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Harminder Singh
Michigan State University

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Precarious Balance: The External Dimension of IT Flexibility

Harminder Singh

Eli Broad College of Business
Michigan State University
singh@bus.msu.edu

ABSTRACT

We study how a firm's sourcing flexibility affects the value it obtains from its IT investments, and propose that the existing literature has, by ignoring external actors, taken too narrow a focus and understudied the richness of the concept in two ways. We argue that a firm's IT sourcing flexibility is restricted by the level of industry concentration among the suppliers of its key information systems. At the same time, increased vendor concentration decreases the variety of applications being used among firms, thus simplifying integration across organizational boundaries. Thus, the short-term beneficial network effects of standardized technologies may be winnowed away over the long term by the high switching costs resulting from the oligopolistic nature of the vendor market. We suggest that IS practitioners and researchers should not ignore the impact of vendors when analyzing the risk of introducing new technology.

Keywords

IT investment, vendor, sourcing, flexibility, switching costs

INTRODUCTION

Over the last thirty years, organizations of all sizes and in all industries have steadily increased their expenditure on enterprise resource planning (ERP) systems. These systems integrate disparate business processes and data onto a single platform, while simultaneously redesigning processes. While organizations have become increasingly dependent on ERP systems to run their operations, the number of ERP vendors has declined precipitously in the last few years¹. Today, SAP and Oracle are the only major competitors left for large firms with sales over \$1 billion, and in some industries, such as defense, SAP is the only vendor available².

This phenomenon leads us to ask: how do firms in the digital economy cope with such high dependence on a few vendors? The experience of Cook County, Illinois, the second largest county government in the United States, is instructive. After installing a JD Edwards system in 1999, its faith in the system being "obsolescence-proof" was shaken when first, JD Edwards was bought by PeopleSoft, and again, when the latter was acquired by Oracle (Kavanagh & Miranda, 2005). The CIO had to choose among three options: continue making incremental investments in the existing system, migrate to Oracle, or to shift to an entirely new ERP strategy. This experience highlights the value of paying attention to the external environment component of project risk (Nelson, 2005). Vendor consolidation also reduces firms' sourcing flexibility, referring to their ability to rely on multiple vendors to add slack (Barki & Pinsonneault, 2005) is reduced. This phenomenon is termed "mono-culture" in the end-user computing domain, where the most common concern expressed in the recent past has been over Microsoft's dominance of the market for PC operating systems.

However, from another vantage point, having fewer vendors equals fewer integration problems in supply chains and other partner relationships. When creating interorganizational linkages, firms prefer dealing with fewer vendors, as it makes decision-making on data and transport protocol standards and process design simpler, easing integration with partners. In terms of IT skills, the reduction in the number of vendors makes it easier for organizations to hire IT staff that are conversant

¹ There were more than 50 mergers among ERP vendors from 2003-2004 (Bryan, Garnier & Co., 2004) and Forrester suggests that the number of ERP vendors (including large and mid-sized ones) will fall from about 1,000 today to 50-100 in 2007.

² Hammerman and Wang, Forrester Research, July 14 2005.

with their application platform. Finally, IT investment decisions are also more easily resolved when there are fewer suppliers to choose from.

This conflation of integration benefits and constrained investment choices compels us to focus on how this change in an organization's sourcing options affects firm vulnerability. This reminds us of Tanriverdi and Ruefli's (2004) call to keep risk in mind when studying the performance effects of IT. An initially attractive proposition may become less desirable when managers realize the risks involved with it. Although the risks that they discuss pertain to the chance and magnitude of loss arising out of IT initiatives, we expand the issue to include the risks due to external events, in this case, an unfavorable vendor concentration ratio. The research questions we seek to answer are: a) how does the concentration of IT vendors affect a firm's IT sourcing flexibility? and b) what is the long run impact of vendor concentration on the value that a firm obtains from its IT investments? Relying on resource dependence theory and the network effects and switching costs perspectives, we propose that the efficiency advantages that accrue to firms from integrating their operations with their partners will be eroded in the long run by the high IT costs resulting from an oligopolistic IT supplier market.

This paper contributes to the literature on the business value of IT by proposing the concept of IT sourcing flexibility. For managers, this paper highlights the importance of reducing firm vulnerability and IT expenditure by expeditiously balancing the need for trading partner integration and organizational flexibility. We proceed as follows. First, we set up our conceptual framework by reviewing three streams of research: resource dependence, switching costs and inter-organizational integration. The dual impact of vendor concentration can be understood through the relational mechanisms that are constructed by an organization to manage its IT portfolio. The resource dependence perspective will explain how relationships with vendors encourage certain actions, based on the asymmetry between the parties and their inter-dependence. Next, we relate the concepts of sourcing capability and firm productivity through our research model and propositions, and describe a possible method by which they could be tested. Finally, we conclude with the implications and contributions of our study.

CONCEPTUAL DEVELOPMENT

Research on the business value of IT has arrived at the conclusion that IT investments do contribute positively to an organization's performance (Melville, et al, 2004). By detailing the different levels of analysis at which IT affects organizations, these authors alert us to the various contingencies that affect the contribution that IT can make, such as complementary organizational resources and trading partner processes. From there, IS researchers have explored the explicit paths IT investments take in creating value for firms, specifically at the individual business process level (Barua, et al., 2004; Rai, et al., 2005; Cotteleer & Bendoly, 2005). Similarly, studies of IT adoption and use in organizations emphasize factors such as meta-structuring processes to encourage use (Orlikowski, et al, 1995) and pressure from organizational peers (Teo, et al., 2003).

However, little consideration is given to the constraints that can be imposed by the external environment. Furthermore, although organizational flexibility is viewed as a combination of an organization's responsiveness and its management's control capacity (Volberda, 1996), studies on IT flexibility have chosen to focus on internal resources and capabilities. Significantly, IT flexibility has been defined as an IT capability that can be adapted to strategic changes within the organization (Henderson & Venkatraman, 1999). Attempts at operationalizing it have maintained this internal focus. Byrd & Turner (2001) describe IT infrastructure flexibility as a composite of technical infrastructure flexibility and human infrastructure flexibility, while Prahalad & Krishnan (2002) concentrate on application flexibility to enhance shared understanding in a business.

We are specifically interested in the impact of vendors on a firm's flexibility, and, propose the inclusion of "sourcing capability" as a key concept affecting the value a firm gets out of its IT investments. "Sourcing capability" is commonly used in the supply chain literature and its dimensions are vendor, process and project management (Balaji & Brown, 2005). We focus on vendor selection, and posit that the fewer alternative sources a firm has for its resources, the more reliant it is on the suppliers it has selected. Thus, the long-term goal is to be flexible in its sources. Resource dependence theory (Pfeffer & Salancik, 1978) maintains that since organizations do not produce all the inputs they require, they are forced to rely on other firms for resources. This interdependence increases the uncertainty they operate in, and limits their ability to achieve desired outcomes from any actions they carry out (Baker, 1990). Participating in these exchanges can generate power and dependency differences among organizations (Scott, 2003). Organizations that are mutually dependent absorb such constraints by vertical or horizontal integration, diversification, or mergers, while unbalanced relationships rely on negotiation (Casciaro & Piskorski, 2005).

Organizations a firm depends upon can also exert coercive pressure, which will affect a firm's intention to adopt particular IT systems (Teo, et al, 2003). Traditionally, IS research studied this in the context of customer-supplier or parent firm-subsidary relationships and their impact on the adoption of inter-organizational systems. Expanding our perspective outside firm

boundaries, pressure from suppliers can be viewed as an additional and integral dimension of coercive pressure, one which can be manipulated by the supplier by limiting its competition. For example, if a large organization needs to adopt an IT enterprise system in this era, it only has two major vendors to approach- SAP and Oracle. Similarly, if it wants to manage its supply chain more effectively, it has to decide between 3 to 4 major vendors- SAP, i2, Oracle and Manugistics.

Vendors can coerce potential customers to purchase their systems by acquiring competitors and removing choice from the market³. Customers are unable to switch to alternative suppliers and their dependence on their original vendors heightens. Unlike physical, financial or knowledge resources, where organizations can manage uncertainty by applying techniques such as forecasting and smoothing out demand fluctuations or stockpiling to maintain stability in input supplies (Scott, 2003), complex, enterprise-wide IT applications are not amenable to such tactics. They are amorphous resources with little or no alternate sources and low fungibility. Thus, the contention that common IT vendor management processes increase a firm's ability to obtain IT products and services for lower cost and higher quality (Tanriverdi, 2006) is doubtful, as obtaining those benefits depends on the level of vendor concentration.

An alternative lens for understanding the usefulness of the concept of sourcing flexibility is the switching costs perspective (Klemperer, 1995). Switching costs arise for a number of reasons, including the transaction costs of switching suppliers, the costs of learning to use new brands, uncertainty about the quality of untested brands, and loyalty benefits. Thus, switching costs can lead to brand loyalty, and explain why market share is so valuable to businesses. Since they tend to reduce competition, firms expend effort in creating them, especially when the costs of creating them is less than any increase in future profits they could lead to. These costs can be mitigated to some extent by customers. For example, BP was faced with high switching costs when it decided to outsource its global IT services, as only 2 suppliers were deemed capable of handling the job. It thus laid down a one-year notice of termination clause to reduce the magnitude of the risk (Aubert, et al., 2000).

Thus far, the focus in prior IS research has remained on the switching costs customers face (e.g. Chen & Hitt, 2002), not on how suppliers can create them. However, some studies allude to this. Forman (2002) found that LAN vendors had strong economic incentives to offer broad product lines, since an installed base influenced future purchases. This explained the acquisition strategies of major networking vendors. Alternatively, first-movers in IT-intensive industries overcome the benefits that late-movers in these industries enjoy in terms of declining technology costs by imposing switching costs on their customers (Demirham, et al, 2002). In the marketing literature, buyer switching costs for customers arise as a result of prior partner-specific investments in physical assets, organizational procedures, and/or employee training (Wathne, Biong & Heide, 2001).

In terms of competitive strategy, competitive markets with switching costs offer vendors additional strategic options (Chen & Hitt, forthcoming). Vendors can increase the switching costs their customers face and lock them in by limiting the competition they face; in other words, a vendor could buy out its rivals and achieve two benefits simultaneously. First, acquiring new customers, even by incurring losses, makes sense as the vendor may, in the future, charge higher prices for repeat-purchases by these customers – what has been termed the “bargains-then-rip-offs” practice (Chen & Hitt, forthcoming). Second, the presence of fewer competitors allows the vendor to tighten its relationship with its customers. Although this is a costly proposition, the long-run benefits of having a captive market outweigh the short-run costs of acquiring competing firms.

In contrast to the above arguments, the reduction in sourcing flexibility can be viewed as a positive development for a firm if we analyze it from the perspective of inter-firm relationships and network effects. While prior literature has focused on the technology supporting such relationships or their relational aspects (Malhotra, Gosain & El Sawy, 2005), we analyze the impact that vendors can have on inter-firm process integration. They can influence interaction practices through normative pressures, such as participation in trade associations or by performing well in long-term interactions, which affect the intention of firms to adopt new inter-organizational technology (Teo et al, 2003).

Little research has focused on how inter-firm integration differs in inter-organizational partnerships faced with different levels of standardization in terms of their key IT applications. Less diversity in the IT platforms used in an industry lowers maintenance and development costs, while encouraging process standardization, greater integration with suppliers and customers, and the creation of a critical mass of customers. The last would lead to a network of developers supporting the platform through add-ons and user support meetings. Network effects arise when users seek compatibility with other users so that they can interact. The value of a single user's investment increases as others adopt it, making the value complementary to

³ Examples would be PeopleSoft's acquisition of JD Edwards, and Oracle's purchase of PeopleSoft and Retek. For the last acquisition, Oracle had to engage in a contest with SAP to purchase it. This has taken place in the supply chain management software, too (AMR Research, 2004).

adoption by others. Incumbent vendors benefit from network effects, since they have little incentive to offer good deals as buyers' decisions hinge on non-efficiency factors, such as market share (Farrell & Klemperer, 2005).

In this section, we have reviewed the relevant prior literature on resource dependence theory, switching costs, inter-firm relations, and network effects. Two parallel and contrasting effects arise when a firm has fewer suppliers: on one hand, it comes close to suffering lock-in, while on the other, its propensity to partner with other firms is higher because the harmonization on fewer platforms lowers costs of process integration. Thus, in terms of its sourcing flexibility, a firm should be mindful of switching costs and network effects when managing its vendors.

RESEARCH MODEL & HYPOTHESES

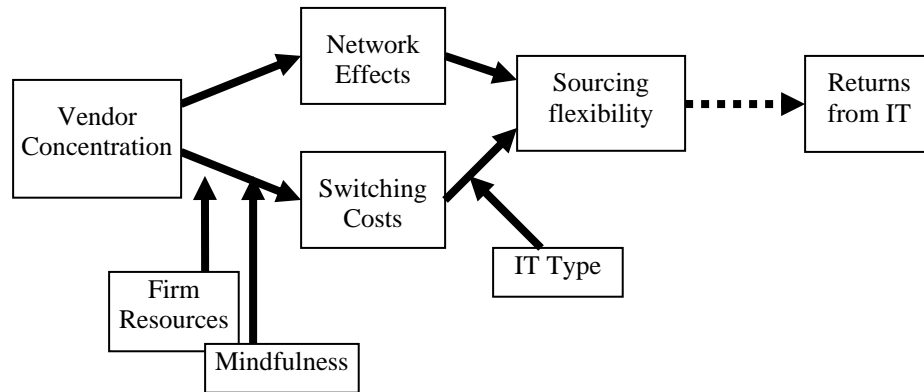


Figure 1: Conceptual Model

Figure 1 above encapsulates the research model. How much firms depend on their suppliers is a function of the importance of the resource, the number of potential suppliers, and the switching costs to work with another vendor (Kern, Kreijger & Willcocks, 2002). Thus, an effective sourcing capability would require a firm to balance between switching costs and leveraging network effects to attain a state of sourcing flexibility. The dotted line from sourcing flexibility to IT returns reflects the former's indirect role in affecting the latter, possibly as a mediator of previously-studied complementary variables, such as process change or partner resources.

One avenue that vendors can use to affect their customer base is to restrict the number of competitors in their market. This will enhance a vendor's market share and, often, its profitability too. Constraint absorption strategies, where organizations acquire the sources which they depend on, are infeasible as a response by customer organizations. Most of them would not be able to acquire IT vendors because of the size imbalance relative to major vendors. Moreover, the in-house IT capability of many firms has been drastically reduced via outsourcing, and re-expanding it would not be feasible. Since an organization cannot respond effectively to the increased dominance of a vendor, an increase in vendor concentration will increase its switching costs and "lock-in" to a vendor.

At the same time, an increase in vendor concentration will make it more valuable for firms to invest in the widely-used platform. If all firms standardized on one or two platforms, the value of using the mainstream platforms to each firm increases, as the costs of integrating with other firms decreases. In other words, the technology exhibits network effects as more organizations use it. In terms of IT skill-sets, the reduction in the number of vendors eases IT hiring issues for organizations, as a higher proportion of applicants would be familiar with the application platform in use. Thus, we propose that a decline in the number of vendors supports the development of inter-firm linkages. It is possible that having only a single vendor may lead to shirking (Ngwenyama & Bryson, 1999), leading the client to incur monitoring costs. If there are multiple vendors, then the client benefits from lower prices, higher vendor performance, and increased bargaining power. Even though monitoring costs may be greater than set-up costs with fewer vendors, the pressure to adopt the dominant vendor's systems, and thereby appropriate the network effect benefits of improved inter-organizational integration, will be much too great to resist.

Proposition 1: An increase in vendor concentration leads to greater switching costs and network effects.

The impact of vendor concentration is tempered by a firm's level of mindfulness, which signifies how aware organizations are about their environments. Organizations that are mindful will be able to make more discriminating decisions and have better scanning abilities (Fichman, 2004). They are less likely to be locked into long-term disadvantageous relationships with their vendors, as their ability to forecast the risk involved in such linkages will direct them to take alternative actions. They could integrate together multiple applications to recreate the functionality of the complex enterprise-wide application, or could sponsor open-source projects to deliver the functionalities they need. These are examples of "countervailing power" which an organization can use to curtail the ability of a single vendor to control them (Ingram & Simons, 1995). Although these are not costless actions, they protect the organization from possible higher IT costs in the future, which might be relatively higher than at present.

Proposition 1a: The impact of vendor concentration on switching costs is moderated by mindfulness.

If a firm possesses relatively more resources than its vendor, it will be in a stronger position to resist the vendor's opportunistic actions (Huang, Miranda, & Lee, 2004). The vendor will be unlikely to exploit its technology knowledge to impose unfair terms on its client, since that will endanger its future revenue streams. Larger clients are able to protect themselves better against non-performance of the vendor by including warranty clauses that specify risk and damages sharing.

Proposition 1b: The impact of vendor concentration on switching costs is moderated by the client's resource level relative to the vendor's.

The ultimate effect of reduced sourcing flexibility would be most pronounced in IT expenditure. An oligopolistic market would enable vendors to charge higher prices for their products. So, even if the quality of the application did not meaningfully improve when it became more costly, which is likely in the situation where the supplier has a captive market, the organization's overall returns from its investment, that is, output as a ratio of costs, will decrease significantly.

Proposition 2: Poorer sourcing flexibility leads to lower firm ROI from IT spending.

However, the salient features of different types of IT affect the impact of vendor concentration on switching costs. Having fewer vendors for IT that is not central to a firm's competitive advantage, such as word processing software, will not have as strong an impact compared to IT that is a core requirement of a firm, such as databases or network security.

Proposition 3: IT type moderates the relationship between switching costs and sourcing flexibility.

DISCUSSION & IMPLICATIONS

Understanding the impact of vendor actions on the value that firms can appropriate from IT is an understudied area. In this study, sourcing capability is determined by the vendor concentration levels in a segment of the IT market. We argue that vendors can manipulate the level of concentration by acquiring their competitors and thus becoming dominant in the process. This market domination affects the returns to IT investment through two routes: a negative impact through switching costs and lock-in risk and a positive impact via network effects and inter-organizational relationships. The hypotheses in the prior section explicate how these two paths both constrain and enable organizational freedom of action. This division of effects parallels the findings that IT confers both economic value as well as competitive advantages on organizations (Melville et al, 2004). Here, we detail some factors that must be taken into consideration when carrying out the study, the study's implications, and its contribution.

Testing the arguments in this study must begin by first taking into account its boundaries. Since the emphasis is on industries that are served by a limited number of vendors, the sample should be selected based on this variable. The study focuses on the behavior of large firms, as issues of power balance and switching costs are more salient and pertinent to larger organizations compared to small or medium sized ones. Finally, the research design should incorporate some form of longitudinal data collection, because the two pathways hypothesized in the research model become manifest over a fairly long period of time. A possible design would be to track how the declining number of vendors in the ERP market influenced the integration activities and switching costs of organizations that are ERP users. For theoretical completeness, the results from this design could be compared to a similar study that looked at a market where the number of vendors has not declined significantly. Prior to commencing large-scale data collection efforts, however, two case studies should be conducted to assess the validity of the arguments made in this article.

In terms of research implications, this study highlights the lack of attention paid to analyzing vendor behavior in IS research. Very few researchers (e.g. Levina & Ross, 2003) have included vendors in their studies, which is surprising considering the significant influence they have on organizational IT adoption decisions. Calls have been made to include other components of

the environment, such as industry and country (Melville et al., 2003), although vendor influence has had limited visibility in the IS field. As such, this study hopes to spur further research in this area.

A separate implication for researchers is the value of studying the impact of variables of interest at multiple time horizons and combining them to consider how they interact. The effects may be complimentary, additive, or suppressive and by taking an integrated perspective, the study's findings are enriched and increase in relevance. As this entails more complex research designs, it would be feasible to take on this perspective when beginning long-term research programs. This suggestion is applicable for IT practitioners too. When calculating the ROI (return on investment) on IT expenditure, it is preferable that they consider both the short and long term consequences of their investment decisions. Although this may be difficult to assess quantitatively, being aware that the impact of IT varies over time and interacts with other decisions offers a more complete perspective. Similarly, this study emphasizes the need to maintain an awareness of the different sources of switching costs. This will provide a more layered and contingent view of IT choices made.

In conclusion, this study extends current IS research which places lesser importance on how conditions in the vendor market affect a focal firm's ability to appropriate the benefits of IT innovations, such as ERP or SCM applications. Although much work has emphasized the importance of managing the complementariness of IT and business capabilities, relatively little attention has been given to how the gains from engaging in such a balancing act can be made much less significant if conditions in the vendor market are unbalanced. This could result in any possible customer surpluses being transferred to vendors, with the customer unable to recover them even over the long term. To sum up, firms faced with large-scale IT investments will need to re-examine their flexibility and vulnerability, by taking into account the interaction of their vendor management strategies with their vendors' propensity to use competitive strategies as a way to increase switching costs and lock-in.

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