Chapter 9
Negotiation Policies for E-Procurement by Multi Agent Systems

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ABSTRACT
The development of Information and Communication Technologies (ICT) allowed the enterprises to adopt an e-marketplace approach to Business to Business (B2B) applications. In particular, these kind of applications are demonstrating their capacity to provide real added value to manufacturing industries by allowing their global performance to increase. The implementation of the e-marketplace by firms is not considered an easy job because of the lack of automation: the human participation is still in all stages of the B2B process. The chapter proposes a three value added services: workflow design, Multi Agent System and negotiation approach. In particular, two negotiation, an auction and single round approaches with three customer behaviors are proposed. A simulation environment is developed in order to test the proposed approaches. The simulations have been conducted in several scenarios in order to highlight what is the best approach to perform.

INTRODUCTION
The development of Information and Communication Technologies (ICT) is deeply changing the way to do business for several manufacturing companies. Especially, Business-to-Business (B2B) applications are demonstrating the capacity to provide real value to manufacturing industries by allowing industry global performance to increase. According to Rangone et al. (2004) a basic classification of B2B solutions can concern their business model focus; indeed is possible to classify B2B solutions in those that are procurement oriented, and those that are supply chain oriented. This chapter focuses on procurement oriented solutions, that support the company in procurement transactions. These solutions are essentially referred as e-marketplace.

Several definitions of e-marketplace (EM) have been provided in the literature from 1998. However, a basic definition has been proposed by Grieger...
Table 1. E-procurement performance

<table>
<thead>
<tr>
<th>Performance area</th>
<th>2001</th>
<th>2004</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Suppliers enabled</td>
<td>30</td>
<td>253</td>
<td>361</td>
</tr>
<tr>
<td>Total End-Users</td>
<td>1,000</td>
<td>2,309</td>
<td>1,381</td>
</tr>
<tr>
<td>Users: Current vs. Planned (%)</td>
<td>12%</td>
<td>43.5%</td>
<td>68%</td>
</tr>
<tr>
<td>Transactions per Month</td>
<td>1,340</td>
<td>5,244</td>
<td>2,977</td>
</tr>
<tr>
<td>Percentage of Indirect Spend managed by system</td>
<td>18%</td>
<td>37.6%</td>
<td>55%</td>
</tr>
<tr>
<td>Percentage of Services Spend managed by system</td>
<td>--</td>
<td>32.7%</td>
<td>29.3%</td>
</tr>
</tbody>
</table>

(2003) that is: “an EM brings multiple buyers and sellers together (in a “virtual” sense) in one central market space. If it also enables them to buy and sell from each other at a dynamic price which is determinate in accordance with rules of the Exchange, it is called an electronic exchange; otherwise it is called a portal”.

In practice an e-marketplace is not an easy job, mainly for the lack of automation: the human participation is still present in all stages of the B2B process. Recently, to ride out this limitation, the diffusion of software agents is increased and, in few years, has lead to the automation of several activities in order to reduce time consuming and diminishing transaction costs. The used software agents differ form “traditional” software because they are autonomous or semi-autonomous, customizable and can be coordinated with other agents.

The e-procurement use by firms, as a recent research of the Aberdeen group (2006) testify, leads to the following improvements performance:

- Increased their spend under management by 36% ;
- Reduced their requisition-to-order cycles by 75% ;
- Reduced their requisition-to-order costs by 48% ;
- Reduced their maverick spend by 36% .

Table 1 reports the trend of the e-procurement applications upon 2001 and 2006.

In particular, the research concerns private neutral linear e-marketplaces owned by a third part where a set of registered buyers, customers, and a set of registered sellers, suppliers, are allowed to play procurement actions. Example of such e-marketplace are CPGmarket, Tribon Marketplace, ChemConnect, etc. According to Barrat et al. (2002) reduces waste and inefficiency in highly fragmented industries, by increasing visibility and a neutral knowledge base for both buyers and sellers. This business model is the most suitable for Small and Medium Enterprises (SMEs). In this context, the e-marketplaces can create value mainly through the matching mechanism among buyers and sellers where transaction attributes are determined at the moment of purchase.

Among the value added services (VASs) the following have a strongest importance:

- Production planning tools;
- Negotiation tools.

Production planning tools allow creating a link between commercialization and production activities providing a better service for the customer, that can gain reliable information about order availability and timing, and for the supplier, that can correctly plan resource use in order to achieve lower costs. On the other hand, negotiation tools allow making transactions able to take into account buyer’s and seller’s identities and goals, providing a better global satisfaction.
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