

Research for Development

Christine Harland

# Supply Chain Management

Concepts, Challenges and Future  
Research Directions



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# Research for Development

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Christine Harland

# Supply Chain Management

Concepts, Challenges and Future Research  
Directions



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My greatest thanks go to John, Sophie and in memory of Alan—I dedicate a life's work to the important people who have always supported me.

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**Part I**  
**The Conceptual Bases for Supply Chain**  
**Management**

# Chapter 1

## Introduction



### 1.1 Purpose of the Book

This book series of ‘Research for Development’ was conceived by Springer and the Politecnico di Milano to “*promote complex texts that are the outcome of wide-ranging and highly sophisticated research projects, defined by multi-disciplinary content and targeting development.*” The purpose of this book is to contribute to this series by focusing on supply chain management, telling a story of the outcomes of a wide range of international, multi-disciplinary research projects, involving empirical and conceptual research, in manufacturing and service contexts, public, private and third sector settings.

The outcomes of these research projects are positioned in the context of extant research in supply chain management, thereby highlighting their particular contributions to the field. It is intended to weave a tapestry that brings together relatively disconnected areas of a field of academia and practice that uses the brand ‘supply chain management’ but has taken very different perspectives and approaches. The book addresses contemporary challenges facing supply chain management and considers what the future may hold for the field and the implications for research.

Within each chapter boxes are used to highlight featured research outputs to illuminate the story. The story is, in part, a personal one as the highlighted research is from the many international teams of academics and practitioners that I have been privileged to work with over the last 35 years. The perspective taken is my personal perspective that is quite normative, positivistic and pragmatic. In this introduction I feel it necessary to explain why I have looked at supply chain management from this perspective and how it has influenced the research contributions presented here.

## 1.2 Combining Perspectives of SCM Research and Practice

As an undergraduate, I studied the first business degree with a specialism in Materials Management at, what was then, Coventry (Lanchester) Polytechnic and is now Coventry University in the UK. As a ‘thin sandwich’ degree, academic study was interwoven with periods of apprenticeship with the Dowty Group, a heavy engineering company headquartered in the UK, sponsoring commercial and engineering students. The academic content was a broad syllabus of business subjects including marketing, finance and accounting, business strategy, economics and law. Students who specialised in Materials Management covered all of the syllabus for membership of the Chartered Institute of Purchasing and Supply (CIPS) and focused their final dissertation on a Materials Management topic, graduating with both an honours business degree and MCIPS.

This Materials Management perspective will be explored in Chap. 2 where the concept of Supply Chain Management is examined as it has developed chronologically. Materials Management focused on what we might now term ‘the internal supply chain’, connecting the materials and information flows from the inbound to outbound ends of manufacturing organisations. However, the academics designing and delivering the teaching were purchasing and supply management specialists.<sup>1</sup> We studied the US academic work of Dean Ammer, Hal Fearon, Charles Faris, Yoram Wind, Gary Zenz, Michel Lienders and, from the UK, the seminal work of David Farmer and Peter Bailey. In the periods of internship, I worked in buying, inventory management, production planning and control, sales and distribution, warehouse management and spent an invaluable time on the shop floor, using lathes, mills, drills, observing and trying a wide range of processes including welding, fabricating, machining, plating and assembly. Most of my time was spent in Dowty Mining Equipment where mining chocks to support the roofs of mines were made. I was there during the time when China came out to the international supply market to source equipment and infrastructure for their large-scale industrial expansion. As China did not have currency to buy this equipment, I learnt about and was involved with product buy-back deals (examined in Chap. 7). We sold the coal mining equipment to China; they paid us later with the coal they had mined using that equipment. I was also involved in the subsequent stages of product buy-back deals—finding buyers for coal, and many other products we were paid in, including wine, craft goods and basically anything less economically developed countries had to trade.

Having graduated I worked in industry in buying, inventory management, production planning and control and other functions within materials management for organisations including Dowty, GEC Telecommunications and companies in the automotive aftermarket, before being invited to apply for an academic position in the Materials Management group at Coventry (Lanchester) Polytechnic. From there I

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<sup>1</sup> My sincere thanks go to John Stevens and Malcolm Saunders of Coventry (Lanchester) Polytechnic.

moved into mainstream Operations Management at Warwick Business School<sup>2</sup> and focused my PhD on the relatively new topic of Supply Chain Management. As part of my doctoral research, I visited as many international scholars who had published using the term Supply Chain Management as I could, only to find they were mostly, implicitly or explicitly, using the term in different ways. The reason for summarising this education and career history is that having worked in academia and practice in operations management and purchasing and supply management/ materials management, profound differences between these two perspectives and communities were evident. From Warwick I moved to the University of Bath where Richard Lamming and I formed and ran the Centre for Research in Strategic Purchasing and Supply (CRiSPS). During my 18 years at Bath, I led teams of researchers conducting coproduced research, particularly with the National Health Service, HM Treasury, the Police Service but also with large private sector organisations including Hewlett Packard, British Telecom, Nestle and Nokia.

Later at Cardiff Business School I was head of one of the largest academic groups in logistics and operations management in Europe. This group has distinct expertise in logistics, systems dynamics and operational research approaches to supply chain management. Working in different academic groups has enabled me to view SCM from multiple perspectives and has led to integration of these perspectives in this research brief.

### **1.3 Reflecting on Programmes and Projects of Research**

Within this research brief ‘our’ research refers to the contributions to supply chain management made by academic teams I have worked with throughout my career. In addition to full time academic positions at Warwick Business School (UK), University of Bath (UK), Cardiff Business School (UK) and Politecnico di Milano (Italy), I have also held visiting positions at Fundacao Getulio Vargas (Brazil), University of Padua (Italy), Swedish School of Economics, (Finland), Curtin University (Western Australia), Politecnico di Bari, (Italy) and Arizona State University (US). My international co-authors to the contributions highlighted within this text by presenting our work within boxes are:

Markus Amann, Alessandro Ancarani, Elmer Bakker, Richard Brenchley, Nigel Caldwell, Guy Callender, Federico Caniato, Stuart Chambers, Jeff Clark, Paul Cousins, Lisa Ellram, Michael Essig, Petra Ferk, Lin Fitzgerald, Samantha Forrest, Federico Frattini, Helen Gilhespy, Rick Grimm, Alan Harrison, Michael Henke, Stuart Humby, Ken James, Thomas Johnsen, Bob Johnston, Louise Knight, Richard Lamming, Davide Luzzini, Jane Lynch, Katy McKen, Antonella Moretto, Guido Nassimbeni, Mark Pagell, Andrea Patrucco, Esmee Peters, Wendy Phillips, Philip Powell, Erik van Raaij, Jens Roehrich, Stefano Ronchi, Frank Rozemeijer, Yasmine

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<sup>2</sup> I am indebted to Professor Chris Voss for appointing me and supporting me to study for a Ph.D. in the burgeoning field of Supply Chain Management.

Sabri, Fredo Schotanus, Gene Schneller, Nigel Slack, Roxanne Sutton, Wendy Tate, Tundai Tatrai, Jan Telgen, Khi Thai, Chris Uden, Helen Walker, Arjan van Weele, Derek Williams, Finn Wynstra, Mohammad Hossein Zarei, Jurong Zheng, George Zsidisin.

My perspective of supply chain management has been greatly influenced by the fact that the majority of my research portfolio has been conducted in complex supply systems, notably the National Health Service of England and Wales and the United Nations. It has also focused on how government spending through public procurement can be used as a lever of public policy implementation. As co-founder of the International Research Study of Public Procurement (IRSP) with Jan Telgen, I have been a member of this international research network which has completed 9 phases of research over 20 years. Working with the National Institute of Governmental Purchasing (NIGP), the Chartered Institute of Purchasing and Supply (CIPS) and the Dutch purchasing association NEVI has focused my research particularly on the profession of purchasing and supply management.

## 1.4 Structure of the Book

Following this introductory chapter, the book is divided into 3 parts. Part I provides the conceptual bases and is divided into 3 chapters. Chap. 2 develops the concept of supply chain management, Chap. 3 examines supply structure and Chap. 4, supply process.

Part II focuses on challenges in Chap. 5 on interconnectedness in supply, Chap. 6 on supply resilience to global crises and Chap. 7 on supply policy.

Part III looks to the future of supply and implications for research. This final chapter is coauthored with Jon Gosling, Amina Imam, Maneesh Kumar, Antonella Moretto, Mo Naim, and Margherita Pero. Contributions to the chapter are based on two workshops with SCM teams at Cardiff Business School and Politecnico di Milano.

## 1.5 Key Reflections

Whilst proposing and positioning the research brief to address Supply Chain Management, this term is used initially as it is the most popular brand that has gained and retained traction in academia and practice. However, this brief tells a story of the development of the concept of ‘supply strategy’, This is not an attempt to try to replace the well-established brand of SCM, but rather to stretch boundaries of the field of SCM beyond how it is conventionally conceived, taught and practised. The first key reflection is, therefore, that more academic work is required on conceptualising SCM to provide greater clarity and sense of identity for future researchers. Chapter 2 features publications of our work dealing with thinking about and developing knowledge on how we conceptualise SCM.

The second key reflection is on how strategy is conceptualised within our field. Operations strategists conceived of strategy as 'structure' and 'infrastructure', based largely on the work of Hayes and Wheelwright (1984) and Terry Hill (1985). Over time, business strategy and economics thinking and language have been embraced within supply chain management. Chapters 3 and 4 divide research contributions into 'structure' and 'process' rather than using the term infrastructure. However, as is exposed in these chapters, there is still a confusing array of uses of 'strategy', 'structure', 'infrastructure' and 'process', so we should still strive to be explicit in our work about how we are using these terms.

Collaborating with co-authors and having the opportunity to read more widely to produce this brief and position our work in extant literature has enabled me to reflect on systems thinking. To make sense of SCM my doctoral thesis delivered a systems level view of the field as something that was happening within firms, in dyadic relationships, in external supply chains and in supply networks. Systems thinking has stayed with me, implicitly and explicitly, in the quest to understand the fragmented, sometimes chaotic and messy world of supply chain management as it developed from birth to how it is conceptualised today. In this brief in Chaps. 3 and 4 knowledge relating to supply structure and process is examined at systems levels of dyadic supply relationships, triadic relationships, supply bases, external supply chains, supply networks, supply systems and supply markets.

A further key reflection is on normative and positive approaches to supply chain management in academic research. Tackling challenges in public sector and not for profit services has necessarily required understanding of larger, more complex systems of supply, as discussed in Part II of the brief where challenges are examined. This impacts on the research methodologies used in much of the research featured here. We have researched *with* organisations and practitioners, in addition to objectively observing from the outside, often creating coproduced findings with practitioners using participatory research methods. Coproduced research is not simply consultancy or bad science; rather it is an engaged, participatory way of conducting empirical research with different methods to ensure rigour. It provides greater opportunity for verification, discursive analysis and delivery of shared outputs with measurable outcomes and impact. It is still challenging to publish coproduced research in top academic journals although, as this research brief shows, it is not impossible. Other academic fields, such as those studying healthcare, social care and climate change, were quicker to embrace these methods and use evidence-based, participatory, coproduced research methods before operations management, purchasing and supply management and supply chain management. If SCM is to broaden its understanding of behaviour and tackle contemporary wicked problems, we can learn more about how to produce rigorous research using a wider range of participatory methods.

Related to this is the contemporary academic debate in Supply Chain Management around contrasting views on when and how supply chain managers can manage supply beyond their organisation boundary and when they cannot. When managing is not perceived as possible, supply chain managers try to understand how to react to, and cope with, what is happening. This contemporary debate in our field is evident particularly in the research outputs of academics researching interorganisational networks



and supply chains as complex adaptive systems. These themes are explored through research featured in Chaps. 3 and 4 where empirical research findings reveal different approaches to supply chain management structure and process are more or less appropriate in different types of supply networks. These themes are explored further in Chap. 5 where the challenges of interconnectivity in supply are examined.

This research brief also contains reflections on the need for broadening beyond our traditional firm-based thinking, originating in the theory of the firm and still prevalent in most MBA teaching. As supply chain managers engage with larger, more complex supply systems arising from globalisation and outsourcing, and contemporary crises including war, pandemics, climate change and natural disasters, they engage with different forms of governance at higher systems levels. Chapters 4, 5 and 6 feature research findings that stretch our boundaries beyond our SCM, firm-based traditions.

Related to this, Chap. 7 deals with supply policy and the role governments, national services for health, security and international development and confederal systems such as the United Nations play in supply. Research on public procurement is featured as a policy lever for these larger, complex systems of supply to use to implement policy.

Chapters 2, 3, 4, 5, 6 and 7 provide the conceptual bases for supply chain management in Part I and key challenges facing our field of research and practice in Part II. Throughout these chapters, 8 explicit principles of supply chain management are developed. These principles are:

**Principle 1:** Supply chain management is a multi-systems level endeavour within internal supply chains, supply relationships, supply bases, external supply chains, supply networks, supply systems and supply markets

**Principle 2:** Supply chain management integrates strategic perspectives of operations management, logistics, purchasing and supply management and marketing

**Principle 3:** Supply chain management transforms resources to supply goods and services to ultimate end users

**Principle 4:** When researching or managing supply in practice we focus on the procurement of resources, their operational transformation and distribution of goods and services. The domain of interest of SCM is not interorganisational or industrial networks of organisations, only the subset of parts involved in operations and supply

**Principle 5:** All supply operations exist in their own unique set of supply structures. From their unique vantage point, they may observe, and attempt to engage with, upstream and downstream supply structures

**Principle 6:** Supply structures comprise supply nodes connected by supply flows and processes

**Principle 7:** Supply is governed and conducted at four managerial levels of supply operations, supply management, supply strategy and supply policy

**Principle 8:** Supply structures and processes are interconnected in complex, dynamic supply systems and supply markets.

In the final chapter in Part III, a team of co-authors bring together their reflections, combined with those of the SCM groups in the University of Cardiff and Politecnico di Milano, on possible futures for supply chain management. In particular, we draw out implications for research and the future development of the field of supply chain management.

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# Chapter 2

## Developing the Concept of Supply Chain Management



### 2.1 Introduction

Supply chain management (SCM) is a commonly used term in business and academia, but with many different meanings, representing different perspectives and varying spans of influence and interest. The term supply chain management was first used in a publication from the Booz Allen and Hamilton consultancy practice in the early 1980s (Oliver and Webber, 1982) to refer to materials flows within manufacturers. Similar concepts were evident from the 1960s, including ‘materials management’ (Ammer, 1962) and ‘materials administration’ (Ericsson, 1969). Related concepts such as ‘value chain’ from industrial economics/ business strategy (Porter, 1980) and ‘commercial chain’ from manufacturing strategy (Hayes and Wheelwright, 1984) have also been used, providing different perspectives for those working in the nascent field of supply chain management practice and research to consider. In the next section this chapter examines the origins and different definitions of supply chain management. A conceptual framework is provided to help position different definitions according to their span of influence and interest, in terms of both the coverage of business decision-making areas and span of organisations involved.

Whilst supply chain management rapidly developed since its inception, other fields of business and economics were also pushing their boundaries to consider similar issues and opportunities for more integrated thinking. Having examined the chronological development of definitions and concepts of SCM, a section on the state of the art of where SCM currently sits, relative to other academic and practice fields is provided. The overlaps and similarities are explored, as are the distinct differences between thinking and perspectives in other related fields.

As the academic field of supply chain management has grown, research has illuminated and enabled reflection here on three key developments that are central to our research. These reflections push the boundaries of supply chain management outwards, expanding by embracing theories and concepts from other fields, rather than focusing on increasing specialisation and fine tuning of existing knowledge