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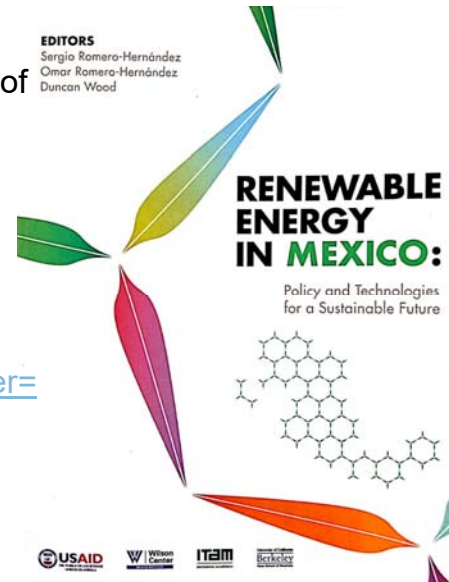
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OPERATIONS AND SUPPLY CHAIN MANAGEMENT
 Vol. 14, No. 2, 2021, pp. 113 - 147
 ISSN 1878-3581, EISSN 2759-8363



A Supply Chain Selection Method for Early-Stage Companies Based on an Adapted Quality Function Deployment Optimization Approach

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ABSTRACT

In this paper, the QFD methodology is adapted to accommodate the uncertainty and volatility of supply chain configuration. This new methodology incorporates a series of factors including supply chain needs, technical specifications, relationships among specifications, and potential coverage. Benchmarking, the original contribution of this methodology is the selection of a supply chain scenario that balances the desire to fulfill a series of needs along with the ability of a supply chain to deliver according to specification. This balance between need fulfillment and availability of supply chain is progressively difficult to reach as early-stage companies. Accordingly, this methodology was applied into the analysis and selection of four different supply chain scenarios considered for the production and final delivery of a large number of customer orders, placed for the Tata Nano car, which needed to be fulfilled in record time. In all cases, scenarios were placed in context of the company's mission on their business goals and operating decisions were aligned. The application was successful, and a specific supply chain design scenario was selected. The proposed methodology could be a roadmap for designing resilient supply chains.

Keywords: supply chain configuration, quality function deployment, multicriteria analysis, multicriteria supply chain, functional analysis, early-stage companies

1. INTRODUCTION

Strategic and increasingly becoming the dominant feature of world economies. They are the backbone of

These supply chains are usually immature, unstructured, and scattered across several geographies. In fact, initial supplier selection could be based on time-to-market concerns (Cheng, 2016) rather than being based on systematic thought out and evaluated processes. As these supply chains grow organically, they face new challenges, including the lack of flexibility to accommodate for constant change in part specifications and large overhead cost, as not all suppliers are selected based on low-cost network configurations and large lead times in processing and assembly. One consequence of these disadvantages is the selection of inefficient supplier supply chain, operating in later stages of company (Ganuks and Bode, 2019). Given the objective of a supply chain to maximize the difference between what the final product is worth to the customer and the effort the supply chain spends in fulfilling customer needs (Garza, 2016; Kusiak, 2020), its role in starting a success cannot be overstated. However, the traditional supply chain selection methods seem inadequate for these evolving needs and the speed of decisions required to meet these needs. Accordingly, we propose a novel modified Quality Function Deployment (QFD) based supply chain selection methodology to serve the unfolding needs of startups.

Practitioners interested in QFD for product development (Gardner, 1988; Shen et al., 2000), quality management (Adams, 1988; Soos, 1988), customer need analysis (Beck et al., 1997), product design (Yang et al., 2000), planning (Ngai and Chiu, 1999), registering

