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## Supply Chain Innovation for Competing in Highly Dynamic Markets: Challenges and Solutions: Preface

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## Preface

Recent years have seen major changes in the logistics and supply chain management (SCM) landscape. Firstly, markets have become more competitive and complex and customers have become more discerning. Secondly, changes in the international economic and business environment have resulted in supply chain configurations becoming more international, and sometimes genuinely global, in complexion. Thirdly, as firms have focused on their core competencies, the outsourcing of supply chain activities deemed to be “non-core” has taken place resulting in a process of vertical disintegration in many supply chains. Finally, successful firms are increasingly recognizing that the supply chain itself represents a potentially major source of competitive differentiation. This point is critical. The key objectives of SCM relate to the consistent achievement of the customer service levels demanded in target markets and the optimization of total supply chain costs. As customer service is becoming an order winning criterion in an increasing number of sectors, the role of SCM as a key source of strategic differentiation has become more critical. The continuous quest by firms to become more cost competitive has also sharpened the focus on the need for robust SCM given that a large proportion of the cost base of organizations is in the supply chain. Leveraging the supply chain as a key source of competitive advantage has, therefore, become a more critical and urgent task.

In this competitive and highly dynamic environment organisations that fail to deal proactively with these challenges will not succeed. The key to success is based on developing competitive supply chain strategies that provide a basis for meaningful change across the supply chain. Failure to change will almost inevitably result in decline (i.e. “standing still = falling behind”). However, it is not about change for the sake of change; rather, it is about carrying out supply chain processes in a different and more innovative manner. The word “innovation” - derived from the Latin “novus” meaning “new” - is about identifying new and better ways of doing things in all aspects of an organisation’s activity.

This book identifies some of the key challenges and solutions when it comes to applying innovative approaches across the supply chain. In particular, it focuses on the barriers to success, as well as on the critical success factors, in identifying the key challenges and implementing appropriate solutions aimed at improving the efficiency and effectiveness of supply chains.

Four main areas of innovation have been identified given their role in the overall SCM philosophy. Firstly, supply chain integration (SCI) has long been regarded as the central tenet of SCM thinking. Any meaningful attempt at innovating supply chains must, therefore, have a strong focus on this area. Section 1 of this book identifies challenges and possible solutions in this area. Recent years have seen rapid developments in supply chain technology based in particular on information and communications technology (ICT). There is little doubt that these tools have the potential to generate significant supply chain improvement if implemented in an integrated and strategic manner. Innovation in the application

of these emerging technologies is the key to ensuring that this potential is realised in practice. This is the focus of Section 2 of this book. The contribution of logistics and supply chain activities to environmental degradation has highlighted the need for more sustainable approaches to the design and management of supply chain operations. Legal, market and financial considerations have brought this issue to the fore in recent years. Section 3 of this book explores innovation in the context of the environmental sustainability, identifying a range of challenges and proposing a number of possible solutions to these challenges. Finally, all supply chains comprise a large number of discrete organisational entities each of which plays a specific role in the value creation process. Effective SCM relies heavily of the ability of firms to properly manage their suppliers in a proactive and strategic manner. Innovation in this complex supply system provides the focus of Section 4 of this book.

## **Section 1: Innovation in Supply Chain Integration**

The contemporary supply chain management (SCM) paradigm focuses heavily on the notion of integration. Integration in this context is primarily concerned with replacing traditional supply chain configurations that were often characterised by high levels of fragmentation with more innovative approaches that are characterised by different supply chain elements working together in a more seamless fashion. The integration concept can be considered at many levels. The two primary levels considered in this book are internal and external. The former refers to the integration of activities and processes within organisations, with the latter referring to interaction between different entities upstream and downstream in the supply chain. Given to centrality of supply chain integration (SCI) in the wider SCM approach, it is clear that any worthwhile attempt at improving supply chain capability and performance should focus on innovation in this regard.

Challenges can only be identified by fully understanding the dynamics of the business environment, as well as the strengths and weaknesses of existing supply chain architectures. In relation to solutions, it is important to recognise that all supply chains are unique and require innovation that is appropriate to the situation under consideration. This uniqueness relates to products, processes, people and much else besides. Identifying the appropriate form of supply chain change must pay attention to detailed issues associated with the distinctive characteristics of an organisation and its operating environment. This is particularly the case with regard to SCI. Identifying the appropriate solution requires that the process of supply chain analysis and planning is carried out in a logical and systematic manner with proper attention to detail. It further required that integration plans are properly implemented, paying particular attention to cultural and other people-related aspects of the change process.

## **Section 2: ICT Supply Chain Innovation**

Although many technological innovations have affected logistics and SCM in recent decades, there is no doubt that developments in information and communication technology have been the main driver of change in the field. Both academics and managers have emphasised the potential role of ICT to pervade the whole supply chain, enabling not only the integration of functions and processes of a single company, but also those of suppliers and customers with broad and long-term implications for an organisation's competitive advantage.

ICT is considered one of the most prominent innovation domains in the supply chain. A growing number of companies have adopted new information systems and technologies for supporting their logistics and SCM operations. Examples include Dell, Wal-Mart, Cisco Systems, Intel, Celestica and General Electric. The main benefits achieved by these companies relate to end-to-end visibility, reduced cycle time and inventories, minimization of the bullwhip effect, and improvements in the effectiveness of distribution channels. This supports the view that ICT has a profound impact on the management of supply chains as new technologies greatly facilitate the flow of information, extend control over remote operations and across organisational boundaries and automate processes.

As result, the adoption of new technology innovations and the benefits associated with specific types of ICT-related innovations are of paramount interest to the different kinds of companies operating in supply chain networks. The chapters included in this part of the book deal with challenges and solutions concerning technology innovations particularly with reference to the adoption of new technologies in the logistics service industry, radio frequency identification (RFID) supply chain applications and intelligent freight transportation systems (IFTS).

Despite information technology capabilities being critical for logistics service differentiation and a tool to cut costs and effectively serve clients through better service customization, the adoption of ICT is a great challenge for logistics service providers, particularly for small and medium-sized logistics service providers. Due to a lack of resources, these companies show difficulties in investing and using ICT. The analysis of a number of case studies of small Italian logistics service companies provides implications for supply chain innovation. Firstly, closeness to customer is a relevant source of collaborative innovation. Secondly, the combination between “service strategy” and “technology strategy” is an important factor stimulating supply chain innovation. Thirdly, in order to obtain differentiation advantages from ICT usage, the focus of small logistics service providers’ technology investment have to be on the way ICT used rather than on technology itself.

A further challenge faced by logistics service providers relates to rapidly changing service requirements. Visibility, capacity and equipment utilization, reduction in inventory and transportation costs, monitoring of supply chain security and environment control are increasingly demanded by buyers of logistics services. As documented by two leading case companies based in an Asian country, the adoption of ICT innovations in these areas may provide solutions at both operational (functions and processes) and strategic level (human, knowledge and technology capital development), at firm and industry levels, and more importantly, some of these innovations may have environmental ramifications.

A key challenging area in SCM concerns uncertainty. Shortening product lifecycles and fast changing customer demand for products or services result in more uncertain and complex environment. ICT applications may provide solutions in mitigating and managing uncertainty in a supply chain context. This is the case with radio frequency identification (RFID) in retail industry. This sector is facing a paradigm shift in managing perishable items characterized by limited shelf-life that make supply chain decisions even more difficult, leading to high loss rates. RFID may provide relevant information in order to make the good’s deterioration process more predictable and visible at the early stages of supply chain. Innovative retailers can use RFID applications to reduce costs and the risk associated with fluctuations in demand and energy costs. Interesting aspects of this innovation might be the positive impact on accountability of losses along the supply chain and implications for contracts and buy-back options.

Uncertainty also affects inventory management. It is considered a challenging task in SCM due to difficulties in estimating demand, especially in the case of new products. In addition, unpredictable demand and dynamic consignment locations make stock control challenging. These issues frequently

result in high inventory costs, inadequate resource allocation and slow response to the customer. An innovative solution for enhancing inventory management should be based on a mix of technology and theory. Combining RFID application for collecting data (to optimize inventory level along the supply chain) and artificial neural network for data analysis (to forecast future demand), it is possible to achieve lean and economically efficient supply chain management.

In recent year, intelligent freight transportation system (IFTS) has been widely used to optimize transport and logistics operations. IFTS opens up possibilities to face many challenges in this area by increasing monitoring, control and planning capabilities. Nevertheless, the strategic potential of IFTS has not been analysed beyond purely operational benefits. Integrating the key IFTS components (smart goods, smart vehicle, and smart infrastructure) may provide solutions to better exploit these innovative systems and provide the base for a more solid evaluation of their effects on transport and logistics operations

### **Section 3: Sustainability Innovation**

The pressure on companies to improve their environmental sustainability is steadily mounting. It is coming from various sources. Government agencies at multi-national, national, regional and local levels are tightening environmental regulations, introducing new forms of green taxation and offering more incentives for companies to clean up their operations. Consumers have become much more aware of environmental issues and are taking greater account of them in their buying decisions. Other stakeholders, particularly investors and employees, also have a strong interest in ensuring that their companies meet high environmental standards.

While the corporate drive to become greener is affecting most aspects of the business, particular attention is focusing on logistics and SCM because these activities are geographically extensive and environmentally intrusive. The movement of freight is a major emitter of greenhouse gases and other air pollutants, is one of the main causes of noise disturbance and is responsible for a significant proportion of traffic accidents. Many of the related costs are external to companies' balance sheets and borne by the community at large and ecosystems. People enjoy having the goods that logistics systems bring them, but generally perceive the delivery process as being bad for the environment.

Many people hold this negative view despite the fact that there have been impressive improvements in the environmental performance of logistical activities over the past few decades. For example, in Europe and North America truck exhaust emissions are an order of magnitude cleaner today than were in the early 1990s. Vehicles are much quieter, safer and less damaging to the road surface. These environmental improvements have resulted from the application of a range of technical and operational innovations. Green logistics has proved to be a fertile area for such innovation and this is likely to continue. This is illustrated by the four chapters in this part of the book which show how a range of new systems, practices, regulations and technologies can reduce the environmental impact of logistics even more.

A first challenge in this field concerns effective ways of increasing the environmental sustainability of road freight transport. Relaxing legal restrictions on truck weights and dimensions allow companies to consolidate freight in a smaller number of deliveries. The experience of companies which permit the use of longer and heavier vehicles (LHVs) demonstrates that they offer a combination of economic, environmental and safety benefits. Proposals to extend the use of LHVs in Europe has, however, proved to be extremely controversial and met with strong resistance from railway interests and environmental groups. Reviews the available published evidence on this issue show how the diffusion of a major transport innovation can be obstructed by government regulation and political lobbying.



The role of the public sector also features prominently in assessing the potential of urban consolidation centres (UCCs) to rationalise the movement of freight in urban areas. Although the earliest UCCs emerged in the 1970s and they have been the subject of numerous feasibility studies since then, it is only over the past few years that their commercial and operational viability has been demonstrated, both in the retailing and construction sectors. A general overview of the UCC concept and its related benefits have been outlined and four case studies in different urban contexts have been used. From the review of the literature and analysis of the case studies, a series of critical success factors have been identified that need to be present for this city logistics innovation to meet its economic and environmental goals.

Another challenge analysed focuses on the return movement of waste products from urban areas. A range of reverse logistics innovations that can improve the efficiency and reduce the environmental impact of the return flow of waste for recycling, reuse or disposal have been analysed. If successfully implemented, these measures can make recycling more commercially attractive, increasing its uptake and yielding additional environmental benefits. The proposed solution is based on various operational, regulatory and equipment innovations, ranging from the integration of commercial and household waste streams to the introduction of 'smart' bin technology.

Finally, the contribution logistics service providers can make to raising environmental standards in this sector has been explored. As a large proportion of logistics expenditure is now outsourced, logistics service providers directly control much of the movement, storage and handling of goods across supply chains. Some logistics service providers now recognise that environmental innovation can be a competitive differentiator, but survey evidence suggests that many are disappointed by their client's lack of interest in environmental initiatives. Logistics service providers need to be given stronger incentives to develop green service portfolios and closer collaboration between logistics service providers and their clients on environmental programmes is recommended.

## **Section 4: Innovation in Supply System Management**

Customer-supplier relationships have been undergoing massive changes at a national and international level. These changes concern various aspects of such relationships: the object of transactions between customer and supplier (such as parts, components, complex systems); the firms' functions involved in the supply relationship (such as production, design, planning, marketing); the supplier's skills required by the customer (such as technical, logistics, managerial); and the level of trust and collaboration which sustain the relationships. From the analysis of the literature emerges that it is not easy to summarise the evolution of the customer-supplier relationships. Nevertheless, it is possible to identify four main evolving phases: 1) traditional supply (1960s - 1970s); 2) supply system development (1980s); 3) strategic alliance (1990s); and 4) globalisation (2000 and beyond). In line with this evolution, customer-supplier relationships are involved both in radical processes of innovation and new challenges oriented to the search of greater efficiency and effectiveness. The chapters included in this part of the book deal with five main challenges related to innovation in supply system management.

The first concerns the problem of the implementation of discontinuous innovation in supply chain relationships. The solution proposed indicates that it is necessary to look beyond the individual psychological barriers and organisational issues that have traditionally been discussed in the relevant literature. A multilevel analysis is needed in order to fully appreciate the complexity of the phenomenon of discontinuous innovation implementation in supply chain relationships.

The second challenge relates to the potential use of formalized supply evaluation models for the strategic management of the supply system. There are at least four good reasons to use formalized models rather than qualitative approaches; these relate to learning, transparency, motivation, and managerial issues. In this way, the customer is facilitated to manage the whole supply chain and constantly re-align the suppliers' objectives with its own goals.

The third challenge involves the concept of preferred customer status as a means for creating supply-side induced advantages in highly competitive supplier markets. This stresses the importance of being a preferred customer, particularly in a new product development context. The implication here is that implementing a preferred customer policy in buying firms this may improve the conditions for innovating with suppliers.

The fourth challenge concerns the human side of the supply chain and its role in supply chain risk management. Starting from a behavioral perspective, innovative approaches that include behavioral analysis in supply chain design and management can significantly contribute to supply chain risk reduction by taking into account the individual attitudes and biases of the decision maker.

The last challenge concerns risk management as a strategic approach to improving logistics outsourcing. The implication is that risk management could be an innovative tool facilitating the success of logistics outsourcing by securing future performance and relationships between supply chain partners.

## **Organization of the Book**

The book is organized into four parts and includes 20 chapters. Each part is dedicated to one of the four supply chain innovation areas indicated previously. This section provides a brief description of chapters included in each of the above four areas.

The first part of the book deals with innovation in supply chain integration (SCI) and includes six chapters.

Chapter 1 analyses the concept of SCI on the basis of an extensive literature review. It focuses on identifying the main challenges associated with the implementation of an integrated business paradigm. The chapter focused on the effective management of both internal and external customer/supplier relationships as prerequisite for achieving the benefits connected with supply chain integration.

Chapter 2 discusses the barriers to SCI. The author notes that relevant literature has analyzed the many possible forms of SCI that may take place but that little progress has been achieved in its practical implementation. For these reasons, the chapter is focused on analyzing three obstacles to SCI: terminology/definitions; information systems and technology; and, organization design. These barriers have been identified as the most are critical challenges improve SCI in the next few years.

Chapter 3 deals with strategies for SCI in electronic product supply chains. The chapter investigates the main similarities and differences between the distribution models of digital and physical products. Using a number of case studies, the authors show how the software and hardware supply chain elements may be integrated within the hi-tech supply chain in order to deliver continuously innovative value to customers.

Chapter 4 is focused on challenges connected with supply chain integration in a mature industry. The work examines the level of SCI in the Thai textile and garment industry. The results of the analysis provide a road map for orienting integration processes in the textile and garment supply chains.

Chapter 5 provides an application of the SCI approach in maritime ports. The authors proposed a new theoretical model aimed at identifying the sources of value creation in port environments. The model may be used to support port authorities in defining strategies on the basis of a pro-active role for ports in an SCI context.

Chapter 6 deals with challenges in the implementation process of SCI in a public hospital in Ireland. The author points out that innovative SCI approaches must be incorporated into the implementation process in this complex environment. Using the action research approach, the work identifies critical success factors and inhibitors to success in relation to SCI in this environment.

The second part of the book is focused on ICT innovation in supply chains and comprises five chapters.

Chapter 7 is focused on the adoption of ICT in small transport and logistics service providers. In this context, technology adoption and investments are particularly challenging. Through a case study analysis conducted in the Italian logistics service market, the work analyses the role of ICT in service customization together with inhibitors and enabling factors influencing ICT related innovation.

Chapter 8 examines innovative ICT applications in transport and logistics in Asia. The work provides examples of effectively usage of ICT tools and applications and how these have shaped the innovation landscape of Asian supply chains.

Chapter 9 discusses challenges in using technology to reduce supply chain uncertainty and losses in the supply chains of perishable goods. Using the example of strawberries in Switzerland, the authors investigate how and under what conditions the value of information provided by the RFID technology may provide increasing efficiency in logistics operations and lowers the environmental footprint of supply chains.

Chapter 10 deals with the challenges posed by demand uncertainty and the bullwhip effect in the supply chain and how to mitigate this effect through the use of technology. The authors discuss the use of RFID to minimize the potential impact of the bullwhip effect through information symmetry across the supply chain and increasing visibility of goods and material flows, keeping track of the location and quantity at distribution centers and warehouses. The work proposes a new framework that, combining the strengths of RFID and neural networks, allows for more accurate inventory analysis and demand forecasting in fast moving consumer products' supply chains such as electronics and automobiles.

The third part of the book presents four chapters focused on environmental sustainability innovation in the supply chain.

Chapter 11 addresses the challenge of analyzing the effects of intelligent freight transportation system (IFTS) in the economic, environmental and social areas. Several effects were found that may increased performance of transport operations including automatic item identification, safety and security prevention, real-time navigation, traffic situation notification and carbon footprint registration. The possible solutions relate in most instances to advanced ICT components that allow more sophisticated ways of planning, monitoring and controlling transportation operations.

Chapter 12 reviews recent studies on size and weight of trucks as a way to improve road freight transport efficiency and reduce its environmental impact. The author presents an analytical framework based on two key benefits that may be achieved through consolidating loads in fewer vehicles: reduction in vehicle operating costs; and, reduction in lorry traffic levels which helps to alleviate environmental impacts and congestion.

Chapter 13 discusses the role that urban consolidation centres (UCCs) can play in helping to reduce goods vehicle traffic and its environmental impacts in urban areas. The authors analyze freight transport and the logistics advantages offered by UCCs. They provide empirical evidence based on four case stud-

ies of recent UCCs trials in the UK comparing objectives, operational and financial aspects and impacts of these UCCs. Critical success factors are also identified.

Chapter 14 presents some of the innovative approaches that have been taken by businesses involved in reverse logistics for the removal of waste from urban areas. This chapter reviews some of these approaches and suggests which could be used more widely based on their specific limitations.

Chapter 15 is focused on the role of transport and logistics service providers in developing sustainability innovation in a supply chain context. The author reviews options available to transport and logistics service providers wishing to market their green logistics capabilities and discusses the potential for them to assume a pro-active role in promoting a more sustainable supply chain.

The fourth part of the book concerns innovation in supply system management and it includes five chapters.

Chapter 16 deals with discontinuous innovation in supply relationship management focusing on its implementation process. The authors present a literature review on motivation, barriers and enablers connected with the implementation of discontinuous innovation. The literature review has been used to analyze the implementation process of discontinuous innovation in two case examples. The results allow the identification of future research avenues in this field.

Chapter 17 addresses the issue of methodology for supplier evaluation. There is a gap between theory and practice in this field. The chapter attempts to bridge this gap proposing a new methodology based on the Analytical Hierarchical Process (AHP) that has been empirically tested in a number of case studies. The results allow identification of the strengths and weaknesses of surveyed suppliers and demonstrate the potential of the method as a strategic tool for managing the supply chain.

Chapter 18 explores the concept of preferred customer status and how this concept may have a positive impact on the generation of innovation upstream the supply chain. This chapter focuses on the importance of being a preferred customer particularly in a new product development context by empirically testing the impact of preferred customer status on the level of supplier innovation in a buyer-seller relationship. The results indicate that implementing a preferred customer policy in buying firms may contribute to improving the conditions for innovating with suppliers.

Chapter 19 discusses behavioral research relevant to supply chain risk management. The work provides an overview of the extant literature on behavioral issues in SCM and outlines opportunities for future research in this area.

Chapter 20 explores the effect of risk management on logistics outsourcing. The authors propose a model for risk management in logistics outsourcing relationships. The model has been tested using a case study. The findings show that risk management may be an innovative tool in managing supply chain relationships as it has positive impact on the various determinants of outsourcing success.