which lead to the flooding of coastal roads, railways, transit systems and runways (Committee on Climate Change and US Transportation, 2008). Besides mitigation policies that are discussed as means to reduce the likelihood and extent of global warming effects, adaptation policies are now increasingly considered. Hence, policy makers and institutions are forced to take into account climate change and the vulnerability of transport systems and infrastructure.

Meanwhile, logistics firms and actually all freight industry sectors (such as trucking, rail, airfreight, ports) have started to develop programmes and initiatives in order to make their businesses greener, as did manufacturing corporations concerning sustainable supply chain management (Boons, Baumann and Hall, 2012). So far, however, overall emissions still remain at high levels as a consequence of the overall growth of trade, travel, and import and export of commodities. Both industry leaders and policy makers will be challenged in the near future to transfer the transport system and thus make it more sustainable (Banister and Hickman, 2013).

Conclusion

North American logistics and freight distribution is adapting the major macroeconomic changes linked with globalization, namely an acute division

of production. In turn, efficient transport systems have made this modern, large-scale and network-oriented mode of production possible. Both respective interrelations are contributing to an increasing amount of freight transport. This development is causing new challenges, particularly between major North American gateways and inland freight distribution systems. In this context, an interesting question is whether there will be a certain reorientation on the global manufacturing and distribution map that reflects the rising degree of risk within the global transport network architecture. The more restricted that transportation infrastructure and efficiency becomes, the more attractive it will be to search for options of reorganization and regionalization of supply chains.

In the foreseeable future, the biggest momentum towards higher efficiency and sustainability of the distribution system will be provided by higher energy prices than those that prevailed in the previous decades. Achieving major modal shifts from road and airfreight towards rail and shipping modes could make the entire system more transport and energy efficient, so this is one of the strategies usually being developed as a response. Yet under current circumstances, both supply- and demand-side operations and requirements may delimit the needed flexibility of shippers and thus the desired change within transportation systems. However, rising transport and logistics costs will be the greatest stimulus among any other measures to reorganize the way that materials flow and goods are delivered. This will trigger a phase of investment in real productive assets to guarantee future economic growth. The reliability of freight transportation infrastructures and operations is likely to be one of the top priorities.

The fact that North American logistics is a trans-jurisdictional issue involves two major dimensions. First, the commercial context is shaped by forces well outside the control and, to some extent, the comprehension of any political jurisdiction. Second, freight transportation and logistics are mostly a private industry and the allocation of assets is the outcome of profit-seeking and efficiency-maximizing strategies. The phase of deregulation that North American transportation went through in the last decades was mainly aimed at the national transport industry. It was not expected that, because of the growing level of internationalization of supply chains, global freight shipping companies such as maritime shippers and port operators would play such an important role in North American logistics. In such a context, the expansion of the Panama Canal is creating a new set of opportunities for North American logistics that could have an impact on inbound container traffic and, particularly, on the export of bulk commodities.

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INDEX

(*Italics* indicate a figure or table in the text.)