

Intelligent Software Agents Analysis in E-Commerce II

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ISA OPPORTUNITIES AND LIMITATIONS IN E-COMMERCE

Cowan et al. (2002) argued that the human cognitive ability to search for information and to evaluate their usefulness is extremely limited in comparison to those of computers. In detail, it's cumbersome and time-consuming for a person to search for information from limited resources and to evaluate the information's usefulness. They further indicated that while people are able to perform several queries in parallel and are good at drawing parallels and analogies between pieces of information, advanced systems that embody ISA architecture are far more effective in terms of calculation power and parallel processing abilities, particularly in the quantities of material they can process (Cowan et al. 2002). According to Bradshaw (1997), information complexity will continue to increase dramatically in the coming decades. He further contended that the dynamic and distributed nature of both data and applications require that software not merely respond to requests for information but intelligently anticipate, adapt, and actively seek ways to support users.

E-commerce applications based on agent-oriented e-commerce systems have great potential. Agents can be designed using the latest web-based technologies, such as Java, XML, and HTTP, and can dynamically discover and compose E-services and mediate interactions to handle routine tasks, monitor activities, set up contracts, execute business processes, and find the best services (Shih et al., 2003). The main advantages of using these technologies are their simplicity of usage, ubiquitous nature, and their heterogeneity and platform independence (Begin and Boisvert, 2002). XML will likely become the standard language for agent-oriented E-commerce interactions to encode exchanged messages, documents, invoices, orders, service descriptions, and other information. HTTP,

the dominant WWW protocol, can be used to provide many services, such as robust and scalable web servers, firewall access, and levels of security for these E-commerce applications.

Agents can be made to work individually, as well as in a collaborative manner to perform more complex tasks (Franklin and Graesser, 1996). For example, to purchase a product on the Internet, a group of agents can exchange messages in a conversation to find the best deal, can bid in an auction for the product, can arrange financing, can select a shipper, and can also track the order. Multi-agent systems (groups of agents collaborating to achieve some purpose) are critical for large-scale e-commerce applications, especially B2B interactions such as service provisioning, supply chain, negotiation, and fulfillment, etc. The grouping of agents can be static or dynamic depending on the specific need (Guttman et al., 1998b). A perfect coordination should be established for the interactions between the agents to achieve a higher-level task, such as requesting, offering and accepting a contract for some services (Guttman et al., 1998a).

There are several agent toolkits publicly available which can be used to satisfy the customer requirements and ideally they need to adhere to standards which define multi-party agent interoperability. For example, fuzzy logic based intelligent negotiation agents can be used to interact autonomously and consequently, and save human labor in negotiations. The aim of modeling a negotiation agent is to reach mutual agreement efficiently and intelligently. The negotiation agent should be able to negotiate with other such agents over various sets of issues, and on behalf of the real-world parties they represent, i.e. they should be able to handle multi-issue negotiations at any given time.

The boom in e-commerce has now created the need for ISAs that can handle complicated online transactions and negotiations for both sellers and buyers. In

general, buyers want to find sellers that have desired products and services. And they want to find product information and gain expert advice before and after the purchase from sellers, which, in turn, want to find buyers and provide expert advice about their product or service as well as customer service and support. Therefore, there is an opportunity that both buyers and sellers can automate handling this potential transaction by adopting ISA technology. The use of ISAs will be essential to handling many tasks of creating, maintaining, and delivering information on the Web. By implementing ISA technology in e-commerce, agents can shop around for their users; they can communicate with other agents for product specifications, such as price, feature, quantity, and service package, and make a comparison according to user's objective and requirement and return with recommendations of purchases, which can meet those specifications; they can also act for sellers by providing product or service sales advice, and help troubleshoot customer problems by automatically offering solutions or suggestions; they can automatically pay bills and keep track of the payment.

Looking at ISA development from an international stand point, the nature of Internet in developed countries, such as USA, Canada, West Europe, Japan, and Australia, etc. and the consequent evolution of e-commerce as the new model provide exciting opportunities and challenges for ISA-based developments. Opportunities include wider market reach in a timely manner, higher earnings, broader spectrum of target and potential customers, and collaboration among vendors. This ISA-powered e-commerce arena would be different than our traditional commerce, because the traditional form of competition can give way to collaborative efforts across industries for adding value to business processes. This means that agents of different vendors can establish a cooperative relationship to communicate with each other via XML language in order to set up and complete transactions online.

Technically, for instance, if an information agent found that the vendor is in need of more airplane tickets, it would notify a collaborative agent to search for relevant information regarding the ticket in terms of availability, price, and quantity etc. from other sources over the Internet. In this case, the collaborative agent would work with mobile agents and negotiate with other agents working for different vendors and obtain ticket information for its user. It would be able to provide

the user with the result of the search, and, if needed, purchase the tickets for the user if certain requirements can be met. In the meantime, interface agents can monitor the user's reaction and decision behavior, and would provide the user with informational assistance in terms of advice, recommendation, and suggestion for any related and similar transactions.

On the other hand, however, this kind of intelligent electronic communication and transaction is relatively inapplicable in traditional commerce where different competitive vendors are not willing to share information with each other (Maes et al., 1999). The level of willingness in ISA-based e-commerce is, however, somewhat limited due to sociological and ethical factors, which will be discussed later in this paper. In addition, designing and implementing ISA technology is a costly predicament preventing companies from adopting this emerging tool. Companies need to invest a lot of money to get the ISA engine started. Notwithstanding the exciting theoretical benefits discussed above, many companies are still not sure about how much ISA technology can benefit themselves in terms of revenue, ROI, and business influence in the market where other players are yet to adopt this technology to cooperate with each other. Particularly, medium or small size companies are reluctant to embark on this arena mainly due to the factor of cost.

Additionally, lack of consistent architectures in terms of standards and laws also obstructs the further development of ISA technology (He et al., 2003). In detail, IT industry has not yet finalized the ISA standards, as there are a number of proprietary standards set by various companies. This causes a confusion problem for ISAs to freely communicate with each other. Also, related to standards, relevant laws have not surfaced to regulate how ISAs can legally cooperate with each other and represent their human users in the cyber world.

Additionally, ISA development and deployment is not a global perspective (Jennings et al. 1998). Despite the fact that ISA technology is an ad-hoc topic in developed countries, developing countries are not fully aware of the benefits of ISA and therefore have not deployed ISA-based systems on the Web because their e-commerce development levels and skills are not as sophisticated or advanced as those of the developed countries. This intra-national limitation among developed and developing countries unfortunately hinders

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