Foreword

Organizations use a variety of computer-based systems such as management information systems, decision-support systems and executive information systems to support decision making. These systems deliver business data and information in a highly aggregated form. However, they have not been able to keep up with the new flood of information, particularly with the explosion in the amount of data being generated, stored, accessed and processed by the ubiquitous Internet technologies. This information overload coupled with competitive pressures signal the need for "intelligent support systems" that can minimize the cognitive load on the knowledge workers and decision makers.

In addition, fierce competition, globalization, and the digital economy have forced organizations to search for new ways to improve customer satisfaction and competitive advantage. This has created tremendous pressure on businesses to minimize cost, increase quality, and reduce time-to-market for products to meet customer demand. In order to satisfy these objectives, businesses are reorganizing themselves into smaller and efficient units by pruning the organizational hierarchy and becoming decentralized. Consequently, there is great need for improving communication and information flow, and providing decision-making capabilities to sites that have to respond quickly to market changes. Organizations are increasingly turning to technologies to support their problem-solving and decision-making activities. To gain dramatic improvement in organizational productivity, emerging information technologies (such as intelligent agents) are being applied to create a cooperative and group-based work environment. Although artificial intelligence (AI) technologies such as expert systems and neural networks have been successfully used in aerospace, communication, medicine, finance, etc., they have not made a significant impact on improving overall productivity due to their narrow scope. In contrast, the new breed of "intelligent support system technologies" hold greater potential in that they can be applied to a large number of domains and a diverse set of problems. For example, a generic intelligent agent-based application can be customized for different domains and a variety of problem scenarios.

Intelligent support systems are generally characterized as systems that help users in carrying out difficult tasks by minimizing complexity and, hence, the users' cognitive load. These systems have a learning component and gain "experience" over time. They respond to changes in the environment and new situations with minimal human intervention. They are context sensitive and capable of making sense out of ambiguous or contradictory information. They also maintain user profiles

including user preferences and previous actions, and serve as a tutor, critic, consultant or advisor by providing suggestions and/or courses of action to take. These systems exhibit "intelligent" behavior by dealing with complex situations and applying their knowledge to manipulate the environment by recognizing the relative importance of different elements within a problem scenario. The following is a partial list of enabling technologies that are used in creating intelligent support systems: a) intelligent agents, b) data mining and knowledge discovery, c) data warehousing, d) fuzzy computing, e) neural networks, f) machine learning, g) client-server and web technologies, h) business components, i) java and XML technologies, and j) evolutionary algorithms. This book discusses the various aspects of designing and implementing intelligent support systems using one or more of the afore-mentioned technologies.

Intelligent agent technology is finding its way into many new systems, including decision-support systems, where it performs many of the necessary decision-support tasks formerly assigned to humans. Agents are loosely defined as "software entities that have been given sufficient autonomy and intelligence to enable them to carry out specified tasks with little or no human supervision." Software agents are useful in automating laborious and repetitive tasks, such as locating and accessing necessary information, filtering away irrelevant and unwanted information, intelligently summarizing complex data, and integrating information from heterogeneous information sources. Like their human counterparts, intelligent agents can have the capability to learn from their managers and even make recommendations to them regarding a particular course of action. Generally, agents are designed to be goal driven, i.e., they are capable of creating an agenda of goals to be satisfied. Organizations are investing heavily in systems that help capture and manage Business Intelligence (BI). One technology used to generate BI is data mining and knowledge discovery. Data mining applications are coming to the forefront of business data analysis and decision making. However, to successfully execute these applications, a significant amount of *a priori* knowledge is required about data mining techniques, their applicability to different scenarios, relevant data selection and transformation, etc. Hence, for a casual user interested in deciphering trends and buying behaviors from customer "digital footprint" data, shielding some of the nuances of normal data mining operations would be a welcome change. Intelligent agent technology can play a major role in the design and development of such data mining systems, particularly in hiding the complexity and implementing a scaleable system. For example, the "interface agent" can assist decision makers (users) to perform actions on a data warehouse that they cannot, or prefer not, to do themselves.

Thus, intelligent agent technology is emerging as one of the most important, and rapidly advancing areas in support system technologies. A number of agent-based applications and multi-agent systems are being developed in a variety of fields, such as electronic commerce, supply chain management, resource allocation, intelligent manufacturing, mass customization, industrial control, information retrieval

and filtering, collaborative work, mobile commerce, decision support, and computer games. While research on various aspects of intelligent agent technology and its application is progressing at a very fast pace, there are still a number of issues that have to be explored in terms of agent design, implementation, integration, and deployment. For example, identifying salient characteristics of agents in different domains, developing formal approaches for agent-oriented modeling, designing and implementing agent-oriented information systems, collaborating and coordinating multi-agent systems, and analyzing the organizational impact of agent-based systems are some of the areas in need of further research. Intelligent support system technologies will attain a permanent place in industry and will be deployed for the purpose of increasing industrial productivity in many roles, such as assistants to human operators and autonomous decision-making components of complex systems. One can easily envision a world filled with millions of knowledge agents where the boundary between human knowledge agents and machine agents is invisible. Intelligent agents have the potential to radically change the way organizational work is currently performed. Human agents can delegate a range of tasks to personalized software agents that can not only make decisions based on the criteria provided by their human counterparts, but also model the reasoning, action, communication, and collaboration skills involved in performing human job functions. Capturing organizational knowledge in a reusable form, and designing intelligent agents having access to this corporate knowledge, is going to revolutionize organizational work environment in the near future.

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