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**Title: "The Impact of Virtuality on Supply Chain strategies"**

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## **ABSTRACT**

The transparency provided by information technologies (IT) allows companies to reposition themselves in the chain and collaborate dynamically with other companies with the purpose of optimizing their position in the business. Thus, this article explores through two cases studies the phenomenon of inter-firm collaboration and aims to analyze the supply chain strategies that have been adopted by the players in the network based on the IT. The case studies has focused on a neutral third party that is the portal site and coordinates the network and aligns the incentives for all players belonging to the network enabling information starts to flow more quickly along the supply chain. The results obtained in this research can contribute to understanding of the concepts and principles of the role of the neutral third party in a value network and formulate the role of the neutral third party that coordinates the network.

Key-words: supply chain, virtual, internet.

## **INTRODUCTION**

The extension in which companies deal to the *marketspace* has become a matter of competitiveness in the current economic scenario and organisations have faced the challenge of creating value not only in the physical world but also in the virtual one. Thus, Internet and

other technologies emerge as powerful tools that allow the process of value creation in the virtual world. However, this depends on how companies would explore this capacity made feasible by those technologies. In this context, “virtualization” has become a new way of structuring companies that can improve efficiency and effectiveness in organisations.

According to Tapscott (1996) instead of thinking of New Economy companies as Internet companies or dot-coms, think about them as companies that use the Internet infrastructure to create effective b-web-based business models. In that context, is very important the companies think about the electronics hubs. The electronics hubs can assume the role important when discuss about the supply chain.

The traditional supply chain suggests a sequence of information flow and material movement that is well-ordered and sequential. Increasingly, this model does not reflect the complex, fast-paced global movement of materials and information. Today, information and materials no longer flow in simple linear fashion from supplier to customer. The flow of information resembles more a complex web of exchanges rather than a chain. Material and information often loop around the enterprise or the world several times before the finished product arrives at the customer's doorstep.

According to Gunasekaran & Ngai (2004) Supply chain management (SCM) is the 21st century global operations strategy for achieving organizational competitiveness. In that context, companies are attempting to find ways to improve their flexibility and responsiveness and in turn competitiveness by changing their operations strategy, methods and technologies that include the implementation of SCM paradigm and information technology (IT).

Specifically the objective that study is to analyze the process of IT adoption by the companies up to the current situation, investigating companies’s reasons for investing in the IT, what processes changed, what alterations transformed the coordination of organizational activities and the new kinds of relationship with focus in Supply Chain.

## **LITERATURE REVIEW**

According to Greis & Kasarda (1997) firms must increasingly organize their operations around real-time information about shifting customer needs and about the availability of their productive capacity. They require not only up-to-date and immediate information about the location and disposition of all productive assets, but also information linking the location of the asset with available transportation opportunities. Under such conditions, logistics is becoming a primary enabler of real-time response to customer needs. In addition is very important the companies increase more visibility and velocity and to be able to make the supply chain more flexible and lean through services that leverage the relationships they have with other players in the chain.

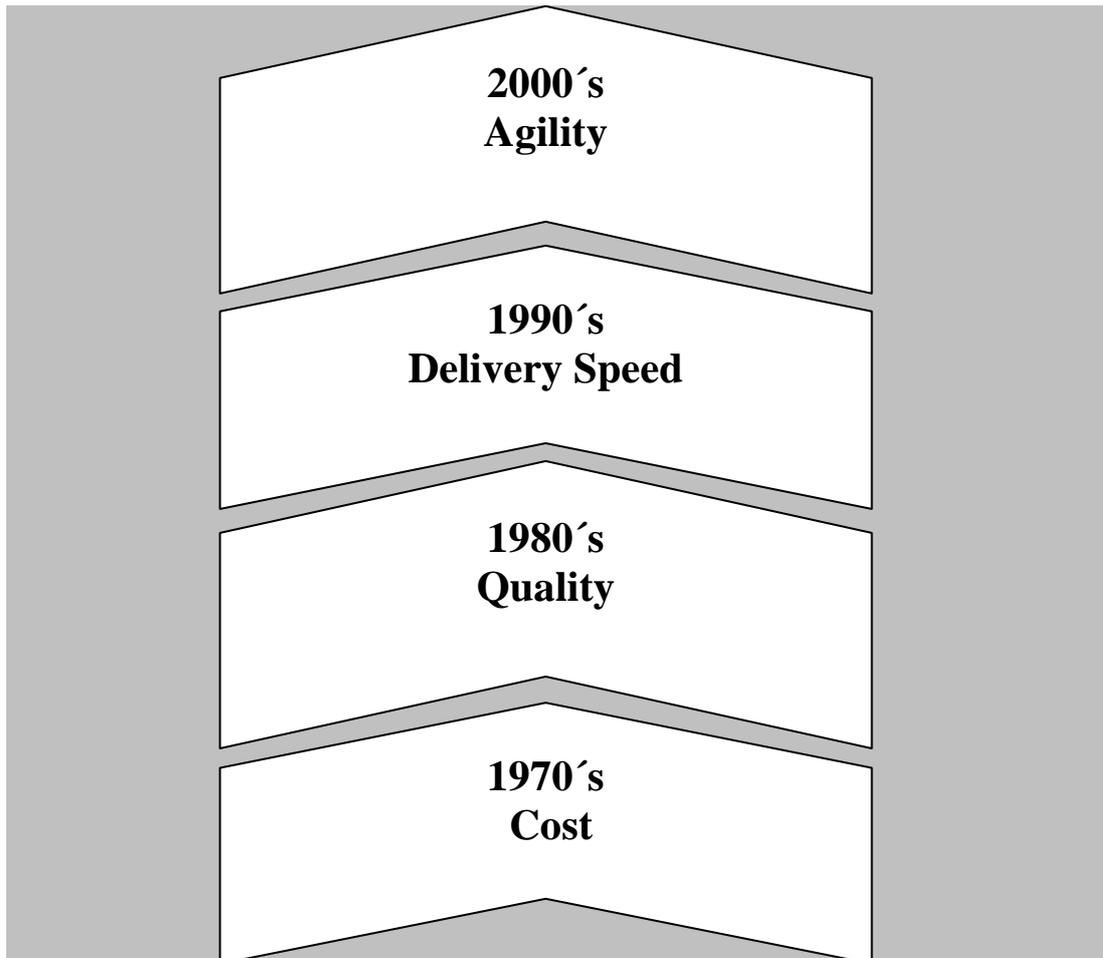


Figura 1- Shifiting Competitive Priorities (Greis & Kasarda, 1997)

According to Zillur (2004) various authors have described benefits from web for individual functional areas such as marketing (Mckenna, 1997), purchasing (Ellinger and Daugherty, 1998) and logistics. In particular, the flow of goods is expected to become more transparent (Bowersox and Daugherty, 1995). Enabling the integrated management of a physically dis-integrated unit (LaLonde and Powers, 1993), and decentralization and centralization within one operating system (Bowersox et al., 1992), and relevance of information exchange in avoiding one of the best known problems in the supply chain that of Forrester's bullwhip effect (Lee et al, 1997).

Growing demand for delivery speed and agility (figure 1) has stimulated a search for new architectures of production that are better equipped to assemble organizational resources quickly in response to market opportunities. A more recent strategy is to redefine a company's

operational environment so that it includes not only itself but also the organizations with which it interacts in creating and delivering a product to a customer. (Greis & Kasarda, 1997). Clarck, T (2004) and Stroeken, J (2001) said Information technology, even taken as an independent environmental factor, and its adoption in professionally run businesses and firms has led to fundamental changes in supply chain behavior and further to the changes in governance structures.

Fine (1998) mention that in the new context competitive the process of the supply chain should be faster and automatic. The main driver behind this transformation is the availability of technological platforms that modify the main attributes of information.

Ordanni (2001) mention that electronic commerce is the main driving force behind this transformation since companies can now carry out transactions in goods, services and information in digital form. In this sense, online business-to-business relations play a central role in changing the structure of vertical value chains. Since b2b transactions are much more complex than those involving the final consumer, b2b e-commerce develops in a more complex scenario. The changes in IT have played a critical role in enabling firms and supply chains to operate on in the new context. Without IT being the enabler, the disintegrated supply network cannot be managed effectively.

Graham and Hardaker (2000) highlight the role of the Internet in building commercially viable supply chains in order to meet the challenges of virtual enterprises. Philip and Pedersen (1997) attempt to study the ways in which the business community harnesses EDI with the help of a literature survey based on the application.

According to Bitran et all, (2006) the company can program its value-adding activities better, including materials purchase and the production and delivery of final products to the customers. Traditional logistics (organizing the physical flow of goods and services) and cognitive activities (information flow management) can be reorganized in many different

ways. In the b2b environment this requires new operators to act as strategic links to integrate physical and virtual processes. Since companies might not exploit the benefits of b2b electronic commerce on their own, the functions of *infomediatio*n services must be carefully considered.

According to Kaplan and Sawhney (2000) most of the B2B activity falls under the sphere of portals that dynamically match buyers and sellers or e-procurement, where buyers and sellers are aggregated. The authors defined eHubs as neutral Internet-based intermediaries that focus on specific industry verticals or specific business processes, host electronic marketplaces, and use various market-making mechanisms to mediate any-to-any transactions among businesses. Kaplan and Sawhney (2000) argued that eHubs create value by aggregating buyers and sellers, creating marketplace liquidity, and reducing transaction costs. In the same way Au and Ho (2002) discuss the B2B e-commerce enabled supply chain management.

Davenport & Brooks (2004) mention that new technologies will be accommodated and according to authors “we will see a few major trends in the functionality vendors add to the systems, in the use of the Internet to achieve “extended enterprise” integration, and in a growing range of outsourcing options”.

In the actual context the collaborative network of partners are emerging to support business to consumers (B2C), B2B and government to citizen interactivity through Intranets (Hackney et al., 2000; Marshall and McKay, 2000). There are numerous web-based exchanges that connect buyers and suppliers in real-time having a significant impact on procurement and supply chain management. Many companies has been adopted portals for enabling the supply chain management. These portals can be considered as in some cases as mini-maestro according discuss by Bitran et all (2006) in their recent article.

### Model Mini-Maestro

In that context, these authors discuss about the role of a maestro - a neutral third party who coordinates the network and aligns the incentives for all players belonging to the network. Viewed in a larger context, one can extract the concepts and principles from the role of the LP in a value network and formulate the role of a maestro. Bitran et al (2006) mention that established and reputable corporations will not see much incentive to buy into the coordination made by such a maestro. As a result, we are observing the emergence of mini-maestros – a neutral third party who takes charge of part of the network, but not in its entirety. As such, the mini-maestro must institutionalize ground level mechanisms for sharing the net costs and benefits of partnering. Typically, as the mini-maestro starts to focus on system optimization, business processes undergo reconfiguration – as a result some players stand to gain or lose more than the others. An example is a distribution center located downstream in the value network which witnesses its inventory rise as a result of a decision to postpone the assembly process further downstream. In such a case, for the distribution center to remain committed, the mini-maestro must institute ways to compensate for its increased inventory. Similarly, network players that contribute to the overall network performance through innovation need to be rewarded appropriately for individual excellence. To say this task is difficult is an understatement; excelling in it requires immense maturity, patience and deep knowledge of network operations.

The emergence of these mini-maestros alludes to a coordinated supply network. In this new state of the supply network, a pure push system is not likely to be optimal. In a pure push system, due to the limited visibility of the supply network and customer demand, production is initiated without much coordination within the parties in the supply network.

## **METHODOLOGY**

Regarding the approach to the problem focused by this study, Qualitative Research was adopted and the selected method was Case Study. According to Claver et al. (2000), the majority of works conducted in the IT area is using the qualitative approach as research methodology. Empirical studies represent, according to Claver et al. (2000), 68% of the researched works, and 21% of them are case studies. Yin (1994) argues that the evidences extracted from multiple cases are considered more convincing, and the global study is seen as being more robust. Each case must serve a specific purpose within the global scope of what one wants to investigate. The study of multiple cases should be considered in the same way as multiple experiences are considered, that is, the logic of replication should be followed.

To develop the present work, two companies that have been using Infomediaries in their operations were selected. One of the studied companies operates with multiple channels of (virtual) interaction for product sale and was founded in 1995. This company searched for a partnership in order to implement projects to manage and improve the performance of the Supply Chain. The partner company had experience in chain management and the management is based on a relationship portal. The other studied organization is a traditional company in the paper and pulp industry which virtualized its services through the utilization of a portal called e-suppliers. The start-up of operations using the portal was in 2004. Secondary data were obtained in sectorial publications, business publications, news agencies, reports from consulting companies and in the company's institutional material.

### **Organization of the Script**

A script was developed for this study. The script was used as a data collection instrument, to guide the interviews that were conducted in the field. It was created with the aim of determining the most important points and to link the theoretical framework with the observed practice. The script was organized and structured based on the theoretical framework

described in section 2 (Theoretical Framework). The interviews, regarding their form of operationalization, can be structured or non-structured. For the purposes of the present research, non-structured interviews were conducted. In non-structured interviews, the researcher aims to obtain, through conversation, data that can be used in qualitative analysis, that is, the aspects considered as the most relevant ones of a research problem.

The script was divided according to the sections below:

Section A – Establishing general information about the company

Section B – Company Virtualization

- The reasons why the companies have been applying virtuality characteristics to their operations;
- How the virtualization solution affected the company's operations;
- The business processes that were or are being affected by the IT / e-business implementations;
- Performance results (efficiency and efficacy);
- The strategic adjustments (if any) between the Business Strategy and the business infrastructure.

## **CASE STUDIES**

### **Company A – General Information**

Company A is a virtual company that is considered the first home shopping in Brazil. The start-up of operations was in 1995, and today it has a basis of 2 million registered customers. 87% of its customers belong to the middle and upper classes. The company operates through several channels: the Internet, telemarketing, catalogs and a television channel. One of the fundamental points for electronic commerce companies is the question of logistics, and in this

context the company had to face some challenges to stay competitive in the market, as listed below:

- Lack of physical space to store large-sized items (mainly home appliances), limiting the number of commercialized products
- Lack of structure to store products that generate traffic in the Internet (for example: books, DVDs, etc.)
- Impossibility to buy all the products offered by suppliers due to the capital optimization policy adopted by company A
- Downsized commercial team, which hinders the management of the purchasing process of a great amount of items
- Urge to expand/optimize the mix of the offered product portfolio
- Occupation of the Distribution Center in São Paulo with products of low stock turnover and high added value.

Faced with these challenges, company A needed to integrate the main suppliers so as to create a synchronized process between demand and receipt of the product in stock. In addition, the company needed to allow that its Distribution Center kept no products in stock, being resupplied only by products defined as stock products. Thus, in light of these needs, company A searched for a partnership in order to implement the projects to improve the performance of the Supply Chain. The partner company had experience in chain management and implemented a solution based on a relationship portal.

### **Solution Developed to company A – Relationship Portal**

The RELATIONSHIP PORTAL is based on information technology and offers services to develop, implement and operate the relationship processes between the companies of the business network of company A, as shown in figures 3 and 4

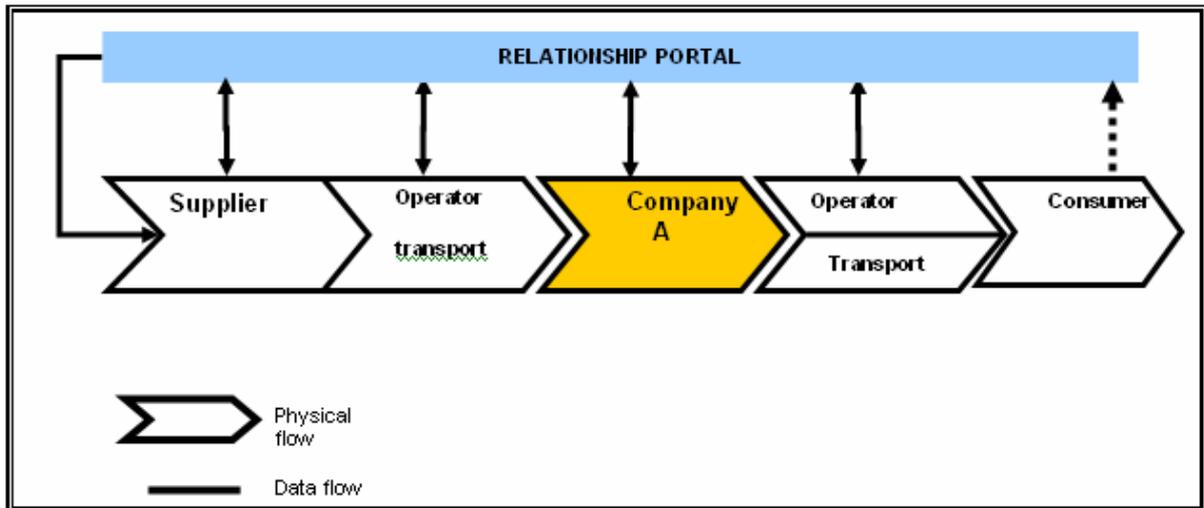


Figure 3- Data Synchronization – Company A

Obtained benefits:

Supplier:

- Greater speed in the launch of new products or models in the consumer market
- Visibility of product demand (including variability), improving the planning of production and stocks
- Possibility to offer all the available products
- Optimization of the financial flow with Customers.

Company A:

- Reduction in investments in stock
- Reduction in the need of space in the Distribution Center
- Diversification and expansion of product portfolio
- Reduction in the final cost in the entire chain, and application of this gain to the product's final price, providing a better position in the market.

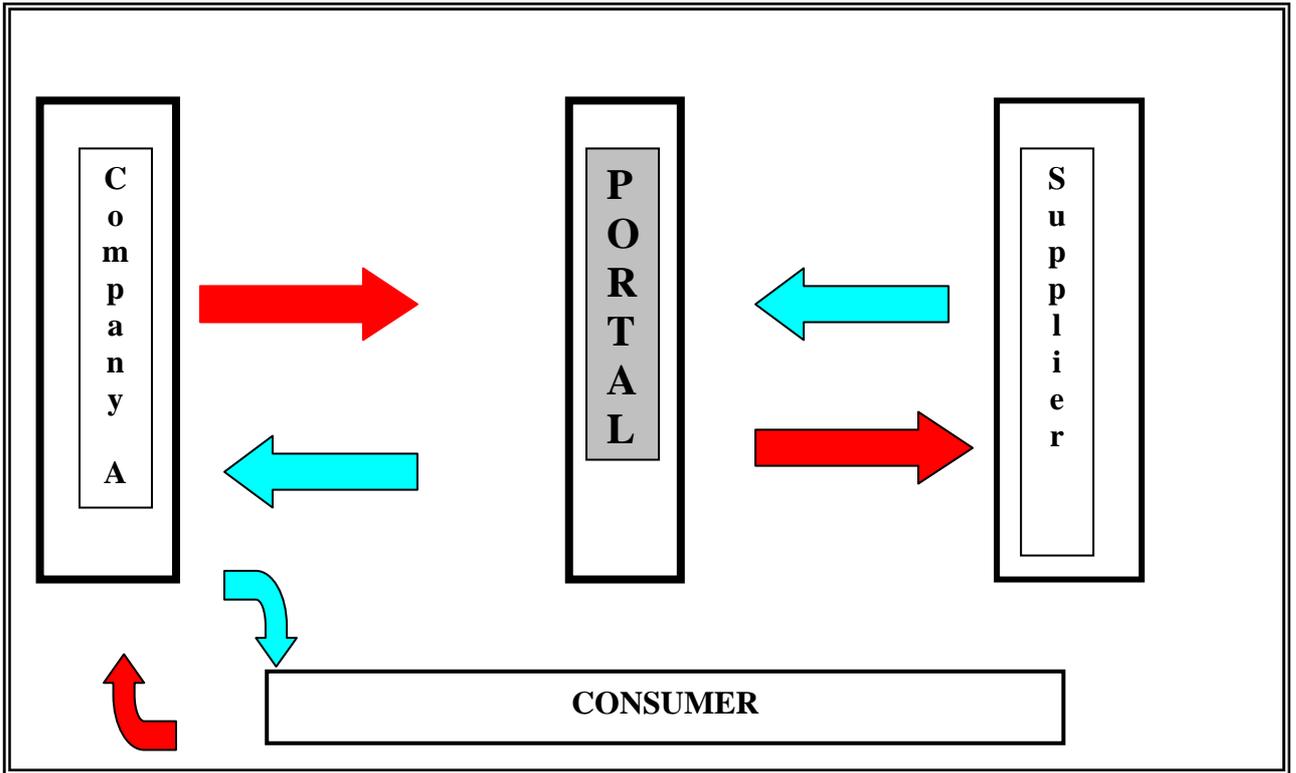


Figure 4 – Integration Process Company A – Suppliers

The Figure 4 outlines the process of integration between company A and the suppliers in its business network and the final consumer. Through this portal, the suppliers have a better visibility concerning demand. It also allows greater speed in the introduction of new products through greater knowledge of the consumer market.

### **Company B – General Information**

Company B is a Brazilian producer and exporter of papers. It occupies the leading position in Brazil in the production of papers and cardboards for packaging, corrugated paper packages and industrial bags.

In the leading position in the segment of Brazilian Corrugated Paper, company B has invested intensively in the last years in its capacity to produce and develop New Packaging Solutions.

From the logistic standpoint, it has production units strategically located in many states of Brazil, supporting the characteristics of agility of the segments that are the company's customers.

### **Virtualization (e-suppliers)**

Organization B decided to virtualize its services through the use of a portal called e-suppliers.

The start-up of operations using this portal was in 2004.

This portal was developed by a technology company that offers solutions and services focusing on the segment of paper and pulp, providing benefits for printing companies, publishing companies, distributors and industries. It is the result of the initiative of five groups of long tradition in the sector. Organization B's decision to use the portal is based on the need to promote the integration of the entire production chain and on specific objectives for the project, as listed below:

#### **Increase in the productivity of several areas that use the purchasing process**

- Elimination of tasks and rework due to deficiencies in the process
- Reduction in the keyboarding load
- Reduction in the number of documents sent by fax
- Reduction in the total time in the resupply process

#### **Increase in information quality and in process quality for the areas of purchasing and physical/tax collections**

- The information comes directly from the source (supplier)
- Previous consistency
- More time for checking and analyzing

#### **Changes in processes and procedures**

- Definitive alignment with the sole model of all units
- Modernization of work and administration practices

 **Opportunity of gains with the other partners of the company**

- Increase in synergy
- Collaboration potential in sharing the tool and its information, as well as in the work practices with the supply market

**Functionalities that are available in the Portal**

- Price quote
- Purchase Order
- Service Register Page
- Copy of the Invoice
- Copy of the Bill of Lading
- Statement of Payments to Supplier
- Anticipation of Receivables to Suppliers
- Evaluation of Suppliers
- Contract Maintenance

**Added Services**

- Inclusion of new suppliers
- Training of buyers
- Support for system utilization
- Supervision of suppliers' answers
- Web hosting
- System maintenance

**Results obtained by Company B**

- Cost Reduction (telephone, fax or paper)..... 50.00%
- Reduction in time spent in price quoting..... 47.50%

- Standardization of quote responses.....40.56%
- Reduction in time spent in the order..... 40.97%
- Standardization of order response..... 37.64%
- Supervision of payments..... 23.19%
- Supervision of deliveries..... 19.58%

### **Analysis of the Cases**

Based on the theoretical framework, both company A and company B use infomediary resources to conduct supply chain processes through a relationship portal. As discussed in the theory section, the term “Infomediary” can refer to aggregators, hubs, or portals. The studied companies call these infomediaries portals.

Tapscott (1996) mentions that the web is a means to innovate the business models as well as a means to reconstruct the value chain in the digital level. According to the author, one of the new business models is the aggregation space (aggregator), which is a company that leads hierarchically as an intermediary between buyers and sellers, between suppliers and customers. Analyzing the cases, it is possible to see that the portals represent these Aggregators discussed by Tapscott (1996).

The study indicates that the role of the infomediary that is used by company A is to organize the relations between the organizations (buyers, sellers, logistics providers) and is characterized by flexible and synchronized aggregation, as discussed by Ordanini & Annalisa (2001). Company A uses a portal that could be characterized as a mini-maestro, as discussed by Bitran et al (2006) in their research study. Its role is to coordinate the network and to align with the players belonging to this network.

As regards company B, it was observed that the portal has functionalities for the purchasing area. It does not play the role of coordinator in one part of the network, unlike the relationship portal of company A. The portal used by company B aligns with the theoretical discussion

about electronic hubs held by Kaplan & Sawhney (2000). Company B uses an electronic hub in its process related to the supply area.

Analyzing the results obtained by the studied companies, it is possible to verify that company B's results are directed towards an improvement in operational efficiency. Company A, through the electronic integration described here, emphasizes the benefits both for its suppliers and for itself. The suppliers obtain greater knowledge about the market, as mentioned in the description of case A. In addition, the company obtains a reduction in the final cost in the entire chain, applying this gain to the final price of the product, achieving a better position in the market. In this case, the portal has been the means through which the suppliers have greater visibility of the products demand (including variability), improving the planning of production and of stocks. The study indicates that the electronic integration through the relationship portal has been a means to acquire and increment the knowledge content of the business network. The virtualization of the organization has allowed the creation of mechanisms and possibilities to expand the knowledge in its supply chain. The study of company A indicates that it uses a "**Mini-maestro**" in its operations, as discussed by Britan et al (2006).

The cases indicate that company A uses these infomediaion resources aiming to obtain a competitive advantage, while company B is in a stage characterized by the search for efficiency.

In case A, the benefits reach all the players in the network, that is, the interviewees point to the benefits of company A, but the suppliers also mention important advantages after the adoption of the Relationship Portal solution, as they call it.

According to Ordanini & Annalisa (2001), the advent of the Internet and the use of computer networks have intensified the changes in the organizations and in their strategies. The digital platforms offer a series of opportunities, as the companies can "*deconstruct*" vertical value

chains and convert them into more flexible and synchronized aggregations aligned to case A and B.

**Summary of the Results: Analysis of the studied Organizations**

Virtual Characteristics applied to the Management of Operations and Results	Organization A	Organization B
<b>Portal / e-hubs</b>	Organization A virtualized its chain through the use of a Relationship Portal. Through the portal, it aimed to improve the integration process between the company and the suppliers in its business network and the final consumer.	Organization B decided to virtualize its services directed at the suppliers through the utilization of a portal called e-suppliers (with functionalities focusing on the supply area)
<b>“Mini-Maestro” Model (Britan et al, 2006)</b>	Case A indicates that the company uses a “Mini-maestro” solution – indicating that the company has added value to organization;	Case B indicates that the company does not use a Mini-maestro solution as discussed by Britan et al (2006)
<b>Affected processes</b>	<ul style="list-style-type: none"> <li>- Order Supervision process</li> <li>- Billings</li> <li>- Logistic Process</li> <li>- Order placement</li> <li>- Planning of supplier’s production and stocks</li> </ul>	<ul style="list-style-type: none"> <li>- Price quote process</li> <li>- Order supervision process</li> <li>- Purchase order process</li> <li>- Billings</li> </ul>
<b>Productivity results</b>	<ul style="list-style-type: none"> <li>- Reduction in investments in stocks</li> <li>- Reduction in the need of space in the Distribution Center</li> <li>- Diversification and expansion of product portfolio</li> <li>- Reduction in the final cost in the entire chain, and application of this gain to the product’s final price, achieving a better position in the market</li> </ul>	<ul style="list-style-type: none"> <li>- Cost Reduction (telephone, fax or paper)..... 50.00%</li> <li>- Reduction in time spent in price quoting..... 47.50%</li> <li>- Standardization of quote responses.....40.56%</li> <li>- Reduction in time spent in the order..... 40.97%</li> <li>- Standardization of order response..... 37.64%</li> <li>- Supervision of payments..... 23.19%</li> <li>- Supervision of deliveries ..... 19.58%</li> </ul>
<b>Performance</b>	The study indicated that the obtained results are presenting an evolution from operational efficiency towards adding value, indicating an impact on <u>Efficacy</u> .	The company has been achieving results focused on <u>Operational Efficiency</u> .

## **CONCLUSION**

The corporate environment has undergone deep changes in the last years, which have been considered to be directly related with IT. One of the most important aspects of this new context is the emergence of the digital environment, which has really allowed the performance of Businesses in the Digital Era and of Electronic Commerce. The information technology applications have created space for competitiveness, allowing the development of a new business architecture based on the Virtualization of the Organization. The analyzed cases indicated the utilization of infomediaries in their e-procurement processes, in the integration between the company and the suppliers in its business network and the consumer. The analyzed companies use the Portal, whose Aggregation mechanism brings to the same virtual environment buyers and sellers, reducing operating costs. The studies indicate that the productivity results for both companies have adhered to the organizations' expectations. It is interesting to notice that, through this electronic integration, the suppliers obtain greater knowledge about the market, as mentioned in the description of case A. In this case, the portal has been the means through which the suppliers have greater visibility of the products demand (including variability), improving the planning of production and of stocks. The study of case A indicates that the electronic integration through the relationship portal has been a means to acquire and increment the knowledge content of the business network, and this is an important theme to be researched, in order to analyze and develop a conceptual model of intermediation using the web platform. Thus, it is worth emphasizing that "Infomediation" may represent a way of obtaining competitiveness and, therefore, the discussed concepts may represent only the beginning of the evolution of hubs, portals and aggregators. Finally, it is important to mention that the present academic article opens some research paths. If the utilization of these

Portals is an element that provides efficiency for the supply chain, as this work presented, investigations in other companies can be profitable.

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