INTRODUCTION

The growth, integration, and sophistication of information technology and communications are changing our society and economy. Consumers now routinely use a variety of networks and the Web to identify sellers, evaluate products and services, compare prices, and exert market leverage. Businesses use the networks and the Web even more extensively to conduct and re-engineer production processes, streamline procurement processes, reach new customers, and manage internal operations. However, the Web was not meant for commercial purposes, and thus a number of issues (e.g., trust, privacy) limit its use for this commercial purpose. On the other hand, the infrastructure for e-business needs to accommodate business that takes place in large-scale, open, and dynamic network environments blending multiple independent systems. One way to cope with the limitation and complexity is to design them as agent-based systems. This book is written to address the importance of agent systems in electronic business.

Agent technologies offer high-level abstractions and mechanisms that address issues such as reasoning, communication, coordination, cooperation, commitments, goals, beliefs, intentions, and so forth. Agent technologies are believed to be one of the most promising tools to conduct business via the networks and the Web in an autonomous, intelligent, and efficient way. On the other hand, electronic business concerns three primary dimensions: electronic business processes (how business is conducted), electronic commerce transactions (buying and selling), and e-business infrastructure (what infrastructures are used to support electronic business processes and conduct electronic commerce transactions). Accordingly, agent technologies could be unfolded along these three dimensions in unveiling business automation.

Meanwhile, electronic business increasingly uses agents and the other emergent technologies acting on behalf of human buyers, sellers, and business. These emergent technologies include Web services, mobile computing, P2P technologies, the Semantic Web, and so forth. Such cross-fertilized techniques have created all sorts of challenging yet interesting agent-based systems in the electronic business area.

This book is organized into five parts: the first part gives an overview chapter of agent-based e-business systems; the second part includes four chapters addressing agent technologies for electronic commerce transactions; the third part provides four chapters discussing agent technologies for electronic business processes; the fourth part gives four chapters presenting agent technologies for e-business infrastructure; finally, the fifth part includes three chapters examining some cross-fertilized techniques in business automation.
BOOK ORGANIZATION

Section I: Overview
Chapter I (Patterns for Designing Agent-Based E-Business Systems) describes a group of architectural patterns for agent-based e-business systems. These patterns relate to front-end e-business activities that involve interaction with the user and delegation of user tasks to agents. Patterns capture well-proven, common solutions, and guide developers through the process of designing systems. These patterns are just the beginning of a pattern language for agent-based e-business system design. As the use of agent technology in e-business matures, this language will evolve as well. Finally, a number of examples then illustrate the application of these patterns.

Section II: Agent Technologies in Electronic Commerce Transactions
Chapter II (The Evolution of Comparison-Shopping Agents) discusses comparison-shopping agents and addresses key events and issues of comparison-shopping agent evolution in three intertwined threads (the emergence of representative agents, the evolution of comparison-shopping agent technology, and the evolution of their business models). These identified key issues include the complexity of product information dimension, consumer expectations, attitudes of online retailer and service providers, and competition intensity in the comparison-shopping markets. These issues intertwine together and shape the development of comparison-shopping agent systems and their activity environments.

Chapter III (A Study of Intelligent Shopping Support: A Case Study of Outbound Group Package-Tour Products in Taiwan) proposes a customer-centric solution to improve the search effectiveness of agent-based shopping support in terms of developing a knowledge base. This knowledge base consists of representation of the product characteristics in the form of ontology as those concepts affect shoppers’ decision-making behavior. A case of outbound group-package tour in Taiwan is investigated and a focus-group interview is applied in order to validate the ontological framework of the knowledge base. In other words, this chapter demonstrates a process of knowledge acquisition to tackle the problem of ineffective online information search by a customer-centric method.

Chapter IV (Agent-Based Matching of Demands and Supplies in Business Transaction Formation) identifies certain problems in conducting electronic business and supply chain management and defines the expected benefits for supply chains with agents working together in coordination and cooperative processes. Moreover, architecture of effective cooperative processing for agents is also proposed.

Chapter V (Evolutionary Auction Design for Agent-Based Marketplaces) designs a new way of efficient auctions by evolutionary computing approaches for its important role in computational economics for resolving multi-agent allocation problems. In the design, a genetic algorithm is used to design auction mechanisms in order to automatically generate a desired market mechanism for electronic markets populated with trading agents. Moreover, this new design also shows that the optimal auction for heterogeneous agents could be a human-designed one while the optimal auction for homogeneous agents is a hybrid one, given the same supply-demand schedule.

Section III: Agent Technologies in Electronic Business Processes
Chapter VI (An Inter-Organizational Business Process Study from Agents Interaction Perspective) introduces a generic pattern of agents interaction derived from the communication patterns of human actors. Two theoretical concepts (the semiotics approach and the language action perspective) are then employed for agent based e-commerce and e-business systems study in the context of inter-organizational business process using diagrams and notations. This chapter demonstrates that the second concept is very useful (as it is diagrammatically rich and easy to communicate to nontechnical users, and provides
sufficient notations to model complex hierarchical agent based e-business systems). This chapter also gives a case study conducted based on a real life business for the illustration of the concept of agent-based systems.

Chapter VII (Applications of Agent-Based Technology as Coordination and Cooperation in the Supply Chain Based E-Business) proposes a newly developed model for an enhanced and effective cooperation process in the field of supply chain management for electronic business by a utilization of a multi-agent system. This chapter also provides a theoretical solution and model for agents that adopt the enhanced strategy for e-business. Both large organizations and SMEs will benefit as the proposed model will enhance their global business by participating and sharing with other businesses to achieve common goals.

Chapter VIII (An Agent-Based Framework for Emergent Process Management, reprint from Debenham, J. (2006), International Journal of Intelligent Information Technologies, 2(2), 30-48) provides a definition for emergent process and presents an inference mechanism to manage emergent business processes (whose execution is determined by the prior knowledge of the agents involved and by the knowledge that emerges during a business process instance) that contribute to the establishment of dynamic business relationships.

Chapter IX (Beyond Intelligent Agents: E-Sensors for Supporting Supply Chain Collaboration and Preventing the Bullwhip Effect, reprint from Rodriguez, W., Zalewski, J., & Kirche, E. (2007), International Journal of e-Collaboration, 3(2), 1-15) presents a new concept of e-sensors for supporting electronic collaboration, operations, and relationships among trading partners in the value chain without hindering human autonomy. E-sensors are next-generation hardware-software agents that are capable of perceiving, reacting and learning from its interactive experience through the supply chain, rather than just searching for data and information through the network and reacting to it.

Section IV: Agent Technologies in E-Business Infrastructure

Chapter X (An Automated Negotiation Mechanism for Agents Based on International Joint Ventures) develops an automated one-to-many multi-attribute negotiation mechanism for facilitating multi-agent technology approaches in scenarios of international joint ventures (emerged as the dominant form of partnership in light of intense global competition and the need for strategic organizational viability), securing positive impact on supplier selection, and partners’ profit. This negotiation mechanism is contributable in terms of a practical approach utilizing the fuzzy logic to represent the attributes and jointed buyer’s behavior within negotiation in order to negotiate in a real world.

Chapter XI (An Agent-Mediated Middleware Service Framework for E-Logistics) presents a service oriented e-logistics middleware service framework for e-logistics infrastructure and network integration and development. This middleware aims to enable more responsive supply chains and better planning and management of complex inter-related systems, such as materials planning, inventory management, capacity planning, logistics, and production systems. Furthermore, this chapter also contributes to the understanding of how logistics middleware systems can seemingly be integrated and self-adapt for optimizing the global supply network.

Chapter XII (A Multi-Agent System Approach to Mobile Negotiation Support Mechanism by Integrating Case-Based Reasoning and Fuzzy Cognitive Map) proposes a new type of multi-agent mobile negotiation support system in which both buyers and sellers are seeking the best deal given limited resources. Two AI methods such as CBR (case-based reasoning) and FCM (fuzzy cognitive map) are used and integrated in the system in order for the decision makers involved in m-commerce regardless of buyers and sellers to benefit from the negotiation support functions that are derived from referring to past instances via CBR and investigating inter-related factors simultaneously through FCM.
Chapter XIII (A Study of Malicious Agents in Open Multi-Agent Systems: The Economic Perspective and Simulation) discusses the issue of malicious agents in open multi-agent systems with several examples in relation to the existing crime study. In addition, various governance schemes are proposed from the perspective of both the system designers and users, justified by an empirical analysis of the governance strategies by means of deterrence theory. Meanwhile, this chapter highlights the importance of mechanisms to make intervention into the multi-agent systems, in an attempt to deter malicious agents from maximizing their utilities through the illegal actions.

Section V: Cross-Fertilized Techniques in Business Automation
Chapter XIV (Features for Killer Apps from a Semantic Web Perspective) describes certain features that distinguish killer apps from other ordinary applications in the context of the Semantic Web. By examining the common ingredients of killer apps in e-commerce, the chapter discusses how such applications might emerge in the Semantic Web. This discussion is important because the Semantic Web community is still awaiting a killer app that can prove the superiority of its technologies; on the other hand, the Semantic Web provides a context for killer app development and a context based on the ability to integrate information from a wide variety of sources and interrogate it.

Chapter XV (Semantic Location Modeling for Mobile Enterprises) presents a novel framework of location modeling in integrating enterprise business models with location models. This framework enables enterprises to effectively recognize the needs of the clients and the partners scattering in different locations, advancing existing business relationships by exerting appropriate service strategies through their mobile workforces. Moreover, enterprises are also empowered to discover the potential business partners and predict the values of their cooperation, gaining competitive advantages when appropriate partnership deals are made by enterprise mobile workforces. In other words, this framework would bestow enterprise mobile workforce location-sensitive decision information so as to properly serve the clients or justifiably negotiate contracts with other enterprises.

Chapter XVI (Service Composition Approaches for Ubiquitous and Pervasive Computing: A Survey) describes and classifies service composition approaches according to ubiquitous and pervasive computing requirements. Moreover, this chapter identifies the key issues related to the efficient implementation of service composition platforms in ubiquitous and pervasive computing environments (characterized with self-adaptation, self-organization, and emergence in systems that operate in an open and dynamic environment). These issues can be classified into two major directions: the languages to specify and describe services and the architectures to enable scalable, fault tolerance, and adaptive service composition.

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