Innovations in Logistics and Supply Chain Management Technologies for Dynamic Economies

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Chapter 1
A Non-invasive Software Architecture Style for RFID Data Provisioning

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Integrating real-time RFID data into autonomous and heterogeneous information systems across the business value chain presents a number of challenges. At an abstract architecture level, this paper identifies important requirements for RFID data provisioning and points of integration. A non-invasive architecture style is proposed to satisfy these requirements. It has the advantages of low entry barriers, low latency, high flexibility, and independent evolvability. The architecture style is used as a basis for evaluating three existing architectures for RFID data provisioning. Various architecture mismatches that could hinder the pace of RFID adoption are identified and discussed. A new asymmetric integration approach is suggested as an alternative to existing methods.

Chapter 2
Facilitating Consumer Acceptance of RFID and Related Ubiquitous Technologies

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The issue of consumer acceptance in the implementation of RFID and related ubiquitous technologies, driven primarily by privacy concerns, is a complex social problem involving consumers, companies, advocacy groups and government agencies – each of whom has different and often incompatible goals. This research decomposes the problem and explores it from the perspective of one of these stakeholders, that is, a company seeking to implement RFID in order to achieve specific business objectives. The authors establish a theoretical framework, based on social justice theory in business ethics, that identifies the factors contributing to consumer and societal resistance to an RFID implementation. Within this framework, they outline the technical and managerial elements of an implementation plan, and relate those elements to the underlying components of social justice theory. The result is a strategy for technology managers that 1) considers the complex mix of consumer, societal and governmental concerns hindering adoption of the technologies, and 2) indicates areas of potential compromise.
Radio Frequency IDentification (RFID) is an advanced tracking technology that can be used to study the spatial organization of individual’s spatio-temporal activity. The aim of this work is firstly to build a new RFID-based autonomous system which can follow individuals’ spatio-temporal activity, a tool not currently available. Secondly, the authors aim to develop new tools for automatic data mining. In this paper, they study how to transform these data to investigate the division of labor, the intra-colonial cooperation and conflict in an ant colony. They also develop a new unsupervised learning data mining method (DS2L-SOM: Density-based Simultaneous Two-Level - Self Organizing Map) to find homogeneous clusters (i.e., sets of individual which share a similar behavior). According to the experimental results, this method is very fast and efficient. It also allows a very useful visualization of the results.

This study examines the potential of RFID technology to increase the agility of supply-chain e-commerce systems by mitigating the bullwhip effect. The bullwhip effect is a supply-chain phenomenon that reveals a lack of business agility characterized by the amplification of inventory variance. This study employs an experiment involving a modified Beer Distribution Game to simulate an RFID-enabled supply chain. The results provide empirical evidence that RFID technology can increase a supply chain’s agility and reduce the bullwhip effect by reducing inventory holding costs, stockout costs, and inventory-level variances. The results are all the more important when applied to interorganizational e-commerce systems.

Proposed protocols work clumsily in resolving the collisions occurred in dense RFID tag environment. QTDFS-ALOHA, a hybrid protocol which combines the query tree protocol and the dynamic frame slot ALOHA protocol, is proposed. In each frame of this protocol, only tags in the active set are allowed to answer in randomly selected slots. Afterwards, the population of tags in the active set is estimated. According to the identification accuracy required, the protocol may choose to continue the identification of the active set with delicately calculated frame length, or to divide the active set into multiple subsets using some binary prefix strings and identify each subset subsequently in the following frames. This process is performed recursively for all tag sets until the required accuracy is achieved. Proposed tag
population estimation methods are summarized and evaluated. Numeric simulation verifies that this hybrid protocol outperforms other frame slot ALOHA based protocols.

Chapter 6
Analysis of the Cargo Service Dynamics in East Asian Airports ......................................................... 83
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This paper examines the effects of primary production and key economic factors on air cargo traffic between 1999 and 2005 in the East Asian airport industry through econometric and clustering analyses. This paper’s findings show that while the relative importance of physical capital to human capital has dramatically risen, adequate provisions and utilizations of physical facilities for landside operations appear to be a more significant driving force for an airport’s cargo traffic performances compared to those of airside operations. Even though cost savings are found to have regained their importance in the recent years, the degree of scale economies has fallen so sharply that airports can no longer rely on size for competitive edge. Nevertheless, there is still a close positive relationship between a nation’s economic development and the volume of cargo traffic at its airport.

Chapter 7
How to Market OR/MS Decision Support .................................................................................................. 105
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This research examines what decision makers must do to utilize OR/MS decision support. The author investigates OR/MS decision support from a new viewpoint of service. Firstly, OR/MS decision support provides information to aid in decision making, and it is shown that OR/MS decision support shares characteristics with service and can be considered a kind of service. This paper analyzes OR/MS decision support from the viewpoint of what is necessary for high quality service, and the issue of a communication gap is clarified. Through analyzing preceding research in OR/MS (Operations Research/Management Science), the author discovers a communication gap between decision makers and decision supporters. Finally, the author shows that it is effective to utilize “problem specification”, which is a decision-maker friendly description of problems proposed by research group including the author, as one approach to bridge the communication gap.

Chapter 8
Perceived Risk Management: Applying the TEID Model to the Traveler Service Chain ...................... 120
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The purpose of this paper is to contribute to the theoretical work on service-perceived risk management of knowledge-based services (i.e., intangible and heterogeneous) and experience-based services and to suggest a framework that helps to formalize these risks and the value associated with their management, by arguing that this risk management relies on a sequence of risks (Threat, Event, Ignorance and Damage, called the TEID model) and on three categories of control measures (preventative, detective
and protective). By categorizing customer-perceived risks, and by integrating control measures and assurances into their offer, providers can design new and valuable services. Service value-chains involve various providers (implicitly or otherwise) who may engender annoyance and damages as risks are a sequence of events. This paper holds the potential to contribute to extending an understanding and management capacity of customer-perceived risks of knowledge-based services. It brings into play a new framework and new risk management process. It also helps with formalizing and making tangible customer added-value.

Chapter 9
Analyzing Requirements and Approaches for Sourcing Software Based Services ..................... 137

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Erwin Fielt, Queensland University of Technology, Australia

Increasingly, software is no longer developed as a single system, but rather as a smart combination of so-called software services. Each of these provides an independent, specific and relatively small piece of functionality, which is typically accessible through the Internet from internal or external service providers. There are no standards or models that describe the sourcing process of these software based services (SBS). The authors identify the sourcing requirements for SBS and associate the key characteristics of SBS (with the sourcing requirements introduced). Furthermore, this paper investigates the sourcing of SBS with the related works in the field of classical procurement, business process outsourcing, and information systems sourcing. Based on the analysis, the authors conclude that the direct adoption of these approaches for SBS is not feasible and new approaches are required for sourcing SBS.

Chapter 10
An Activity Theory Analysis of RFID in Hospitals ................................................................. 148

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Although there have been many proposed applications of RFID in hospitals, few of those applications have received sustained use in hospitals, to-date. As a result, this paper investigates the use of RFID in hospitals in an emerging application, that of using RFID as part of the prescription process, including pharmacists generation of the prescription and nurses' administration of the medicine. Using activity theory, activity templates are generated for pharmacists, nurses and the hospital to investigate the introduction of RFID. This paper finds that the introduction of RFID involves changes in the activities, as measured by changes in context variables, not just changes in technology. Also, the RFID-based approach eliminates substantial "medicine" slack. Further, using activity theory, the activity design for using RFID facilitates "technologically insulation" of pharmacists and nurses, from each other and doctors. Finally, such "digital specification" of activities likely leads to fewer errors, and constrains action, limiting inappropriate use of prescription drugs.

Chapter 11
Collaboration in Cyber Transportation Logistics: Paradigms and Technologies .......................... 167

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Although the topic of supply chain (SC) and logistics (L) has been discussed in many fora, placing it in today’s cyber (e) space is still a subject that receives little attention. This paper analyzes the role of e-SC/L in the context of global business to business (B2B) electronic commerce (e-commerce). A major beneficiary of e-SC/L are small and medium enterprises (SMEs), who can leverage information technology to bypass the extra cost associated with employing a third-party broker, who traditionally bridges the gap between suppliers and retailers. In this paper, a framework for incorporating both e-commerce and e-SC/L for SMEs is proposed in an e-marketplace context. The model consists of a trading platform with e-SC/L capabilities, and a classification scheme for different levels e-SC/L collaboration, presented with relevant types of information, communication and transportation technology (ICTT) needed to facilitate the design of each collaboration level. Included in the highest level are transportation, identification, and modeling and simulation technologies that enable the design of effective forward-looking collaboration.

Chapter 12
Managing Enterprise Service Level Agreement ................................................................. 183

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The continued trend of globalization and technology improvement like the internet and transportation have spawned an increasing number of complex service chains that span across local, regional and national boundaries. Service level agreement (SLA) plays a crucial role in gluing service chains together. In that regard, this paper provides a complete guidance of end-to-end lifecycle management of SLA, including SLA-aware service modelling and terms optimization, contract drafting and compliance tracking. Among these, the author introduces his work in the area of enterprise SLA optimization to address existing deficiencies in this area including a roadmap for industry-strength SLA optimization capability and an initial version of SLA modeling and optimization toolset—code-named SLA-OASIS. Some out-of-box toolsets for SLA contract drafting and compliance tracking are also introduced.

Chapter 13
Hospital Supplier Relationship Management: Cooperation, Coordination, and Communication ................................................................. 208

Peter Rohner, University of St. Gallen, Switzerland

The structural transformation of modern societies (e.g., aging of population, mobility) as well as continuously increasing market dynamics (e.g., mergers, technological advancement) induces health care organizations to reduce their costs while enhancing service delivery. In other industrial sectors this was achieved by optimizing cooperation, coordination, and communication particularly with regard to the supplier base. However, as the pressure to innovate will increase extensively in the next years, similar developments are becoming relevant for the health care supply chain. In this paper, the authors adapt the current findings on supplier relationship management (SRM) to the health care context. The authors analyze theoretical foundations of SRM and explore a particular area of application in health care, namely the ordering of pharmaceuticals by hospitals. Finally, on the basis of a case study, applications of different SRM services are discussed.
Chapter 14
Research on Innovation Mechanism and Model of Logistics Enterprise: A Chinese Perspective

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As a new field in the service industry, logistics is growing rapidly and is regarded as a fundamental industry in a national economy. Its development is an important symbol of a country’s modernization and national strength. It also works as an accelerator in economic development. At the initial stage of transforming traditional logistics service to a modern logistics service in China, logistics enterprises have encountered many difficulties and problems including an imbalanced supply and demand, distempered industrial structure, faultiness of serving process and backwardness of logistics technology since 2005. Compared with developed countries, there is a great gap between Chinese logistics enterprises and advanced countries’ in the aspects of service concepts, model, and content and techniques. Therefore, based on the service innovation driving model theory, the authors analyze the integrated innovation model of logistics enterprises, logistics technology and network model, and the value-added service model. The authors select Shenzhen China Overseas Logistics Co. LTD (COL) as the empirical object to analyze its operation of technology and non-technology innovation and summarize its inner and outer driving force on promoting service innovation.

Chapter 15
Managing Customer-Centric Information: The Challenges of Information and Communication Technology (ICT) Deployment in Service Environments

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Despite many years of business-orientated information and communication technology (ICT) deployment, contemporary organisations continue to struggle with customer-centric implementation of new technologies that are profitable and contribute to sustainable service business success. This paper reviews the difficulties inherent in using ICTs to manage customer-related information, and identifies the particular challenges for customer-centric deployment of ICTs. It provides a model of different levels of customer centric information use in organizations. The authors review implications for future research in this emerging area and conclude that the challenges of ICT deployment and use must be addressed with an uncompromising focus on customer value as the central principle of both ICT design and deployment, and of information management in service organizations.
Chapter 16
A Game Theoretic Approach for Sensitive Information Sharing in Supply Chain
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With the adoption of radio frequency identification (RFID) technology, information sharing among participants in a supply chain is greatly facilitated, raising privacy concerns on sharing sensitive information. Balancing the conflicts between the improvement of visibility and the decrease of sensitive information shared is paramount. In this paper, the authors propose a leader-follower game model called LFM to model the strategic game between buyer and supplier. A Stackelberg equilibrium state is then computed as the solution to this game model. The proposed approach exhibits better performance when compared with conventional optimization approaches via derivation in terms of the total information sharing level and the total gain acquired verified by the experiments. In the future, the authors will extend this approach to a more complex situation with more participants in a dynamic environment.

Chapter 17
Evaluating the Use of Electronic Door Seals (E-Seals) on Shipping Containers
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In this study, electronic door seals (E-seals) are tested on shipping containers that traveled through ports, over borders, and on roadways. The findings show that using RFID devices increases supply chain efficiency and improves the security of containerized cargo movements, particularly when E-seals replace common mechanical seals. Before the benefits of E-seals can be realized, several barriers must be addressed. A lack of frequency standards for E-seals is a major problem, hindering their acceptability for global trade. Routine use of E-seals also requires new processes that may slow their acceptance by the shipping industry. Disposable E-seals, which decrease industry concerns about costs and enforcement agency concerns about security by eliminating the need to recycle E-seals, are not common because they must be manufactured in large quantities to be cost effective. Compatibility with existing highway systems could also promote E-seal acceptance, as containers could be tracked on roadways.

Chapter 18
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The growing awareness of the strategic value of service along with higher product performance expectations has directed many industries to adopt service centric competitive strategies in managing their supply chains. Service innovation based on currently available advanced technologies has become critical in improving enterprises’ competitive strengths. Wireless sensor network (WSN) technology, which can provide a mobile, scalable, and reliable monitoring solution, is emerging as a tool for service innovation.
in supply chain management. This paper provides an overview of wireless sensor network technology and discusses how it can benefit modern industries. The fundamental theories of WSN are introduced as well as an overview of the development. The impact of information technologies on supply chain management and service innovation is then briefly discussed. Much emphasis is placed on the feasibility, procedures, and critical challenges of implementing WSN in supply chain management innovation. Current and future applications of WSN are also provided, followed by a case study demonstrating the application potentials of WSN for service innovation in the healthcare industry.

Chapter 19
Business Service Scheduling ................................................................. 324
   Jürgen Dorn, Vienna University of Technology, Austria

The management and predictive planning of the processes to create business services is more difficult than the planning of production processes, because services cannot be produced in stock and customers are involved in their creation. In this paper, the author proposes a method for service scheduling and optimization based on an ontology to describe business services and related concepts. The author schedules operations required to create a service. With each service process and its operations, soft and hard constraints on the execution of operations and the required resources are posted. These constraints are derived from service level agreements. A legal plan must then satisfy all hard constraints. All soft constraints are matter of optimization. Using a tabu search, a near-optimal solution of the service scheduling problem is achieved.

Chapter 20
Streamlining Knowledge Map Construction for an Online Auction House Using Automatic Term Filtering ................................................................. 336
   Shailaja Venkatsubramanyan, San Jose State University, USA

Organizations are building automated technical support software that can help both consumers and field support engineers with problem resolution. The goal of the automated technical support system is reducing operational cost and increasing customer satisfaction. This paper examines the set of challenges that knowledge engineers face in building automated technical support software. This paper uses a technical services engagement with a major online auction house with tens of millions of users to highlight the challenges and present an automated knowledge map generation technique. The objective of this automated technique was to improve the quality of expressions extracted from documents, which would reduce the burden on knowledge engineers to construct knowledge maps. The technique was run on large corpora of documents in the online auction house and found a significant increase in the quality of the knowledge map. Further experimentation showed that the technique works well for other domains as well.

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