

Chapter 18

Applying the Linguistic Strategy–Oriented Aggregation Approach to Determine the Supplier Performance with Ordinal and Cardinal Data Forms

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ABSTRACT

Supply chain management is a new and evolving paradigm for enterprises to cope with international competition and to improve global logistics efficiency. The suppliers' performances affect not only supply chain execution results but also the profit capability and business survivability. However, suppliers' performance assessment always involves a large dimension of supplier behaviors. Information on supplier behaviors is often difficult to be accurately demonstrated as quantitative data. For this reason, the study employs a 2-tuple linguistic variable to perform the initial evaluation and final assessment while keeping track of both linguistic information and data, which can avoid a tied result. Additionally, the modified linguistic ordered weighted averaging (M-LOWA) operator with maximum entropy is used to derive the maximum aggregation value under the current business strategy to reflect on the criteria. The focal company can then rapidly rely on the assessment results to represent the performance of suppliers and provide integrated information to decision makers. This study draws the complete framework for the issue of supplier performance assessment without limitations on categories of variables and scales.

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INTRODUCTION

Today, enterprises must develop a new perspective toward suppliers from being competitive to cooperative in order to not only cope with the challenges of international competition and global logistics but also to establish their efficient supply chain systems. Hence, the mechanism of supplier assessment becomes critical for developing the supply chain. The assessment criteria must consider supplier ability, performance and potential capability. More importantly, the criteria must include enterprise strategy (Krause et al., 2001), product position (Aitken et al., 2003) and supplier performance (Carbonara et al., 2002) to improve the compatibility of the assessment results and to demonstrate the advantages of the supply chain.

Due to the broad range of content for assessing supplier performance, supplier behavior information should be analyzed in various ways according to the characteristics of each criterion that increases the difficulty of the assessment process. Choi and Hartley (1996) evaluated supplier performance based on consistency, reliability, relationship, flexibility, price, service, technological capability and finances, and also addressed 26 supplier selection criteria. Verma and Pullman (1998) ranked the importance of supplier attributes including quality, on-time delivery, cost, lead-time and flexibility. Vonderembse and Tracey (1999) discussed supplier and manufacturing performances that could be determined by supplier selection criteria and supplier involvement. Furthermore, they concluded that supplier selection could be evaluated by quality, availability, reliability and performance, while supplier involvement could be evaluated by product research and development (R&D) and improvement, and supplier performance could be evaluated by stoppage, delivery, damage and quality. Additionally, manufacturing performance could be evaluated by cost, quality, inventory and delivery.

Krause et al. (2001) devised a purchasing strategy based on the competitiveness in cost,

quality, delivery, flexibility and innovation. Tracey and Tan (2001) developed supplier selection criteria, including quality, delivery, reliability, performance and price, and assessed customer satisfaction based on price, quality, variety and delivery. Furthermore, Kannan and Tan (2002) made supplier selection based on commitment, needs, capability, fit and honesty, and developed a system for supplier evaluation based on delivery, quality, responsiveness and information sharing. Kannan and Tan (2002) also made supplier selection and evaluated supplier performance based on the weights of evaluation attributes or criteria with crisp values that depend on subjective individual judgments.

Muralidharan et al. (2002) compared the advantages and limitations of nine previously developed methods of supplier rating, combined multiple criteria decision-making and analytic hierarchy processes to construct multi-criteria group decision-making model for supplier rating. The attributes of quality, delivery, price, technique capability, finance, attitude, facility, flexibility and service were used for supplier evaluation, and the attributes of knowledge, skill, attitude and experience were used for individual assessments. Sarkis and Talluri (2002) suggested that purchasing function has been attracting growing interest as a critical component of supply chain management, and multiple factors have been considered in supplier selection and evaluation, including strategic, operational, tangible and intangible measures within planning horizon, culture, technology, relationship, cost, quality, time and flexibility.

Chan (2003) discriminated between quantitative (cost, resource utilization) and qualitative (quality, flexibility, visibility, trust, innovativeness) performance measurements from the supply chain, and defined the belonging dimension and scale. Sharland et al. (2003) made supplier selection based on cycle time, proximity, manufacturing quality, comparative price and ease of qualifying to evaluate supplier performance and

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