



Timing cooperative relationships with sequential capability development process to reduce capability development trade-offs



Ramesh Dangol, Mona Bahl, Birsan Karpak

Williamson College of Business Administration, Youngstown State University, Youngstown, OH 44555, USA

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ABSTRACT

A key challenge for a firm is to continuously develop new capabilities in order to address changes in the external environment. Prior research on firm capabilities posits that knowledge sharing within supply chains can contribute to the firm's new capability development efforts. Although existing research on capabilities clearly links firm capabilities to firm advantage, it does not prescribe a process by which a firm should develop the capabilities required to compete successfully in the marketplace. Such prescription is necessary because (1) a firm faces *trade-offs* when developing capabilities in the short-run and (2) interdependencies among capabilities require a firm to prioritize and develop capabilities in a sequential manner. The sequence in which a firm develops new capabilities matters when the development of one capability can influence the development of a different capability and the effect is unidirectional and asymmetrical. Prior research primarily relies on Ordinary Least Squares (OLS) and Structural Equation Model (SEM) to determine whether differences in a firm's capabilities explain differences in performances. However, these statistical tools have limitations when determining the sequence in which a firm should develop various interdependent capabilities. Therefore, the purpose of this study is to delineate and prescribe a capability development process using Analytic Network Process (ANP) to reduce capability development trade-offs. ANP can be used to determine which capabilities are more important to achieving a desirable firm performance and to prescribe the sequence by which a firm can develop capabilities. We show that a firm can avoid capability development trade-offs and develop interdependent capabilities by efficiently using knowledge acquired from suppliers and customers when it develops a quality capability followed by low cost, delivery, and flexibility capabilities.

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1. Introduction

Two fundamental goals of management research are (1) to predict changes in performance given changes in management actions and (2) to prescribe management actions that improve firm performance. For example, regarding the first goal, research on cooperative supply chain networks (cooperative relationships) predicts a positive relationship between cooperation with both suppliers and customers and firm performance (Fynes et al., 2005a, 2005b; Wong et al., 2011). Using this observed positive relationship, researchers recommend that firms cooperate with suppliers and customers in order to attain competitive advantage (Dyer, 1996a, 1996c; Dyer and Singh, 1998; Frohlich and Westbrook, 2001; Hult et al., 2003, 2007). This addresses the second goal of management research.

One way cooperative relationships help a firm achieve a competitive advantage is by allowing the firm to develop new capabilities that are required to gain a competitive advantage.

Cooperative relationships help a firm acquire external capabilities that are embedded in its suppliers and customers' operating routines (Fynes et al., 2005a; Keynes, 2006; Salvador et al., 2004). A firm can leverage these acquired capabilities from suppliers and customers to develop its internal capabilities. Although it is true that cooperative relationships help a firm develop its internal capabilities, existing literature on cooperative relationships ignores the process by which a firm ought to develop them efficiently. The process by which a firm develops internal capabilities using capabilities from external suppliers and customers matters when different capabilities are interdependent and when a firm faces capability development trade-offs in the short-run. With regards to the development of interdependent capabilities, changes in one capability can affect development of different capabilities. For example, improvements in a firm's quality capability can improve the firm's low cost capability (Ferdows and De Meyer, 1990). In some cases, a change in a given capability could have a greater effect on another than the effect of the latter capability on the prior. For example, a firm's quality capability has a greater effect on the firm's cost capability than cost capability has on quality capability (Ferdows and De Meyer, 1990; Porteus,

E-mail addresses: rdangol@ysu.edu (R. Dangol), mbahl@ysu.edu (M. Bahl).

1986; Rust et al., 2002; Sarkar and Moon, 2013). Under this condition, simply suggesting that a firm needs to cooperate with its suppliers and customers in order to develop internal capabilities has a limited use for managers because this prescription does not show a process that managers can follow to develop the required capabilities efficiently.

A firm can efficiently develop multiple capabilities (i.e. low cost and quality capabilities) by reducing capability development trade-offs (Alptekinoglu and Corbett, 2010; Boyer and Lewis, 2002; Corbett and Van Wassenhove, 1993; Ferdows and De Meyer, 1990). A firm is forced to make trade-offs when a given capability (i.e. low cost) is incompatible with a different capability (i.e. operational flexibility), thereby forcing a firm to choose one capability over another (Porter, 1980, 1985, 1996). Ferdows and De Meyer (1990) argue that a firm faces trade-offs when it attempts to develop incompatible capabilities simultaneously in the short-run and that the firm can reduce capability development trade-offs by developing multiple incompatible capabilities sequentially. Although some efforts have been made to understand the process by which a firm can develop multiple capabilities sequentially (Schroeder et al., 2011), little effort has been devoted to understanding how a firm can leverage external capabilities embedded in its suppliers and customers' operating routines to develop its internal capabilities sequentially. *Therefore, the purpose of this paper is to delineate a process by which a firm can use cooperative relationships to develop multiple interdependent capabilities efficiently.* Particularly, we argue that a firm can reduce capability development trade-offs by timing cooperative relationships with a sequential capability development process.

If sequential development of capabilities can help in avoiding capability development trade-offs, then a firm's managers need to prioritize among capabilities. A firm can prioritize among different capabilities by using the Analytic Network Process (ANP), which uses firm managers' rationality and subjective views to select the best alternative from a set of known alternatives (Saaty, 2004a, 2004c; Saaty and Peniwati, 2008). In this study, cooperative relationships with suppliers and customers are considered alternatives, while capabilities are treated as the criteria for selecting these two alternatives. Comparisons between the given two alternatives are carried out using experts' judgments, feelings, experience, and intuition (Saaty and Vargas, 2012). Although ANP can be a powerful method for managers to use in decision making, it has some limitations. ANP heavily relies on expert judgment; therefore, the results obtained are subject to managers' cognitive limitations and psychological biases. Experts might be inherently optimistic in some cases, inherently pessimistic in other cases, or inherently overconfident in still other cases (McKay and Meyer 2000). Such cognitive limitations can produce biased results, thereby prompting a firm to implement a sub-optimal alternative to a given problem which leads to sub-optimal organizational performance. We integrate ANP with SEM to reduce experts' subjective biases. More specifically, we use regression coefficients obtained from SEM as inputs for ANP to examine the process by which a firm can develop multiple incompatible capabilities. We find that when a firm has to rely on suppliers and customers to develop its internal capabilities, a firm can improve its performance by timing the quality capability development process with cooperation with customers and timing the low-cost capability development process with cooperation with suppliers.

2. Literature review

The hypotheses presented in this study rely on two management perspectives: (1) cooperative relationships and (2) the sand cone model. Cooperative relationships are defined as networks of suppliers and customers that exchange the raw materials, information and

idiosyncratic knowledge required to transform inputs into outputs through cooperation, rather than through arms-length market exchange (Dyer and Singh, 1998; Hult et al., 2003). Literature focused on this topic predicts a positive relationship between cooperative relationships and firm performance (Dyer and Singh, 1998). This predicted relationship has been supported by empirical research (Frohlich and Westbrook, 2001; Petersen et al., 2005; Schoenherr and Swink, 2012). Frohlich and Westbrook (2001) find that firms that have established high levels of cooperative relationships with both their suppliers and customers outperform their competitors who lack similar relationships. They also find that firms with high levels of cooperative relationships with both their suppliers and customers outperform firms that have high levels of cooperative relationships with only one or the other. Predictions of literature on cooperative relationships are supported by anecdotal stories. For example, Toyota Motors (Toyota) used cooperative relationships to gain a competitive advantage over its competitors, including General Motors (GM), Ford Motors and Chrysler Group LLC (Womack et al., 1990, 1991). Womack et al. (1990) illustrates that Toyota cooperated with its suppliers and customers when designing new products and when solving existing manufacturing problems. In addition, Toyota collected information from its dealers to understand general customer needs and wants. On the other hand, GM, Ford, and Chrysler did not cooperate with either suppliers or customers and, in some cases, pitted one supplier against another in an effort to secure inputs at a lower cost. According to Womack et al. (1990), a lack of cooperative relationships with GM, Ford, and Chrysler's suppliers and customers contributed to each firm's demise in the 1990s. A review of theoretical and empirical research on cooperative relationships shows that a firm's ability to realize a competitive advantage depends on the firm's ability to cooperate with its suppliers and customers.

Building on theoretical research about cooperative relationships, recent research focuses on the mechanisms by which cooperative relationships contribute to firm performance (Dyer and Nobeoka, 2000; Fynes et al., 2005b; Hult et al., 2003, 2006; Narasimhan and Jayaram, 1998; Petersen et al., 2005; Schoenherr and Swink, 2012; Spekman et al., 2002; Wong et al., 2011; Xu and Beamon, 2006). Dyer and Nobeoka (2000) show that firms that cooperate with suppliers and buyers are more willing to share valuable knowledge, consequently creating new knowledge by combining the collective information possessed by different suppliers and customers. Combination and recombination of diverse existing knowledge can lead to the creation of new firm capabilities (Helfat and Winter, 2011; Teece, 2009; Teece et al., 1997). These capabilities are essential for gaining and sustaining a competitive advantage in the changing marketplace. This cited research delineates the belief that cooperative relationships are a conduit for acquiring capabilities embedded in the firm's supplier and customer production routines. Petersen et al. (2005) find that a firm that cooperates with suppliers when designing new products is able to formulate superior product designs compared with competitors who do not cooperate with suppliers in the product development processes.

Although existing research on cooperative relationships clearly links external knowledge acquired from customers and suppliers to improvements in a firm's internal capabilities, little effort has been made to delineate the sequence in which a firm ought to develop internal capabilities. As discussed in the preceding section, when a firm's internal capabilities are interdependent, and when a firm faces capability development trade-offs, a firm needs to understand the sequence in which new capabilities must be developed.

According to Ferdows and De Meyer (1990), a firm gains a competitive advantage when it develops a capability that has a higher impact on other capabilities first and accumulates less important capabilities on top of it. The authors use the sand cone term to sequentially describe the capability development process

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