

# Information Technology in Business Process Reengineering

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*Today's environment is characterized by increasing levels of competition. Enterprises wanting to increase their market share or obtain profits must adapt to changes in the environment. Consequently, many changes in business methods are beginning to appear. One of them is business process reengineering (BPR), defined as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance. Among the potential enablers of BPR is information technology (IT). IT makes it possible to obtain improvements in BPR, though not just by itself. This paper will demonstrate the importance of IT in one of the most prominent methodologies. Enterprises can make their tasks easier, redesign their organization, change the way they work, and achieve spectacular improvement using, among other enablers, IT. (JEL M12; Int'l. Advances in Econ. Res., 6(3): pp. 581-589, Aug. 2000. ©All Rights Reserved.)*

## Introduction

Despite their type of business, the degree of technological advances in their products or services, and their national origin, most firms drag along a Taylorism logic with their organization. They tend to split the processes into tasks, putting specialized people in different tasks and making a hierarchic ranking based on their specialization level. Therefore, they are structured following the Adam Smith theory of labor division. The bigger the firm, the more specialized the work and the more steps for the work to be split. Because of this, tasks are being divided more and more. This tendency has greatly complicated the total process of producing and delivering a product or service, has increased staff at the medium level of the organization, and has distanced top management from users even more.

However, these business methods do not function in most enterprises today, environments where nothing is constant or foreseeable. Today's environments are featured by the following three forces [Hammer and Champy, 1994, pp. 29-34]:

- 1) Customers are assuming control. Today, customers assume control instead of salesmen. Customers tell the suppliers what they want, when they want it, and how much they are willing to pay. They demand products and services designed for their particular needs. Customers have the upper hand with salesmen, partly due to easy access to more information.

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- 2) Competition is growing. Before, the most important variable in sales was price. Now, similar products are sold on different competitive bases which include quality and pre- or after-sale service, not just price.
- 3) Change is continuous. The very nature of change has changed.

Companies must adapt quickly to these changes to keep or improve their competitive position. In this way, a methodology is necessary which allows changes to be made in companies to make improvements in costs, quality, time, and service.

In recent years, one of the more prominent approaches to making changes in business methods is business process reengineering (BPR), which is primarily concerned with making changes in business processes. To make these changes and improvements proposed by BPR, it is necessary to use elements known as enablers. These elements ease the redesigning of processes, pointing out more specifically information technology (IT). This paper will try to show the importance of IT as an enabler of BPR.

### **The Concept of BPR**

Hammer and Champy [1994, p. 19] define BPR as "fundamental revision and radical redesign of processes to reach spectacular improvements in critical and contemporary measurements of efficiency, such as costs, quality, service and quickness." Key words in this BPR definition are:

- 1) Fundamental: What is the company's basic style of working?
- 2) Radical: All existing procedures and structures must be forgotten and new styles of working must be discovered. Superficial changes are not useful. Changes must be made at the very root.
- 3) Spectacular: Spectacular changes must be discovered, not marginal improvements.
- 4) Processes: Redesign must be fixed on the processes not on the tasks, jobs, people, or structures.

Consequently, a firm must start over, leaving their old procedures behind, testing the work without prejudices, and forgetting systems used up to now. In other words, redesigning is changing. Reengineering is centered in the processes. Davenport and Short [1990] define a process as a set of logically related tasks performed to achieve a defined business outcome. Furthermore, a process is a sequence of activities which, when jointly taken, produce a valuable result for the customer.

Other methodologies are also centered in the processes, such as continuous improvement or total quality management, and they reorientate the basic tasks of the company to satisfy customers' needs. However, they can be quite comfortable with their existing processes and they may not want to introduce new ones.

### **Review of Literature**

Hammer [1990] introduced reengineering in his work, "Reengineering Work: Don't Automate, Obliterate." Through it, he pointed out the general lines and principles of this methodology and discussed its advantages through the application in U.S. companies such

as Ford Motor and Mutual Benefit Life. Damampour [1991] remarked that radical changes provoke fundamental changes in the activities of an organization. They represent a clear desertion of existing practices, as opposed to the incremental changes that usually accompany such practices.

Due to this, it is necessary to distinguish between incremental (or evolutive) change and radical change as high scale or revolutionary. Barczak et al. [1987] showed that incremental or additional changes generate long-term inefficiencies. On the contrary, radical changes may involve a reorganization of the company. They identified the variables that provoke a dissolution of the existing structures or processes and the creation of new and different ones.

Hammer and Champy [1994] developed this methodology in their work, *Redesign of the Business*. This work explains how the people and improvements are affected once the redesign decision is made.

Whitman and Gibson [1997] developed a study for discovering why companies use BPR. In order of importance, these reasons are:

- 1) to improve inefficient business processes;
- 2) to be the industrial leader;
- 3) to reorganize business functions;
- 4) to improve current industry position;
- 5) to be among the industry leaders; and
- 6) to dramatically turn the company's position around.

Ardhaldjian and Fahner [1994] consider that BPR is a methodology based on processes and directed by top management who wants better performance from the organization through radical changes.

### **Information Technologies**

Today, we find a great number of advances in the ITs being used in companies. In one way, remarkable advances in personal computers and communications allow employees to work outside the office while still being connected to the office. Employees may work from home or other locations. Multimedia communication systems, which send and receive audio and video data, help us in making decisions by using electronic mail, file transference, or video conference. Computer-aided design/manufacturing/engineering (CAD/CAM/CAE) techniques allow for coordinating product design, manufacturing, and engineering activities.

Using new IT allows companies to gain important advantages such as:

- 1) cost savings and improving the accuracy of exchanging information;
- 2) avoiding human mistakes inherent when complex and repetitive tasks are used;
- 3) saving money because it reduces errors and the time it takes to accomplish tasks;
- 4) integrating and coordinating several functions at once; and
- 5) improving the organizational efficiency and effectiveness by eliminating delay, administrative intermediaries, and redundant processing steps and by providing better access to information.

### **The Role of IT in BPR**

BPR is a methodology that promotes change and introduces new processes and new styles of working. So certain elements will be required to make change possible. These elements are known as enablers and may be defined as elements that act as vehicles for processes to change. IT promotes changes in organizations, mainly changes in the nature of the work, the integration of business functions, and the transformation of competitive forces [Scott-Morton, 1991].

IT can help make the changes promoted by reengineering, and it can be considered as an enabler of BPR. There are several studies that show IT as a fundamental capacitor of process redesigning [Naisbitt and Aburdene, 1985; Davenport and Short, 1990; Hammer, 1990; Harrington, 1991]. Nevertheless, how can IT help in changing processes?

#### *IT and Processes*

Processes may be classified according to two dimensions: degree of mediation and degree of collaboration [Teng et al., 1994]. The degree of mediation refers to the sequential flow of input and output among the participants' functions in a business process. A process at a high degree of mediation involves a large number of intermediate steps, performed in various functions that contribute indirectly to the process outcome. A process at a low degree of mediation has several functions that contribute directly to the process outcome without the mediation of sequential steps. The degree of collaboration dimension is related to the degree of collaboration between functions through information exchange. The frequency and intensity of information exchange can range from none (process at the low degree of collaboration) to extensive (process at the high degree of collaboration).

Today's environment is demanding firms to quickly develop and offer products that will satisfy customers' needs. Companies may not be able to do this if they use processes with many steps and scarce collaboration. Consequently, this environment forces a change in business processes to feature reduced mediation and increased collaboration.

Can IT make this change easy? That is, does IT diminish the degree of mediation and increase the degree of collaboration? First, companies must reduce the degree of mediation in processes. That is, they must convert processes with a great number of intermediate steps into processes that take part directly in the final outcome. The ITs that make this modification easy might be:

- 1) Shared databases: Different functions are allowed to take part directly by using the information stored in databases. Each function can approach, enter, or recover information from this database the moment it is needed.
- 2) Imaging technology: Several people may work at the same time on a digitalized image of documents or graphics.
- 3) Electronic data exchange and electronic funds transference.

Furthermore, shared computing resources make it possible for different functions to have access to information at any time.

Second, companies must increase the degree of collaboration in processes so that involved functions will share information. The IT that makes the collaboration easy among different people may be communication technologies. These allow information transfer by using tools such as electronic mail, video conference, and file transfer protocol.

*IT and Types of Processes*

Up to now, this paper has referred to the influence of IT on business processes. An in-depth study could be done for defined processes. Davenport and Short [1990] proposed an initial classification of processes by using three criteria: dimension of the involved, object, and activities.

Regarding dimension of the involved, there are three types of processes: interorganizational, interfunctional, and interpersonal. The use of IT, such as electronic data interchange and shared databases, reduces transaction costs and eliminates intermediaries in organizational processes. Telecommunication networks make simultaneous work in various locations possible in interfunctional processes. Technologies that combine work and image technologies make it easier to integrate tasks into interpersonal processes.

Regarding the object, there are physical or informative processes. Physical ones require a labor reduction or substitution which is facilitated by CAM and robotics. Informative ones imply processing a great deal of information, made easier by new IT.

Activities criteria differentiate between operational and managerial processes. ITs, such as electronic commerce and shared databases, reduce time and costs and improve the output quality in operational processes. Besides, expert systems, decision support systems, and executive information systems are useful techniques in managerial processes.

Gunasekaran and Nath [1997, pp. 96-7] classify the most important processes in a manufacturing or service company and distinguish the following ones: order flow, strategic process, product, marketing or sales, services, accounting, personnel, and technology.

Order flow includes supplying activities, product assembly, product manufacturing, obtaining order, delivery, and installation of the product. Bearing in mind that this process is specific for each company depending on its main activity, goals, or customer needs, IT may have a key role. In this way, some ITs might ease the material and information flow through the whole process. Some examples are multimedia, shared databases, artificial intelligence (mainly expert systems), computer-integrated manufacturing, CAD/CAM/CAE, electronic data interchange, and electronic funds transfer. These technologies not only can reduce lead time of order flow, but they help eliminate certain barriers among the different functions.

The strategic process is composed of formulation functions of the strategy and design of the organizational structure. This process demands not only an external analysis, but an internal analysis as well. So the strategic process will collect and manipulate a great deal of information in order to elaborate corporate strategy. In this way, we can differentiate between two IT uses. First, there are technologies that collect and distribute information such as video conferences, databases, e-mail or telecommunication networks, and executive information systems. Second, there are the information systems that help make decisions, namely decision support systems and intelligent decision support systems. Management information systems and expert systems will have less importance in this process once they become programmed decisions.<sup>1</sup>

The product process is formed by design functions, engineering, and process planning. CAD/CAE and concurrent engineering technologies make the previously mentioned functions easy, provoking important improvements in productivity and cost savings.

The marketing or sales process includes customer satisfaction, market research, forecasting, and product-mix decisions. This process acquires the most information possible on customer needs, preferences, and testing. The ITs that make this process easy are computer-assisted telephone interviews and company-customer communication through the internet.

The service process is formed through the maintenance of products and after-sales service. In this way, client-server systems are very useful.

The accounting process includes product pricing, budgeting, and make-or-buy decisions. This process requires information from all company areas. This process takes many steps and is slow in collecting data. This task could be made easier by implementing integrated systems such as SAPR/3 which connects the whole company and obtains the necessary information. Of course in this case, the telecommunication network is of great importance.

The personnel process involves several functions such as recruitment, selection, training, compensation systems, and performance appraisal. Traditionally, IT has had a scarce role in this process, but today, new possibilities are appearing. Employees desire more participation in changes that affect them, and this might be made easier by introducing multimedia technologies and networks. Stillwagon and Burns [1993] propose human performance engineering, defined as a new method of organizing, developing, and changing the human resources of an organization, utilizing geometric or algebraic principles, as typically found in engineering analysis, with functional elements of performance.

Therefore, IT acquires a relevant role at the time to integrate the different functions involved in a process. As discussed previously, BPR demands the elimination of existing barriers within each functional area. This can be obtained by implementing IT.

### **Other BPR Enablers**

So far, this paper has presented the importance of IT as an enabler or an element that may facilitate redesigning the process. However, IT is not the only enabler. There are possibilities offered by other elements.

Love and Gunasekaran [1997] consider four enablers: IT, total quality management, human resources, and organization. The role of IT as a BPR enabler has already been presented here. Bear in mind that the rest of the enabler list would require a more detailed study, so comments will be generalized for each one.

Organizational enablers are grouped within two categories: structural and cultural. Structural enablers are used to demand a change in human resources management, mainly in training areas and reward systems. BPR involves introducing generalists to the organization, that is, workers who perform different tasks related to a project or a case. In this way, case teams arise as a group of persons collaborating in the consecution to a result. Therefore, a redesign project demands an organizational change in the modification of grouping criteria, from a functional structure to team units. Mainly, there are three major structural enablers:

- 1) Self managing work teams drive themselves and do not need a formal leader.

- 2) Cross-functional teams involve several functions, so their members collaborate among themselves to get a result.
- 3) General-purpose problem-solving teams are formed by persons from the same department and are in charge of solving different matters in a periodic way.

On the other hand, cultural enablers include those norms, values, and beliefs about how things should be done. Process reengineering involves changes that simultaneously demand sharing, innovating, and giving new ideas. All this must be instilled gradually by the management so that at the time of redesigning the processes, employees could participate and accept it willingly. In a company with a rigid culture where everything must be specified and suggested by a superior, process change would be much more difficult.

A third group of enablers is human resources. If a company needs motivated employees who accept changes, propose ideas, share, and are able to vary their style of working, then half of the effort should be centered around human resource management. Therefore, in-depth training and motivation aspects must be studied. On one hand, it would be necessary for workers to gain knowledge in team work and development of new tasks. On the other hand, the company must motivate its employees through incentive systems and by allowing their involvement in the decision-making process.

Finally, total quality management is an element that might make process redesigning easy as it may incite the idea of a change needed in the company. Although of course, total quality management does not really affect BPR's possible results.

### **Actual Examples**

Here are some examples that show the role of IT in process redesigning through some companies' experiences. Texas Instruments' new product development involves personnel located in different countries such as Japan, India, Malaysia, and the U.S. Document transfers have been avoided by using CAD/CAM systems together with telecommunication networks. Therefore, in developing their calculator, this company has increased its collaboration level and diminished the mediation grade by 39 percent of needed time.

Ford Motor was chosen by Hammer [1990] to demonstrate the advantages of BPR. By applying shared databases in the accounts payable process, which includes purchasing, receiving, and accounts payable, Ford reduced its employee work force by 75 percent.

Hewlett-Packard changed the working style of its salesmen. Using portable computers, they connected to the company's inventory database. They get on-time information and apply directly for promotions, price changes, or discounts. Needless to say, their time dedicated to customers has increased by 27 percent and sales, by 10 percent.

When Citibank transformed its credit analysis system by reducing paper processing, it obtained an increase of 43 percent in time dedicated to collecting new customers. IBM Credit used to take two weeks to finish a financing claim because there were five steps to the process. By redesigning the process and by involving generalists who work with databases and telecommunication networks, it now takes only four hours.

## Conclusions

BPR is a methodology by which important improvements are obtained, although it requires big changes in organization and work style. This involves the need to change or even increase working styles, job functions, needed knowledge, and organization values. In this way, reengineering requires long-time dedication, resources, and effort. These are made easier by using elements called enablers.

This paper has discussed the importance of IT as a facilitator. Its role is crucial because it allows a company to alter processes in two ways: collaboration grade increase and mediation grade decrease through the implementation of shared databases and communication technologies.

So, IT may help companies to obtain important improvements on variables such as costs, quality, and delivery time. Although these are not the only important elements, also bear in mind structural changes, company culture, and human resources.

## Footnotes

1. A programmed decision needs a sequence of answers. Because of this, this used to be called a repetitive decision. Generally, strategic decisions used to be nonprogrammed.

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