

Summer 6-1-2014

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Recommended Citation

Wang, Zhiqiang; Zhou, Qiang; and Ye, Fei, "Antecedents and Outcome of Information Sharing in Supply Chain" (2014). *WHICEB 2014 Proceedings*. 81.

<http://aisel.aisnet.org/whiceb2014/81>

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Antecedents and Outcome of Information Sharing in Supply Chain

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Abstract: Information sharing is an important factor in supply chain management. Based on literature review and theoretical arguments, we propose a framework including antecedents and outcomes of information sharing. We develop hypotheses relating to the effects of supply uncertainty and information technology linkage on information sharing content and information sharing quality. We also hypothesize the direct impact of supply uncertainty and information technology linkage on two operational performances: efficiency performance and responsiveness performance. In the end, we link information sharing content and information sharing quality to two operational performances.

Keywords: information sharing, information technology linkage, supply chain

1. INTRODUCTION

The globalization and competition of business and the advancement of information technologies drive supply chain operations. Integration is essential to supply chain operations. However, the lack of access to supply chain partners' information is the major obstacle to supply chain integration, because information sharing is one of key elements of supply chain integration ^[1]. It is impossible to integrate supply chain without information sharing.

The study of information sharing has been a growing research arena in information systems ^[2] and operations management ^[3]. A wide variety of studies examined the effects of information sharing on organizations. For example, information sharing may increase supply chain agility and flexibility ^[4, 5]. Zhou and Benton (2007) ^[3] showed that information sharing and supply chain practice mutually reinforce each other to improve supply chain performance. Schloetzer (2012) ^[6] found that information sharing directly contributes to financial performance of the focal firm in supply chains. Information sharing, as a capability, subjects to the influence of a lot of factors. Some studies, therefore, explored antecedents of information sharing. Li and Lin (2006) ^[7] indicated that supplier uncertainty is the only environmental uncertainty influencing information sharing. Fawcett et al. (2007) ^[8] noted that technological connectivity, as one of antecedents of information sharing, is positively related to operational performance. Huo et al. (2013) ^[9] revealed that international competition stimulates firms to share information both internally and externally. Most studies considered information sharing as a unidimensional construct except ^[7]. In this study, we explore the impact of two aspects of information sharing, content and quality, on operational performance of supply chain members, and whether two antecedents, supply uncertainty and information technology (IT) linkage, have direct influence on supply chain performance.

This paper is organized as follows. Section 2 establishes research model, reviews relevant literature, and proposes hypotheses.

2. RESEARCH MODEL AND HYPOTHESES

Figure 1 illustrates the conceptual model showing relationships among supply uncertainty, IT linkage,

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information sharing, and operational performance.

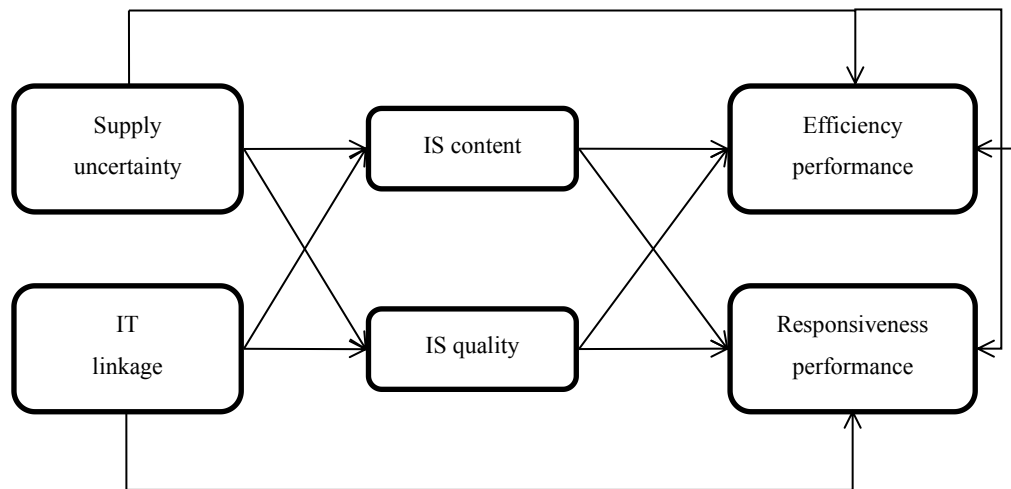


Figure 1. Conceptual model

2.1 Supply uncertainty and information sharing

Supply uncertainty is unreliability and unpredictability in terms of information, design, quality, and delivery performance from the suppliers ^[10]. Though the outcome of supply uncertainty has been discussed ^[11], few studies have analyzed the direct impact of supply uncertainty on information sharing.

When the supply uncertainty is high, the information, quality, delivery time of the suppliers are unpredictable and unreliable. Thus, manufacturers need suppliers' information on a real-time basis to reduce uncertainty. Therefore, the level of information sharing between manufacturers and suppliers may be higher. When the supply uncertainty is low, it is easier to predict suppliers' activities so that there is less demand for manufacturers to acquire real time suppliers' information. Thus, the level of information sharing may be lower. Similar to Li and Lin (2006) ^[7], we explore two dimensions of information sharing, content and quality.

These lead to the following hypotheses:

H1a: Supply uncertainty has positive impact on information sharing content between a manufacturer and its major supplier.

H1b: Supply uncertainty has positive impact on information sharing quality between a manufacturer and its major supplier.

2.2 IT linkage and information sharing

Nowadays, the development of IT has diversified the way of communication between companies. IT not only facilitates the cooperation and reduces the transaction costs between supply chain partners ^[12], but also enables companies to share information across products, services and locations ^[4]. Wong et al. (2008) ^[10] claimed that information sharing is more effective under connected information systems. Similarly, Ye & Wang (2013) ^[1] indicated that seamless information sharing among supply chain partners needs IT infrastructure support. In practice, an increasing number of companies invest in IT in order to share information with its supply chain partners. For example, IBM installed the SAP software and the purchasing system for its suppliers, thus enhancing the IT linkage with its suppliers. The IT linkage can improve the speed, quantity and quality of information transferring ^[12, 13]. IT has been regarded as an infrastructure for information sharing.

Therefore, we offer the following hypotheses:

H2a: The level of IT linkage between a manufacturer and its major supplier is positively associated with

their information sharing content.

H2b: The level of IT linkage between a manufacturer and its major supplier is positively associated with their information sharing quality.

2.3 Supply uncertainty and operational performance

Supply uncertainty makes it difficult for a manufacturing firm to predict and control the activities of its suppliers, thereby posing a negative influence on firm performance [14, 15].

The supplier with high uncertainty may fail to deliver materials to its downstream on time or with stable quality. Manufacturers have to hold more inventories, which lead to higher inventory cost, that is, lower efficiency. More seriously, late delivery may result in production stoppage, which in turn lowers the ability of rapidly responding to the market.

Therefore, the following hypotheses are developed:

H3a: Supply uncertainty has negative impact on manufacturer's efficiency performance.

H3b: Supply uncertainty has negative impact on manufacturer's responsiveness performance.

2.4 IT linkage and operational performance

The relationship between IT linkage and firm financial performance has been examined in past studies [5, 16, 17]. Santhanam and Hartono (2003) [17] demonstrated that firms with superior IT capability show better financial performance. Bharadwaj et al. (2000) [4] indicated that firms with high IT capability tend to outperform a control sample of firms on a variety of profit and cost-based performance measures.

Different from the previous studies, we analyze the impact of IT linkage on operational performance measured by efficiency and responsiveness. On one hand, IT linkage between supply chain partners accelerates the information flow and makes more accurate demand forecasting, which in turn reduces the inventory level and increases the production efficiency. On the other hand, the IT linkage shortens the order processing time and delivery time, thus enhancing the responsiveness.

Therefore, we propose that:

H4a: The level of IT linkage between a manufacturer and its major supplier is positively associated with manufacturer's efficiency.

H4b: The level of IT linkage between a manufacturer and its major supplier is positively associated with manufacturer's responsiveness.

2.5 Information sharing and operational performance

As the successful information sharing schemes conducted by international companies, such as P&G and Wal-Mart, have been widely publicized, more and more researchers became interested in the value of information sharing. Cachon et al. (2000) [18] found that supply chain with full information policy will cost 2.2% lower on average than the one with tradition information policy, and the maximum difference reach 12.2%. On the contrary, Steckel et al. (2004) [19] showed that the sharing POS information is not always beneficial. As mentioned above, the effect of information sharing on firm performance is undetermined. Extending from the previous studies, this paper investigates the impact of two aspects of information sharing (content and quantity) on both efficiency and responsiveness dimensions of firm performance.

On one hand, more information sharing in supply chain can lower the cost of obtaining information and help companies to adjust their production schedule and inventory strategy based on the real-time data, thereby reducing the production and inventory costs enhancing the flexibility and ability of rapidly responding to the market. On the other hand, when the information shared in supply chain is of high quality, that is, the

information is accurate, timely, complete, etc., it is beneficial to mitigating the bullwhip effect caused by information asymmetry, thus reducing the inventory level, improving service level and enhancing the competitiveness.

Therefore, it is expected that:

H5a: The information sharing content between the manufacturer and its major supplier has positive impact on efficiency performance.

H5b: The information sharing content between the manufacturer and its major supplier has positive impact on responsiveness performance.

H5c: The information sharing quality between the manufacturer and its major supplier has positive impact on efficiency performance.

H5d: The information sharing quality between the manufacturer and its major supplier has positive impact on responsiveness performance.

ACKNOWLEDGEMENT

This research was supported by the National Natural Science Foundation of China under Grant 70971042, 71001041, 71131003, Key Project of Philosophy and Social Sciences Research, Ministry of Education (12JZD042), and the Fundamental Research Funds for the Central Universities, SCUT (2013ZM0122).

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