INTERNET AND THE INTEGRATION OF THE VALUE CHAIN

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ABSTRACT
This paper assesses the possible impacts of the Internet in the integration of companies to their suppliers and customers. Some of the available technologies for the electronic exchange of data among participants of a supply chain are discussed here, as well as some practices that speed up the information flow from the distribution side of the value chain to the manufacturers' one, with respect to the pace at which products are being sold and delivered to consumers. The paper presents the results of a survey involving more than 650 industrial companies in Brazil, which intended to depict changes caused by the Internet and other IT in the way companies interact along their supply chains. Such information is analyzed, some conclusions are taken and a reflection is made about the future of the integration of supply chains and the challenges ahead of those who decide to embrace it.

Key-words: Internet, supply chain, integration.

INTRODUCTION
Geoffrion and Krishnan (2001) make a distinction between physical products, such as cars and computers, and information products, such as magazines and music. They also separate physical services, such as transportation, from information services, such as news providers. Such differences are essential to understand the kind of benefit that the Internet can provide to organizations that produce or commercialize such products.

Information products and services
Information products and services are those that can be digitized, i.e., converted into bits and bytes. Typically, they involve very low production marginal costs because, after the first unit is generated, their reproduction doesn't require significant effort (SHAPIRO and VARIAN, 1998). In many cases, it doesn't even require raw-materials to be incorporated to the product, which would otherwise contribute to higher production costs. With the possibility of delivering such products and services through the Web, even the transportation costs have almost disappeared, as they can be transferred from the premises of the vendor to a place of convenience for the customer, electronically.

According to Starr (2003), companies such as eBay (electronic auctions), Fandango (theater tickets), Orbitz and Priceline.com (air tickets, hotels and car rental), just to mention a few well known Internet operations, do not concern about managing inventory, neither about developing complex logistics infrastructure to deliver their products. In fact, for information products and services, warehousing and shipping are no longer important issues, except for the need of developing policies and strategies for storing and distributing information, in order to preserve its integrity and avoid malicious access to it.

Information products and services can be reproduced and moved almost instantaneously and with very little limitation (GEOFFRION and KRISHNAN, 2001). In such cases, Internet represents a complete business solution. Vendors can use the Web to develop their products and services, they can advertise their products to potential buyers, take orders, replicate and deliver them to customers, receive payment, get feedback from consumers and provide after-sales support. Impressed with such possibilities of virtual companies, *The Economist* said the following about eBay: "the Internet auctioneer is not a B2C company but a near-perfect

model of software and network economics. Once its programmers built the auction tools, eBay could almost run itself." (2000, p. 67). The physical supply chain for information products and services is probably going to become each time less relevant, as physical processes and logistics tend to be gradually replaced by a virtual model, based on the Internet, with cost advantages, as well as more flexibility and diligence.

Physical products and services

Companies that have their operations based on pure physical products and services, on the other hand, can only use the Internet as a new channel for part of their activities. The delivery of physical goods or services cannot be performed through the Web. Physical transportation is still required from some point along the supply chain, where products are manufactured or stored, to the place where the customer wants them. Geoffrion and Krishnan (2001) remark that "physical products and services do not enjoy the magical qualities" that make information products and services so fit to the Internet.

Even though, the company's Web site may represent a good window for displaying the company's physical products or services, it can be used to carry out the transaction, to receive payment, to establish a communications channel with customers and as the means to develop after-sales activities. Such organizations may also find that the Internet is a useful means to coordinate activities and integrate processes with suppliers and customers, with the intent of delivering a higher quality product in a faster manner.

The research project that originated the data that were analyzed in this paper was developed with the purpose of providing a better understanding of the way Brazilian industrial companies (which usually produce just *physical products*) use the Internet to support their strategies and business practices. An electronic survey was sent to all manufacturers contained in a database of FIESP, the organization that congregates manufacturers in the state of Sao Paulo, the most industrialized Brazilian state. All companies in that database that had a valid e-mail address were sent a message with the invitation to participate in the survey. 655 usable responses were obtained, which represent about 8% of the population.

This paper, specifically, focuses on the evaluation of the responses that were provided by the participants, related to their current use of the Internet or the intention of future use, in order to coordinate and integrate the supply chain, surely one of the greatest challenges in marketing *physical goods* in a world that is each time more *virtual*.

METHODOLOGICAL APPROACH

As it was said above, companies were contacted through an e-mail message that had an attached automated form. The structured questions followed a Likert scale. The participants could choose from a list of alternatives presented in a *drop-down* menu, which made the process of responding to the questionnaire very fast and easy. The authors wanted the questionnaire to be simple enough to be filled in at the time the respondents were checking their e-mail. If it were left to be answered at a later time, the authors believed that chances of obtaining an answer would dramatically decrease.

The questionnaire was pre-tested, with respect to the content, having been presented to a group of executives working in the field, who conveniently happened to be taking a course where the authors were instructors. They gave important contributions in order to make the questions more accessible and understandable to the "actual" participants in a later stage. With respect to the format, the authors randomly separated one per cent of the whole database and sent the questionnaire to those companies a month in advance. No changes in format were found necessary, after the pre-test answers arrived and, by the time the larger group of companies was invited to participate in the survey, the researchers already had a reasonable idea of the return rate that could be achieved, based on the return rate of the pre-test sample.

There were questions about technologies, methods and techniques that the organizations use or intend to use in the near future, based on the infrastructure made available by the web.

The tabulated data were handled with Excel and Minitab, for the generation of graphs and statistics.

Multiple regressions were used to estimate the variables that were more strongly related to the level of impact/change caused by the Internet and other IT on the integration of the supply chain.

Respondents belonged to a convenience sample formed by those companies that answered the survey. Demographic data of the companies comprising the convenience sample were roughly compared to data for the population of manufacturing companies contained in FIESP's database, as a whole. The authors have no reasons to believe that the sample that they obtained is not representative of the population. However, it should be highlighted that any inference about the behavior of the population of industrial companies in the country, based on this convenience sample is dangerous, which represents a limitation of the study.

THE POSSIBILITY OF USING THE INTERNET IN THE INTEGRATION WITH BUSINESS PARTNERS

The struggle to improve coordination with suppliers, in order to increase the efficiency of the supply chain as a whole, has taken companies, as well as the suppliers of logistics services to carry out massive investments in technology. The ideal situation would be (or will be) to be able to count on the information about sales to consumers, in real time, in order to define the next production actions (COTTRILL, 2003). That demands:

- agility in the information flow, from the consumer towards the producer and
- production and logistics flexibility, from the producer towards the consumer,

so that the organization gets closer to the SOMO (*sell one, make one*) performance target standard – i.e., only produce a new item after another one has been sold – which is so desirable when the customer dictates the rhythm of consumption and determines the specifications of what s/he wants to buy.

Next, we present a few technologies that can be used in order to improve the information flow, which benefit from the infrastructure provided by the Internet, as well as a few practices and techniques that help to make production and logistics processes more flexible.

ELECTRONIC DATA EXCHANGE ALONG THE SUPPLY CHAIN

Internet may become an important platform for the exchange of data among business partners, contributing to the reduction of *lead-times* and, therefore, attenuating the nasty consequences of poor information flow along the supply chain, particularly the Forrester effect, also known as "bull whip effect", which consists on the amplification of the demand variation for a specific product along the supply chain, when there is any demand fluctuation in downstream links of the chain (SAAB and CORRÊA, 2004).

Electronic data interchange (EDI)

One very important technology used by organizations to ensure quick information flow with suppliers is the so called *electronic data interchange* (EDI) or its variations for the Internet, according to Schaffer (1998).

EDI has been around in the market for over 20 years, as a standardized way of transmitting business forms and documents among suppliers and customers, such as purchase orders, invoices, shipment notices and delivery schedules (SWEET, 1999; BEDNARZ, 2004). Such technology is responsible for 80% to 90% of the information flow among companies, according to Sliwa (2004), who doesn't believe it is going to be replaced, in the short run, by any other means of trading information, such as the XML standard or the AS2 protocol, for example (see ahead).

There are many reasons for the use of EDI in order to transmit transactional data among business partners, among which the following deserve to be highlighted (COYLE, BARDI and NOVACK, 1999; SWEET, 1999; REID and SANDERS, 2004; SAAB and CORRÊA, 2004): possibility of quick access to the information in a standardized way; elimination of human transcription and interpretation errors; reduction of transaction costs, as a result of the elimination of most labor costs related to forms manual filling in; improvement of inventory control; reduction of telephone and fax costs; improvement of service to the customer; quick warns about problems with shipments, reducing the negative impact of the situation; possibility of auditing transactions; and reduction of purchase batch size (as a result of the reduction of transaction costs). If those reasons are not enough, many times the customer demands EDI to be used for the transmission of operational and billing information.

However, due to its high implementation and maintenance costs, traditional EDI was confined to large companies and their major suppliers, among which there was enough information sharing to justify it. The traditional EDI technology demanded that its users had access to a VAN (value added network) and, therefore, had to cope with the costs of maintenance of such service. In addition to that, a sophisticated IT infra-structure was required, involving complex proprietary software (BEDNARZ, 2004). Most EDI applications focused on the manufacturing industry, whose processes, particularly those involving supply chain partners, demand a lot of information sharing (ALBERTIN, 2003).

Marques and Di Serio (2000) say that the Internet has provided a public infra-structure through which transactions could be performed, allowing for the electronic integration of companies of all sizes. In fact, the more recent possibility of carrying out EDI transactions over the Web is democratizing its use, as it only requires a Web navigator and the installation of basic software. The new possibility significantly reduced the cost per transaction of adopting EDI (SLIWA, 2004). Thus, the EDI technology is starting to spread also to the service industry and smaller industrial manufacturers. According to Meta Group's data, mentioned by Bednarz (2004), EDI transactions over the Web are growing 50 to 60% a year, while traditional EDI, based

on VANs has stagnated. That means that companies that implemented traditional EDI systems in the past continue to use and benefit from the technology, simply because it works. Newcomers, however, adopt internet solutions, instead (SWEET, 1999).

Extensible Mark-up Language (XML)

Companies from different industries got involved in the development of the new XML standard for inter-organizational communication, which defined interface procedures to be used for electronic communication between partners, including purchase orders and inventory information (BABCOCK, 2003). Some of the world leaders in the software market are among the supporters of the XML initiative, such as IBM, Microsoft, Novell, Oracle and Sun. Those companies have been working together since 1999 in the definition of the XML standard, designed to allow access and management of large volumes of transaction data, related to the communication needs of companies involved in a supply chain over the Web (RIBEIRO, 2004).

The XML standard intends to provide the same flexibility to the data exchange between applications and business partners that the HTML standard brought to the publication of Web pages, in the mid 90's.

Instead of using VANs to send data related to a transaction, as it happens for traditional EDI, XML-based systems are able to convey business documents in a much cheaper way, using Internet's usual protocols, such as HTTP (*HyperText Transfer Protocol*), SSL (*Secure Sockets Layer*) or FTP (*File Transfer Protocol*). That is why Sweet (1999) believes that companies that didn't implement traditional EDI systems up to now won't find any good reason to do it in the future. Most likely, they will go straight to a B2B solution, which may involve the use of technologies such as XML, even though the use of the EDI standard with the AS2 (*Applicability Statement 2*) protocol also represents a strong trend. Wall Mart, for example, requested that its suppliers stopped using VANs for their transactions with the organization and started using AS2, still in 2002 (SLIWA, 2004).

Applicability Statement 2 (AS2)

The AS2 (*Applicability Statement 2*) is a specification for electronic data exchange among business partners, which relies on the Web's infrastructure and the HTTP protocol. It was developed by EDI over the Internet (EDIINT), which is a work group of the Internet Engineering Task Force (IETF) in charge of the creation of safe and reliable communication standards for data exchange among organizations (BEDNARZ, 2005).

The use of the HTTP or HTTPS protocol enables communication in real time among business partners, instead of the use of e-mails. In addition to providing means to ensure authenticity, integrity and privacy of the message, using cryptography and digital signatures (RADKO, 2002), the AS2 prevents the addressee from denying having received the message, which would reduce his/her level of commitment, depending on the convenience. This is called non-repudiation.

Almost any type of data can be transmitted using the AS2 standard, which reduces the cost and difficulty of having the parties using different communications protocols. One only needs an EDI transfer machine (software) and digital certifications in order to exchange data using AS2, which is just a "package" for EDI files to be sent through the Internet, instead of VANs (FERGUSON, 2002).

This standard started becoming more popular in the retail industry after Wal-Mart chose it for its communication with suppliers, although it can be used in any sector, replacing the expensive value added networks (VANs), which are still used with most EDI applications. The adoption of this technological solution eliminates the need of dial-up connections from Wal-Mart to thousands of small size suppliers, which do not have access to traditional EDI, to order their products electronically.

Intranets and Extranets

Organizations started using the Internet to visualize content that was being openly made available by other companies and in order to publish information about themselves that they considered to be convenient and relevant for general access. But the Web soon started being also considered a good platform for the publication of content of restricted interest, as users became acquainted with its environment and available resources, reducing the cost and need of additional training. As a result, many organizations started to structure internal networks using tools and services that are similar to those of the Internet, only protecting them from external access. Such internal networks, used to make information available and to share it among the company's employees are the so called intranets. After developing intranets, the next step was to allow business partners to have access to part of such network, or networks developed specifically for them, with the purpose of improving the communication and integration of supply chain links. That is how extranets came about. They are networks that use the Internet's infra-structure and services, congregating the organization and its suppliers/customers, in a protected way, preventing the access of other parties (O'BRIEN, 2001).

MONITORING, PLANNING AND CONTROLLING INVENTORY ALONG THE SUPPLY CHAIN

Companies use computer programs, in order to optimize the levels of inventory in each point of the supply chain, being able to provide the level of service that the customers require, without incurring in excessive inventory costs. But just having a good inventory system is not enough, though. One also needs to have effective ways of feeding the system with the information about the physical inventory at all times. In order to do that, other technologies also have to be used, in order to capture the information to be fed to the inventory system and to share information with business partners.

Next, a few of those technologies and approaches will be discussed that can be used to collect and to share information used in planning and controlling inventory levels along the supply chain.

Identification of materials and products using bar codes

For many activities to work effectively – related to the inbound logistics (milk-run, sequencing, just-in-time), to the distribution logistics, and even to the logistics involved in returning products to the manufacturer (reverse logistics) – it is necessary to quickly identify the items that are being processed. The most widely spread technology available in the market for that purpose is bar codes.

Bar codes are very simple to use. They consist on white and black stripes that are arranged according to a pattern that conveys specific information. When a scanner device is used, it emits light that is reflected (or not) on the bars of the bar code, being captured and interpreted.

There are several bar code standards in the market, among which the most popular ones are linear codes. But there are also bi-dimensional codes, which can include several lines of bars and matrix codes, capable of containing a significantly larger volume of information.

Bar codes are used by manufacturers and logistics operators, but also in supermarkets, department stores and warehouses. When used together with EDI, or some other technology for sharing information with business partners, it helps tracking the product along the supply chain (COYLE, BARDI and NOVACK, 1999).

VMI (Vendor Managed Inventory)

When information flows more easily along the supply chain, companies are able to improve planning of their activities, involving the purchase of materials, the production and delivery of products to customers. The use of tools that increase the visibility of the flow of materials and products along the supply chain allows the interested parties to know when materials and components are arriving to the manufacturing plant, but also if what is being transported matches what was ordered, which is essential for just-in-time operations that use expensive parts or parts that get obsolete quickly (HANNON, 2004).

Slack *et al.* (1999) remind us that inventory along the distribution channels exists because the products cannot be transferred instantly from the production facility to the place where they are being demanded (in the case of physical products, of course). Some of that inventory is available at the point of sale and some is in transit. An alternative way for suppliers to make sure that their products are available to the consumers at any time is to start managing, directly, the point of sale's inventory. This initiative may also help eliminating distortions and delays along the supply chain, according to Sterman (*apud* Saab and Corrêa, 2004).

VMI (*Vendor Managed Inventory*) is a practice based on the idea that the vendor should manage inventory along the whole downstream value chain, determining the volumes to be delivered and eliminating the need of orders placed by customers. With VMI, instead of the retailer monitoring inventory to decide when to place an order, that responsibility is thoroughly transferred to the vendor. It improves the manufacturer's knowledge about end customers' demand behavior, reducing Forrester effect and the overall costs.

Supermarkets and other high inventory turn ratio retail operations are particularly suited to this kind of initiative, which has motivated investments in technology by suppliers (vendors) and customers (retailers).

RESULTS OF THE SURVEY

Next, we present the results of the survey that was applied to manufacturers in the state of Sao Paulo, Brazil. The authors intended to assess the intensity of use of the Internet and other surveyed technologies/practices in order to find out how organizations use them to better integrate their supply chains.

Companies that participated in the survey were separated according to their size. They were considered large companies when they had more than 500 employees, mid-size companies when the number of employees was higher than 100 and small, otherwise. This distinction is important because it was soon noticed that Internet adoption is influenced by this factor. Then, graphs were generated showing the behavior

of each of the variables that were studied, taking into account the company size. Graphs relate to the perception of the participants with respect to the intensity of use of the web for the integration of the supply chain. They also express the respondents' expectation for the next 3 years (one should keep in mind that the survey was applied late in 2003 and early in 2004).

Figures 1 to 6 present separate stack-bars for large, mid-size and small companies. Inside each rectangle that forms a vertical bar, the number of companies appears, in absolute terms, which provided a specific answer to the proposed question (according to the legend next to the graph). The vertical axis presents a percentage scale, used in order to provide a "relative" value for the absolute figures contained inside the rectangles. This scale is also useful to aggregate answers. For example, **Figure 1** shows that 36.4% of the large companies (8/22) consider that the changes to the integration of the supply chain that were caused by the Internet and other IT, along the last 3 years, were at least moderate. This is the aggregate percentage for the one large company that considered that changes were radical (red), the one company that considered them very significant (orange), the one company that considered them significant (yellow) and the five companies that considered them to be moderate (green).

Impact of the Internet and other IT on the integration of the supply chain

When asked about the impact of the Internet and other IT on the integration of the supply chain, along the last 3 years, 36.4% of the respondents of large companies stated that the impact was at least moderate, as mentioned above. Among mid-size companies, that percentage was 23.2% and among small ones, it was 18.9% (see **Figure 1**).

Information systems about the suppliers of the suppliers (upstream the supply chain)

In order to understanding the importance given by the manufacturers to the integration of the supply chain, they were questioned if they had information systems that allowed them to gather information about the suppliers of their suppliers (and not just about first tier suppliers) in order to improve decision making.

The results are presented in **Figure 2**. Curiously, considering that for most other questions large companies revealed to use IT more intensively than smaller ones, when the matter is information systems about the upstream side of the supply chain, smaller companies have shown greater interest. Only 4.8% of the large companies claimed that they used information systems at least to a moderate extent with that purpose, while 10.6% of the mid-size ones and 7.6% of the small ones did that. However, among those companies that admitted not using such systems, large companies were more inclined to start using them along the next 3 years: 33.3% of them intend to develop efforts towards that, while only 24.2% of mid-size companies and 23.0% of small ones have the same intent. 42.9% of large companies do not intend to gather that kind of information, or consider it doesn't apply to their businesses. The same happens with 44.7% of mid-size companies and 55.2% of small ones.

Information systems about the customers of the customers (downstream links of the supply chain)

The same way participants were questioned about the collection of data about the upstream links of the supply chain, the survey also concerned about the information the organizations had about downstream links, i.e., the consumers of their products. This time there were no surprises. The general trend of large companies using the technology more intensively than smaller ones was confirmed. Among large companies, 23.8% said that they use the Internet at least to a moderate extent to obtain information about the customers of their customers. Only 6.9% of mid-size companies and 5.6% of small ones have shown the same concern (see **Figure 3**).

Among large companies, 38.1% intend to start collecting and using information on the customers of their customers, within the next 3 years. The same happens with 23.1% of the mid-size ones and 22.8% of the small ones. The percentage of companies that do not intend to use information systems with that purpose is significantly high, among small and mid-size companies (58.6% and 55.4%, respectively). For large companies, this percentage is smaller: 28.6%.

Use of intranets and extranets

Intranets and extranets are efficient ways of spreading important information to employees and business partners. While 90.9% of large companies already use intranets, only 59.3% of mid-size and 41.8% of small ones do it. Extranets are also more present in large companies (54.5%) than in mid-size (37.4%) and small ones (17.0%). However, companies of all sizes could make more intensive use of such technologies, considering the great benefits they can provide, related to the internal integration of the organization and the integration of the supply chain.

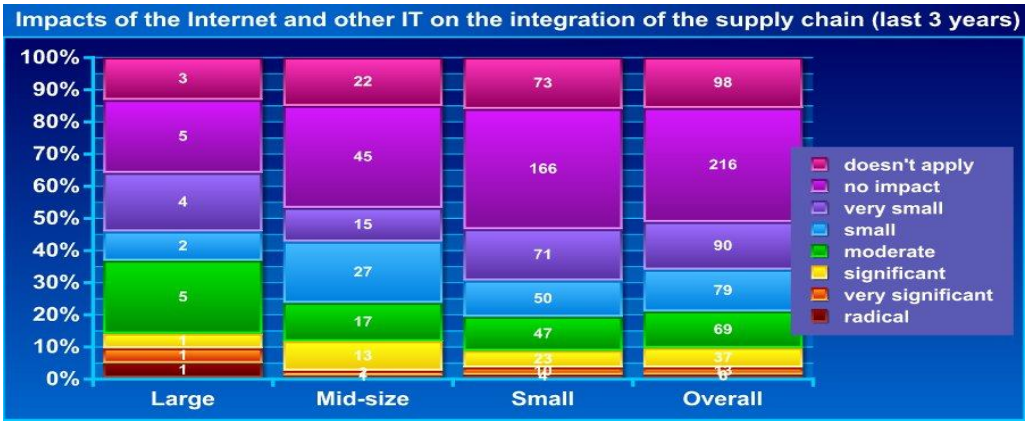

Figure 1 – Impacts of the Internet and other IT on the integration of the supply chain, within the last 3 years, according to the company's size

Figure 2 – Current use of information systems about the suppliers of the suppliers (upstream side of the value chain) and the perspective for the next 3 years, according to the company's size

Figure 3 – Current use of information systems about the customers of the customers (downstream side of the value chain) and the perspective for the next 3 years, according to the company's size

Figure 4 – Current use of EDI and the perspective for the next 3 years, according to the company's size

Figure 5 – Current use of bar codes and the perspective for the next 3 years, according to the company's size

Figure 6 – Current use of VMI and the perspective for the next 3 years, according to the company's size

Electronic data exchange among business partners (EDI)

EDI presented a relatively high level of usage, when compared to other tools that were surveyed. Among large companies, 42.3% use EDI to a moderate extent, at least. The same happens with 28.8% of mid-size companies and 12.8% of small ones. Only one large company, representing 4.8% of the companies of that size that participated in the survey, said that it didn't intend to start using EDI within the next 3 years. Among mid-size companies, 27.3% do not intend to use it or consider it not applicable to their reality. The same happens with 41.8% of small companies.

No distinction was made, in the survey, between traditional EDI (using VANs) and Web EDI, using XML, AS2 or some other standard.

Use of bar codes

Bar codes can be used to quickly identify items to be transported or stored, making it easier to track them within the supply chain, at any time, as discussed before. Companies were asked about the intensity of use of bar codes in their operations and the answers are presented in **Figure 5**. Among large companies, 54.5% already use the technology at least to a moderate extent, while 27.3% intend to start using it within 3 years. Only 9.1% consider that bar codes are not useful to their businesses or do not intend to use the technology in the near future. For mid-size companies, the intensity of use was considered at least moderate by 43.3% of the respondents. 24.1% of them intend to use bar codes within the next 3 years. But the percentage of companies that do not intend to use the technology or consider it unnecessary is higher (21.3%). Only 20.7% of small companies use the technology at least to a moderate extent. 27.5% of them intend to start using it soon. However, 43.1% do not expect to use it in the near future or consider that it doesn't apply.

Use of VMI

The use of VMI is more frequent among large companies than smaller ones. Wanke (2004) reminds us that the adoption of VMI depends on the bargaining power of the supplier, in order to convince the customer to accept this form of inventory management and replenishment, in which customers give up their control over the inventory, handing it in to the supplier, which starts replenishing goods without the need of any formal request by the customer in that sense. This may explain why large companies practice VMI to a greater extent, as they do have more bargaining power. 20% of large companies use VMI at least moderately. Among mid-size companies, that percentage falls to half (9.8%) and among small ones, it falls to half, once again (4.9%). One fourth of large companies believe that VMI doesn't apply to their businesses, or they do not intend to use it in the near future. Among mid-size companies, this percentage is more than twice as high (55.3%). And among small ones, it reaches 62.1%, according to **Figure 6**.

ANALYSIS AND REFLECTION ABOUT THE FINDINGS

The results that were obtained were, in general, compatible with the authors' expectations based on the review of the literature and their own experience. However, one thing that called the authors' attention was the huge number of industrial companies that do not use or intend to use information systems in order to obtain better knowledge and control over their value chains. It makes one wonder if companies give the same importance to supply chain management issue as does academia. Another unexpected finding was that small and mid-size companies have shown to be comparatively more interested in obtaining information on the suppliers' side of their value chains than large companies. On the other hand, large companies paid more attention to the customers' side of their value chains. The authors weren't able to find an explanation for such curious result. They speculate that maybe large companies are positioned closer to the upstream end of their value chains and, therefore, may not need to monitor many links in that direction, while small and mid-size companies, in their turn, are positioned closer to the downstream end of their value chains, not requiring sophisticated information systems to obtain a good understanding of their clients, but willing to know more about the suppliers of their suppliers. This is a good issue to be further studied in the future.

According to the multiple regressions that were made, companies that considered that the Internet and other IT had greater impact on the integration of their supply chains were the ones that also acknowledged greater changes in the way they performed their material and distribution logistics. Those were the two most relevant independent variables in determining the impact on the level of integration of the supply chain, revealing themselves as very good predictors of the independent variable (integration of the supply chain) and showing that logistics changes most probably had an integrating intent.

CONCLUSIONS

The electronic integration of companies to their customers and suppliers allows customers, at least in theory, to interact directly with their suppliers' production systems, triggering the production of items they need. Customers are also able to interrupt the production of items for which their own customers have cancelled orders, or change the production plan for their suppliers' plant, in order to increase the priority of items that are more urgently needed.

On the other hand, being aware of the customer's inventory turn and level of stock at any time, suppliers may be authorized to decide on the delivery of a new batch of products, without express order from the customer, in order to assure replenishment in due time.

Such level of foreign interference on the company's internal processes will only be accepted, however, by organizations that trust their partners and have strong common interests with them, in order to justify giving up part of the their own autonomy, in order to improve the efficiency of the value chain as a whole.

Even if the technological challenge of connecting different agents in virtual value adding networks is overcome, other conditions need to be met, in order to ensure the success of such supra-organizational coalitions. If, on one hand, the dynamics of the environment justifies and stimulates partnerships being settled with companies that perform complementary activities, reducing the risk and increasing the agility of the value chain, on the other hand, power relationships and interests change along the time, challenging the attempt to build long-lasting partnerships!

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