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An Open Tender Framework for Parts Supply System

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1. Introduction

Parts supply system plays the key roles in manufacturing industries but many problems may cause the failure of this system. For example, components don't arrive on time from suppliers, customers change due dates or production specification, forecasts are wrong, etc. Those problems make the production lead time longer and the efficiency of parts supply process lower. An appropriate approach is required to overcome those problems. Open tender is one of the approaches to improve the flow of parts supply process in manufacturing industries. Collaborative parts supply system between companies and suppliers is required to shorten the production lead time and to increase the efficiency of parts supply process.

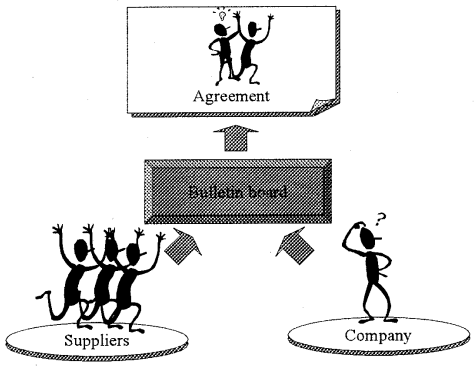

Figure 1. Open tender in parts supply system

This study proposes open tender framework through bulletin board(BB) to develop a collaborative parts supply system. The open tender framework is designed to provide open and free opportunity to companies and suppliers. The open tender framework broadens the companies opportunity to find a new supplier in case the problems happen in their factories. For example, a supplier fails to supply the companies with the required parts on time. The companies are provided with a list of candidate supplier in the open tender framework. The companies can choose a new supplier to replace the failed supplier for their parts replenishment through the list of candidate supplier. This replacement may help the companies to avoid the delay of product delivery to their customers.

Figure 1 shows the general view of open tender concept. A company issues a tender and publishes it to BB. Candidate suppliers are invited to issue their quotations to BB for open competition. The most appropriate candidate supplier is selected as a result of open competition.

2. Open tender framework

Companies are required to comply with customer orders even if they may be hard to do so. Companies have to respond to the orders quickly and efficiently in the limited time available to fulfil the customer's requirements. Unexpected rush orders, however, may come sometimes, which causes the delay of delivery and decreases efficiency in all of the supporting members. The collaboration of parts supply members(suppliers, company, distributors and customers) and the introduction of negotiation techniques among IAs in open tender concept provide a solution to those problems. Collaboration and negotiation work to find an appropriate supplying company in open tender trading.

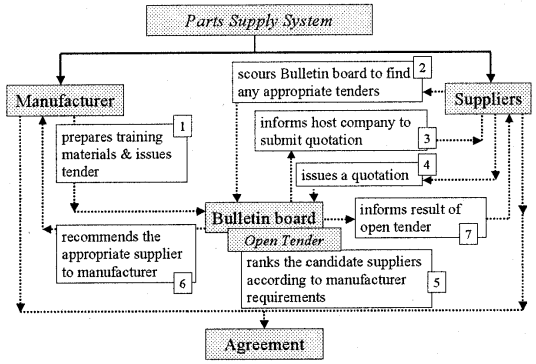

Figure 2. Framework of open tender in the collaborative parts supply system

Figure 2 shows the framework of open tender concept in parts supply system. For parts/materials replenishment, a company publishes a tender to BB, which can be reviewed by the entire aviation community of suppliers. This is the start of open tender competition. Supplier agents for each supplying company scour BB to find any appropriate

tenders. When an agent find one, it will urge its host company to submit a quotation. BB publishes quotations submitted by candidate supplying companies, which may urge revision of quotations, or negotiation among these companies. BB closes the tender when the most appropriate quotation is selected based on selection criteria. The most appropriate supplier is recommended to the company. The company can choose a new supplier if the recommended supplier does not fulfil its requirement. In this context, IAs work for communication and negotiation processes between a company and its supplier to achieve their mutual goal.

3. Intelligent agents interaction in open tender

IAs play an important role in parts supply system for smooth communication and collaboration within suppliers and companies. IAs identify the critical information from incoming resources, monitors the information and trigger actions based on the contents of information. According to the contents, IAs execute collective tasks on behalf of users as an autonomous process. This study is comply with collaboration among IAs for streamlining and integrating the entire process of parts supply system. The application of IAs in parts supply system strongly promotes cooperation among suppliers and companies.

Figure 3 shows interaction of IAs in open tender process. In open tender, the company can find the most appropriate supplier in each occasion in a dynamic manner using collaboration of agents, which include inventory stock control agent (ISCA), manufacturer agent (MA), supplier agent (SA), supplier stock control agent (SSCA), and bulletin board control agent (BBCA). The company sets up the minimum inventory level so that the agent can control the inventory. When the inventory stock reaches to the level, an ISCA sends a signal to Purchasing Department so that they can take an appropriate action to place an order to suppliers. When it happens, an MA urges Purchasing Department to fill out an order request form (ORF) including several key items, such as part name, part number, selection criteria, delivery point, order record, etc. MA verifies ORF and submits it to BB as a tender. When a new tender is published, supplying companies are notified by each SA working for each supplier so that they can consider their supply positions. Details of the tender are available on BB, so that not only the issuer of tender but also supplying companies can refer to the details if necessary.

If a supplying company wants to obtain the tender, Sales Department of the company checks availability of the parts through SSCA. If it is available, then an SA urges the department to fill out a quotation form (QF). SA verifies the QF and submits it to BB, which means that the company shows an intention to join a competition for the tender. In this way, list of supplying companies to the tender and details of each quotation are open through BB so that every participant can understand what is going on regarding the tender until the final stage of open competition and, of course, which company obtains the tender in the end. Latest information is fed back to each company either by MA or SA.

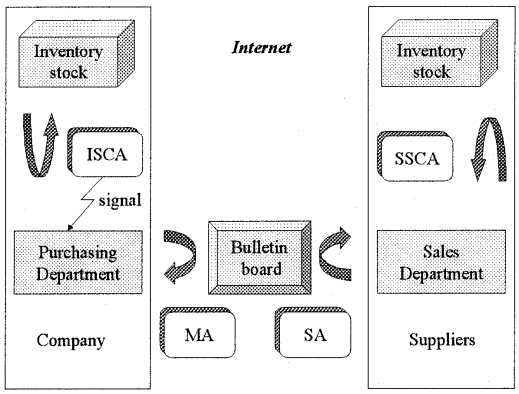

Figure 3. IAs interaction in open tender system

4. Conclusion

The paper presented the idea of open tender concept with BB and IAs to implement a collaborative parts supply system. The collaborative parts supply system increases the efficiency of material flow and shortens the production lead-time. It also broadens the company choice through open competition and provides the candidate suppliers with an equal opportunity in quotations competition. Through the support of collaboration and negotiation techniques, IAs coordinate interactions, generate resolutions, and derive agreements to fulfil the users' requirements.

Reference

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[2] Carrie Beam and Arie Segev: Automated Negotiations: A Survey of the State of the Art , CMIT Working Paper 97-WP-1022,1997.(http://haas.berkeley.edu/edu/ citm/ wp-1022-summary.html)