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# Strategic supplier performance evaluation: A case-based action research of a UK manufacturing organisation



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## ABSTRACT

The main aim of this research is to demonstrate strategic supplier performance evaluation of a UK-based manufacturing organisation using an integrated analytical framework. Developing long term relationship with strategic suppliers is common in today's industry. However, monitoring suppliers' performance all through the contractual period is important in order to ensure overall supply chain performance. Therefore, client organisations need to measure suppliers' performance dynamically and inform them on improvement measures. Although there are many studies introducing innovative supplier performance evaluation frameworks and empirical researches on identifying criteria for supplier evaluation, little has been reported on detailed application of strategic supplier performance evaluation and its implication on overall performance of organisation. Additionally, majority of the prior studies emphasise on lagging factors (quality, delivery schedule and value/cost) for supplier selection and evaluation. This research proposes both leading (organisational practices, risk management, environmental and social practices) and lagging factors for supplier evaluation and demonstrates a systematic method for identifying those factors with the involvement of relevant stakeholders and process mapping. The contribution of this article is a real-life case-based action research utilising an integrated analytical model that combines quality function deployment and the analytic hierarchy process method for suppliers' performance evaluation. The effectiveness of the method has been demonstrated through number of validations (e.g. focus group, business results, and statistical analysis). Additionally, the study reveals that enhanced supplier performance results positive impact on operational and business performance of client organisation.

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## 1. Introduction

Today's manufacturing procurement focuses on building long term relationships with upstream suppliers and downstream customers to enhance supply chain performance. Performance evaluation of suppliers is regarded as an essential element of today's production planning and control (Chan et al., 2003). It not only integrates supply chain stakeholders but also enhances supply chain performance through capitalising potential opportunities (Holmberg, 2000; Chan et al., 2003). Organisations require a structured flexible framework (constructs and methods) to facilitate in auditing suppliers' performance (Medori and Steeple, 2000) that in turn helps improve entire supply chain performance. Further, it has been reported that although there are frameworks for evaluating suppliers' performance about 60% of enterprises are unhappy regarding their "ability to consistently measure and manage supplier performance" (Minahan and Vigoroso,

2002). Therefore, an effective supplier performance measurement framework is required, which is easily adoptable, efficient, reliable, flexible, and compatible to other organisational systems. Further, an effective supplier performance measurement method provides feedback to suppliers to improve their performance.

Procurement cost comprises of 60–80% of production cost for many manufacturing organisations. Suppliers not only contribute in product innovation, but also help achieve highly effective production processes. Therefore, enhancement of supplier performance helps achieve overall organisational excellence. Although supplier evaluation eventually facilitates to improve supplier performance through identifying improvement measures, such measures are complex and cumbersome to implement (Estampe et al., 2013). These measures are critical to success (Fawcett and Cooper, 1998). The suppliers' performances are well related to manufacturing performance enabling the firm to meet its manufacturing objectives. Therefore, firms' communication channels with suppliers are required to be improved (Galt and Dale, 1991; Vonderembse and Tracey, 1999).

There are abundant studies on supplier selection and evaluation. On one hand there are studies on methods for supplier

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selection and evaluation, and on other hand there are researches on constructs for supplier performance measurement. Number of studies demonstrates innovative frameworks for supplier selection and evaluation using operations research tools and techniques such as the analytic hierarchy process, the analytic network process, fuzzy theory, data envelopment analysis, and multiobjective decision analysis. There are also hybrid methods, where two or more techniques are combined together to develop innovative heuristics for supplier performance evaluation.

Although there are studies on innovative frameworks for supplier selection and evaluation and their applications in industry, real life demonstration of supplier performance measurement and its impact on overall supply chain performance is scant. Moreover, systematic identification of most appropriate criteria for supplier evaluation with the consideration of both leading (proactive) and lagging (reactive) factors is also rare. The objective of this case-based action research is to identify appropriate criteria for supplier evaluation, develop an analytical framework for performance measurement, measure supplier performance of a UK-based manufacturing organisation and suggest improvement measures, and reveal the impact of supplier performance on operations and overall business performance in the downstream client organisations.

The paper is organised as follows. Section 2 articulates the existing methods for supplier performance assessment and factors/criteria/constructs for suppliers' performance evaluation through an exhaustive literature review. Section 3 explains the methodology that has been used to measure the supplier performance. Section 4 describes the case-based action research for the supplier performance evaluation within a UK-based carpet manufacturing organisation. Section 5 elucidates the contributions through discussion on both theoretical and practical implications of this research. Section 6 concludes the article indicating further scope of research.

## 2. Literature review

There have been number of studies on supplier selection and evaluation covering both wide range of constructs and methods. Recently, there are number of review articles (e.g. Ho et al., 2010, Chen, 2011, Chai et al., 2013) revealing both constructs and methods for supplier selection. Prior studies reveal that analytic supplier selection processes result in better decision outcomes (Kaufmann et al., 2012). More recently hybrid methods have become more popular in research and industry (Chai et al., 2013).

The following paragraphs describe the literatures on methods and constructs for supplier performance evaluation along with rationale for selecting the integrated analytical approach for this study.

### 2.1. Supplier evaluation methods

Multiple Attribute Decision-Making (MADM) techniques have been extensively used for supplier selection and evaluation (Chai et al., 2013). Ho et al. (2010) report that the analytic hierarchy process (AHP) is the most popular method for supplier selection. Levary (2008) and Lin et al. (2010) use the AHP and the analytic network process (ANP) respectively. Other MADM techniques like Elimination and Choice Expressing Reality (ELECTRE), Preference Ranking Organisation Method for Enrichment Analysis (PROMETHEE), Techniques for Order Performance by Similarity to Ideal Solution (TOPSIS) have been demonstrated by Sevki (2010), Chen et al. (2011b) and Saen (2010) respectively for supplier selection and evaluation. Wu and Blackhurst (2009) use data envelopment analysis (DEA), Lin et al. (2011) adopt linear programming, Hsu et al. (2010) apply non-linear programming, Yu et al. (2012) use

multi-objective programming, Kull and Talluri (2008) utilise goal programming, and Li and Zabinsky (2011) apply stochastic programming. Researchers also apply artificial intelligence techniques such as genetic algorithm (Guner et al., 2011), grey system theory (Tseng, 2011), neural network (Lee and Ouyang, 2009), Bayesian networks (Ferreira and Borenstein, 2012), decision tree (Guo et al., 2009), case based reasoning (Faez et al., 2009), and ant colony algorithm (Tsai et al., 2010).

Additionally, number of hybrid methods has been proposed. The AHP and ANP have been combined extensively with linear programming and goal programming for supplier selection and evaluation (e.g. Kull and Talluri, 2008; Demirtas and Üstün, 2008; Demirtas and Üstün, 2009). Researchers have also combined DEA with other MADM techniques such as the AHP, ANP, TOPSIS etc. (e.g. Azadeh and Alem, 2010; Zeydan et al., 2011; Kuo and Lin, 2012, Zhang et al., 2012). There are studies (e.g. Wang et al., 2009; Lin, 2012) that combine MADM techniques and mathematical programming techniques for supplier selection. Fuzzy theory has been used extensively by the researchers in combination with other methods such as the AHP, ANP, TOPSIS ELECTRE, PROMETHEE, DEA, linear programming, goal programming, multiple objective programming etc. for supplier selection (e.g. Montazer et al., 2009; Wang et al., 2009; Azadeh and Alem, 2010; Amid et al., 2011; Chen et al., 2011a; Vinodh et al., 2011; Bhattacharya et al., 2014; Jadidi et al., 2014).

Quality function deployment (QFD), a customer focused approach, has been used by Ansari and Modarress (1994) for supplier selection. Rich (1995) shows the application of QFD for evaluating the potential suppliers in an automotive industry. Bevilacqua et al. (2006) combine fuzzy QFD in order to model stakeholder requirements in supplier evaluation. Bhattacharya et al. (2010) use an integrated QFD-AHP method to determine importance of stakeholder requirements in supplier selection. More recently Ho et al. (2011) and Scott et al. (2013) also apply a combined QFD-AHP approach for strategic supplier selection using three houses of quality.

As revealed in prior researches, every method has its pros and cons. The selection of specific method for supplier evaluation depends on many factors such as characteristics of supplier evaluation constructs, implications of supplier evaluation decision on overall organisational performance, user friendliness, flexibility, and both capital cost and operating costs of the model. In fact, there is no best method. Therefore, there is significance of demonstrating real life case study of supplier evaluation in order to depict the process involved, perceptions of the stakeholders, constructs being considered, comfortableness of using a specific method, and the impact of supplier evaluation on overall organisational performance.

### 2.2. Supplier performance evaluation criteria

Prior studies use traditional supplier selection criteria – quality, delivery schedule and past performance (e.g. Lehmann and O'Shaughnessy, 1982). Wilson (1994) uses flexibility and services of suppliers along with delivery schedule. Swift (1995) introduces number of indicators (product, dependent, experience, price and acquired) in order to decide single or multiple supplier. Goffin et al. (1997) reveal that earlier studies consider price, quality and speed of delivery for supplier selection and current studies focus on suppliers' technological capacity, financing capability, after-sales service and strategic considerations. Narasimhan et al. (2001) put forward to major evaluation indicators – supplier capability and supplier performance. Quayle (2002) suggests number of criteria – price, quality, time to market immediacy, product credibility, service reliability, support capability, research and development power, purchase speciality, value analysis, value engineering and e-commerce. Schmitz and Platts (2004) list supplier performance indicators as

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