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Section 1
The Use of Information Technology in Supply Chain Management

Chapter 1
Enterprise Applications for Supply Chain Management .............................................................. 1
Susan A. Sherer, Lehigh University, USA

Although many companies have implemented ERP systems to track and share information across cross functional business processes, they often supplement them with legacy, custom, or best of breed applications to support supply chain execution and management. This article offers a framework for understanding all types of enterprise applications that support the supply chain. In this study, the authors organize these applications, define acronyms, and describe the various types of systems that make up an information infrastructure for supply chain management.

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The increasing rate of technology growth has resulted in decrease in cost of information. These technologies are helpful in coordinating the activities resulting in effective management of the supply chain. Literature shows that the use of Information Technology (IT) plays an important role in managing the processes of SCM. This has resulted in increasing use of IT in SCM. The computerization of SCM processes, if implemented in one go may result in failure. IT implementation prioritization in supply chain is a major issue before the planner as there is no clear cut formula to solve this problem. This paper considers components of SCM like material management, purchase management, production management, logistics and distribution and customer interface for IT implementation prioritization. Two multi-criteria decision making methods (MCDM) viz. analytical hierarchy process (AHP) and a technique for order preference by similarity to ideal solution (TOPSIS) are used in this paper. The novelty of the paper lies in integration of AHP and TOPSIS methods for IT implementation prioritization. The weights of the criterions and the alternatives are calculated using AHP method which is used as an input for TOPSIS analysis for prioritization of IT implementation.
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Rebecca Angeles, University of New Brunswick Fredericton, Canada

In this study, the author examines organizations’ perceptions of the importance of absorptive capacity attributes in the deployment of radio frequency identification (RFID) in a supply chain and their relationships with operational efficiency and market knowledge creation as moderated by information technology infrastructure integration and supply chain process integration. Data was collected using a survey questionnaire administered online to members of the Council of Supply Chain Management Professionals (CSCMP). Four proposed hypotheses were partially supported in this study. Both variables, IT infrastructure integration and supply chain process integration, moderate the relationships between three predictor variables, business process modularity, standard electronic business interfaces, and breadth of information exchange and the two dependent variables examined in this study, operational efficiency and market knowledge creation to a considerable extent. This study has clear implications for how decision makers affecting their firm’s supply chains should make a business case for robust IT elements that support both IT infrastructure integration and supply chain process integration.

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Historically, the growth of the beef industry has been hampered by various entities, i.e., breeders, cow-calf producers, stockers, backgrounders, processors, etc., within the beef industry’s supply chain. The primary obstacles to growth are the large numbers of participants in the upstream side of the supply chain and the lack of coordination between them. Over the last decade significant advances have been made in information and communication technologies, and many new companies have been founded to promote these technical advances. This research looks at both the upstream and downstream participants to determine the degree to which information technologies are currently being utilized and the degree that these new technologies have driven performance improvements in the beef industry’s supply chain. Through surveys, the authors find that the beef industry does not use information technologies to their benefit and that the US beef supply chain is not yet strategically poised to enable the use of these technologies.

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Mickey Howard, University of Exeter, UK
Richard Vidgen, University of New South Wales, Australia
Philip Powell, Birkbeck, University of London, UK, & University of Groningen, The Netherlands

Amid the turmoil of the current economic crisis, the wild expectations for business-to-business electronic marketplaces or ‘e-hubs’ as transformative modes of exchange for all industries have subsided. However, e-hubs continue to elicit interest in industries such as car production. Yet, there is little research that investigates firms’ strategies for e-procurement in the automotive industry and the potential benefits of
e-hubs to them. This research re-examines the transition from bespoke electronic data interchange to
generic electronic procurement, and conflicting motivations and complex barriers at firm and industry
level are revealed. The article develops a framework that examines the benefits and barriers to firms
joining e-hubs, applies the framework to the car industry, and proposes an e-procurement matrix that
offers alternative strategies. Six cases from vehicle manufacturers and component suppliers demonstrate
a shallow industry structure that lacks supplier integration, where a particular concern is the emergence
of consortium e-hubs that combine a transactional approach for reducing price, with a collaborative ap­
proach that requires sharing knowledge. While this dispels the myth of simplistic e-commerce models,
the governance of e-procurement across collaborative supply chains is still uncertain.

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Experiences from enterprise-wide integration initiatives during more than four decades indicate that
industry-wide information integration could render substantial benefits. Two ways in which industry-wide
integration differs from enterprise-wide integration are that there is no common management level and
the economic units in the integration are the constituent units, not the industry. Management involve­
ment has been emphasized as perhaps the most critical success factor for enterprise-wide information
integration. The common economic unit enables increased costs in one part of the organization to lower
the total cost in the company as a whole. In this article the authors address which consequence these two
differences have for the development of information integration in four industry-wide supply chains.
The authors find the existing methods for enterprise-wide information integration, such as BPR, virtually
impossible to apply on industry-wide information integration and that the disjoint economic responsibility
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Supply chain performance is often equated with acquiring the best technology or process. However,
current studies suggest that supply chain performance also requires human collaboration. To change
conventional thinking, this paper proposes a holistic approach to supply chain management (SCM),
clarifies the forces that facilitate human collaboration, and identifies the steps management can take to
create a more collaborative network.

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This paper examines how supply chain conflicts across domestic and international jurisdictions arise and
become resolved given that conventional conflict resolution tribunals cannot effectively settle fast enough
to serve the needs of supply chain partners. Observations from the field should guide practitioners, and
in combination with information technology, may lead to best practice rules in dispute resolution. For
this study, the Delphi Method was selected, in which a panel of 14 experts participated in three rounds of successive surveys over a one-year period. Survey data was collected by mail as well as via telephone conversations and interviews, while under the Delphi method, the content of the second questionnaire was derived from the responses of the first questionnaire. All participants were supply chain experts in the United States from eight different industrial sectors, and none of the participants interacted with one another. End results show that supply chain’s relationships are very private trade arrangements and that disputes arise, predictably, from common performance criteria such as quality, timely delivery and payment issues.

Chapter 9
Fair Distribution of Efficiency Gains in Supply Networks from a Cooperative Game Theory Point of View

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In this paper, the authors address the distribution of efficiency gains among partially autonomous supply network actors in a manner they will accept as fair and as an incentive to cooperation. The problem is economically significant because it requires substantiating efficiency gains in an understandable manner. Moreover, supply networks suffer from a conflict potential because the partially autonomous actors seek to maximize their own shares of the efficiency gain. The method applied appropriates a model from cooperative game theory involving the τ-value. The special nature of the τ-value ensures that it seems rational to the actors to cooperate in the supply network. The proposed method for the distribution problem offers a fair distribution of efficiency gains in the supply network and ensures that the distribution results can be communicated easily.

Section 3
Production Planning and Inventory Management

Chapter 10
Dynamic Price and Quantity Postponement Strategies

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This paper studies duopolistic competition under dynamic price and production quantity postponement for two differentiable products, which share common components from one supplier at a certain degree of substitution. Both price and quantity postponement is benchmarked according to the Bertrand and Cournot Stackelberg game. In addition, system dynamic is applied to show the long term effect of both strategic decisions (price and production quantity) on profit and against demand uncertainty. The results show that price postponement is appropriate for high modular products (make-to-stock) and production quantity postponement for special orders (make-to-order). The final part of the paper concludes with results and outlines future research directions.

Chapter 11
Determining Optimal Price and Order Quantity Under the Uncertainty in Demand and Supplier’s Wholesale Price

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Manufacturers in a high-tech durable product industry may have to make operational decisions in the presence of uncertainties associated with product demand and supplier's wholesale price. In this paper, the authors investigate the impact of such uncertainties on the activities of a manufacturer and its supplier and develop an optimization model that describes how the manufacturers should reflect the uncertainty issues in their pricing and order quantity policy to achieve a desirable profit. In the modeling process, three important managerial problems are discussed, i.e., the effect of coordination between a manufacturer and its supplier in dealing with uncertainties on product demand and supplier's wholesale price, strategies for mitigating both errors in demand forecasting and supply risk, and modeling frameworks to determine the optimal solution for price and order quantity based on the varying levels of coordination. To identify best operational decisions under market uncertainty, the authors use the stochastic optimal control theory.

Chapter 12
Simulation of Inventory Control System in a Supply Chain Using RFID

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This paper employs a simulation model in a Supply Chain Management (SCM) system. This study is one of the first to present simulation model of inventory control system in supply chain management using barcode and Radio Frequency Identification (RFID). The main objective of this model is to compare two inventory systems in a supply chain, one using RFID, versus the barcode. The model will help company to consider moving from a barcode system to the RFID application. A quantitative analysis based on a simulation model is developed. The model runs for both systems using ARENA simulation software with a comparison between the two systems. Furthermore, the simulation model is tested by applying three different types of demand for both scenarios. The results have shown that regardless of demand distribution pattern and customer order rate, the outcomes of the model are consistent and provide promising RFID technology adoption to improve inventory control of the entire supply chain system. The installation and unit cost of RFID implementation were estimated and considered to be the main barrier. Such model can offer the policymakers insight into how RFID might improve SCM system performance. Additional test has been conducted for demand with normal and triangular distributions using real data provided by ABC-Dubai Company. The results obtained from running the two models for these distributions are consistent with the original results.

Chapter 13
Two-Commodity Markovian Inventory System with Set of Reorders

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This article examines a two commodity substitutable inventory system—two different brands of super computers under continuous review. The demand points for each commodity are assumed to form independent Poisson processes. The reordering policy is to place orders for both the commodities when the total net inventory level drops to any one of the prefixed levels with prescribed probability distribution. Lost sales are assumed during the stock out period. The lead time for a reorder is exponentially distributed with parameter, depending on the size of the ordering quantity. The limiting probability distribution for the joint inventory levels is also evaluated. Various operational characteristics and total expected cost rate are derived. Numerical examples are provided to find optimal reorder quantity and band width.
Chapter 14
A New Look at Selecting Third-Party Reverse Logistics Providers ..........................................
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The use of Data Envelopment Analysis (DEA) in many fields is based on total flexibility of the weights. However, the problem of allowing total flexibility of the weights is that the values of the weights obtained by solving the unrestricted DEA program are often in contradiction to prior views or additional available information. Also, many applications of DEA assume complete discretionary of decision making criteria. However, they do not assume the conditions that some factors are nondiscretionary. To select the most efficient third-party reverse logistics (3PL) provider in the conditions that both weight restrictions and nondiscretionary factors are present, a methodology is introduced. A numerical example demonstrates the application of the proposed method.

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Logistics problems are gradually becoming more complex and a better understanding of logistics management as a subject is a key to deal with the new challenges. A core element of logistics management is logistics planning, which substitutes for low customer service levels, high waste, and the use of buffers and slacks in the execution of logistic activities. Furthermore, the availability of information and problem-solving capabilities are established as the core parts of logistics planning. Based on this, in this paper, a conceptual model for the management of logistics planning is proposed and discussed. In this regard, the model is built on ideas from microeconomics.

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Albert Wee Kwan Tan, National University of Singapore, Singapore
Peter Hosie, University of Wollongong, Dubai, United Arab Emirates

Third Party Logistics (3PL) in Asia emerged as an important trend in logistical management and Thailand continues to develop in this service rapidly. While a great deal has been written about the dissemination of information technology (IT), few empirical investigations address the use of IT in relation to 3PLs in Thailand. In this article, the authors use an empirical study to investigate the profiles of 3PLs in Thailand and their company strategies for providing logistics service and use of IT. Survey results show that Thailand’s 3PL companies must expend more effort to strengthen basic IT and infrastructure to enhance competitiveness. IT capabilities in Thailand are increasing rapidly and its effective adoption has the potential to significantly enhance the competitiveness of small 3PLs. Still many barriers exist to the successful adoption of IT by these providers. Given the importance of such companies in supply chain management, these issues must be fully understood.
Section 5
Supply Chain Monitoring and Performance Management

Chapter 17
Design and Development of an e-Platform for Supporting Liquid Food Supply Chain Monitoring and Traceability

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In this paper, the deliverables of a research project are presented, which aims at the development of a web-based platform capable of supporting the traceability of liquid products like milk, wine, and olive oil. First, it includes the design of a supply chain reference model and the identification of the data required for the efficient operation of the traceability system. The main elements of the proposed model defined in this paper are the entities, stages, events, and processes. The reference model consists of three distinct phases that represent stages of real-life supply chains. Each of these phases is defined by certain interactions between the above basic elements. Additionally, the proposed e-platform is based on the above reference model aiming to follow and register the production and distribution processes of the raw materials, semi-finals, and final products that are used in the examined industry.

Chapter 18
A Composite Method to Compare Countries to Ascertain Supply Chain Success: Case of USA and India

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Supply chains are assessed for the contribution they make in improving business processes. Assessment also looks at the return on investment and improves the overall functioning of the entire chain. However, supply chains extend beyond geographical borders and span a wide variety of activities; therefore, a systematic examination of factors required for success of supply chains is essential. This paper proposes a composite method by which supply chains could be assessed at multiple levels to enable a comprehensive comparison. The objective is to first compare at a global level and then narrow down to the firms’ level. Although over time a number of measures have been developed to evaluate supply chain performance, this paper provides a methodology involving well-known techniques to assess the supply chain success based on objective considerations. Furthermore, the authors demonstrate how global players can select the partnering countries to reap maximum benefits. Finally, a comprehensive model is provided involving three approaches that look at the issue of comparison from different perspectives and are debated with respect to India and the United States.

Chapter 19
An Automated Supply Chain Management System and Its Performance Evaluation

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The MIDAS system is an automated supply chain management system that enables customers, manufacturers, and suppliers to cooperate over the Internet. MIDAS aims to achieve high customer satisfaction by supporting the build-to-order customization model and to reduce inventory carrying costs and logistics administration costs at the manufacturer by supporting the just-in-time manufacturing model.
It allows a manufacturer to choose from the MIDAS Registry, suppliers of components, and negotiate based on the prices, availability, and delivery times of those components. The manufacturer can use one of several strategies to aggregate customers’ orders before processing them, and one of several strategies to accumulate suppliers’ quotes before deciding on a particular supplier. The paper presents an evaluation of these strategies in terms of the customer’s satisfaction, as measured by the customer response time, and the manufacturer’s gain, as measured by the number of orders aggregated or the best price ratio.

Chapter 20
Supplier Selection by the Pair of AR-NF-IDEA Models ................................................................. 349

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Supplier selection is the process by which suppliers are reviewed, evaluated, and chosen to become part of a company’s supply chain. To select the best suppliers in the presence of cardinal data, ordinal data, nondiscretionary factors, and weight restrictions, this paper proposes a new model considering all of these assumptions. A numerical example demonstrates the application of the proposed method.

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