



# The impact of knowledge complementarities on supply chain performance through knowledge exchange



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## ABSTRACT

The extent of knowledge complementarities (KC) is an important theoretical and practical issue in inter-firm relationships. However, extant research on KC is not clear about what constitutes KC and how the benefits of KC are realized. Further, few empirical studies have examined the impact of KC on inter-firm performance. The purpose of this study is to identify the dimensions of KC and to empirically examine the relationships among KC, inter-firm knowledge exchange, and supply chain performance. We have used data collected from 70 matched pairs of buyer and supplier in a procurement dyad to test a proposed model. In both sample sets, the results show that the relationship between knowledge exchange and supply chain performance was positive and significant. We also found positive relationships between knowledge exchange and inter-organizational relationship characteristics such as inter-organizational trust and inter-organizational information systems integration. While the path from KC to knowledge exchange was positive and significant in the buyer sample, it was not significant in the supplier sample.

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## 1. Introduction

Few firms can internally control all the resources required to function effectively. Among other resources, knowledge is considered as the most strategically significant resource possessed by a firm. If a firm is deficient in a particular knowledge domain, and possession of that knowledge is deemed essential to gain competitive advantages, then the firm will take purposive actions such as forming strategic alliances to access that needed knowledge (Reid, Bussiere, & Greenaway, 2001).

Alliances are more likely to form for firms with mutual needs to exchange knowledge. In reality, however, many alliances are not successful (Hitt, Dacin, Levitas, Arregle, & Borza, 2000). Harrison, Hitt, Hoskisson, and Ireland (2001, p. 685) assert that strategic alliances may fail because of 'poor partner selection' or 'poor management of the alliance'. An important criterion for partner selection is the presence of complementary knowledge that cannot be developed internally in either a timely or a cost-effective manner (Park & Ungson, 2001). The concept of knowledge complementarities (KC) is rooted in the economic theory of complementarities (Milgrom & Roberts, 1990; Milgrom & Roberts, 1995). Complementary knowledge held by a partner leads the participants to

cooperate for economic purposes. However, extant research on KC is not clear about what constitutes partner knowledge complementarities. Thus, the first objective of this study is to scrutinize the understudied construct of KC by identifying its dimensions in the context of supply chain management.

KC refers to the relevant knowledge each partner brings to the relationship and works as a "raw material" that is used to create synergistic value. In this definition, synergistic value derived from a partner's complementary knowledge is an essential component of complementarities. In order to achieve the synergistic value, complementary knowledge needs to be exchanged and combined between supply chain partners. The general idea of inter-organizational relationships is to arrange cooperative relationships so as to obtain mutual benefits by 'exchange, sharing or co-development of products, technologies or services' (Gulati, 1998, p. 293). In accordance with these ideas, several researchers emphasize effective knowledge actions for the implementation of synergistic value (Cohen & Olsen, 2015). However, empirical investigations on the relationship between KC and knowledge exchange have rarely been conducted (Harrison et al., 2001). Thus, the second objective of this study is to investigate the relationship between KC and knowledge exchange.

Furthermore, few studies have been devoted to a theoretical work in the development of causal relationships between KC and inter-organizational relationship management (Stieglitz & Heine, 2007, p. 2). Potential benefits that can arise from the ideal

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combination of complementary knowledge may not be realized due to *poor management of the alliance* as well. Knowledge management (KM) literature suggests that knowledge exchange may be affected by the characteristics of inter-organizational relationships. Hence, we attempt to advance our understanding on knowledge exchange by simultaneously examining the inter-organizational relationship characteristics. Specifically, we incorporate inter-organizational information systems (IOS) integration as a way for knowledge exchange, relationship continuity, and trust as antecedents for knowledge exchange.

In this paper, we formulate a research model in the context of buyer–supplier relationships in a supply chain and test hypotheses, using data collected from 70 matched-pairs of buyer and supplier in two major automobile manufacturers and a major telecommunication service firm. Buyers and suppliers have specialized knowledge in their own domains and their knowledge should be complementary to achieve competitive advantages. The required coordination between buyers and suppliers provides a good context for the study of KC and knowledge exchange in procurement and supply relationships.

## 2. Theoretical background

Several authors (e.g., Madhok, 1997; Ramanathan, Seth, & Thomas, 1997) have made attempts to systematically apply the resource-based view (RBV) to strategic alliances. RBV is considered an appropriate lens for examining strategic alliances in that firms usually form alliances to gain access to other firms' valuable resources when these resources cannot be efficiently obtained through other ways (Das & Teng, 2000). The knowledge-based theory of the firm considers organizational knowledge as the most critical resource of a firm because it is usually difficult to imitate and socially complex, resulting in sustainable competitive advantage (Alavi & Leidner, 2001; Kogut & Zander, 1992). Strategic alliances are a useful vehicle for enhancing the focal firm's critical knowledge when the necessary knowledge is lacking (Madhok, 1997). Competitive advantage of alliances also arises from the effective integration of the partners' complementary knowledge.

### 2.1. Dimensions of knowledge complementarities

Das and Teng (2000) propose a typology of inter-partner resource alignment based on the two dimensions of resource similarity and resource utilization, generating the four types of partner resource alignment: complementary, wasteful, supplementary, and surplus. Among these, the complementary alignment has been studied extensively in the strategic alliance literature (Lei, 1993). Das and Teng further assert that complementary alignment exists under two conditions: the resources have to be *dissimilar* and also be *utilizable*. Extant literature explains the requisite attributes of dissimilarity in various ways such as non-redundant unique resources (e.g., Hill & Hellriegel, 1994), different resources (e.g., Helfat, 1997), and compatible resources (Parkhe, 1991). Based on the extant literature, we propose that dimensions of KC encompass both uniqueness and utilizability of a partner's knowledge. First, uniqueness of knowledge refers to the extent to which knowledge contributed by a partner for achieving the alliance goals is valuable and different from that of the focal firm (Dyer & Singh, 1998). Recent studies on complementarities (Harrison, Hitt, Hoskisson, & Ireland, 1991; Harrison et al., 2001; Hill & Hellriegel, 1994; Krishnan, Miller, & Judge, 1997) emphasize the uniqueness of knowledge resources. An exchange of different knowledge has a higher possibility to create valuable synergy than that of similar knowledge (Harrison et al., 1991). Thus, uniqueness of knowledge

among the firms in a supply chain is considered an important dimension of KC.

Second, extant research on strategic alliances argues that utilization of the partner's specialized knowledge provides important motivation for forming an alliance. Das and Teng (2000, p. 49) define *utilizability* as "the degree to which the resources contributed by the partners are utilized for achieving the goals of the alliance". In order for the partner's knowledge to be of any value, it should be utilizable and have the capacity to enhance the alliance performance. Efficient utilization of knowledge is achieved where the knowledge domain of the firm matches exactly the knowledge requirements of the product domain of the firm.

### 2.2. Two different types of knowledge in a supply chain

SCM literature (Bowersox, Closs, & Cooper, 2007; Lockamy & McCormack 2004) treats planning and operational knowledge as two distinct categories of a firm's knowledge required for effective functioning in a supply chain. First, planning is related to the forecasting of future events which deals with aggregate data, simulation models, and longer-term periods. In order to balance future supply and demand, firms need to plan future activities in key functional areas such as raw material procurement, production, and shipping and delivery (Huang, Stewart, & Chen, 2010). In this planning process, the focal firm's knowledge needs to be complemented by the partner's knowledge (Wang & Shao, 2012). For example, effective production planning for a supplier requires knowledge about ultimate markets from its buyers. Second, operation is related to the execution of supply chain plans which requires great attention to details of a transaction such as available storage capacity and delivery time. Operational knowledge encompasses all the major functional areas such as procurement, production, and sales and marketing. This classification of knowledge categories is consistent with the SCOR (Supply Chain Operations Reference) model, developed by the nonprofit Supply Chain Council (The Supply Chain Council (SCC), 2005) and widely used by SCM practitioners.

Building on the above discussion, this study specifies KC as a second-order construct that comprises four first-order constructs: (1) uniqueness of planning knowledge, (2) utilizability of planning knowledge, (3) uniqueness of operational knowledge, and (4) utilizability of operational knowledge. Fig. 1 depicts the second-order KC construct.

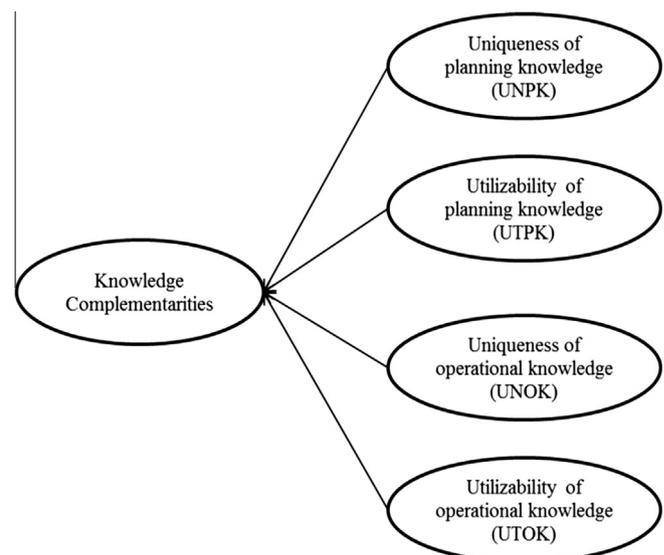


Fig. 1. Second-order KC construct.

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