Preface

The Internet has created tremendous business opportunities and is revolutionizing the whole structure of retail merchandising and shopping. Internet usage around the world is said to be doubling every 10 days. The number of people on the Internet is expected to increase tenfold from around 100 million in 1999 to one billion by 2005. The biggest transformation resulting from this is in the area of Internet commerce, which is enabling participating businesses to simultaneously serve both domestic and foreign customers, even from the first day of their operation. There are many examples demonstrating that organizations can reap benefits if they can innovate successfully using Internet commerce. Consequently, marketers may spend large sums to create and promote online brands. According to an April 2000 Forrester research report, the rush for customer acquisition will swell the online promotions market to $14 billion by 2005. So there is no doubt that it will be imperative for businesses to be part of the global Internet commerce community. With the development of Internet trading, the amount of business information available on the Internet is growing at an extraordinary speed. Management, security, legal and other issues are arising accordingly. Existing businesses are seeking answers to the question of if and how they may adapt their business processes to meet the new demands and new startups are arising to take advantage of the shifting strategic horizons of Internet commerce.

As the Internet grows, it is becoming infeasible for customers and merchants to manually visit each Web site, analyze the information there, and thus to make sound business decisions regarding the trading of goods or services. Under such circumstances it is inevitable that buyers may miss finding the best deal in the vast ocean of information. In this scenario the use of software agent technologies, both mobile and stationary, offers a new paradigm for trading on the Internet and presents a revolutionary approach to conducting analysis and market research. Software agents may be designed to be capable of automating the more routine, tedious and time-consuming tasks involved in today's trading processes. They may be able to negotiate and make autonomous decisions and commitments on behalf of their owners. With knowledge about the habits and shopping trends of the e-consumers, accurate and personalized user profiles may be created. Agent technologies may use this knowledge to establish a much higher degree of sales confidence and create loyal and sustained relationships with customers. However, software agents for Internet commerce still have some way to go before they can fully demonstrate all of their potential advantages and ensure participant trust with regard to their privacy and the security of the transactions they undertake.

This book addresses, in 20 chapters, many of these major Internet commerce issues and the challenges to be met in achieving automated and secure Internet trading using software agents. Topics covered include the development of intelligent tools, business models to maximize the benefits of agent technologies, agent-based payments, recommender systems, web based smart card agents, Internet lottery systems and wireless virtual communities. The chapters are grouped into the following interrelated sections.

- Internet commerce and applications
- Agents in e-commerce: introduction and impact
- Agents in e-commerce: frameworks, applications and cases
- A human interface to software agents
- Payment systems, recommender systems and the future

The chapters in the first section provide some background and an overview of some problems and concerns, in an effort to rationalize the building of web-enabled enterprise information systems for conducting business transactions over the Internet. An improved understanding of Internet commerce is provided through this overview plus some requirements, benchmarks, development and implementation methodologies and approaches to successfully achieving the ultimate goal of producing robust, effective, and viable Web-enabled enterprise information systems. The second chapter considers the impact of Internet commerce on export marketing strategies The main determinants of an electronic export marketing strategy are examined and the chapter discusses how firms can best capitalize on Internet commerce for their particular types of products and services. This chapter also represents a first attempt to incorporate new technologies into existing theory on export entry strategy, as well as providing a basis to conduct future research to measure the effects of Internet commerce on export performance. The next chapter of this section deals with the issue of consumer trust and confidence in Internet commerce, which is fundamental to its eventual success. If consumers cannot be confident that personal information is safe and secure, the Internet will never reach its economic potential. There is thus a very strong incentive for the Internet business community to provide a safe and acceptable business environment for consumers. The next chapter addresses the policymakers who need to recognize the inherent complexity and unique dynamics of the global Internet mass market in the 21st century. The final chapter in this section considers a specific Internet commerce application domain, namely Internet Lottery Commerce. This chapter provides a structured guide for senior executives and strategic planners who are planning on or interested in Internet lottery deployment and operation. The chapter demonstrates the case for applying the guidelines it proposes for the lottery business.

Section two provides an overview of agent technologies, with the definitions, properties, security issues and future research and challenges for software agents in electronic commerce. The second chapter in this section provides a socio-technical perspective on intelligent agents. It argues that the new business environment requires a re-conceptualization of knowledge management. Therefore, the infrastructure and technological functionality needed to support knowledge management will be an important topic of future research. A framework is proposed that is based on the data lifecycle and on knowledge discovery using intelligent agents. One of the key ideas of this chapter is that in this period of profound social and economic changes, managers should focus on the meaning of information, not on the technology that collects it. The next chapter considers how agents can facilitate the various activities necessary for successful e-commerce. It also identifies the different types of intelligent agents that are currently being utilized in different e-commerce models and markets. A generic architecture for designing and implementing such agents is presented.

Section Three provides different frameworks for specific applications and demonstrates these with cases. The concepts covered in Section Two are elaborated upon and extended with examples. The first chapter in this section includes an overview of different reasoning and negotiation strategies among agents, followed by a discussion of the issues relevant to the architecture, design and implementation of multi-agent systems based on constraint technology and software patterns. The focus is on the implications of the theoretical work on design. The next chapter presents a conceptual framework for designing and developing software agents that will enable customized electronic commerce, and highlights several effective techniques for building specific constructs within this framework. Some of the key characteristics of customized electronic commerce are demonstrated by experimentally prototyped software agents. Examples are Electronic Tour Agents, Electronic Property Agents and Electronic Auction Agents. Technical feasibility is demonstrated based on available market products and existing research findings. In the following chapter some of the key challenges in turning agent research into commercial applications are presented with an overview of electronic commerce business models and a discussion of how they can benefit from the new developments in agent technologies. The discussion is illustrated with examples of the work that is being undertaken in projects from the IST Research Programme of the European Union. Following this, a Secure Agent Fabrication, Evolution & Roaming (SAFER) architecture for agent-based e-commerce is presented. SAFER provides services for agents in e-commerce and establishes a rich set of mechanisms to manage and secure them. The definitions and functions of the various components in the SAFER architecture are explained. This chapter also illustrates three main aspects of the SAFER architecture, namely agent fabrication, agent evolution and agent roaming.

The issues of usability, security, and mobility are major concerns for e-commerce implementations that aim to gain widespread public acceptance. To address these issues the next chapter in Section Three proposes a combination of software agents and smart cards to build a smart card agent environment. A functional overview of the proposed environment and a design is presented to illustrate how these two technologies can be integrated to offer e-commerce services with high usability, security, and mobility. A prototype implementation of the concept has demonstrated how the various agents can work with a smart card agent in a secured way. In the subsequent chapter in this section the tendering process is analysed with framework solutions proposed highlighting the benefits of the online tendering system. In the next chapter a component framework is introduced for a multi-agent-based architecture to support inter-company integration implemented with Java, and in the final chapter of the section wireless virtual communities are discussed.

It may be argued that high quality, personalized customer service will be one of the more significant drivers of e-commerce success. Thus, a more human visual interface to the Web will be an important step towards making agent technology more accessible and user-friendly to online consumers. The chapter in section four discusses the development and underlying components of a prototype 3-D audio-visual virtual salesperson talking head. Such an interface has the potential to automatically generate a voice response to many of the routine natural language queries received from customers by organisations.

Internet-based payment mechanisms are an integral part of Internet commerce. Payment systems have evolved from metal coins, paper notes, and bank checks to savings cards, credit cards, and now electronic forms through an abstract representation of commodity values. Development of secure payment systems over an open network is a basic prerequisite to the success of online commerce. The first chapter in Section Five discusses these issues. It presents a brief survey of some existing types of payment systems and focuses on mobile agent-based computing trends in e-commerce. An e-payment scheme designed for agent-based SAFER e-commerce is also proposed and explained in detail. Incorporating cryptographic techniques with software agent technology the scheme aims to provide a flexible and secure financial infrastructure for Internet commerce. In the next chapter a new payment mechanism is proposed for the use of software tools on demand, which charges users according to how much they have used a given tool. This amounts to pay-per-use rental. The chapter discusses the benefits of pay-per-use for users and producers with evidence for the critical issues in designing a system to support pay-per-use. The third chapter in this section focuses on the application of software agents together with cryptographic technology in automating and securing the processes of negotiation and payment, which are the principal and most time-consuming steps during Internet

trading. A software-agent-mediated Internet trading framework integrating negotiation and payment procedures is proposed.

The final chapter introduces the concept of recommender systems as a successful Internet commerce tool. It demonstrates their similarities to and differences from traditional data analysis and knowledge discovery methods. Also included is a detailed analysis of recommender system interfaces for some Internet commerce applications. The chapter describes how they are being used to make profits by generating and maintaining customer loyalty. A taxonomy of the application space for distributed recommender systems is then presented. Some frameworks for implementing distributed recommender systems are discussed and several implementation models are described.

The nature and range of the topics covered means that this book can be used by business professionals, technologists, academics, students and policymakers. Professionals from the business community may use it to improve their understanding of the technical concepts involved in present and future Internet commerce, something that is necessary if they are to participate in the emerging global marketplace. The book will also enable technologists to achieve a better understanding of the trading applications to which Internet technology and software agents may be applied. We are confident that the discussions of some of the key business and technical issues of this growing technology, supported by the cases demonstrated, will help the book's varied audience to expand their knowledge and motivate further contributions to their fields.

Credit for the successful publishing of this book is due to many people, including the chapter authors who contributed their ideas and expertise and many colleagues who have contributed invaluable suggestions in their thorough reviews of each chapter. We would like to take this opportunity to thank the editorial staff at IGP who patiently supported us at all times. Finally, thanks are due to our family members who have given us their constant support even when missing our company for extended periods of time.

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