INTERNET'S IMPACT ON THE MANUFACTURERS' INTERACTION WITH CUSTOMERS

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ABSTRACT
This paper presents the results of a survey that was carried out with industrial companies in Brazil, about their perception of the impacts the Internet had on their interaction with customers. The data was gathered from responses to a questionnaire by more than 600 manufacturers from Sao Paulo, the most industrialized state in Brazil. An exploratory factor analysis was carried out in order to check the relationship among the several variables in the study. The authors found out that there were three major factors related to the adoption of the Internet for marketing purposes, in the perception of the participants: customization/customer focus, sales support and consumer information gathering.

Key-words: Internet, customization, information gathering.

INTRODUCTION
The Internet allows companies to offer convenient products and services to their customers, which are better suited to their specific needs and provided in a quick way. But, the greater the expected level of service, the more companies need to focus on the understanding of special customer requirements and the more they have to emphasize the extent to which it is practically feasible.

Customers are becoming each time less tolerant to problems with Internet orders. This is partially the result of the existence of a few world class players that, relying on massive investments in the development of technology and new business models for the Web, created operations that are almost impossible to match, specially considering that most other organizations don't benefit (and never will) from the same scale. Inevitably, all other companies will be compared by Internet users with those with outstanding performance, regardless of them being direct competitors or companies that play in completely different fields. It doesn't matter if they are global operations or local businesses. Another important factor for the existence of high expectations related to the speed and reliability of the delivery is the fact that it is so easy to buy over the Web: products are just a few clicks away. People find it difficult to understand, unless they really think about it, that the fulfillment of the order is much more complex than the actual reception of it.

Therefore, it is essential that companies that sell products over the Internet concern themselves with the development of efficient communication channels with customers, which may help them to match perceptions and expectations, and provide them with a clearer idea of the efforts that need to be carried out in order to improve the operation.

The Internet is also a promising tool to help industrial companies communicate with their customers and the customers of their customers, i.e., the consumers of their products.

For a long time, manufacturers were isolated from the consumers of their products due to the existence of many links that separated them from end customers: distributors, wholesalers, retailers etc. This contributed to the exacerbation of the focus on the product and not the customer, along the time. The dissociation of the production effort from specific needs was a requisite of scale production, in order to reduce the cost, ironically, so that it could become more attractive to the consumer. The intent was to

produce something that the customer didn't want much for a low price (to increase interest), because producing exactly what the customer wanted was unfeasibly expensive.

More recently, the automation of production processes became more flexible and new manufacturing techniques were developed, which allow for a more diversified production without the advantage of scale production being lost. The problem became, then, to identify how to diversify production, considering that industrial companies had lost direct contact with consumers, who could provide them with the information about preferences and specific needs. In that sense, the Internet is a powerful means for direct contact of those who manufacture and those who use a product, allowing for the configuration and customization of products, customers' participation in the development of new products, detection of trends etc.

The enormous potential of the use of the Internet by manufacturers, for their internal processes or for the interaction with customers, was the justification for this study. 655 manufacturers from Sao Paulo, the most industrialized Brazilian state, took part in the survey, whose contact data were originally obtained from a database made available by FIESP (the Federation of Industrial Companies of Sao Paulo), according to the details provided in the Methodological Approach section, ahead.

CUSTOMER INTERACTION WITH THE SUPPORT OF THE INTERNET

The use of information systems allows companies to store large amounts of information about their customers, which may be used to help them provide products and services that are better suited to their customers' specific needs. The Internet, on its turn, may work as the interface between the human agent and the company's databases, which may be accessed directly, even by customers, in many cases. As such interface is also electronic, the result of the interaction with the system is automatically recorded, not demanding any additional data feeding procedure. Thus, transaction costs are reduced, while a personalized service is offered, which allows for virtual intimacy with the customer to be built, as discussed ahead.

Next, we discuss a few possible uses of the Internet, which were included in the survey that was carried out with Brazilian manufacturers.

Virtualization of pre-sale and after-sale activities

The Internet has become an important sales tool and that is no news, anymore. But it also has the potential of helping companies to achieve better performance in other activities related to their businesses. After-sales and support activities may migrate, at least partially, to the Internet, providing fast and easy access to information and, consequently, a higher level of customer satisfaction. Figallo (1998) believes that the Web is able to replace the services of call-centers and paper manuals by a personalized and updated on-line information service. “This will help companies save money and, at the same time, provide a better quality service” (p. 363).

Graeml and Csillag (2003) surveyed software developing companies in California about the use they made of their web-sites. They found out that 60% of the participants believed that the area that needed most urgent change in their web-sites was after-sales support. The respondents would like to do much more than they already did, using the Internet. They would like to act directly on their customers' computers, in order to update software versions or correct eventual problems.

Software companies may get to the extreme situation of offering all after-sales support through the Web. Companies working with more tangible products may not be able to virtualize the whole after-sales service, but just the fact of starting the support using the Internet may already represent a large step towards getting closer to the customer, even when the next steps of the service can't be performed in a virtual way.

Development of virtual intimacy with the customer

Analyzing the actions of companies that attempt to use all the information they have access to in order to provide each customer with a unique experience with their web-sites and products, configuring and dynamically customizing products, many researchers agree with the idea that companies should try to establish some sort of virtual intimacy with customers, getting to know their individual needs, in order to provide offers that are better fit to their requirements.

It should be highlighted, though, that many civil rights agents, particularly in the United States, are starting to oppose to on-line marketing assertiveness, arguing that companies are becoming too invasive of their customers' privacy, without their awareness and authorization (TEIXEIRA JÚNIOR, 2000). Discriminated transaction records, such as those obtained by credit card companies, but also by supermarkets and companies that sell their products over the Web, specially when they refer to items of

differentiated consumption (items that can give hints about the consumer's behavior or life style, allowing for inferences about his/her consumption pattern for other items, which can also be offered to him/her), may be taken almost as if they were notes on a person's personal diary, to which the retailer has access, as reminded by Cameron, Ferguson and Zabin (2004).

The Web offers the possibility of converting virtual shops in personalized sites. Graeml (2003) believes that the new technologies provide organizations with the tools to establish a real time dialog with consumers of their products and services, strengthening the relationship among the parties and increasing customers' loyalty.

Customer Relationship Management (CRM)

The purpose of CRM is to identify, acquire, serve, extract value and retain profitable customers, allowing for a thorough and integrated relationship with them, in which all contact points between the company and the customer are used effectively: marketing, sales and services (via e-mail, face to face, through regular mail, on the telephone, via web-site etc.).

The adoption of CRM practices is even more important in Internet times. A much larger amount of data is available in digital format, allowing for automated processing of customer needs in order to provide "personalized" services. For Vrechopoulos (2004), the enormous capacity of managing information in the scenario of Internet retail, now-a-days, provides a challenging opportunity for research, with clear managerial implications for suppliers and retailers.

For Peppers and Rogers (2001), a good CRM system should provide incentive for the increase of the company's relationship with its current customers, not the market as a whole. Executives should be stimulated to look for new products and services that they could offer to the already existing customers, ensuring the development of those accounts along the time. In order to do that, it is necessary to know the customers individually and in detail, which may demand some effort to gather relevant information that can be used to establish virtual intimacy with customers, as discussed above. It is also important to be able to recognize customers, regardless of the point of contact of the operation that they reach (PEPPERS and ROGERS, 2001). The customer should never be obliged to say the same thing twice. But that is only possible and feasible, today, by means of intensive use of technology.

Mass customization

Mass customization is an attempt to achieve the benefits of scale economy and the advantages of customization, which can be obtained as a result of the design of modular products, capable of being rapidly configured according to the customer's taste, without that representing a burden to the production process.

From the manufacturer's point of view, mass customization is attractive due to several reasons:

- as products are made to order, there is no need for stocking finished goods;
- as the customer him/herself defines the features and the configuration of the product, there is better alignment between what s/he wants and what is made available by the manufacturer;
- as a result of better alignment between offer and needs, the product or service has more value to the customer, who may be willing to pay more for it; and
- customers who place personalized orders help the manufacturer better understand the market and improve its planning also for the mass market.

From the customer's point of view, the major advantage is to receive a product or service that is better adjusted to one's needs. Of course, this advantage comes along with an increased effort to configure the product, or to show how it has to be done. Therefore, the company has to make sure that the required effort is kept as low as possible. Otherwise, if the effort is higher than the perceived improvement in the results, customers won't be interested.

On the other hand, there are difficulties that need to be overtaken, so that customization can definitively be incorporated to the organizations' production processes: made to order production, which is usually related to customization strategies, reduces the possibility of efficient use of the manufacturing system, as warned by Steger-Jensen and Svensson (2004). That increases costs and production complexity.

For the product to allow a greater level of customization, at manufacturing time, without great efficiency loss, the product needs to have been conceived with that purpose in mind. It is also important to develop production processes that allow for a good balance of inventory, equipment and labor, in order to achieve a reasonable environment for build-to-order production, instead of build-to-stock. The system needs to have be designed to be lean, capable of producing only what the customer wants and when s/he wants it (TREBILCOCK, 2004).

Dynamic pricing

There are several reasons that justify the adoption of variable prices for the company's product, which involve differences in perception of product value (which is distinct for each customer) and supply/demand issues.

Bichler (2002) reminds us that, although the Internet reduced customers' effort in order to obtain information on products and prices of different suppliers, it also reduced the costs for companies to communicate and change their prices. That increases the importance of price definition strategies, which tend to be more dynamic in the future.

Different customers are willing to pay different prices for the same products, because their perception of value is different. That is one reason for the seller to change its prices. Another reason is to get protection against cost changes. Regardless of the reason, Coffee (2002) alerts to the fact that retailers that don't start using flexible pricing strategies will loose money, from now on.

In a traditional store, it is difficult to charge different prices to different customers, without generating dissatisfaction. It is usually also not practical to make little price adjustments that affect all customers. The cost of changing price labels may be higher than the additional gain obtained from selling the product for a slightly higher price.

On the Web, on the other hand, it is easy to carry on a policy of dynamic pricing, i.e., buy and sell goods in markets where prices change quickly, adjusting to the floatation of supply and demand (JAYARAMAN and BAKER, 2003) or to the characteristics of a specific deal.

Differently to what happens in the traditional market, where price changes are slow, due to information delay, on the Web, changes may take place almost instantly and at a much lower cost than that incurred by brick and mortar stores. For that reason, dynamic pricing will become a frequent strategy used by virtual operations.

Having so much information about the customers, virtual stores like Amazon, for example, could even use their databases to decide if it is suitable to give a discount, in order to trigger an impulse sale. Prices could, actually, be determined on an individual basis for each customer, depending on his/her profile.

There is no evidence that Amazon uses that kind of strategy in its virtual store, but the possibility to do so is real. Some sites like CNET's (http://shopper.cnet.com) have attempted to use a simpler technique to sell to different customers at different rates: the web-site asks the customer if s/he would like to be informed when there is a reduction in the price of a specific product. If so, the potential customer is invited to tell the price below which s/he would like the web-site to send him/her a *"price drop alert*". Well, after having provided the site with that information, the customer, in practice, told the company how much s/he is willing to pay for the product. It shouldn't be a surprise if, 5 minutes later, s/he received an e-mail message from the company telling him/her that the product was momentarily available for the price the customer wanted, as a result of a special promotion. The company would only need to check if the price was higher than the production cost plus the company's acceptable profit margin.

Information systems about the downstream side of the supply chain

Retail and other intermediaries have always performed as filters, that prevent information from flowing in due time and with the desired quality from customers to the manufacturer. Industrial companies would be able to significantly improve their performance if they could count on real time sales information to the end customer, in order to define their next production actions (COTTRILL, 2003). In order to achieve a performance standard that is closer to the SOMO (*sell one, make one*) target, which is so desirable now that the consumers dictate the rhythm of consumption and determine the specifications of what is going to be consumed, it is important to increase the agility of the information flow, in the direction consumer → production. That demands investment in specific data communication technologies and information storage, in addition to the definition of more collaborative relationships with downstream links in the supply chain.

Incentive to the formation of virtual communities

For those companies that definitively do not want to risk getting involved in conflict of interests with their traditional sales channels, but still want to gain direct access to the consumers of their products, in order to better understand their needs and wishes, another alternative that is made available by the Internet are the virtual communities of consumers.

Virtual communities, developed by the company or sponsored by it, are a precious resource for obtaining information and for the generation of new ideas (ARMSTRONG and HAGEL III, 1996; VENKATRAMAN and HENDERSON, 1998).

Usually, when people are invited to express their opinions and participate in the development of a new project with their ideas, they feel as if they were part of the development team. Even the acceptance of the product that results from such effort is faster and the level of commitment with the brand increases, after it is made available to the market (MCKENNA, 1995).

Venkatraman and Henderson (1998) consider that the formation of a community, in which customers can interact with one another and with the company, is an important stage in the virtualization of a venture. The virtual community should bind the customers and the company, establishing a two way communication channel for information to be captured and converted into knowledge that can be used to improve the company's products.

Albertin (1999) considers that, when companies create virtual communities, they contribute to new levels of customer loyalty and, consequently, they generate higher levels of income. Steil and Barcia agree. For them, "virtual communities can increase customer loyalty to the product and to the company and allow for a direct communication channel with the organization to be settled, using the information provided by the customers to add value to the products" (1999, p. 7).

Rheingold (2000) believes that only a few large companies will be able to generate profit directly from the "social cyber-spaces" they create and sponsor. Most organizations will use virtual communities to generate value for their employees, customers, suppliers and other business partners. For him, the most significant impacts of virtual communities on the companies that create them are internal. He considers that companies that generated deep internal changes along the last few years, creating intranets that spread throughout the organization, will amplify the utility of their internal on-line communities, taking advantage of their intellectual capital and the good-will of the employees.

METHODOLOGICAL APPROACH

Companies that participated in the survey were contacted by means of an e-mail message, which contained an attached MS Word form. The electronic questionnaire in that form had *check-boxes* and *drop-down* menus with possible answers to be chosen. A scale was used that was inspired in a Likert scale and could be filled in by clicking the mouse on top of an alternative answer, which contributed to reduce the time required to complete the questionnaire. Ray and Tabor (2003) argue that, although *radio button* or *check box* questions make a questionnaire clearer, a list of alternatives in a *drop-down* menu reduces the physical size of the questionnaire, considering that the menu is only presented while the question is being answered. **Figure 1** shows an example of a *drop-down* menu that was used in the survey, precisely with the intention of reducing the number of pages of the questionnaire, which could have a positive psychological effect on the respondents.

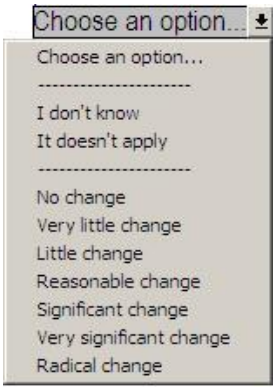

Figure 1 – Drop-down menu used for questions about the level of change related to several value adding activities, resulting from the use of the Internet

The electronic questionnaire was sent to all industrial companies contained in FIESP's database that had a valid e-mail address, which resulted in 655 filled in questionnaires being returned to the researchers, corresponding to a return rate of ca. 8%. FIESP is the association of manufacturing companies in the state of Sao Paulo, Brazil. FIESP's database (updated in 2002), which was used in the survey, included 15,279 manufacturing companies. As companies would be contacted via e-mail, only those having an e-mail address in the database could be invited to participate in the survey. Such companies were 11,838. However, a previous survey that had been carried out by Cohen (2003) the year before, using the same set of data, had already found out that 1,247 of the e-mails in FIESP's database were wrong. Thus, target companies to the survey were reduced to those manufacturing companies contained in FIESP's database that had a valid e-mail account. During the application of the survey, approximately 30% of the messages that were sent didn't reach the addressee, as a result of wrong e-mail addresses. The increase in the number of invalid e-mail addresses from 1,247 to 3,547 was not interpreted as companies giving up the use of e-mail. Although no scientific verification was made for the significant increase of invalid e-mail addresses, the authors speculate that it was the result of Internet provider replacement, or the creation of the company's own domain and, therefore, the change of the e-mail address, in order to use the company's own e-mail server. This assumption is supported by the great number of companies that, even having received the message through the e-mail address contained in FIESP's database, requested that future contacts took place by means of a different e-mail address.

The participants of the survey represented a convenience sample, as a result of the methodological approach that was used, which restricts the possibility to assume that results that are obtained for the sample are also valid for the whole population. However, the authors carried out comparisons of the existing demographic data for the companies that took part in the study and those comprising the population and didn't detect any evidence that the sample didn't fit the population. On the contrary, χ^2 tests for the location of the companies and their size were very favorable.

For the analysis of the data related to the interaction of the participating companies with customers and consumers of their products, the technique that was used was factor analysis, which allows for the identification of the correlation among several variables related to a specific phenomenon that is observed, grouping them in factors that keep the capacity of explaining the situation.

It was expected that, when the answers provided by the respondents about the several possible uses of the Internet for the interaction with customers were analyzed, using factor analysis, factors would be generated that could explain several variables at once, which, in practice, would indicate that the respondents considered such variables either complementary or different ways of dealing with the same issue. This, in fact, happened, according to what will be demonstrated ahead.

A limitation of the study is that the factor analysis didn't take into consideration the fact that the participating companies belong to several different segments of the manufacturing industry, each of which, presumably, has its own influence on the way companies think about the potential benefits of the Internet. Therefore, it is not possible, by means of this study, to determine how relevant each of the three factors that were achieved actually is, to each different industry segment. Future studies could concentrate on evaluating the relative importance of the factors that were evidenced here to different segments of the manufacturing industry.

EXPLORATORY FACTOR ANALYSIS OF THE SURVEY'S DATA

In order to analyze the responses obtained from the companies that participated in the survey, a factor analysis was carried out, involving the following eight variables, which were discussed above:

– use of the internet for pre-sales activities,
– use of the internet for after-sales activities,
– use of the internet for developing virtual intimacy with customers,
– use of the internet for CRM,
– use of the internet for customization,
– use of the internet for dynamic pricing,
– use of the internet to gather information on the customers/consumers, and
– use of the internet to establish virtual communities of customers/consumers).

A rule of the thumb to choose the number of factors to use in the analysis, when an exploratory factor analysis procedure is used, is to keep in the analysis those factors with eigen-value higher than 1. Considering that there are only 2 eigen-values higher than 1, in this case, as seen on **Figure 2**, that should

be the number of factors chosen for the analysis. Two factors would be able to explain 55.3% of the data, but some variables had high loads for both factors, which reduced the explanatory power of the model, as the factors didn't relate to a specific set of variables. As a result of that, the authors decided to include a third factor, whose eigen-value was 0.9024.

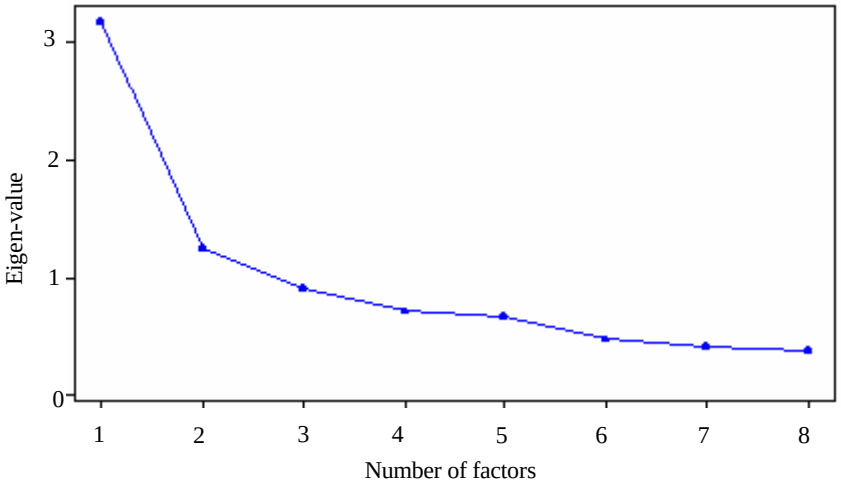

Figure 2 – Eigen-values of the possible factors to be used in the factor analysis

The following three factors were obtained: factor 1 grouped variables related to "**customer focus**", factor 2 involved variables related to "**sales support**", and factor 3 conveyed variables related to the company's "**customer/consumer information gathering**", as can be seen on **Figure 3**, below.

Rotated Factor Loadings and Communalities - Equimax Rotation

Variable	Factor1	Factor2	Factor3	Communality
Pre-sales	0,124	**0,855**	0,106	0,757
After-sales	0,195	**0,857**	0,089	0,780
Virtual intimacy	**0,684**	0,138	0,274	0,563
CRM	**0,718**	0,310	0,132	0,628
Customization	**0,664**	0,384	-0,020	0,589
Dynamic pricing	**0,706**	-0,006	0,271	0,571
Customers' info system	0,055	0,206	**0,819**	0,717
Virtual community	0,264	-0,028	**0,805**	0,719
Variance	2,0485	1,7709	1,5053	5,3246
% Var	0,256	0,221	0,188	0,666

Figure 3 – Minitab's Equimax rotation factor analysis output for the surveyed data

The three factors, together, explain 66.6% of the information provided by the 8 variables initially available, with the advantage of significantly reducing the number of dimensions of the study. They also provide a pretty good degree of explanation of each one of those variables, independently, as can be seen in the *Communality* column, in the software's output. Most of the individual values are higher than 70%.

The result of the analysis shows that participating companies perceive the Internet's potential as a tool to provide a closer relationship with customers/consumers according to three major dimensions: provision of personalized products/services, pre-sales and after-sales support and obtainment of information about customers/ consumers.

Figure 4, below, presents a hypothetical evaluation diagram, by means of which a company could compare its efforts in using the Internet to interact with customers with those carried out by other organizations. Of course, the diagram is only for the sake of illustration, as the authors haven't developed,

so far, any study about the relative importance of the factors to different industry segments. However, if the diagram of **Figure 4** expressed the reality of facts, the hypothetical company under analysis would realize that it needed to improve its *customer focus* and *information gathering* in order to meet market demands with respect to those factors.

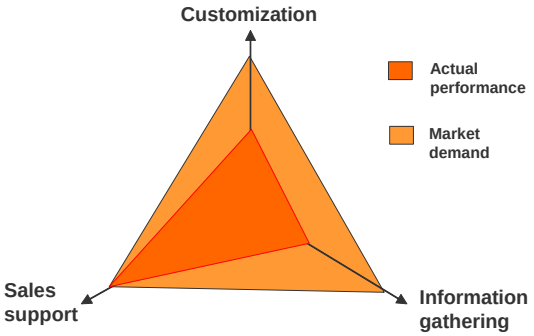

Figure 4 – Performance of a hypothetical company with respect to the factors of potential impact of the Internet on the communication with its customers

The authors believe that, after further research is carried out about this issue, it will be possible for benchmarking diagrams as the one shown above to be used in order to help organizations find out improvement opportunities with respect to the use they make of IT and the Internet, in order to develop such tasks.

CONCLUSION

The results of the survey have definitively shown that Brazilian manufacturers do not consider that the possibilities offered by the Internet are restricted to the sale of products/services. There are several other benefits that may arise, simply from the use of the Web as a means for the interaction with customers. The factor analysis that was carried out led the authors to identify three major factors of Internet use on which manufacturers consider it is important to concentrate marketing efforts, related to the interaction with customers: *customer focus, sales support and customer information gathering*.

Companies that are able to create an environment in their Web-sites that inspires trust and makes the customer confident in buying through the Internet (pre-sale) have a good chance of succeeding in e-business. But, another way of benefiting from the Internet is exploiting its potential as a media for the solution of problems that eventually happen afterwards. Participants in the survey also seem to believe that the Internet can be an efficient mechanism to help users to clear doubts about the functionality of products and to increase their loyalty (after-sale).

The study didn't make any distinction among companies, according to their market segment. Thus, although the three factors were clearly evidenced, it is impossible to determine, at this stage, if there are differences in the relevance of each factor to different industrial segment. Future research could focus on the evaluation of the relative importance of the achieved factors to different industrial sectors. Knowing about the existence of such major factors (related to the interaction of industrial companies with their customers/consumers), any player in a specific field will then be able to evaluate its own performance, benchmarking it against its major competitors or market expectations, according to what was shown in the hypothetical example presented in the previous section.

Another limitation of this study is that it is based on the perception and intentions of the participants. It is important to be conservative with respect to companies' intentions, because they don't necessarily turn into reality, when the matter is the adoption of new practices and technologies. There are a series of barriers that separate intentions from actions. Intending to do something doesn't generate any cost, differently to the actual implementation of an idea or project.

One should not consider the Internet as an isolated phenomenon, though, solely responsible for the severe changes that are taking place in the corporate environment. Other advances in IT and other organizational practices preceded or took place along side with the adoption of the Internet by companies, contributing to a new wave of change. Studies need to be carried out from a broader perspective of

corporate processes, their inter-relationship and the Internet's ability, together with other IT, to virtualize or transform them.

The virtualization of corporate processes has been more frequent in market practices than theoretical studies developed by researchers in academia, which needs to wake up to the potential of such initiatives of complementing or replacing traditional ways of carrying out business, establishing a new rhythm to the interaction of customers and suppliers in business transactions and the contact with consumers.

The impact of the Internet on the way industrial companies perform their daily tasks is only now becoming noticeable. The "revolution" that the Internet may cause in the manufacturing industry is silent but persistent. It is almost impossible to foresee the reach of such transformation, although it is easy to realize that it has already started. The rhythm of change is in the hands of the companies, themselves, which have to suitably adjust their structure, processes and organization culture, in order to benefit from the full potential of the new technologies.

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