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A knowledge-based supplier intelligence retrieval system for outsource manufacturing

K.L. Choy*, W.B. Lee, Henry C.W. Lau, L.C. Choy

Department of Industrial and Systems Engineering, Hong Kong Polytechnic University, Hong Kong, China

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Abstract

Knowledge management is to promote business success through a formal, structured initiative to improve the use of knowledge in an organization, in which an effective organizational memory information system plays an increasingly important role. Unlike the past, the performance of an enterprise now depends much on the performance and relationship of its customer–suppliers in the value chain. Good customer–supplier relationships are important for an organization to respond to dynamic and unpredictable changes. This paper describes a knowledge-based supplier selection and evaluation system, which is a case-based reasoning decision support system for outsourcing operations at Honeywell Consumer Products (Hong Kong) Limited in China. As a result, collaborative suppliers are identified quickly during the new product development process. By using the system, the cumulative performance of suppliers is constantly updated automatically according to past practice. This means that the knowledge of suppliers can be retained, categorized, retrieved and managed effectively.

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1. Introduction

Management of suppliers' competitiveness and alternative suppliers has become a critical activity for manufacturers because many outsourcing activities are knowledge-driven. It is therefore critical for an outsourced type manufacturer to manage this knowledge in a coherent manner. This leads to the management of supplier intelligence (SI), the knowledge of which is important for the daily operations of purchasers. However, for an effective supplier management system to be functional, the types of supplier knowledge (i.e. both quantitative and qualitative) need to be captured, codified, and cataloged.

Over the past two decades, globalizations of economies and advances in IT technology have complicated purchasing decisions. For example, the rapid expansion of information technologies means that manufacturing industries are gradually moving to a borderless business environment. Different factories play different strategic roles to cooperate and form collaborative partners within the value chain in order to increase their competitiveness. In addition, the role of the buyer–seller relationship has evolved from arms-length to collaborative, making purchasing decisions

even more complicated. In fact, the quality of buyer–seller relationship becomes more important when the environment is uncertain and dynamic [1]. As for flexible and efficient purchasing decisions, there is a growing trend that companies divide supplier bases into two categories—competitive and collaborative. Hence, a knowledge-based system is therefore in great demand for supplier categorization purpose. Such system is essential for company to acquire, share and retain knowledge [2] of suppliers. However, there is little literature regarding the management of SI such as the integration of supplier categorization, supplier assessment criteria and supplier performance rating system using knowledge-based systems.

When companies outsource a significant part of their business, the process of supplier selection is involved. Consequently, supplier categorization, supplier assessment criteria and supplier performance measurement must be adopted and retrieved when a decision on outsourcing has to be made. Nevertheless, no such system is currently available in the market. In this paper, a case-based supplier selection and evaluation system (CSSSES) for the new product development process is presented. At present, research on the use of Artificial Intelligent technology to integrate supplier management activities is limited. The purpose of this paper is to perform supplier selection and categorization

* Corresponding author. Tel.: +852-2766-6597; fax: +852-2362-5267.
E-mail address: mflchoy@inet.polyu.edu.hk (K.L. Choy).

system based on suppliers' past practices. A conceptual new approach of allying collaborative suppliers as strategic partners with manufacturers who outsource significantly is explained.

This paper is divided into eight sections. Section 2 introduces SI and its role in supplier management. Section 3 is the introduction of Case-based reasoning (CBR) technique and its application in managing SI. Section 4 describes an integrative model linking three different supplier management activities. The construction of CSSES using a hybrid inductive-nearest neighbor CBR approach is explained in Section 5. Section 6 is about an application case study using CSSES in the purchasing department of Honeywell Consumer Product (Hong Kong) Limited to aid the supplier selection process. While the detail of implementation, result and benefits are addressed in Section 7, a conclusion of the application in general is made in Section 8.

2. Supplier intelligence

The buyer–supplier relationship is a key factor in manufacturing strategy when the environment is uncertain and dynamic. In the mid-1980s, transactions between buyers and sellers tended to rely on arms-length agreements based on market prices, while relationships in the 1990s were based more on trust derived from collaboration and information sharing [1]. Hence, buyers used to play at a large number of suppliers against each other in order to gain price concessions and ensure continuity of supply at first, while only a small number of suppliers are required to supplement their core competences to satisfy their customers. The emergence and widespread use of the Internet allows the search of suppliers from the smallest company to largest corporations on a global scale. This has resulted in the availability of a large number of qualified suppliers who can satisfy customers' requirements. The amount of supplier information grows exponentially and becomes almost a management nightmare. A lot of companies still rely on traditional IT systems to tackle problems at the data and information level but many errors have been reported to blame the supplier management system from the perspective of business intelligence.

According to Breeding [3], SI is about the intelligence level of the manufacturers to handle abundant supplier information. Manufacturers must enhance SI, which covers areas such as information on discussion progress between customers and the proposed supplier, and evaluations for forming collaborative partnerships, in the knowledge era. As companies are increasingly outsourcing more and more activities to suppliers in order to specialize and focus on their core competences and thereby become more effective and efficient, the suppliers are pushed to co-operate [4]. Since outsourcing activities reduce a company's internal added value in the product value chain to its core

competences and at the same time the supplier's influence on quality increases to assume a dominant role in some cases, a company needs to enhance its ability to acquire SI. A further factor contributing to the growing importance of SI has been the shortening life cycles of new technologies. Early and extensive supplier involvement has shortened the product development process and has been an important source of innovation [5]. Especially, the need to ensure manufacturing flexibility, which enables a company to introduce new products more quickly and to defend themselves against competitive threats by modifying existing products, has also necessitated a more intense interaction with suppliers. By means of dispersed manufacturing network and responsive supply chain information systems integration [30–32], concepts such as vendor managed inventory and continuous replenishment have led to tremendous cost saving. By implementing concepts, such as simultaneous engineering with suppliers, the speed of the product innovation and launching process has been increased. Apart from shorter cycle times in the development phase, intensive cooperation with suppliers can increase the quality of products and the probability of technical product success [6]. Kalwani and Narayandas [7] concluded that the uncertainties that are inherent in market relationships coupled with the bounded rationality of decision makers have made it likely that customers, manufacturers and suppliers will seek to standardize their transactions by developing more robust relations with each other based on sound scientific principles rather than ad hoc business decisions. Hence, SI is useful in tackling supplier management problems such as supplier selection and categorization, defining supplier assessment criteria and measuring supplier performance [8–11].

Supplier selection and categorization is considered to be one of the main tasks in purchasing [12,13]. The objective of the supplier selection and categorization process should be to reduce risk and maximize the total value for the transaction, which involves the consideration of a series of strategic variables. Among these variables are the time frame of the relationship with suppliers [14]; the choice between domestic and international suppliers [15]; the number of suppliers such as the choice of single or multiple sources [16]; and the type of product. Nowadays, the value of building a collaborative relationship is believed to be greater than that of a competitive relationship for all products. Hence, companies take benefit by applying and managing these two kinds of relationships in the purchasing environment. Adversarial relationships assume that there are no differences in suppliers' abilities to provide value-added services, technology gains, process innovations and other methods in gaining competitive advantage. Hence, it does not make direct use of the total resources of the supplier and results to engender long-term coordination or cooperation between buyers and suppliers. Collaborative relationships require trust and commitment for long-term cooperation along with a willingness to share risks.

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