

## Chapter 20

# Enhancing Cooperation in Enterprises using Agent and Web Services Paradigms

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### ABSTRACT

*At the present time and with the economic orientation towards maturity, enterprises unlike the traditional competitive business strategies are wanted out of necessity to cooperate with other enterprises and to add new activities to their existing profiles. The rapid growth of technologies motivates enterprises to invest more and more in this domain with the adoption of the cooperative e-business applications. Consequently, we propose in this paper an approach that permits enterprises to enhance their cooperative activities. This approach is based on the agent and Web services paradigms. It is organized in the form of cooperative application groups representing the different parts of a company. Agent coordinators orchestrate the cooperative work of these groups. The most requested functionalities inside the enterprise and those offered to the external world can be exported as Web Services. We describe the Web Services with DAML-based Web Service ontology (OWL-S). The search, invocation and exploration of these Web services can be offered by an intermediate agent called Web Service Finder Agent. The proposed approach provides a new vision of the cooperation context where the companies and their partners share knowledge and offer functionalities as agents and Web Services.*

### INTRODUCTION

The rapid growth of the World Wide Web and the changes made in the economic world motivate

organizations to invest more and more in the e-business and in the same way to cooperate with other organizations. Due to the complexity of current products and services, no single organization can produce a complex product by itself. This

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means that we see the emergence of cooperative e-businesses or virtual enterprises centered on the realization of specific product types and consisting of a possibly large number of autonomous organizations (Paul, Nokolay, Giorgos, Georg & Rik, 2009). In its simplest form, the e-business can be defined as the conduct of businesses on the Internet. It is a more generic term than e-commerce because it refers not only to buying and selling but also to servicing customers and collaborating with business partners. Companies use the Web to buy parts and supplies from other companies, to collaborate on sales promotions, and to do joint researches.

Since e-business became an economic cooperation activity, we can say that it has changed the rules of the market and the role of information technology (IT). The rapid growth of the technical and organizational needs creates several intelligent solutions for the e-business domain (Khubaib & Mansoor-uz-Zafar, 2008). According to (Lee, Lau, Ho & Ho, 2009), recurring problems have been identified in this field, but the main perceived obstacle to e-business is the scarce number of methodologies that exist for the development of complete e-business projects. A business model must reflect the operational and output system of a company, and as such captures the way the firm functions and creates value (Bernd, Oliver & Sebastian, 2010)

In order to ensure the effective establishment of e-business applications in a company, applications must be developed and implemented from the business requirements and not from the technological viewpoint. Although, initial expectations of e-business growth were often overly optimistic, there is no doubt that commercial applications of Internet, Intranet, and related technologies have rapidly assumed an important position in the global economy. Although technology can play a very important role, it is a tool for obtaining results but never an aim in itself (Gregorio, Kassiech, & De Gouvea Neto, 2005). The demands of e-business for rapid response and agile adaptation

to the market-place require sharing knowledge among not only the intra-organizational staff but also among the partners and customers in new and more efficient ways. Furthermore, the cooperation between the business actors is more than necessary.

Being confronted with the needs related specifically to the concepts of knowledge management and cooperation, the agent metaphor seems to be an adequate solution (Minhong, Jiming, Huaqing, William, & Xiaofeng, 2008). It can be viewed as an encapsulated problem with entities which exhibit the properties of autonomy, social ability, responsiveness and proactiveness (Wooldridge, 2002). In spite of these advantages, the kind of cooperation brought by the agent technology and notably in the e-business context is not sufficient with the emergence of Web Services, which are a new breed of Web applications. They are self-contained, self-describing, modular applications that can be published, located, and invoked across the Web.

Most organizations and companies want to exploit this new technology with standards such as the UDDI repository Universal Description Discovery and Integration ([http://www.uddi.org/pubs/uddi\\_v3.htm](http://www.uddi.org/pubs/uddi_v3.htm)) in their various tasks. For them, a Web Service can be defined as an application available on the Internet by a supplier and accessible to customers. Several works tried the combination of the agent paradigm with Web Services. This combination uses agents as proxies that assist users and web applications during the selection of Web Services according to some criteria (Maximilien & Singht, 2004) or even in the reasoning about the semantic description, the composition and the use of Web Services (Richards, Van Splunter, Brazier, & Sabou, 2003).

For us, our new vision is that Web Services promise universal support for cooperative systems. Exploring these features allows an agent-based application to be more open in their cooperation mode. In this paper, we propose an approach for designing and developing cooperative e-business applications. This approach can be used

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