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A BAYESIAN NETWORK MODEL FOR RESILIENCE-BASED SUPPLIER SELECTION

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ABSTRACT

Supplier selection is an important strategic decision in the context of supply chain management. Existing literature on the subject of supplier selection is focused on evaluating primary (e.g., cost, quality, lead time) and green (e.g., CO_2 emission, environmental practices) criteria. However, the concept of supplier resilience has recently emerged due to advent of competitive and global supply chains (and the operational and disruptive risks to which they are exposed). Several resilience-based supplier selection criteria are developed with respect to absorptive, adaptive, and restorative capacities. This paper further proposes a Bayesian network (BN), a paradigm that effectively models the causal relationships among variables but that has not been used in the context of supplier evaluation and selection, to quantify the appropriateness of suppliers across primary, green, and resilience criteria. Some benefits of the BN paradigm, including an ability to handle expert evidence and to perform sensitivity and propagation analyses, are demonstrated with an initial illustrative example of three suppliers.

KEYWORDS: RESILIENCE, SUPPLIER SELECTION, BAYESIAN NETWORK

1. INTRODUCTION AND MOTIVATION

According to recent estimates [Beli 2010], the average U.S. manufacturer spends roughly half its revenue to purchase goods and services. As such, the choice of suppliers poses an important consideration for manufacturers as they have a large financial stake in how suppliers perform. And such a decision is made all along the supply chain, with ramifications to all members of the supply chain.

The supplier selection problem is a challenging multi-criteria decision problem that involves tangible and intangible factors [Ho et al. 2010]. Gonzalez and Quesada [2004] highlighted the important role of suppliers in meeting the goals of a larger supply chain, particularly in achieving high quality products and customer satisfaction. The supplier selection problem aims to select the best supplier among a set of potential suppliers to satisfy certain requirements while subject to their limitations. Traditionally, supplier selection problems account for primary criteria including quality, cost, service level, and lead time, among others [Dickson 1966].

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