



Size and Culture as Determinants of IT Strategy in International Supply Chain Management

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INTRODUCTION

The objective in supply chain management is to manage all activities associated with the flow of products and services from the beginning of the manufacturing or processing cycle through to the end-user [Handfield and Nichols, 1999]. The challenge is to manage this process in such a way as to establish collaborative alliances with strategic suppliers [Dyer, Co, Chu, 1998] and to explore ways in which the management of suppliers can be used to gain a competitive advantage in the industry [Porter and Millar, 1985]. Information technology plays a pivotal role in the firm's ability to provide the information necessary to manage and control an effective alliance [Bowersox and Closs, 1996].

For Fortune 500 companies the achievement of an integrated and seamless supply chain systems is a formidable challenge. What about smaller organizations or suppliers located in the far corners of the globe? Do these variables affect the development of textbook IT supply chain systems? This paper looks at two organizations, one from South America and another from the US. Several conclusions are drawn about size and culture.

EVOLUTION OF INFORMATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT

In recent years the role of information technology in supply chain management has changed dramatically. In the first stage, and not more than a decade ago, most interorganizational information traveled through the postal system or by fax [Rosenberg and Valient, 1992]. Electronic Data Interchange, EDI, in the second stage, had a dramatic effect on the introduction of technology to facilitate these flows. During the 1990's the growth of EDI was estimated to be 37 percent [Rosenberg and Valient, 1992]. In the third stage, the data shared through EDI use Internet-based EDI technologies. There are two categories of Internet-based EDI. In the first, a web-based browser is used to capture the data, it is then sent over the Internet to a VAN where it is stored and later forwarded to the second party in the data exchange. In the second strategy, EDI servers are maintained by the host company and transfer of documents is done without a third party. In both strategies data is transmitted over the WWW and as such minimizes telecommunication costs. In the fourth stage, a more integrative strategy has emerged. For an increasing number of firms, a wider range of supplier activities is monitored to ensure the receipt of acceptable quality inputs, on-time delivery, and correct quantities. Not only is transaction data targeted, but integration extends to data used for management and control. This stage is characterized by Enterprise Resource Planning (ERP) systems that are often the outgrowth of Manufacturing Resource Planning (MRP II) applications within the firm.

For large organizations, with appropriate financial and technical resources, the role of supply chain management now has the potential to become more active and pervasive. It can extend back through first tier and even second tier suppliers, and it can cover much more than purchasing and invoicing. Large retailers, like Wal-Mart, can now expect manufacturers to monitor demand at their retail sites to determine when orders should be initiated to maintain adequate retail stocks and avoid stockouts [Handfield and Nichols, 1999]. In this way their stock management activities can be 'outsourced' to suppliers.

But the options open to medium size companies are much more limited. They and their trading partners may not have the financial nor technical expertise to integrate their operations.

RELATIONSHIP SPECIFIC IT INVESTMENTS

Integrating and linking activities requires that data is accessible to all trading partners; the customer must be linked to databases inside the supplier's organization and the supplier must be linked to databases inside the customer's organization. Accomplishing this usually requires relationship-specific investments [Dyer, Co, Chu, 1998] in which both parties must develop the hardware and software capabilities to establish these links. While the advantages of this strategy include better integration of activities and eventually more effective supply chain activities there may be a substantial cost in linking these systems.

Hypothesis 1: Relationship-specific investments are difficult for small and medium sized firms to demand of their suppliers.

SIZE AND IT STRATEGY

Large firms often achieve bargaining power over their suppliers, especially when they purchase a significant portion of the supplier's capacity [Porter and Millar, 1985]. Moreover, they can often require them to make relationship-specific investments in information technology to support an integrated supply chain [Handfield and Nichols, 1999]. While large firms have addressed integrative supply chain management issues for several years, the concept is new to many medium and smaller sized firms. One objective of this study is to explore how these medium sized firms are coping with the competitive forces that are driving them toward more collaborative supply chain relationships.

Hypothesis 2: Small and medium sized firms have considerable difficulty in establishing integrated IT supply chain systems with their suppliers.

CULTURE AND IT STRATEGY

It is a universal characteristic of humans, and the organizations in which they work, that they resist change. Regardless of

the advantages that new methods or technologies can promise, there develops a reluctance to accept these changes. Some cultures may face change very differently than others. National culture influences the way people work, the way they are managed, and the way tasks are designed and even performed. Resistance to change will depend upon how these work practices challenge culturally based work behavior. Hofstede (1980) defines culture as a set of mental programs that control an individual's responses in a given context. Parsons and Shils (1951) define it as a shared characteristic of a high-level social systems, while Erez and Earley, (1993) defined it as the shared values of a particular group of people.

Classifying cultures and identifying those dimensions that differentiate cultural behavior is difficult and controversial. One major study, undertaken with the support of IBM and conducted by Hofstede (1980), provides a very useful framework. Utilizing data from 116,000 questionnaires administered in 40 countries he found that national culture could be defined by four dimensions. He identified these dimensions as; power distance, uncertainty avoidance, individualism-collectivism, and masculinity-femininity.

How does culture affect supply chain management? The study cited earlier by Dyer, Cho and Chu provide some answers. It concludes that the customer or 'focal firm' needs to segment its suppliers according to the type of working relationship required. Cultural differences, however, suggest that it may be difficult to expect suppliers from some countries to modify the way they relate to their customers. Can a company in a country characterized as high in *individualism* find it as easy to engage collaboratively in the partner relationship as it can with the arm's-length relationship? Can a company from a country characterized as high in *collectivism* (low individualism) find it as easy to engage in an arm's-length relationship as it can with a partnership relationship? Can a company in a culture characterized by high uncertainty avoidance adopt new technology? If the answer to these questions is no, what can be done to help initiate change and facilitate these relationships?

Consider the difference in supply chain relationships for American, Japanese and Korean automakers described by Dyer, Cho and Chu. American manufactures primarily follow the arm's-length model. The cultural characteristics that describe Americans are high individualism and low uncertainty avoidance (they ranked first in individualism and 43rd in uncertainty avoidance). It would therefore be expected that relationship distances between these focal firms and its suppliers would be high (high individualism) and that frequent bidding and supplier changes would be expected (low uncertainty avoidance). This is exactly what the Dyer, Cho and Chu study found. The opposite would be expected for Korean manufacturers. They ranked 43rd in individualism and 17th in uncertainty avoidance. It would therefore be expected that they would have few suppliers, that these suppliers would be integrated into their planning processes (low individualism), and that they would maintain a reliable and long-term relationship with them (high uncertainty avoidance). Again, this is what the study found. While the focal firm may wish to develop an integrated IT supply chain system with its suppliers, the cultural context may make it difficult to achieve.

Hypothesis 3: Cultural differences may influence the ability of the customer and suppliers to develop integrated supply chain information systems.

METHODOLOGY

The purpose of this study is to explore the three hypotheses

stated above. It is a qualitative study in which the case study method is used. But, Gable [1994] warns that a disadvantage of this approach is that conclusions may not be generalizable to other organizations.

Two organizations are studied. One manufactures athletic shoes, the other is a purchasing organization that is a wholly owned subsidiary of a South American government. These two firms provide the opportunity to explore two very different environments. The first is a medium-sized business with limited power over its suppliers. The second is a nationalized purchasing company with all the problems of a large bureaucracy and somewhat more control over its suppliers.

CASE STUDY OF LARGE BUREAUCRATIC ORGANIZATION

The first case study focuses on a subsidiary of a state-owned holding company located in South America. The holding company includes several production and service divisions including steel, aluminum, electricity, mining, forestry and construction. This study focused on one of its subsidiaries, a purchasing organization, with headquarters in the southeast US. The purchasing organization provides a "total logistics service package" to its "client" organizations. With satellite offices in Holland, Japan and its home country, it coordinates purchasing and shipping activities between their client companies and 1,300 suppliers located throughout the world. Of these 1,300 suppliers, fifty were classified in this study as strategic while the remainder provided non-strategic products and services.

The holding company is in a transitional state, moving from a centralized and bureaucratic organization to a decentralized organization exposed to market competition. Consequently current practices are likely to change in response to competitive influences.

A study of current purchasing procedures identified a well-defined structure followed by most orders. Orders originate in one of the state owned companies (clients) and follow several steps:

- Order from clients received by fax at headquarters in the US.
- Original order also sent by mail to headquarters in the US.
- Three potential suppliers are identified.
- Requests for quotations sent to suppliers.
- Quotations evaluated in the US office.
- Copies of quotations sent by fax or e-mail to clients.
- Clients approve a quotation and return approval via fax or e-mail.
- Purchase orders beyond \$10,000 require three signatures including the buyer, finance manager, and general manager.
- Purchase orders sent to suppliers via e-mail or fax.
- Goods sent to US where they are consolidated and shipped to clients.

The current supply chain system is bound by procedures that ensure effective execution of orders, but these procedures are capable of introducing inefficiencies into the purchasing process. Waiting times appear to be one of the major problems. Fax is slow, and there is no automated data entry. The original order is considered part of the documentation and is sent by mail to the US office. Three suppliers must be used even when unnecessary. Clients must approve all purchase orders. Signatures are required for all orders over \$10,000, and consolidation takes precedence over inventory carrying costs. In addition it is common for paperwork to be delayed as it waits for other approvals and signatures. Due to these delays, proposals from suppliers may expire. Since they are valid only until a certain date, the client may have to initiate the bid process again.

Information technology plays a small but increasing role in this process. Client/server technology supports two major software systems. The first is a commercial package, initially installed in 1989-1990, with several upgrades since. It supports the purchasing process from the requisition of goods to receipt of goods. It involves requisition entry, quotation processing, vendor selection, purchase order creation, and purchase order verification. The second application is a financial management system that includes general ledger, accounts payable, accounts receivable, payroll, fixed assets inventory, and purchasing modules. These two information systems are not integrated nor are the systems integrated with its clients. It is necessary, for example, to enter purchasing data manually, when an order from a client is received.

The supplier relationships can be characterized as arms-length (Dyer, Co, and Chu, 1998). The focus is on efficiency and low cost. Negotiations are often very competitive and the purchasing division attempts to minimize dependence on any one supplier. In most negotiations the purchasing staff feels they have most of the bargaining power.

CASE STUDY OF MEDIUM SIZE COMPANY

The second company studied is a shoe manufacturing company located in the southern part of the U.S. It manufactures low price sneakers sold to major discount department stores. The company has 250 employees. Shoes are designed and assembled locally, but part of the shoe is manufactured in China while the remaining items are purchased from suppliers in the U.S. The final product is assembled at their manufacturing facilities that includes six injection lines, three packaging lines, and one testing machine.

Once a product is sold to a retailer, a pattern, sample, and a request for a quote is sent to one or more of three Chinese suppliers. Negotiations usually focus on two areas: price and delivery. According to the company, when dealing with the Chinese suppliers it is more of an arms-length relationship than a partnership. The suppliers take the upper hand in the relationship as they have full production schedules and are known as the lowest cost producers. Typically the price set for a new order is based on the price of previous orders, but the suppliers are constantly attempting to raise their price. The shoe company feels that it is difficult to introduce a competitive environment in the quote process because the suppliers all seem to charge the same prices.

Another difficulty is delivery. Often the suppliers are unable to produce a shoe as soon as the customer would like to take delivery. One reason is that their suppliers (second-tier suppliers) do not have the raw materials on-hand. Usually, these second tier suppliers require two to three weeks for material procurement. Once the raw material is available, the Chinese manufacturer requires one month for a typical order of 30,000 to 50,000 shoes.

Information technology is limited to fax machines. Faxes send offers and counter-offers between the shoe manufacturer's headquarters in the U.S. and the supplier in China. Using this technology and withstanding the inconveniences of time zone changes, the negotiation process itself can take as much as three weeks.

ANALYSIS

In both cases, these organizations have had difficulty in adopting more advanced information technologies commonly found in larger organizations. Neither organization had invested in relationship-specific investments to facilitate information flow. Nor had they discussed this issue at any great lengths with its partners.

Size is one explanation for this inability to develop more effective systems, especially for the shoe manufacturer. In that case they have little or no power over their suppliers in China and can certainly not pressure them into adopting EDI, for example.

But cultural differences may shed additional insight into the problems of migrating toward a more cooperative model of customer-supplier relationships and the relationship-specific investments in technology that could improve supply chain management.

The South American firm had entrenched procedures and ways of relating to suppliers that they fully 'justified'; they feel a competitive environment best suits their needs and that anything less would jeopardize their ability to obtain the best competitive price for their needs. The same is true for the Chinese suppliers. In their present situation, without competitive threats, these suppliers are not compelled to change. While it would benefit the shoe company to access information from its overseas first and second-tier suppliers, in the current competitive climate and without power over its suppliers, such a change is unlikely.

What becomes apparent from the two companies in this study is that an arms-length relationship is in effect between customer and supplier. For the shoe company, they may face a collusive trading environment among the three Chinese firms because the Chinese culture can be characterized as highly collectivistic. To introduce change may require that all suppliers be convinced of the advantages that such technology will offer. Convincing only one would be tantamount to violating cultural constraints.

In the case of the South American Company, culture again may play a significant role. High uncertainty avoidance and high collectivism may provide a difficult hurdle in making the necessary changes since organizations may be more comfortable emphasizing rules and procedures while avoiding the uncertain issues of the competitive environment and the movement toward the adoption of new technology.

CONCLUSIONS

With all the appropriate warnings about a study that focused on only two companies, two influences on the adoption of IT to support supply chain management are suggested. The first is size. Those companies that command a significant share of their supplier's capacity can pressure them to implement relationship-specific IT investments. Size, however, is not enough. While the South American company could be classified as a large company, other factors interfered with their implementation of contemporary information technologies. From the information collected in these two cases, cultural factors seem to help in the understanding of the pace of supply chain technology transfer. The results suggest that in countries with high collectivism and high uncertainty avoidance, resistance to change can be a problem.

SUMMARY

Global outsourcing is a major competitive strategy used by organizations. But the outsourcing process requires that suppliers be managed if the firm is to maintain its competitive position. This paper has considered two organizations that use outsourcing but have been unable to adopt the latest technology in managing their suppliers. Two factors were considered: Size and national culture. Preliminary evidence from these case studies suggests that these factors are worth exploring further.

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