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Developing a model for effective supplier selection using Analytic Network Process (ANP)

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If any organization needs to survive in this intensively competitive market, they should possess a competitive advantage over other companies. An effective supplier selection process is a major determinant of the degree of competitive advantage within an organization. The common drawbacks in the existing supplier selection processes which hinder the selection of effective supplier/suppliers are the absence of a systematic mechanism and subjectivity of decisions. It is also a disadvantage from suppliers' perspective, as a supplier cannot systematically align their processes because requirements and expectations differ from organization to organization. Therefore, the objective of this research is to propose a mechanism and a general model to prioritize criteria, sub criteria, and alternative suppliers along with appropriate set of criteria and sub criteria and to validate it across few industries. With the scope of this paper, supplier selection was considered as a multi criteria decision making problem (MCDM) because supplier selection is the evaluation of trade-offs between inconsistent, contradictory and competing criteria with each other. Analytic Network Process (ANP) which is a technique to solve MCDM problems in which the criteria affect each other and have nonlinear correlation, is used here to prioritize criteria and alternatives. In this study, a systematic review of literature was conducted to identify the different research approaches, limitations, and gaps and to determine most appropriate criteria, sub-criteria, tools and techniques used for supplier selection. Then developed the tentative criteria list and tentative ANP model using data gathered through literature review. Then this model and criteria list was finalized through a survey in a chemical manufacturing company, by acquiring industry experts' opinion. After finalizing the model, it is validated by feeding data obtained through past supplier selection records into it. Here results were compared and constructed with the actual results in each case. The results of the survey show that most important criteria that should consider when selecting suppliers for the selected product in this chemical manufacturing company are the production capability, delivery capability, financial capability and service capability of the supplier. In the current supplier selection process in this company, they consider only factors like the quality and price of product and punctuality delivery goods by suppliers. But these limited set of criteria have led to choosing ineffective suppliers. The result of this study shows the scope and the importance of criteria and sub criteria that should be used for supplier selection in this company. Here when comparing these results with past literature, it can be concluded that industry wise prioritizations are not exactly similar but can relate to general model with few modifications and assumptions. Also, when comparing the finalized model and mechanism with past literature it can be concluded that this model is more appropriate for large scale manufacturing companies who are mainly focusing on exports, procuring products than services, procuring products use as the raw materials in manufacturing processes.

Keywords: Analytic Network Process (ANP), General supplier selection model, Supplier selection process