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A Frame-Based Induction Expert System For Supplier Selection

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***Abstract*—In today's competitive world, one of the most important processes performed in organizations is the evaluation, selection and continuous assessment of suppliers to support their supply chains. Supplier selection process is a multi-criteria decision making problem, which includes both qualitative and quantitative criteria. Nowadays standardization regulations such as ISO binds companies to audit their current suppliers. Therefore, there is a database of supplier's performance in most of organizations. This historical data is one of major sources for evaluating potential vendors. In this paper, C4.5 algorithm is applied to generate a decision tree and rule set for an inductive frame based supplier selection expert system, which can be effectively used to help managers in making proper decisions about their suppliers based on previous proceedings and results.**

Keywords- Supplier selection, frame based expert system, induction system, C4.5 algorithm

I. INTRODUCTION

Nowadays most of industries tend to be specialized; therefore outsourcing is becoming a prevalent way to reduce total cost and improve quality in any organization. Organization's ability to be qualitatively productive at a reasonable cost and in a timely manner is heavily influenced by its suppliers'capabilities. Supplier selection is one of the key issues of supply chain management (SCM) because the cost of raw materials and component parts constitutes the main cost of a product management. The cost of row materials, parts and services purchased from external suppliers is significant for most manufacturing firms [1].

In recent years, extensive multi-criteria decision making approaches, such as the analytic hierarchy process (AHP), analytic network process (ANP), case-based reasoning (CBR), artificial neural network (ANN), data envelopment analysis (DEA), fuzzy set theory, genetic algorithm (GA), mathematical programming, simple multi-attribute rating technique (SMART), technique for order preference by similarity to ideal solution (TOPSIS), and their hybrids, have been used for supplier selection.

These methods rank suppliers based on the predefined weight of each attribute. The result of evaluation of suppliers through a predefined method of MCDM is the weight or rank of suppliers, so that the decision maker will select the top most suppliers. The authors of [2] reviewed different approaches for supplier selection and evaluation as well as the most prevalent evaluation criteria.

However, in some cases the weights of decision-making attributes can be changed due to special conditions. For example, consider a situation where the price is more important than the delivery time in decision maker's point of view, so that the weight of delivery time criteria is lower than the weight of price. Possibly, a supplier with lower price becomes the topmost supplier. Besides the current situation of the company requires immediate delivery. Therefore managers decide to assign a contract with the vendor, which has a lower score in the list. The example states that weight of criterion might be changed at specific situations for a company. Moreover the historical records of suppliers' evolution and signed contracts are a detailed source of information about company's strategy in supplier selection, while in most of papers the attribute weights are elicited from the experts.

Moreover, each of these MCDM methods applies special algorithm and final ranking of suppliers by each of them is diverse. So decision maker confronts with a new challenge to select one of these methods. On the one hand, it may be argued that Mathematical Progarmming-models are more objective than rating models because they force the decision-maker to explicitly state the objective function. At the other hand, MP-models often only consider the more quantitative criteria [3]. As
mentioned MP models are not dynamic to the condition of company.