

Preface

About the Subject

This book addresses the virtual organization (VO) model, a new organizational paradigm, virtually the most advanced organizational paradigm today.

The implementation of this organizational model is complex and challenging, and although we have VO implemented in compliance with a number of theoretical models that were developed in the last few years, we can observe that the implementations still represent a lot of potential for further improvements, as well as that there are needs for new, more advanced, more effective, more efficient, more competitive, and more sustainable. Considering this, the editors have conceived this book with the objective of collecting recent contributions at the several dimensions that can be identified in organization, knowledge, and technology management in the context of VO:

- **Organizational dimension:** Includes approaches, concepts, organizational models, and knowledge management models
- **Managerial dimension:** Includes the process management, integration management, relationship management, process integration, performance measurement, knowledge management, technology integration management, and information integration
- **Technological dimension:** Includes the infrastructures and technologies to support process management, integration management, relationship management, process integration, knowledge management, technology integration management, and information integration, standards, and protocols
- **Organization, knowledge, and technology management applications in virtual organizations,** through case studies and solutions

The mission of the book is to contribute to the discussion of the main issues, trends, and opportunities related to knowledge and technology management in virtual organizations,

from the above-mentioned perspectives or dimensions, and to disseminate proposals, solutions, and conclusions that we believe are relevant to practice.

It is necessary to mention that this book does not cover the whole area of knowledge and technology management in VO. In fact, and besides the effort of the editors, the continuous emerging of solutions made it impossible to totally cover the current state-of-the-art. On the other side, several relevant contributions were not included due to book size restrictions.

However, in its 16 chapters authored by 32 internationally renowned and experienced researchers and professionals in the domain of virtual organizations, the book collects recent models and solutions advanced both by academe and business. It includes different but complementary aspects, such as organizational models, VO models and architectures, VO management, and VO-supporting technologies and infrastructures, all these contributing to make possible the VO model. In this way, *Knowledge and Technology Management in Virtual Organizations: Issues, Trends, Opportunities and Solutions* presents a good representation of emerging contributions that complements the editors' previous book, *Virtual Enterprise Integration: Technological and Organizational Perspectives*, also published by Idea-Group Publishing.

The book is both for an academic audience (teachers, researchers, and students, mainly of post-graduate studies) and professionals (managers, organizational and system developers, and IT specialists) in terms of explaining the requirements and frameworks for the development of solutions.

Organization of the Book

The book contains sixteen chapters, written by a group of internationally-renowned and experienced authors in the VO field, as well as a set of younger authors showing a high potential for research and development. Contributions came from the USA, Latin America, several countries of Eastern and Western Europe, Australia, Taiwan, and Japan. At the same time, the book integrates contributions from academe, research institutions, and industry, representing a good and comprehensive representation of the state-of-the-art adaptive technologies and knowledge management to address the several dimensions of this fast evolutionary area of knowledge.

The sixteen book chapters are organized in four sections:

“Section I: Organizational Requirements” introduces the present business requirements for inter-enterprise integration, namely virtual enterprises or virtual organizations integration and organizational models.

- Why inter-enterprise integration?
- Why virtual enterprise or networked and collaborative organizations integration?
- Which are the integration enablers?

The first three chapters of the book contribute to answering these questions.

Chapter I, “Environments for Virtual Enterprise Integration,” introduces the virtual enterprise model as an emerging approach relying on dynamically-reconfigurable partnerships, with extremely high performances, strongly time-oriented while being highly focused on cost and quality, in permanent alignment with the market, and strongly supported by information and communication technology, dictating a paradigm face shift to the traditional organizational models. Networking and reconfiguration dynamics are the main characteristics of this model, which make the claim for enabling and supporting environments, at bearable costs. Some existing technologies and Internet-based environments can partially support this organizational model, but the reconfiguration dynamics can only be assured by environments able to manage, control, and enable networking and dynamics in virtual enterprise creation/reconfiguration. Several environments are introduced in the chapter, and particular focus is given to the market of resources, an environment coping with the requirements of the virtual enterprise model.

Chapter II, “Service Engineering and Extended Artefact Delivery” introduces the main challenges that the manufacturing business should satisfy in order to survive in the move to the new context of an economy of scope under global competition. These challenges are: (1) granting the on-duty performance at the point-of-service; (2) addressing value-added intangibles; and (3) lowering life-cycle eco-impact. These changes in industry reflect on the human society; they are driven both through economical and political measures, as well as being increasingly affected by ecological constraints. Servicing and recovering become challenging demands. Besides technical aspects, spur is in enabling economic profits on the supply chain (by new businesses in maintenance, remanufacturing, etc.), with account of legal acts (suppliers responsibility, etc.), ruled by *voluntary agreements* or by *compulsory targets* frames. The chapter emphasizes the following new paradigms: extended virtual enterprise and extended product, service engineering, life-cycle engineering, product life-cycle management, proactive maintenance, recovery, reuse, recycling, ubiquitous computing, and communication.

Chapter III, “Offshoring: Evolution or Revolution?” describes the emergence of *offshoring*, defining relevant concepts and documenting its rapid growth, and discusses the factors differentiating *offshoring* from outsourcing, especially access to markedly lower costs, extra risks, and cultural differences. The chapter proposes a methodology for deciding what processes to offshore, and establishing, maintaining, and renewing offshoring projects. Offshoring is no longer the preserve of organizations; individuals can obtain an increasing variety of services from overseas. Offshoring is contentious because it threatens to replace high-paid jobs in First World countries with less well-paid Third World jobs. Most outsourcing depends on organizations’ ability to transfer data instantly, accurately, and at nearly zero marginal cost. This chapter suggests that the ramifications for individuals, organizations, and societies of this technical advance are underestimated.

“Section II: Models and Architectures” is composed by three chapters that contribute through addressing the specification and development of models and architectures to support networking and interorganizational collaboration and integration. These chapters discuss the questions:

- How can one efficiently and effectively promote networking and interorganizational integration?

- How can one promote business processes and information integration in and inter-organizational context?
- How can networking and interorganizational integration bring competitive advantages?

Chapter IV, “How should Enterprises Integrate? From the Need to the Solution ...” discusses the new challenge of industrial companies of building relationships with other value chains. While industrial companies have learned to establish added-value relationships and flows with their supply chain satellite companies, now they suffer from the lack of existing know-how and expertise in meta-value chain operation and management (including methodologies, reference models, case studies, best practices, and business and ICT solution maps). Collaboration only becomes a competitive advantage for a meta-value chain when it leads to meta-value chain agility. Customizing and continuously adapting an extended value proposition is mainly achieved by reshaping the composition and geometry of the whole extended enterprise, relying on dynamic agile business models. This meta-value chain agility needs in turn to be based on extended organizational learning, requiring continuous assessment processes and models based on key performance indicators.

Chapter V, “A Generation of Moderators from Single Product to Global E-Supply” presents the concepts and history of *moderator* research, covering the long journey from the first engineering moderator to recent proposals for an *e-supply chains moderator*. The main function of a moderator is to support a design group or team by raising individual members’ awareness of the needs and experiences of other team members. Moderators are specialist intelligent software systems which support each individual to perform his particular role from a position of strength, using his preferred methods of working while still understanding the needs of other individuals and the total team. This research addresses demanding and complex business requirements by exploiting the increasingly powerful technologies and infrastructures available for business integration.

Chapter VI, “Integrating Business Processes and Information Systems in an Interorganizational Context,” describes the need of organizations engaging in close cooperation to reorganize the business processes that serve the interface between them. This reorganization is often done with the help of business process models and, as a result, the underlying information systems have to be adapted, too. The changes to the latter can be supported by information system models which are typically “written” in a different language from that of the business processes. The authors suggest an approach to facilitate the development of information system models based on the models of the respective business processes, achieved by mapping a suitable business process language to the Unified Modeling Language. This approach is applied in the context of an interorganizational business process.

“Section III: Virtual Organization Management” addresses the organizational and managerial tools to enable networking and interorganizational collaboration implementation (or integration processes). The five chapters of this section present and discuss several organizational and managerial solutions and contribute to the answer to the questions:

- How can one manage process, knowledge, and information integration in networked and collaborative models?

- How can one measure performance in collaborative and networked organizational models?
- How can one manage to fully exploit opportunities and advantages of these organizational models?

Chapter VII, “The Organizations of Performance Measurement in an Extended Enterprise,” discusses the administrative requirements for business integration between partnering companies in the extended enterprise who operate a performance measurement system. It argues that, while on the one hand, interorganizational performance measurement is expected to become increasingly significant in the research literature, it is currently difficult to legislate and coordinate the various performance measurement activities that must be taken into account so as to overcome the disparity in geographical location and culture of extended enterprise nodes. Furthermore, while extended enterprise performance measurement concepts are increasingly being promulgated, the complex nature of these models has made business integration of the firms involved a difficult task: There are problems with regulating the policies and behavior of those who participate in the system, as well as assessing their understanding of the process itself. The chapter tackles these problems by the development of a series of questionnaires and assessment checklists, and by their application in an empirical study in an extended enterprise of the automotive industry.

Chapter VIII, “Process-Driven Business Integration Management for Collaboration Networks” develops a framework for cross-enterprise business integration management addressing the organizational and technical dimension. Firstly, the authors identify basic characteristics of cross-organizational business processes whose complexity results in the need for an efficient and effective business integration management. Therefore, a holistic framework is focused, consisting of a view concept for knowledge management in collaboration networks, a three-tier architecture, and a process-oriented life-cycle model. The framework for business integration management offers the required methods to set up enterprise processes and ICT-support in collaboration networks. Finally, the chapter proposes a management guideline for collaboration participants defining what, why, when, and how they might manage their business integration intra- and cross-organizationally.

Chapter IX, “The Role of Ambiguity in the Transfer of Knowledge within Organizational Networks,” discusses that the transfer of knowledge between organizations joining multi-organizational networks to mitigate environmental uncertainties and to access knowledge, cannot be assumed simply as a function of network membership. Researchers identified several factors that have been found to affect the transfer of knowledge within, between, and among organizations. This chapter investigates specifically how organizational ambiguity impacts the transfer of knowledge within multi-organizational networks. The authors explore the effects of causal ambiguity, defined as the ambiguity related to inputs and factors, in a multi-organizational context and discuss the existence of a previously undefined ambiguity, the ambiguity related to outcomes or “outcome ambiguity.” The chapter provides a discussion on why outcome ambiguity is particularly relevant when multiple organizations are engaged in a network, where the objective is access to knowledge.

Chapter X, “Systemic Innovation Capability: The Case Study of Embraer, the Brazilian Aircraft Manufacturer,” proposes the concept of systemic innovation capability, which is the ability to effectively combine knowledge from a variety of internal and external sources into

innovative products, services, efficient business processes, and valuable new combinations of knowledge, holistically taking into consideration business, marketing, operations, and technological aspects. Additionally, the author validates the concept by presenting the case of Embraer, a Brazilian commercial aircraft manufacturer successfully competing in the global marketplace. Based on an extensive literature review with support from Embraer's case, the author proposes the knowledge partnership model and the concept of "knowledge relevance," which is roughly a mutually-attractive force between partners' knowledge pools. The chapter concludes with practical considerations about concepts and models.

Chapter XI, "I-Accounting: An Adaptive Approach (Method + Practices) to Account for Intangibles," introduces the core aspects of an approach facilitating the valuation of intangible assets created by virtual organizations. The approach presented relies on established simple unified procedures which can drastically reduce problems caused by handling each situation individually, especially if there is no previous experience of similar cases. At the same time, the volume, value, and visibility of transactions between the various stakeholders and involved parties is increased. The authors conclude with an example case analysis related to the reality faced in collaborative research projects, which are carried out by diverse partners operating as a virtual organization whose different intellectual assets and the value thereof need to be recognized in order to prepare the ground for successful project completion.

"Section IV: Technologies and Infrastructures" consist of five chapters describing and discussing the development of solutions for processes, knowledge, and information integration in a VE/VO context. It helps with answering the questions:

- Which are the main technologies and infrastructures enabling the VO model?
- Which are the main technologies and infrastructures to support knowledge creation and management in an interorganizational context?
- Which are the main technologies and infrastructures to support process and information integration in VO?
- Which are the main technologies and infrastructures to support technology management in VO?

Chapter XII, "Enabling the Virtual Organization with Agent Technology," introduces the emerging agent-based systems as offering new means of effectively addressing complex decision processes and enabling solutions to business requirements associated with virtual organizations. Intelligent agents can provide more flexible intelligence and expertise and help the smooth integration of a variety of system types (i.e., Internet applications, customer relationship management, supplier network management, enterprise resources management, expert systems). This chapter presents an overview of expert systems as the most widely-used approach for domain knowledge management today and agent technology, and shows the latter as a superior systems development vehicle providing flexible intelligence/expertise and the integration of a variety of system types. To illustrate, a system is developed first by an expert system approach and then by an agent-based approach, in order to identify the strengths and weaknesses of the agent-based approach. Last, the chapter addresses the practical implications of a company adoption of agent-based technology for systems development.

Chapter XIII, “Enterprise Organisational Structure Integration and Service-Oriented Architectures,” examines the service-oriented architectures (SOA) in conjunction with the enterprise organizational structure integration problem, applied to innovative organizational models such as virtual enterprises. The chapter presents the evolution of software architectures, from traditional to SOA, along with the characteristics, advantages and disadvantages, and problems and difficulties in applying the SOA, while also focusing on the compatibility between SOA and modern organizational structures. It also examines the new standard in the service orchestration level BPEL and its impact to the integration problem, and also examines new messaging protocols and frameworks such as the enterprise service bus or messaging service bus. The main focus of the chapter is on the SOA technology trends of modern organizational structures, regarding their formation and integration. The comparison between SOA and traditional architectures provides a clear path to their adoption in various cases.

Chapter XIV, “Knowledge Creation and Adaptive Collaboration Based on XML Web Services,” introduces the adaptive collaboration (AC) and its potentials in the new paradigm of the 21st century networked society. It is an innovative information technology system for knowledge creation based on the XML Web services, which is essential to promptly meet the increasingly diverse needs and kaleidoscopic changes in economy. The AC is critical in the ubiquitous society, where constant improvement of business processes and cooperation and collaboration with both existing and new systems are required. Today’s knowledge is considered ecological and organic in a way that it is flexible enough to swiftly sense numeral shifts in the environment. The new method that integrates a number of different systems and applications into one system to enable the AC has been generating much attention as it may meet the diverse and growing demands in the future of the ubiquitous society.

Chapter XV, “Software Agent Technology for Supporting Ad Hoc Virtual Enterprises,” introduces a new idea of using software agents for supporting ad-hoc virtual enterprises and similar forms of temporal business-to-business collaboration. The authors argue that current information and telecommunication technologies, based on information interchange and local data processing, are not flexible enough to deal with modern business requirements, especially dynamic and temporal business relations, heterogeneity of hardware, software and communication means, and data complexity. The proposed approach, consisting of distributed and remotely-executed programs—software agents—working in the name and under the authority of their owners, differs in the distribution of both data and programs for data treatment at-the-place and just-in-time. The proposed techniques for agent preparation, distribution, and execution should make the whole system safe and secure, providing an efficient environment for wide spectrum of temporal and ad-hoc business collaboration.

Chapter XVI, “Business Networking: The Technological Infrastructure Support,” discusses that enterprises are impelled to adapt their way of undertaking business, from traditional practices to e-business, and to participate in new forms of collaboration, such as networked organizations. In this context, standards, frameworks, technologies, and infrastructures supporting collaborative business become key factors in achieving environments with a desired high level of collaboration and inter- and intra-organization business processes alignment. The chapter underlines the main issues, trends, and opportunities related to business integration from a technological perspective, analyzing and discussing the most relevant (existing and still under development) business integration reference models, frameworks, standards, technologies, and supporting infrastructures, and to briefly present relevant research proj-

ects in the area of business networking developed in Europe and USA. A special emphasis is made on frameworks such as ebXML and RosettaNet, and the importance of papiNet, BPLe4WS, and freebXML is underlined. Challenges regarding self-forming networked organizations are also advanced.

Expectations

The book provides researchers, scholars, and professionals with some of the most advanced research developments, solutions, and implementations. It will provide a better understanding of knowledge and technology management in virtual organizations, from an organizational, managerial, and technological perspective. We expect that this book will be read by academics (i.e., teachers, researchers and students), technology solutions developers, and enterprise managers (including top level managers). We believe that this book will help and support teachers of several graduate and postgraduate courses, from management to information technology.

The Editors,

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