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# Perspectives on Quality Coordination and Assurance in Global Supply Chains

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## GUEST EDITORIAL

### Perspectives on quality coordination and assurance in global supply chains

#### 1. Introduction

The 2007 recall of Berko Electric Toe-Space Heaters made in the US, the recall of backpack blowers made in Japan, the recalls of toys and pet food produced in China have exposed the potential of global supply chain disruptions. This product recall storm leads to the issue of quality assurance in global supply chain management. Product recalls indicate that manufacturing companies are particularly vulnerable to ensure quality when they source via a global supply chain with poor visibility. Obviously, a supply chain cannot afford this kind of sourcing and supply structure that threatens the supply-chain integrity. This special issue on quality assurance in global supply chains intends to offer a few useful concepts, methods, and approaches to ensure quality in global supply chains. The 14 articles presented here identified common themes and indicate increased emphasis on supply chain quality assurance.

#### 2. Quality assurance themes

The authors of this special issue have identified several research streams in the area of supply chain quality coordination and assurance. The research published in this special issue considers a number of supply chain quality management topics, from supply chain quality assurance model, process of quality assurance, product design quality, the role of information technology and human factors in supply chain to market reaction to product failure. The identified common themes highlighted key opportunities for future research.

##### 2.1 *Supply chain quality assurance models*

A few studies have provided comprehensive supply chain quality assurance models to ensure quality in multi-layer supply chains. Das proposed a strategic global supply chain model that integrates critical-to-quality issues along with other supply chain quality requirements that allow a global supply chain to assure product quality and safety to the primary user. The proposed model ensures product quality and other critical-to-business requirements for global supply chains that operate in various multi-layered, multi-location-based suppliers and manufacturing plants. By integrating a quality-based supply management system to global supply chain operations, the study provides a procedure for introducing a quality monitoring process for the continuous improvement of supplier plants, as well as global supply chain operated plants in its overall strategic decision making process.

The study conducted by Li *et al.* has broadened the existing research on the Supply Chain Operations Reference model to ensure quality in supply chain. Based on the survey data from 232 companies that have obtained ISO 9000 certification, the study extends the five decision areas provided in the SCOR-model (Plan, Source, Make, Deliver, and Return)

to integrate quality assurance measures in the supply chain process. The results show that individually, each decision area has a positive impact on both customer-facing supply chain performance and internal-facing firm level business performance. Collectively, 'Plan' and 'Source' decisions are more important to customer-facing supply chain performance (reliability, response, and flexibility), and 'Make' decisions positively affect internal-facing performance metrics (cost and asset). This study has opened up a new venue for firms to consider how to score their quality assurance effort in the entire supply chain process.

Jayaram *et al.* suggested that supply chain coordination relationships are contingent upon factors such as firm size and clockspeed. Using empirical data collected from 197 production/operations managers of Chinese manufacturing firms, a regression analysis approach is employed to test the theoretical framework. They concluded that it is not only important to have effective supply chain coordination upstream (supplier) but also important to have effective supply chain coordination downstream (customer). Of the two contingency variables, size displayed a more detailed pattern in the coordination-performance relationships as compared to clockspeed.

Zhang *et al.* provided a retrospective synopsis on supply chain quality coordination, technology application, supply chain risk management and reliability control to promote further exploitation on the quality coordination research in supply chains. They found that supply chain coordination, technology application, risk management, and reliability assurance are a few important measures for continuous supply chain quality improvement.

## **2.2 Ensuring quality in the process of outsourcing**

Purchasing and outsourcing are common practices in supply chains and these activities link supply chain functions as well as trading partners. Companies outsource for different reasons, some seek technical expertise, some want to reduce cost, some need quick response to market requirements, and some try to build strategic agility. In the case of outsourcing engagement, achieving effective quality objectives requires effective use of integrative supply management practices. Xiao *et al.* explored coordination of a supply chain. They developed a game theoretic model to investigate how an upstream firm coordinates the supply chain with quality assurance policy via a revenue-sharing contract. Specifically, the paper focuses on how the manufacturer coordinates the service quality (i.e., reciprocal of delivery lead-time) and retail price decisions when facing consumers with heterogeneous sensitivity to product quality.

Makris *et al.* introduced a probabilistic inference method of quantifying a buyer's likelihood to purchase a good-quality customised product. The probabilistic inference method utilises the principles of the Bayesian networks. Additionally, the method is integrated into an Internet based supply chain control logic where supply chain partners ensure the process quality by providing real time or near real time information. The supply chain plan that is generated is robust, ensuring the supply of the right part at the right time at a rather reasonable cost, thus eliminating the defects of the product. The concept is demonstrated in a supply chain case, which was taken from the automotive industry.

Tse and Tan argued that better visibility of risk in supply tiers could minimise the quality threat. They proposed a product quality risk and visibility assessment framework, which integrated both the incremental calculus and marginal analysis. The framework was then applied to a case study. The results of the case indicate that the proposed approach has a number of benefits: (a) enables firms to have a better 'visibility' of quality risks in

multi-tier supply network; (b) allows firms to establish risk indices for product components; and (c) a traceable justification path for supplier selection.

The study by Li *et al.* examined cross-border outsourcing issues. Their empirical results show that product quality mediates the positive relationships between explorative and exploitative learning and financial performance. They also found that financial ties positively moderate the relationship between exploitative learning and product quality, but negatively moderate the relationship between explorative learning and product quality.

### **2.3 Ensuring supply chain quality through information management and information sharing**

Achieving supply chain quality objectives requires effective use of information technology and IT infrastructure. In recent years, applying information technology to ensure supply chain quality has drawn a lot of attention in both the research community and the industry. Xu comprehensively explores the enabler of real-time quality management in supply chain, the architecture for supply chain quality management, and the current state of the art in information management for supply chain quality management. The result of the study indicates that appropriate information architecture helps make supply chains more integrated, effective, and responsive in the face of complex and fast-changing market conditions.

Wu *et al.* studied a two-level supply chain consisting of two competing suppliers and one buyer. Both suppliers experience some level of uncertainty on product quality, which, in turn, leads to additional cost on the buyer's side. In the research, the authors developed an analytical model to investigate each member's performance with and without quality information sharing. After evaluating the benefits of sharing information on suppliers' product quality with the buyer, they concluded that the buyer always benefits from quality information sharing. Suppliers are encouraged to share quality information, particularly inspection results of sampled product with its customer to improve overall supply chain performance. This result is meaningful to the downstream member in making better decision on inter-organisational collaboration. Numerical experiments are provided to further illustrate the concept.

### **2.4 Integrating quality certificates to ensure quality in supply chain**

Dowlatshahi examined two sets of constructs in maquiladoras with respect to ISO 9000 certification. The maquiladora industry is a manufacturing model that uses the Mexican workforce and foreign investment and technology on the border area between the United States and Mexico. The managerial support and employee involvement as well as quality systems were internal constructs, and the global supplier selection criteria were external constructs. The standards of ISO certification were studied and analysed through a survey instrument and extensive field interviews with experts of maquiladora plants in El Paso, TX and Juarez, Mexico. The results indicate that ISO-certified companies exemplified better and longer-term relationships with their main or core suppliers, greater top managerial support, more employee involvement and communication, and more effective quality systems than those of non ISO-certified companies.

### 2.5 Impact of product failure on supply chain cost and market reaction

Kumar and Schmitz analysed the management of recalls in a consumer products supply chain. A Six Sigma DMAIC methodology is used to understand the root causes and management of recalls. They concluded that there are many variables in a supply chain, so it is essential for manufacturers to have procedures in place to prevent failures that result in a product recall. Technology can be used to track parts throughout the entire global supply chain. Companies in the consumer products industry need to consider not only the cost to their financials in an event of a product recall, but also the loss in terms of goodwill and consumer risk.

Bayo-Moriones *et al.* addressed quality management practices in the global supply chain. More specifically, they studied the association between the geographical location of suppliers (within a country or in low labour cost countries) and quality assurance practices. Three hypotheses are proposed and tested using a sample of 401 Spanish manufacturing establishments with at least 50 workers in all industries. The results indicate that plants purchasing a higher proportion of their inputs in low-cost countries are more likely to be certified according to a quality standard. However, no associations have been found between the localisation of suppliers and the establishment of close relationships with suppliers in order to assure quality.

The study by Soltani *et al.* explored the nature of supplier-manufacturer-customer relationship and its implication for product quality. Focusing on two global manufacturing firms operating in high growth sports footwear and apparel sector with worldwide market, the evidence revealed both SCM and QM practices must advance from traditional firm-driven, fire fighting and product-focused mindsets to a more collaborative mode of inter-firm relations in that a much greater level of cooperation.

### 3. Conclusions

Of course, a special issue such as this does not allow space to fully encompass the full range of topics and research propositions contained in the area of supply chain quality coordination and assurance. Future research may consider integrated supply chain models that can provide a guideline for quality assurance, integrate reversed logistics issues, encompass emerging economies such as Brazil, Russia, India and China, and incorporate a stochastic percentage of defectives. This would further enhance the coordination mechanisms. Another possible study could be to investigate learning in inspection errors. One could also study the effects of a probabilistic demand from the customer in response to the market's behaviour.

We pay great tribute to Dr. John N. Warfield, who passed away unexpectedly during the process of editing this special issue. Dr. Warfield provided instrumental ideas throughout the process of this special issue.

#### Guest editors

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