

## Preface

The success of an enterprise today is funded by its information system. Enterprise information systems (EIS) comprise of information systems such as enterprise resource planning (ERP), supply chain management (SCM) and customer relationship management (CRM). The information system of an enterprise is composed of both software and hardware, and information can be represented in both the human cognitive system and in the digital device system. Disruption of information systems even for a short period of time would cause big problems for business operations.

This edited book "Enterprise Information Systems and Implementing IT Infrastructures: Challenges and Issues" aims at identifying potential research problems and issues in the EIS such as enterprise resource planning (ERP), supply chain management (SCM), and customer relationship management (CRM). It seeks to guide the research scholars and members of faculty working in this area to get a quick glimpse of the current research issues in EIS and the channel to manage those issues. Most of the research works in EIS expresses concern over the managerial factors only and very few research works deal with the technical factors. This book addresses both the managerial and the technical factors.

This book consists of two sections. Section 01 deals with the challenges and issues in enterprise information systems. Section 02 deals with the supply chain management (SCM) system using information technology (IT) and mathematical modeling. An overview of the chapters is presented hereunder.

Chapter 1, "*Engineering the Coordination Requirements in Cross-Organizational ERP Projects: A Package of Good Practices*" by Maya Daneva considers a cross-organization ERP implementation as a coordination problem, and introduce a coordination complexity model based on an organization's level of participation in a business network. It also shows how the external coordination characteristics of an organization can be mapped to ERP-supported mechanisms for cross-organizational coordination. To incorporate this activity in the state-of-the-art ERP RE processes, we propose a set of good practices that counterpart certain coordination issues at different complexity levels. This chapter is based on empirical data gathered from secondary sources. An early validation assessment based on an online focus group composed of ERP solution architects has been carried out.

Chapter 2, "*Agile Software Development for Customizing ERPs*" by Rogério Atem de Carvalho, Björn Johansson, and Rodrigo Soares Manhães maps some of the main agile practices to ERP customization processes. Customization of ERP systems is a complex task, and great part of this complexity is directly related to requirements management. In this context, a well-known problem is the misfit between the ERP functionalities and the business requirements. This problem comprises communication bottlenecks and difficulties in responding to changes. Limitations on the agile approach to ERP customization have been discussed and well illustrated in this chapter.

Chapter 3, "*Software Components for ERP Applications*" by Muthu Ramachandran and S. Parthasarathy identifies a set of key characteristics of ERP system and then map onto a software component model which has been customised for ERP characteristics. A component based software process model for ERP projects is proposed and its significance during the ERP implementation is indicated.

Chapter 4, “*Application of Software Metrics in ERP Projects*” by S. Parthasarathy proposes a Software Metrics Plan (SMP) containing different software metrics to manage software processes during ERP implementation. Two hypotheses are formulated and tested using statistical techniques to validate the SMP. The statistical analysis of the collected data from an ERP project supports the two hypotheses, leading to the conclusion that software metrics are momentous in ERP projects. This chapter presents the literature to emphasize the fact that the failure of ERP projects is because of the poor management of software processes during ERP implementation.

Chapter 5, “*ERP Implementation in a Steel Major in India*” by Sanjay Kumar, Anurag Keshan, and Souvik Mazumdar presents a case study of an ERP implementation in a steel major in India. The implementation of ERP systems in the organization has been described at each stage of the implementation. The activities at each stage and also the issues arising at each stage of the implementation have been discussed. The benefits identified by the managers have also been highlighted.

Chapter 6, “*Implementation of ERP Systems: A Seven Stage Adoption Model*” by Manoj Jha and Sanjay Kumar gives us a new model for effective ERP implementation. This chapter proposes a seven stage model of ERP implementation and adoption from the viewpoint of the ERP implementation consultant. The model also addresses subsequent stages such as a data exploitation stage where organizations learn to use data for decision making and process management. The model also addresses the subsequent stages of extension of ERP to partners like suppliers and dealers, and the innovation stage when the organizations start to experiment with newer solutions based on ERP systems.

Chapter 7, “*Understanding Based Managing Support Systems: The Future of Information Systems*” by Lidia Ogiela, Ryszard Tadeusiewicz and Marek R. Ogiela presents cognitive systems designed for analyzing economic data. Such systems have been created as the next step in the development of classical DSS systems (Decision Support Systems), which are currently the most widespread tools providing computer support for economic decision-making. This chapter defines a new category of systems - UBMSS (Understanding Based Management Support Systems) which conduct in-depth analyses of data using an apparatus for linguistic and meaning-based interpretation and reasoning. This type of interpretation and reasoning is inherent in the human way of perceiving the world. In this chapter, a new class of UBMSS cognitive economic information systems has been designed. This will automatically perform a semantic analysis of business data.

Chapter 8, “*EIS for Consumers Classification and Support Decision Making in a Power Utility Database*” by Juan Ignacio Guerrero Alonso, Carlos León de Mora, Félix Biscarri Triviño, Iñigo Monedero Goicoechea, Jesús Biscarri Triviño and Rocío Millán presents a new methodology to create Enterprise Information Systems which are capable of using the customers’ information completely. As an example of utilization of this methodology, an Enterprise Information System for classification of customer problems is proposed. This EIS implements several technologies. Data Warehousing and Data Mining are two technologies which can analyze automatically corporative databases. Integration of these two technologies is proposed by the present work together with a rule based expert system to classify the utility consumption through the information stored in corporative databases.

Chapter 9, “*Enhancing the Electronic Customer Relationship Management through Data Mining: A Business Intelligence Approach*” by M. Vignesh holds a bird’s eye view of the usage of data warehousing approaches for a systematic business intelligence approach and its varied applications in view of electronic customer relationship management. There exists a hiatus between the data storage and the information retrieval. If capturing and storing the relevant data is a hectic task, then analyzing and translating this data into the actionable information is the other corner stone in any information systems of a concern. This chapter attempts to bridge this gap by the concept of business intelligence.

Chapter 10, *“Towards a Model-Centric Approach for Developing Enterprise Information Systems”* by Petraq Papajorgji and Panos M. Pardalos aims to present a new modeling paradigm that promises to significantly increase the efficiency of developing enterprise information systems. Currently, the software industry faces considerable challenges as it tries to build larger, more complex, software systems with fewer resources. MDA is a model-centric approach that allows for modeling the overall business of an enterprise and capturing requirements to developing, deploying, integrating, and managing different kinds of software components without considering any particular implementation technology. Currently there are two main approaches trying to implement MDA-based tools. One of the approaches is based on the Object Constraint Language and the other on Action Language. An example of designing, developing and deploying an application using this new modeling paradigm is presented. The MDA approach to software development is considered as the biggest shift since the move from Assembler to the high level languages.

Chapter 11, *“Global Emergency-Response System Using GIS”* by Salem Al-Marri and Muthu Ramachandran proposes a model for Disaster Classification System of Natural Disasters and Catastrophic Failures activity. This model also considers the emerging technologies such as ubiquitous computing and wireless communications systems. Furthermore, this chapter proposes the deployment of Global Information Systems (GIS) as an aid to emergency management by identifying the related areas pertaining to disaster and thus to help the personnel involved to analyze disasters more accurately by developing a tool. The aim of this tool is to determine potential and affected disaster areas using the GIS technology and to provide support for decision makers during emergencies. Due to the significant development of computerization, networking and mobile systems, reporting a disaster, nowadays, is only a matter of seconds whereas, in the past it would take days or even weeks for the news to reach the people.

Chapter 12, *“Testing Guidelines for Developing Quality EAI Projects”* by S. R. Balasundaram and B. Ramadoss focuses on the testing aspects related to EAI applications. Especially the significance of testing for various types of “Integrations” is discussed elaborately. Organizations are turning into a new generation of software called Enterprise Application Integration (EAI) to fully integrate business processes. It is an activity that integrates and harmonizes an enterprise’s isolated business applications, processes and functions. EAI is a complex task involving both technological and business challenges. This chapter frames the guidelines for a developing quality EAI projects.

Chapter 13, *“The Post Implementation Phase of a Large-Scale Integrative IT Project”* by Marco Marabelli and Sue Newell focuses on the iterative process that occurs within the implementation phase of an ERP which is depicted as a series of learning cycles: managers make decisions, identify mistakes, and accumulate experience (lessons learned). The author examines these “learning cycles” through the lens of absorptive capacity and illustrates using a case study. It is observed that the learning process is path dependent, organizational memory plays a fundamental role, and double loop cycles contribute in the development of absorptive capacity seen as a dynamic capability.

Chapter 14, *“Challenges in Enterprise Information Systems Implementation: An Empirical Study”* by Ashim Raj Singla identifies the critical success factors for the implementation of enterprise information systems. Enterprise information systems inherently present unique risks due to tightly linked interdependencies of business processes, relational databases, and process reengineering, etc. Knowledge of such risks is important in design of system and program management as they contribute to success of overall system. In this chapter an attempt has been made to study the design and implementation risks factors for ERP systems in large scale manufacturing organizations. Guidelines are presented to mitigate and manage such risks.

Chapter 15, *“Meta-Heuristic Approach to Solve Mixed Vehicle Routing Problem with Backhauls in Enterprise Information System of Service Industry”* by S. P. Anbuudayasankar, K. Ganesh and K. Mohandas presents the development of simulated annealing (SA) for a health care application which is

modeled as Single Depot Vehicle routing problem called Mixed Vehicle Routing Problem with Backhauls (MVRPB), an extension of Vehicle Routing Problem with Backhauls (VRPB). This chapter provides empirical proof in sustain of the hypothesis, that a population extension of SA with supportive transitions leads to a major increase of efficiency and solution quality for MVRPB if and only if the globally optimal solution is located close to the center of all locally optimal solution.

Chapter 16, “*Information Technology enabled Vendor Managed Inventory in modeling Supply Chain Issues: A Review*” by Subramanian Nachiappan and Natarajan Jawahar reviews some of the soft issues in two-echelon supply chain models and proposes a classification schema. This chapter surveys the theoretical background and application of vendor managed inventory systems based on environment, operational issues and solution approaches. Hence it is concluded that the framework presented in this chapter would aid supply chain managers and researchers to further look into the soft issues while modelling supply chain with information technology enabled vendor managed inventory systems.

Chapter 17, “*Two-way Substitutable Inventory System with N-Policy*” by N. Anbazhagan presents a two commodity stochastic inventory system under continuous review. The maximum storage capacity for the  $i$ -th item is fixed as  $S_i$  ( $i = 1, 2$ ). It is assumed that demand for the  $i$ -th commodity is of unit size and demand time points form Poisson distribution with parameter  $\lambda_i$ ,  $i = 1, 2$ . The reorder level is fixed as  $S_i$  for the  $i$ -th commodity ( $i = 1, 2$ ) and the ordering policy is to place order for  $Q_i (= S_i - s_i)$  items for the  $i$ -th commodity ( $i = 1, 2$ ) when both the inventory levels are less than or equal to their respective reorder levels. The lead time is assumed to be exponential. The two commodities are assumed to be substitutable. That is, if the inventory level of one commodity reaches zero, then any demand for this commodity will be satisfied by the item of the other commodity. If no substitute is available, then this demand is backlogged up to a certain level  $N_i$ , ( $i = 1, 2$ ) for the  $i$ -th commodity. Whenever the inventory level reaches  $N_i$ , ( $i = 1, 2$ ), an order for  $N_i$  items is replenished instantaneously. For this model, the limiting probability distribution for the joint inventory levels is computed. In this chapter, various operational characteristics and expression for long run total expected cost rate are derived.

Chapter 18, “*A Fuzzy AHP model for 3PL Selection in Lead Logistics Provider Scenarios*” by Rajbir Singh Bhatti, Pradeep Kumar and Dinesh Kumar discusses the use of Fuzzy Analytic Hierarchy Process (FAHP) to effectively manage the qualitative and quantitative decision factors which are involved in the selection of providers of 3PL services under Lead Logistics Provider (LLP) environments of today. The fuzzy-AHP has been adequately demonstrated in literature to be an effective tool which can be used to factor-in the fuzziness of data. Triangular Fuzzy Numbers (TFN) has been deployed to make over the linguistic comparisons of criteria, sub-criteria and the alternatives. The FAHP based model formulated in this chapter is applied to a case study in the Indian context using data from three leading LSPs with significant operating leverages in the province of Uttarakhand (India). The proposed model can provide the guidelines and directions for the decision makers to effectively select their global service providers in the present day competitive logistics markets.

Chapter 19, “*Achieving Alignment in Production and Logistics Operations in Three Echelon Supply Chain Network through New Heuristic Optimizer*” by Rajeshwar. S. Kadadevaramath, Jason. C. H. Chen and Mohanasundaram deals with the modeling and optimization of a three echelon supply chain network architecture using new Particle Swarm Optimization algorithm. Network optimization is the most basic type of modeling that can be performed with tools which helps to identify optimum paths or flow of goods in supply chain network. It is observed that the demand uncertainty and constraints posed by the every echelon are important factors to be considered during the supply chain design operations.

Chapter 20, “*Achieving Supply Chain Management (SCM): Customer Relationship Management (CRM) Synergy through Information and Communication Technology (ICT) Infrastructure in Knowledge Economy*” by Ashutosh Mohan and Shikha Lal tries to provide insight into how information and communication technology can be leveraged for supply chain value creation and make it possible to achieve

synergy with customer relationship management. The concern about organizational competitiveness and development is closely linked to notions of the information sensitive society and global knowledge based economies. The business organizations under global knowledge economy can emerge and grow rapidly by formulating and adopting the innovative business practices. Information's impact is easily seen—it substitutes for inventory, speeds product design and delivery, drives process reengineering, and acts as a coordinating mechanism, helping different members of the supply chain work together effectively.

Chapter 21, “*Benefits of Information Technology Implementations for Supply Chain Management: An Explorative Study of Progressive Indian Companies*” by Prashant R. Nair focuses on the usage of IT tools for Supply Chain Management (SCM). It also highlights the contribution of IT in helping restructure the entire distribution set-up to achieve higher service levels, lower inventory, and lower supply chain costs. An overview and tangible benefits of the existing IT tools, which are widely deployed, is provided with focus on existing configuration considerations, available applications, and deployments in India. The rapid adoption of the Internet for communication with all stakeholders seems to reflect the potential of the new-age communication media. It has also been observed that several progressive Indian companies are extensively using emerging tools like virtual supply chains, web services, Radio Frequency Identification (RFID), and electronic commerce to shore up their supply chain operations. However, adoption of tools like software agents and decision support systems for supply chain integration by Indian companies is limited.

Chapter 22, “*Mathematical Modeling of Supply Chain Management Systems*” by C. Elango and N. Anbazhagan attempts to find why we require different supply chain for different companies. This chapter discusses the role of stochastic models in supply chain management system. This chapter also discusses other mathematical models for SCM.

Chapter 23, “*Stochastic Modeling in Supply Chain Management Systems*” by C. Elango introduces the concept of Supply Chain Management System (SCMS). Two stochastic modelling problems are discussed in this chapter. Poisson demand process with  $(s, S)$  installation policy at retailer nodes are assumed to simplify the study. The system performance measures are computed with reference to specific cost structure. The total average annual variable cost is taken as optimization criterion. Numerical examples are provided to illustrate the problem.

The objective of this book is to expand the knowledge on enterprise information systems (EIS) and in turn help researchers and practitioners to develop suitable strategies, tactics, and operational policies for EIS and for improving communication in organizations. The book tries to enable the young research scholars to kick off their research in EIS effortlessly and provide them the channels required to do research in EIS meticulously to help the enterprises improve their performance through the successful implementation of an information system. Discussing the design and implementation issues of EIS from different perspectives will help the practitioners to get adapted to the information system in a smooth way and reap its benefits. This book intends to be a forum for exchanging new ideas and developments in the field of EIS. It also acts as a medium of communication among EIS researchers and practitioners.