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# Supply-chain linkages and operational performance

## A resource-based-view perspective

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**Abstract** *In order to improve performance at the operational level, more and more firms are developing explicit linkages with suppliers and with customers. While the question of "what beneficial impact do linkages with suppliers and with customers have for a firm" has been addressed in numerous studies, the equally important question of "why" this beneficial impact arises deserves further discourse and explication. This paper borrows and applies the Resource-Based View of the Firm, a theoretical perspective prevalent in the strategic management literature, to develop a conceptual framework to describe, explain, and predict the advantages of a firm's linkages with entities in its supply chain on its internal operations. The proposed framework can be used to justify decisions to develop, strengthen, and protect relationships with suppliers on the upstream side and with customers on the downstream side. The framework can also be used to evaluate practices implemented to link a firm to its suppliers and customers and to provide a decision roadmap for firms to better understand how to maximize operational performance benefits from these supply chain linkages.*



### Introduction

Firms are becoming increasingly cognizant of the interdependencies that naturally exist between a firm's internal operational processes and those of suppliers and customers (Watts and Hahn, 1993). This awareness has encouraged both academia and practitioners to seek to better understand the criticality of developing explicit linkages with suppliers and with customers (i.e. supply chain linkages) and the benefits of such linkages. By "supply chain linkages, we refer to explicit and/or implicit connections that a firm creates

with critical entities of its supply chain in order to manage the flow and/or quality of inputs from suppliers into the firm and of outputs from the firm to customers. These linkages are created by implementing practices that include, for example, the involvement of suppliers and customers in product design activities, the investment in enterprise resource planning systems to allow information sharing across the supply chain, JIT II, Web-based system contracting, etc.

A few scholars (e.g. Ellram, 1991; Choi *et al.*, 2001) in studying this phenomenon have borrowed and applied theories from other disciplines (e.g. industrial economics, complexity science) to provide rich insights to better understand the benefits that firms derive from linkages with suppliers and with customers. We believe that such efforts to integrate knowledge from outside a discipline should be encouraged, since they "... can provide opportunities for richer introspection ... [and] can potentially create innovative insights and solutions to ... issues and problems [facing a discipline]" (Rungtusanatham and Anderson, 1996, p. 364). To this end, this paper borrows and applies the resource-based view of the firm (RBVF) from the strategic management discipline with the intention of augmenting extant insights to the following question:

Q1. Why does the operational performance of a firm benefit from its linkages with suppliers and with customers?

We chose the RBVF based on a two-part logic. First, we recognize that supply chain interactions represent a form of inter-firm relationships (see Carter and Ellram, 1994). Second, the RBVF has been successfully applied to develop insights into other forms of inter-firm relationships such as alliance (e.g. Dyer and Singh, 1998; Eisenhardt and Schoonhoven, 1996; Lorenzoni and Lipparini, 1999; Mowery *et al.*, 1996). Hence, the application of the RBVF may be useful in advancing conceptual and pragmatic understanding of the operational performance impact of supply chain interactions.

We begin by providing a selective literature review pertaining to the operational performance benefits of supply chain linkages. This literature review is not intended to be exhaustive. Rather, it aims to illustrate some of the most widely acknowledged positive impacts of supply chain linkages on operational performance. We then present a discussion on the evolution of the RBVF and a summary of its key tenets. We do so in order to provide a common understanding of the theoretical lens that is being borrowed and to establish a language we will consistently use throughout the paper. We then apply the tenets of the RBVF to articulate two arguments to support the positive impact that supply chain linkages have on operational performance. We conclude in the final section with suggestions for future research and implications for practice.

### **Operational performance impact of supply chain linkages**

The supply-chain-management literature reports a number of studies on the operational performance benefits that a firm derives from linking with suppliers and with customers. Armistead and Mapes (1993), for example, found that information exchanges among supply-chain entities lead to improved quality consistency, delivery lead time, ability to change volume quickly, and price. Berry *et al.* (1994) showed that practices underlying supply chain integration (e.g. electronic data interchange) dampens demand amplification effects along the supply chain, consequently reducing inventory-carrying costs and improving delivery performances. A case study by Carter and Ellram (1994) found that supplier involvement in product design has a positive impact on defect rate in the later manufacturing stage. Kalwani and Narayandas (1995, pp. 4, 13-14) reported that when a firm engages in a long-term relationship with its customers, the firm can reduce demand uncertainty, improve its servicing of customer needs, and lower inventory holding and monitoring costs. Forza (1996), using data provided by 43 Italian plants, concluded that supply chain interactions improved plant performances along a number of competitive dimensions. Narasimhan and Jayaram (1998) similarly demonstrated that by managing suppliers strategically, a firm could improve its operational performance, in terms of dependability, flexibility, cost, and quality. Furthermore, in Groves and Valsamakis (1998), the strength of the partnership between a supplier and a buyer explained significant differences in the timeliness of delivery both from suppliers to the firm and from the firm to its customers. Most recently, Salvador *et al.* (2001) reported that when firms interact with suppliers and with customers on issues related to materials flow and quality, firms can expect better time-related operational performances in terms of speed and delivery punctuality.

To summarize, the question of "what impact do supply chain linkages have on a firm's operational performance" has received due visibility and attention in the literature. However, from the perspective of science and the development of scientific knowledge, answering just the "what" question is not sufficient. Equally important is to probe the related question of "why do linkages that a firm develops with suppliers and with customers benefit the firm's internal operations?". As Whetten (1989) pointed out, for theory to develop properly, we need to go beyond identification of constructs underlying a phenomenon of interest to specify the logic that explains why these constructs relate and to articulate any critical assumptions that are embedded into these explanations. We do not claim, of course, that research has completely neglected an exploration into why supply chain interaction may affect a firm's operational performance. For instance, reducing uncertainty in demand (Forrester, 1961; Towill *et al.*, 1992) and improving operations control capability (Salvador *et al.*, 2001) have been offered as possible explanations. However, we still lack a systematic understanding of why such interactions may or may not secure a

sustainable competitive advantage for a firm embedded in a supply chain. We do not yet know why (and why not) supply chain interactions may have a strategic value. This question of “why” motivates the efforts, in this paper, to borrow the RBVF perspective and to apply it to examine the operational performance benefits of supply chain linkages.

### The RBVF

The RBVF (see Barney, 1991; Grant, 1991; Peteraf, 1993; Wernerfelt, 1984) is a theoretical perspective that attempts to describe, explain, and predict how firms can achieve a sustainable competitive advantage through acquisition of and control over resources. Resources, according to the RBVF, include both tangible (e.g. equipment) and intangible (e.g. process knowledge) assets (Grant, 1991) that facilitate the production and delivery of goods and services. Firms seek to acquire and exert either permanent or semi-permanent control over resources that can provide a competitive advantage over competitors. Because firms may exert different levels of control over different types of resources, they would differ in terms of the collective whole – commonly referred to as bundle of resources (Barney, 1991) or resource endowment – that would be available to them (Amit and Schoemaker, 1993). These differences, in turn, should lead to different product and/or service attributes (Conner, 1991; Schulze, 1994, p. 130, Wernerfelt, 1984) that ultimately account for the firms' competitive position.

Barney (1991) and Peteraf (1993) have discussed, in more specific terms, the five explicit characteristics of a resource that would allow firms to attain a sustainable competitive advantage. First, the resource must be valuable in that it improves firm efficiency and/or effectiveness. Second, the resource must be rare so that by exercising control over it, the firm can exploit it to the disadvantage of its competitors. Third, the resource must be imperfectly imitable to prevent competitors from being able to easily develop the resource in-house. Fourth, the resource must be imperfectly mobile to discourage the ex-post competition for the resource that would offset the advantages of maintaining control of the resource. Fifth and last, the resource must not be substitutable; otherwise, competitors would be able to identify different, but strategically equivalent, resources to be used for the same purpose.

Many RBVF scholars (e.g. Black and Boal, 1994; Cohen and Levinthal, 1990; Dierickx and Cool, 1989; Peteraf, 1993; Schulze, 1994) have elaborated further on exemplary conditions that could deter the imitability and/or increase the imperfect mobility of resource. For example, a firm maintaining a 15 percent annual investment in R&D over ten years would experience larger incremental increases in the stock of R&D knowledge than a competitor maintaining a 30 percent R&D investment over a shorter time period (e.g. five years). Intuitively, one could imagine how the former situation would entail a higher level of tacit knowledge within a firm compared to the latter situation, because the

knowledge generated is spread across a large time span. Dierickx and Cool (1989, p. 1507) described this phenomenon as arising from “time compression diseconomies” that reduce the imitability and mobility of a resource. The sequence of decisions related to a particular resource that a firm makes over time, or “history,” may also deter imitability especially if these decisions represented unique opportunities (Barney, 1991; Cohen and Levinthal, 1990; Dierickx and Cool, 1989). For example, IBM’s decision to rely on Microsoft for the development and supply of the MS-DOS operating system for its personal computers essentially led to IBM’s loss of competitive advantage in this area. Conversely, Microsoft’s decision to partner with IBM at the time allowed it to acquire and control a resource (in this case, operating systems development know-how) that continues to yield rent today.

How a particular resource fits within a firm’s resource endowment or interacts with a firm’s other resources can also reduce imitability and deter mobility (Penrose, 1959). More specifically, the embedding of a resource within a complex social network would likely make the resource even more difficult to replicate; this phenomenon is commonly referred to as “social complexity”. Wernerfelt (1989), in explaining social complexity, has argued, for example, that the social complexity of a team effect, especially for successful teams that interact within a system of facilities, decreases the likelihood of such teams being successful in other contexts – an argument that may explain the failures of quality circles outside of Japan (e.g. Hill, 1991). Of course, the intangibility of a desirable resource, as well as legally imposed restrictions and regulations (e.g. patents and licenses, industrial espionage laws), also serves to protect the resource from being readily duplicated or traded (Rumelt, 1987).

More recently, RBVF theorists have begun to explore how such resources can create and sustain a competitive advantage (e.g. Amit and Schoemaker, 1993; Barney, 1996; Conner and Prahalad, 1996; Grant, 1991, 1996a; Winter, 1995). For example, Grant (1991) equated the concept of organizational capability to core competence (Prahalad and Hamel, 1990) and to organizational routines (Nelson and Winter, 1982). In doing so, he explicitly argued that organizational routines – defined as “regular and predictable patterns of activity ... [and] sequence of coordinated actions” (Grant, 1991, p. 122) – deploy rent-yielding resources, thus creating a competitive advantage. Amit and Schoemaker (1993, p. 35), making the same argument, extended the definition of capability as “information-based, tangible and intangible processes that ... provide enhanced productivity of its resources, as well as strategic flexibility and protection for its final product or service”.

Information gathering and processing mechanisms, therefore, represent a capability that can allow a firm to embed its knowledge assets – including information, know-how, and skills that are controlled or accessed by the firm – into value-adding processes (Grant and Baden-Fuller, 1995; Galunic and Rodan, 1998). Further contributing to this perspective have been advances made by

such scholars as Demsetz (1991), Kogut and Zander (1992), and Nonaka (1994) who elaborated on the unique properties of knowledge (e.g. lack of transferability, imitability, etc.). These unique properties, in turn, have led scholars to argue that knowledge assets represent the principal source of economic rent for a firm (Conner and Prahalad, 1996; Hall, 1992; Spender and Grant, 1996; Winter, 1995) and to the articulation of a more restrictive form of the RBVF, namely the Knowledge-Based View of the firm.

In conclusion, we can summarize the major tenets of the RBVF as follows:

- to compete, each firm seeks to acquire, control, and bundle resources with capabilities;
- resources are tangible or intangible assets that are key inputs into the production and delivery of goods or services;
- capabilities are organizational routines or mechanisms that enable a firm to acquire and deploy resources to facilitate the production and delivery of goods or service; and
- resources and capabilities that are valuable to the firm, rare to come by, imperfectly mobile, not imitable by competitors, and not substitutable (or simply VRINN) provide the firm with a sustainable competitive advantage.

### **Supply chain linkages and operational performance: through the RBVF lens**

Having established the existence of a positive relationship between supply chain linkages and operational performance and having elucidated the key tenets of the RBVF, we now turn our attention to developing two broad arguments to describe and explain why supply chain linkages and a firm's operational performance are positively related. Within this scope, the first argument posits supply chain linkages as a resource that provides operational performance benefits to a firm, and the second argument posits supply chain linkages as a capability to acquire a resource that, in turn, yields benefits to the firm's internal operations.

#### *Supply chain linkages as a resource*

According to the RBVF, when a firm controls resources that are VRINN, the firm gains a sustainable competitive advantage. When a firm creates linkages with suppliers and with customers, the resulting connections, to the extent that these links exclude competitors from forming the same connections with the same critical suppliers and/or customers for the same purpose, should provide competitive benefits to the firm. Because these connections, per our definition of supply chain linkages, facilitate the management of the flow and/or quality of materials into (i.e. raw materials) and out of (i.e. finished goods and services) the firm, the benefits should accrue directly to operational performance.

For example, by involving critical suppliers in the product design stage, a firm can get an early commitment from these suppliers to ensure an uninterrupted supply of critical parts to the firm. Deere & Company is a case in point. Headquartered in Moline, Illinois, USA, this *Fortune* 500 company decided in 1996 to involve critical suppliers in the design of a small, light, versatile and easy to handle skid-steer loader for use at construction and ground care sites. The objective was to bring a product from design to market within 24 months. The fuel tank, a part with high production tooling costs and a lengthy production tooling time, was recognized to be a critical part in this effort. A decision was then made to involve the fuel tank supplier early in the design stages of the skid-steer loader, which allowed tooling time to be reduced approximately 50 percent from 12-14 weeks to approximately 7 weeks. By collaborating with the fuel tank supplier, Deere was able to meet the 24 months deadline and commit a supplier to the ongoing delivery of a critical part at the agreed target costs (National Association of Purchasing Managers, 2001). Furthermore, as concluded in Carter and Ellram (1994), the involvement of suppliers in the design stage can reduce quality problems during the manufacturing stage.

Likewise, exclusive sourcing arrangements in which a firm commits to purchasing a large percentage of a supplier's output or when a customer accounts for a large percentage of a firm's output erects barriers that, in turn, prevent competitors from accessing the same supplier and, hence, the same sourced part. For example, it is not unusual for Intel Corporation, in times of temporary shortage of computer chips, to "pareto" the customer base so that customers who historically accounted for a large volume of its output would get preferential treatment in terms of delivery of computer chips that are in shortage (Harvard Business School, 1999, p. 3). The same phenomenon can be observed in the US automobile business. When a new car that receives much consumer fanfare at automobile shows (e.g. the Honda S2000 or the BMW Mini) becomes available on the market, the dealers with explicit and historically strong links and relationships with automobile manufacturers tend to receive preferential treatment in terms of timing of delivery.

The examples above represent anecdotal evidence of how supply chain linkages, as a resource in the context of the RBVF, can guarantee materials flow and/or quality from suppliers to a firm and from a firm to customers. But, supply chain linkages, such as those highlighted above, must be enacted on an ongoing basis to maintain their VRINN properties, i.e. the same supplier is involved every time a new design is envisioned, the supplier or the customer continually maintains exclusive sourcing agreements, etc. Otherwise, the VRINN properties of a particular firm's supply chain interactions are likely to be easily usurped by competitors. In other words, in the long run, the potential for competitors to be able to create the same linkages with the same supplier and the same customer remains a threat to the VRINN properties of a particular

firm's supply chain linkages, unless the firm continually behaves in a way to protect their integrity.

In conclusion, consistent with the RBVF perspective, supply chain linkages that guarantee availability of quality materials from suppliers to a firm or from a firm to customers represent a VRINN resource and can create an operational performance advantage for the firm. However, we believe that such operational performance advantage tends to be temporary and, in order for a firm's supply chain linkages to provide a sustainable operational performance benefit, a firm must continually seek to protect the integrity of the VRINN properties of its supply chain linkages. Therefore, we can state the first two RBVF-motivated propositions about supply chain linkages as follows:

- P1. In the short-run, a firm's supply chain linkages represent a VRINN resource that provides superior, but temporary, operational performance advantages to the firm.
- P2. The extent to which a firm is able to continually protect the integrity of the VRINN properties of its supply chain linkages will determine whether or not the firm will enjoy sustainable superior operational performance advantages from such connections with suppliers and with customers.

#### *Supply chain linkages as a resource-acquisition capability*

Alternatively, rather than being a resource *per se*, supply chain linkages can be viewed as connections between a firm and its supply chain entities that enable the firm to acquire a VRINN resource. More specifically, we posit that this VRINN resource takes the form of both explicit and tacit knowledge and that this knowledge allows a firm to better manage the flow and/or quality of incoming and outgoing materials. In fact, RBVF theorists (e.g. Conner and Prahalad, 1996; Galunic and Rodan, 1998; Grant, 1996b; Hall, 1992; Winter, 1995) have explained the benefits of inter-firm relations by invoking a similar argument; inter-firm relations generate and share knowledge that ultimately benefits the firm. For example, Lorenzoni and Lipparini (1999, p. 334) proposed that by developing trust-based relationships with suppliers, a firm is able to continually tap into the suppliers' knowledge stock to its benefit and to the benefit of the entire supply chain. According to Dyer and Singh (1998, p. 666), cooperative buyer-supplier relationships such as those manifested by Toyota should create knowledge with benefits not just to Toyota but also to its suppliers. Following this logic, the motivation behind a firm's interest in implementing ERP systems within and beyond organizational boundaries becomes clearer, since these systems, in theory, enable a firm to capture valuable information about demand and supply factors (for explication on these demand and supply factors, see Lee and Whang, 2000) and to leverage



such information to more efficiently and effectively manage the flow and/or quality of incoming and outgoing materials (Davenport, 1998).

A case in point that illustrates the criticality of knowledge from suppliers is the stock-out of insect bite ointment at Wal-Mart stores in Florida in the summer of 1995 (Lee, 2002). That year, Florida experienced a rapid growth of mosquitoes as a result of a heat wave. The increase in the mosquito population led to a parallel increase in the number of humans being bitten and in need of insect bite ointment, which, in turn, created a stock-out situation for Wal-Mart stores. In the hopes of preventing future stock-outs, Wal-Mart contacted Warner-Lambert to review the situation and learned that the stock-outs could have been avoided. Warner-Lambert, in its own research, had been monitoring weather patterns, had already noted the heat wave, and had even predicted a potential increased demand for insect bite ointment. But, at the time, Warner-Lambert had no means of communicating this knowledge to Wal-Mart. Since then, Wal-Mart has maintained an active link with Warner-Lambert by engaging in "collaborative forecasting and planning" activities.

Supply chain linkages that are developed between a firm and its customers can similarly yield VRINN knowledge (e.g. demand forecast, order status, sales, promotions, etc.) to help the firm better manage the flow and/or quality of outputs to its customers. Consider, for example, the case of Dell Computer Corporation (see Margetta, 1998). Dell perceives knowledge from customers to be of critical value to the successful execution of its mass customization business strategy and long-term survival. Dell has agreed, therefore, in structuring relationships with its 200 largest global customers, to allow individual employees within these companies to specify and choose individually tailored personal computer configurations when placing orders interactively. Doing so allows Dell to continually monitor the changing needs of its customers and gain access to valuable information instrumental to the execution of its mass customization strategy. Such knowledge is not easily substitutable, since Dell cannot efficiently and effectively satisfy the varying needs of its customers without knowing what these needs are. This knowledge, by its virtue, is also rare since it is not readily available unless an organization expends efforts to capture and document it. In the long term, one can, of course, argue that such insights are accessible not only by Dell but also by its competitors as well. However, in the short term, this knowledge has low imitability, especially given Dell's substantial investments in information technology infrastructure to capture, document, and analyze changing customer requirements. These investments have allowed Dell to embed the knowledge it obtains from customers into its existing systems and, in the process, to enact barrier conditions making it difficult for competitors to readily mimic what it does. Once such knowledge from customers has been accessed, it would be unlikely, given the criticality of this resource, for Dell to sell the

information to competitors, thereby enhancing the imperfect mobility of insights into changing customer needs.

*Seven Eleven Japan* (Stanford University Graduate School of Business, 1998, pp. 5-6) offers us an example of another company that has successfully leveraged customer-based knowledge that exists, in this case, as point-of-sales (POS) data to benefit individual store performance. POS data, which tracks product type, customer gender, customer age, and timing of sales are analyzed to resolve such operational concerns at the store level as inventory stocking levels, timing of inventory orders, and shelf space allocation (which affects store layout). Furthermore, by sharing POS data with manufacturers, distributors and wholesalers, Seven Eleven Japan is able to ensure timely delivery of incoming inventory, particularly those items for which freshness is an important sales requirement.

As a final example, consider the JIT II concept developed at Bose Corporation (see Harvard Business School, 1994). By placing a vendor's representative at the customer's production facility, JIT II seeks to provide both the customer firm and the supplying firm access to and to share knowledge about events that may disrupt the flow of and/or negatively affect the quality of critical materials that are being sourced. Such knowledge must then be leveraged with respect to sourcing decisions, inventory decisions, capacity decisions, etc. to minimize the negative operational performance impact of not having incoming materials available.

These anecdotal evidence agree with the premise made in Grant and Baden-Fuller (1995, pp. 17-18) that when firms interact with external constituents, be they suppliers or customers, they seek to acquire and/or maintain access to critical knowledge that otherwise would not be efficiently available. In fact, this assumption is consistently embedded in empirical studies on strategic alliances (e.g. Eisenhardt and Schoonhoven, 1996; Mowery *et al.*, 1996). Grant (1996a, p. 377) has further suggested that the integration of knowledge derived from supply chain linkages into a firm's operations decisions for producing and delivering goods and services can lead to superior operational performance for the firm. But, as in the case of equating supply chain linkages to a VRINN resource, the operational performance benefits of the knowledge-acquisition capability of supply chain linkages tend to be temporary in nature, unless a firm consciously behaves to protect the VRINN properties of such a capability. Hence, we can state the third and fourth RBVF-motivated propositions as follows:

- P3. A firm's supply chain linkages allows it to acquire a VRINN resource in the form of supply-chain based knowledge that, in turn, provides superior, but temporary, operational performance benefits to the firm.
- P4. The extent to which a firm is able to continually protect the integrity of the VRINN properties of knowledge-acquisition capability of its supply

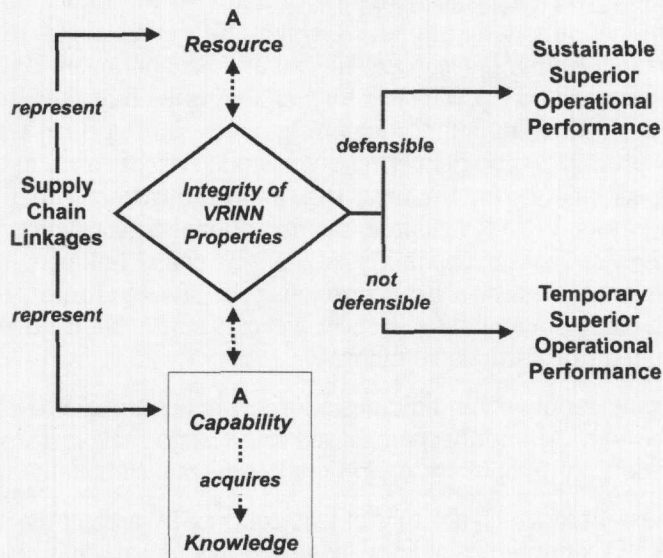
chain linkages will determine whether or not the firm will enjoy sustainable superior operational performance benefits from such connections with suppliers and with customers.

*Conceptual synthesis and roadmap*

The four RBVF-motivated propositions relating supply chain linkages to operational performance are summarized in Figure 1. As shown, supply chain linkages have both a direct effect and an indirect effect on operational performance, depending on whether supply chain linkages represent a resource or a knowledge-acquisition capability. Furthermore, if a firm is able to protect the integrity of the VRINN properties of its supply chain linkages, irrespective of whether they represent a resource or a knowledge-acquisition capability, the firm will enjoy sustainable superior operational performance benefits; otherwise, the superior operational performance benefits will only temporary in nature.

**Conclusions**

During the past two decades, manufacturing firms, convinced that operational excellence would be crucial to survival, have invested attention and resources to improve their internal operational capabilities (e.g. Hayes *et al.*, 1988; Schonberger, 1986). These firms, under increasing pressure to demonstrate operational excellence, have embraced the many practitioner-driven management prescriptions (e.g. total quality management, just-in-time, world-class manufacturing, business process reengineering, etc.) that focus on improving operational performance. Many of these management



**Figure 1.**  
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prescriptions, although focusing on internal operational improvements, also prescribe cooperating with and involving external parties (i.e. suppliers and customers) as part of a more comprehensive management system. One of Deming's (1986, pp. 23-4) 14 points quality management approach, for instance, commands organizations explicitly to develop long-term relationships with suppliers that is based on trust and loyalty (point 4).

In this paper, we asked the question of why – why does a firm's operational performance benefit from its supply chain linkages? This question, at a more strategic level, raises the issue of why supply chain linkages would yield strategic advantages for a firm. The importance of the why question should not be understated, for it is the essence of theory building and theory testing (Bacharach, 1989; Chafetz, 1977; Whetten, 1989). To answer this question of why, we borrowed and applied the RBVF lens to avoid the potential trap of having to "reinvent the wheel" (Amundson, 1998, p. 357). At the same time, as argued in Rungtusanatham and Anderson (1996, p. 364), this interdisciplinary borrowing can offer an opportunity for richer introspection – introspection that, in the current context, has led to the appreciation of the supply chain linkages as a resource and as a knowledge-acquisition capability that can promise either temporary or sustainable superior operational performance for a firm, depending on whether the VRINN properties of supply chain linkages are defensible.

From the standpoint of management, the results reported in this paper offer three notable insights. First, the conceptual roadmap in Figure 1 hints at a framework for justifying decisions that a firm makes to develop, strengthen, and protect linkages with suppliers and with customers on both sides of the supply chain. For example, firms can use the conceptual roadmap to complement the evaluation of "make-or-buy" decisions or substantial investments in information technologies, so that transaction cost or investment dollars do not become the only means to evaluate the criticality of particular connections with suppliers or with customers. Even though the relational benefits of enhanced supply chain linkages are not easily quantifiable, the managers should be reminded that these linkages can yield rent and can offer concrete competitive advantages.

Second, while we did not provide specific guidance as to what practices a firm should implement in linking with suppliers and with customers, our conceptual development strongly suggests a requirement for these practices. We would argue that practices linking a firm to its suppliers or to its customers should continually provide opportunities to acquire knowledge to facilitate the management of a firm's internal operations. Managers can, therefore, use this principle to ask, beyond investment cost and immediate advantages, about long-run potential performance benefits from specific initiatives that foster linkages with suppliers or with customers.

Finally, while we agree that the digital economy (e.g. business-to-business and business-to-consumer business models) presents increased opportunities

for growth and profitability, we also see a threat to the continued evolution of such technology. As the technology that facilitates digital-based economic transactions becomes less costly to implement, it would be increasingly difficult to deny access to, or to protect, the VRINN properties of either supply chain linkages or the knowledge derived from these linkages. Therefore, firms that are increasingly embracing these business models must clearly understand not only what critical knowledge needs to be captured and leveraged but also how to protect the imitability of this knowledge.

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