Chapter 11
Dynamic Co-Opetitive Network Organization Supported by Multi Agent Architecture

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ABSTRACT

The emergence of institutional or informal networks, formed by cluster groups appears to be a major new feature of the contemporary industrial economy. The focus of this chapter is the development of a Multi Agent Architecture to support a network of enterprises that collaborate in a co-opetition relationships environment. The research concerns the investigation of a life cycle of the network in which the partners change dynamically. In particular, the enterprises that participate in the network can exit or continue to participate, while the enterprises that operate outside the network can evaluate to participate in the network. A simulation environment is developed to implement and test the proposed Multi Agent Architecture. The simulation tool allows to evaluate the proposed approach in a co-opetitive network during the operational activities. The simulation results show that the proposed approach is a very promising tool to support the plant's participation decision.

INTRODUCTION

Nowadays, the costs of cooperation and communication among the enterprises are reduced drastically, this condition encourages the enterprises to establish relationship among them. The collaboration among enterprises is necessary to obtain a competitive advantage in the actual business environment characterized by global competition, frequent introduction of new products, large fluctuations in product demand, etc. Several investigations have been discussed on inter-firm

DOI: 10.4018/978-1-60960-581-0.ch011

relationship (Song and Panayides, 2002; White, 2005; Janssen, 2008). The importance of inter-firm relationship is supported by several studies, among them Lavie (2007) finds an increase from 32% to 95% for the percentage of corporations in the US software industry that engage in alliances between the beginning and the end of the 1990s. The co-opetition paradigm seems to be the most promising approach to establish efficacy and efficient relationship among enterprises. Co-opetition concept was expanded upon by Brandenburger & Nalebuff (1996a; 1996b); it is a model in which firms engage in simultaneous cooperation and competition with each other to create maximum value. Several examples of co-opetition have been developed in recent years. In the 90s GM and Ford, the major American car-makers, established an e-procurement platform for procuring basic components. The joint venture between Toyota and PSA Citroen-Peugeot, established in 2002, is another very relevant example of co-opetition in automobile industry. The two companies agreed in building a common plant in Czech Republic and using common components for the production of three new separately-owned city cars. In Italy, in 2002, the two biggest motorcycle companies, Aprilia and Piaggio made an alliance for joint-procurement, though competing in the final market. In ICT industry, the Simian is a joint-venture among the main mobile wireless telephones manufacturers in the world: Nokia, Ericsson, Panasonic, Samsung, Siemens AG, and the leading company in the mobile digital computing, Psion. (Psionhas sold its own shares in 2004). The phenomenon of co-opetition in R&D activities and co-promotion is also very common in pharmaceutical and biotechnology industry.

The development and rapid expansion of World Wide Web technologies allowed the acceleration of applications that can support e-collaboration for business to business applications. These tools allow enterprises geographically dispersed to cooperate in order to better respond to business opportunities. Multi Agent technology has been considered as an important approach for developing distributed architecture (Shen, 1999). In particular, the multi agent technology can be used to structure the framework for dynamic collaborative web tools. The main motivations to adopt a multi-agent platform concern especially:

- The dynamicity of the system- enterprises can evaluate the possibility to enter or leave with the needed intelligence of software components.
- The scalability of the system - enterprises have different system to integrate and the environmental condition can be affected by rapid change.
- The naturally distributed environment.

In this context, the "multi agent technology" can be viewed as a framework at high level of abstraction (knowledge level) to support and implement the features of a collaborative distributed environment.

Collaborative web applications support the development of sophisticated multi agent architectures with high intelligence that improve the performance level of decentralized approaches.

The contribution of this chapter concerns the following issues.

The first issue concerns the design of the Multi Agent Architecture able to support transaction, information sharing and collaboration among the enterprises that participate in a co-opetition network. In particular, to form a functional perspective, the architecture is described by using the class diagram formalism, while its dynamics are specified by UML activity diagrams.

The second issues concerns the development of strategies performed by the generic firm. In particular, the firms have to take the following decisions:

- if the generic firm participates in the network, it applies a periodic review of the advantages / disadvantages obtained by