Impact Of Information Technology on BPR: A Study Of Information Technology As BPR Enabler in Tractor Industry In Pakistan

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Abstract

Business Process Reengineering (BPR) is 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 it. This study examines a series of relationships between information technology (IT) and business process reengineering (BPR). Specifically, it argues that those aspiring to do business process reengineering must begin to apply the capabilities of information technology. The purpose of this paper is to answer some questions regarding this issue, like: Is the use of information technology a critical success factor of reengineering ? Is it possible to reengineer the business without the existence of IT sophistications? What are the facilitations that have been contributed by IT to successful reengineering? The methodology that has been adopted in the study is reviewing the literature to explore answers for such questions. It was found that IT has a critical role in the success of BPR project in achieving dramatic improvements, at the same time BPR introduced well defined strategies to make an organization heavily extracts the benefits from such enablers with huge capabilities and to employ IT correctly and efficiently.

The main objective of this study is to explore the possibilities for improvement in the processes of Cost Accounting Information System in Tractor industry after re-engineering through use of information technology. Data has been collected through unstructured interviews from the technical experts in the companies and from the website. Besides, extensive study has been carried out from the existing literature. By applying BPR techniques and technology, Most of the companies in tractor industry has achieved about 50% reduction in waste in production (WIP), 20% reduction in lead times and 90% reduction in overtime resulting into a lot of savings.

Keywords: Businesses Process Reengineering; Information Technology; Manufacturing Companies; Tractor Industry in Pakistan.

Introduction

1. 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. In today's ever-changing world, the only thing that doesn't change is 'change' itself. In a world increasingly driven by the three Cs; Customer, Competition and Change, companies are on the glance for new solutions for their business problems through **Business Process Reengineering** (BPR). Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical and contemporary measures of performance such as cost, quality, and service and speed . The term ''reengineering'' first appeared in the information technology (IT) field and has evolved into a broader change process. The aim of this radical improvement approach is quick and substantial gains in organizational performance by redesigning the core business process. In the 1990s, many US companies embraced reengineering as an effective tool to implement changes to make the organization more efficient and competitive. As it has been investigated in most studies and researches, the role of IT in the success of BPR was always a dialectical issue throughout stakeholders; it is not built on specific criteria, which makes it difficult to be well specified. This dispute creates two rivals regarding

this issue the first one thinks and believes that BPR has the capability to achieve its goals without the support of IT, while the second urges that IT has the favor in the success of BPR. Information Technology is a set of tools, processes, and methodologies such as coding, programming, data communications, data conversion, storage and retrieval, system analysis and design, systems control and associated equipment employed to collect process and present information. In broad terms IT also includes office automation, multimedia, and telecommunications (Business Dictionary Online). This paper tries to answer such questions by reviewing the literature dealing with the role of IT in the success of BPR project and also to assess the views of supporters and opponents of the idea of enabling role of IT in BPR. Since the notion of the role of IT in BPR project success is not clear or well defined in literature, the study was carried out by reviewing the literature, choosing some case studies which were a suitable means to collect the data. By studying these case studies and analyzing the particular situation and factors that play a positive role in the success of BPR in each organization, researchers developed a better interpretation of the role of that played by IT as a real enabler in BPR project. Finally the truth that can't be denied is that IT has its clear finger prints in the success of BPR.

2.   The main benefits of information technology have moved beyond the efficiency and effectiveness gains of the 1960's and 1970's and towards strategic advantage which will transform the organization of the future. Therefore, if real benefits are to be realized from business process change it will often involve redesigning the information systems and information technologies (IS/IT) that support the processes. Working together, BPR and IT have the potential to create more flexible, team oriented, coordinative, and communication-based work capability. IT is more than a collection of tools for automating or mechanizing processes. It can fundamentally reshape the way business is done and enable the process design. In leading edge practices, information technology makes BPR possible and worthwhile. BPR and IT are natural partners, yet their relationships have not been fully explored. Given the growing dominance of services, their recursive relationship is in need of further analysis and redesign. Since Cost Accounting is a process by which a company documents and determines the cost of a product, therefore, reengineering in cost accounting information system means exploring efficient and improved ways of calculating/documenting the cost of a product in order to maximizes the profit. Keeping this backdrop in view, the main objective of this study is to explore the possibilities of improvement in the processes of Tractor Industry with the use of technology in business process reengineering.

3.   **Problem Statement**.   The researchers intend to investigate as to what extent application of Information Technology influences success of Business Process Re-engineering efforts in Tractor Industry in Pakistan.

4.   **Objectives of the Study**

   a.   To study the impact of Information Technology on performance and efficiency of tractor industry in Pakistan.

   b.   To prove that the use of information technology as a critical success factor of reengineering.

   c.   To find out whether it is possible to reengineer the business without the existence of IT sophistications.

   d.   To find out the facilitations which have been contributed by IT to successful re-engineering?

5.   **Research Question**.   Is the use of Information Technology a critical success factor of re-engineering in tractor industry in Pakistan?

6.   **Originality of the Study**. The impact of Information Technology on BPR has been found in previous studies but, not in the context the researchers intend to find out especially with regard to tractor industry in Pakistani environment. This is the deficiency in the existing body of knowledge. This research does fill this deficiency making it a great addition in the literature on the subject.

7.   **Applied Aspects**.   The researchers hope that this contribution will be useful as it will help indicating the effect of IT on success of BPR in manufacturing industry in the world in general and in Pakistan in particular. By applying BPR techniques and technology, tractor industry can achieve reduction in waste in production, lead times and overtime resulting into a lot of savings. Hence, the subject is having great value for research in present environment. Findings of the study can be utilized by all manufacturing industries in Pakistan, as well as other organizations around the world while planning for re-engineering.

Literature Review

8.   Over the last few years, the reengineering concept has evolved from a "radical change" to account for the contextual realism (Caron et. al 1994, Earl 1994), and to reconcile with more incremental process change methods such as Total Quality Management (TQM), towards a broader, yet more comprehensive process management concept (Davenport 1995). Kettinger & Grover (1995) outline some propositions to guide future questions into the phenomenon of BPR. Their propositions center around the concepts of knowledge management, employee empowerment, adoption of new IT's, and a shared vision. Earl et al. (1995) have proposed a "process alignment model" that consists of four emphases: process, strategy, IS, and change management and control and used it to develop more BPR strategies. Malhotra (1998) has developed the key emphasis on these issues based primarily on an integrated view of recent literature from organization theory, organization control, strategy, and IS. King (1994) believes that although the current interest in BPR may end, process reengineering, in some form or another would endure.

9.   **BPR and Information Technology.** There is a relationship between BPR and information technology (IT). Hammer (1990) considers it to be the key implementation of BPR. He says the use of IT is to challenge the assumptions inherent in the work processes that have existed since before the advent of modern computer and communications technology. He argues that at the heart of reengineering is the idea of discontinuous thinking. Discontinuous thinking is a way to recognize and break away from the outdated rules and fundamental assumptions

that underlie operations. Usually, these rules are based on assumptions about technology, people, and organizational goals that no longer exist. Hammer (1990) suggests the following principles of reengineering:

  a. Organize around outcomes, not tasks.
  b. Have those who use the output of the process perform the process.
  c. Interleave information processing work into the real work that produces the information.
  d. Treat geographically dispersed resources as though they were centralized.
  e. Link parallel activities instead of integrating their results.
  f. Put the decision point where the work is performed, and build control into the processes.
  g. Capture information once and at the source.

10.   Davenport & Short (1990) argue that BPR requires taking a broader view of both IT and business activity, and of the relationships between them. IT should be viewed as more than an automating or mechanizing force but rather as a way to fundamentally reshape the way business is done. Many researchers and practitioners have increasingly considered factors related to IT infrastructure as a vital component of successful BPR efforts. Effective alignment of IT infrastructure and BPR strategy, building an effective IT infrastructure, adequate IT infrastructure investment decision, adequate measurement of IT infrastructure effectiveness, proper IS integration, effective reengineering of legacy IS, increasing IT function competency, and effective use of software tools are a few of

the most important factors that contribute to the success of BPR projects. IT can best enhance an organization's position by supporting a business-thrust strategy (McDonald, 1993). The business strategy should be clear and detailed. Top management should act as a strategy formulator who provides commitment for the whole process of redesign, while the IS manager should be responsible for designing and implementing the IS strategy. The strategy describes the role of IT in leveraging changes to business processes and infrastructures. IT strategic alignment is approached through the process of integration between business strategy and IT strategy, as well as between IT infrastructure and organizational infrastructure. The degree of alignment between the BPR strategy and the IT infrastructure strategy is indicated by including the identification of information resource needs in the BPR strategy, deriving the IT infrastructure strategy from the business strategy, examining the IT infrastructure strategy against the BPR strategy, the active involvement of management in the process of IT infrastructure planning and IT managers in business planning, and by the degree of synchronization in formulating the two strategies. The following figure shows the multidimensional nature of BPR.

11.   **Multidimensional View of BPR (Light, 2000).**   Business activities should be viewed as more than a collection of individual or even functional tasks. They should be viewed as a way to achieve maximum effectiveness. IT and BPR have recursive relationships. IT capabilities should support business processes and

business processes should be implemented in terms of the capabilities IT can provide. Davenport & Short (1990) refer to this broadened, recursive view of IT and BPR as the new industrial engineering. Business processes represent new approach to coordination across an organization. IT's promise is to be the most powerful tool for reducing the costs of coordination (Davenport & Short 1990).The way related functions participate in a process can be differentiated along two dimensions: degree of mediation and degree of collaboration. They define the Degree of Mediation of the process as the extent of sequential flow of input and output among participating functions. They define the Degree of Collaboration of the process is the extent of information exchange and mutual adjustment among functions when participating in the same process. Also, innovative uses of IT would inevitably lead many firms to develop new structures, enabling them to coordinate their activities in ways that were not possible before. Although, BPR has its roots in IT management, it is primarily a business initiative that has broad consequences in terms of satisfying the needs of customers and the firm's other constituents (Davenport & Stoddard 1994). The IS group may need to play a behind-the-scenes advocacy role; convincing senior management of the power offered by IT and process redesign. It would also need to incorporate the skills of process measurement, analysis, and redesign. Davenport and Short (1990) argue that awareness of IT capabilities can and should influence process design.

Methodology

12.   Trying to find answers for the questions of the study, researchers reviewed some articles that have discussed the relationship between IT and BPR in the literature, and investigate the role of IT in BPR project. This is achieved by studying the case studies and analyzing the particular situation and factors that play a positive role in the success of BPR in each organization. Researchers developed a better interpretation of the role that is played by IT as a real enabler in BPR project.Data has been collected through unstructured interviews from the engineering personnel's in the tractor industry. Along with that extensive study has been carried out from the existing literature. Company's websites are also visited to get information. The cost accounting information system (CAIS) being one of the most important information systems in any business has been studied and the fact that how IT makes it possible to obtain improvements in BPR, though not just by it.

13.   **Historical Perspective**.   Major breakthrough in manufacturing of tractors in Pakistan was achieved in 1964 with establishment of Millat Tractors Limited (MTL) to introduce and market Massey Ferguson (MF) Tractors in Pakistan. An assembly plant was set up in 1967 to assemble tractors imported in semi-knocked down (SKD) condition. The company was nationalized under Economic Reforms Order in 1972 and started assembling and marketing tractors on behalf of Pakistan Tractor Corporation (PTC) which was formed by the Government for import of tractors in SKD condition. In 1980 the Government decided on indigenization of the tractors and entrusted this task to PTC. PTC transferred this role of indigenization in 1981 to MTL. This was the turning point in the history of tractor industry and it went about the task methodically and rapidly. Just in one year's time, first step towards self-reliance was taken by setting up the first engine assembly plant in Pakistan. In 1984; sophisticated manufacturing facilities for the machining of intricate components were set up. Currently, critical components like Engine Blocks, Sump, Transmission Case, Axle Housing, Hydraulic Lift Cover, Front Axle Support and Centre Housing are all being machined in-house at MTL from locally sourced castings. Research and Development wing of the tractor industry helped to expand the business in following ways:

   a.   Preparing research proposals.
   b.   Designing research projects.
   c.   Obtaining services of consulting group.
   d.   Visiting different companies to document best practices.
   e.   Producing magazines and marketing materials.

Cost Accounting Process in Tractor Industry in Pakistan

14.   Accounting is the system of organizing, maintaining and auditing the financial records of a company (or an individual). Cost accounting is the process of identifying and evaluating production costs. It refers to the initial data and procedures that are used to build up the accounts. In principle, these will refer to the actual prices paid (historic cost accounting). In order to take into account the effect of inflation other methods exist (inflation accounting) that allow reflecting in the records the depreciation in real terms of the assets.

15.   **Computerized Accounting Information Systems**.   Along with the improvements in the technology, information systems have been computerized. Improvements in this technology have replaced manual bookkeeping systems with computerized ones. A computerized accounting system saves a great deal of time and effort, considerably reduces (if not eliminates) mathematical errors, and allows for much more timely information than does a manual system. In a real-time environment, accounts are accessed and updated immediately to reflect activity. Since the computer is programmed to post amounts to the various accounts and calculate the new balances as new entries are made, the possibility of mathematical error is markedly reduced. Computers may also be programmed to record some adjustments automatically at the end of the period. As a result, accounting information systems that were previously performed manually are now performed by computers in tractor industry. Companies can now capture, process, store, and transmit data with the help of computers. Whereas data collections and processing were performed manually in historical systems, on-line collection and processing of data are performed by computerized systems. Functions of manual AIS can be explained for computerized AIS as follows:

    a.   **Data Input Function**.   In manual AIS, the data are captured with the source documents and directly processed in journals and transferred to ledger accounts. On the other hand, in computerized AIS, after data are captured, they should be converted into machine-readable form. For example, bar code scanners used in retail stores can record the sale transaction just as scanning devices read the codes located on the products. In addition to the data scanned into the computer, there are existing data bases that contain stored data for future processing.

    b.   **Data Processing**. After the data are collected and entered into computers, they are processed. The most common data processing activity is data maintenance. Data maintenance is the processing of transactions to update stored data. For example, when sales transaction takes place, data are entered into the computer. In turn, computer immediately updates sales and accounts receivable files.

    c.   **Information Output**.   After the data are entered into the computer and processed, information output is produced to meet the needs of the users. Information is presented in three forms: a document, a report, or a response to a query.

Problems in Tractor Industry's Processes

16.   Tractors industry in Pakistan intends to build a world class infrastructure for production of tractors. It has spread its products throughout the length and breadth of the country. Today the total number of tractors production in Pakista exceeds over 500,000 units. This achievement has been made possible only through the industry's commitment to quality, after sale service, and competitive prices of tractors. This industry intends to ensure that each product is delivered to its customers at the right time in the right quantity and quality and at reasonable price. Besides other processes, a properly functioning cost accounting information system (CAIS) is an essential ingredient for survival and growth of the industry as it is the process of identifying and evaluating production costs. The CAIS is one of the most important information systems in any business. However, in tractor industry in Pakistan, traditional approach towards cost accounting information system has been denting the companies' growth to a great deal.

Business Process Re-Engineering in Tractor Industry

17.   Although the whole process have been re-engineered and technological advancements are being used to help develop better mechanism for the tractor industry, but keeping in view the scope of this paper only impact of technology on BPR in has been studied so as to see how this particular aspect affects the performance and efficiency of the tractor industry in Pakistan.

18.   **Purpose of Business Process Reengineering in tractor Industry.**   Traditional cost accounting information system has been replaced with computerized cost accounting process for effective utilization of resources and more accurate/effective cost calculations. It will definitely help companies to gain customer satisfaction and capture better market share.

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19. **Business Process Improvement after Application of IT.** After computerization of tractor manufacturing companies' cost accounting information system, following outcomes or betterments have been visualized:

    a.   Increase in company's sale volumes.

    b.   Just in time product availability at all sale points which in return increases customers trust in companies.

    c.   Better utilization of companies' resources.

    d.   Deduction in companies' operating cost due to involvement of lesser human resources.

    e.   Better and advance product sourcing and distribution planning.

    f.   Cost reduction in logistics of product.

Application of Information Technology in Tractor Industry

20**.**   Tractor industry has created its own web site to globalize its business. Besides utilizing different software's for cost accounting information system, the companies are fully utilizing computerized information system. Other than setting up Web server and application of customers access package-tracking database per day, the facilities used for cost accounting and analysis system are:-
    a. Intranets
    b. Decision support systems
    c. Artificial intelligence
    d. Expert systems

21.   **Product Cost Calculator**   To calculate the cost of products latest product cost calculator is being used which uses spreadsheets. This worksheet assists in calculating the cost of products. The program allows creating a cost card for a product that has up to a 12-step manufacturing process. The program summarizes for yielded fixed and variable cost. It is used as:-

    a.   Financial data is Input into the blue highlighted cells. The black highlighted cells are calculated cells. Any changes make to a format or a calculated cell becomes final once file is re-saved.
    b.   Input all of manufacturing and cost data onto the spreadsheet entitled   product cost calculator - detail (this information is printed out on a three page report).
    c.   The information is automatically sum onto the product cost summary sheet worksheet (this information is printed out on a one page report).
    d.   Additional uses of this calculator are:-
         (1)   Investment Research.
         (2)   Enterprise Solution.
         (3)   Balanced Scorecard.
         (4)   Calculates ROI Benefits.

22.   **Activity Based Costing (ABC)** is used by the manufacturing companies when:-
    a. Overhead is high.
    b. Products are divers complexity.
    c. Volume, amount of direct labor.
    d. Costs of errors are high.
    e. Competition is stiff.
23.   **Manufacturing Technologies used in the Tractor Industry**
    a. Numerical Control (NC).

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       (1) Computer numerical control.

       (2) Direct numerical control.

   b. Robotics.

   c. Flexible Manufacturing Systems (FMS).

24.   **Other Systems used in Tractor Industry**

   a.   **Unanet PSA/PPM Software** is an earned value management system used by the companies that improves resource scheduling and forecasting, project management, project portfolio management, project accounting, timesheets and expense reports for government contractor, professional services, advanced technology, internal services organizations.

   b.   **PRO Financial Solutions** serves as the foundation for Financial Management and compliance suite, which encompasses eleven integrated solutions that promote a unified technical environment.

25.   **Computerized AIS viz- a -viz JIT Production System**.   Since tractor industry has started to apply just-in-time (JIT) production system as a tool to become competitive, therefore, JIT production system aim at minimizing all inventory levels and delivering the goods and services to customers on time. In this sense, use of IT has also helped tractor industry to apply JIT production system more effectively.

26.   **Benefits of Computerized Cost Accounting Information System**.   Overall advantages of cost accounting information system and use of IT researched for tractor industry are:-

   a.   **Word Processing**. Accountants use word processing software to prepare reports, billings, memos, and financial statements.

   b.   **Graphics Software**. Graphics can be prepared using graphics software. Many auditors and managerial accountants use the graphics software to graph the data in financial statements and reports.

   c.   **Image Processing**. Image processing captures electronic image of data so that it can be stored and shared. With the help of document imaging, accountants can scan paper documents into the computer and process all of the files electronically.

   d.   **Electronic Data Interchange (EDI)**. EDI enables companies to communicate with each other electronically. For example, computerized network enables purchaser and the supplier to exchange purchase orders and invoices electronically in the form of images.

   e.   **Electronic Funds Transfer (EFT)**. Company is now connected to banks through EFT. This system enables company to make payment and collection electronically. Accounting information systems equipped with these kinds of technologically advanced tools can now perform accounting functions more effectively and reduce costs.

   g.   **Enterprise Resource Planning (ERP)**.   Modern ERP systems provide a broader view of organizational information, enabling the use of advanced accounting techniques, such as activity-based costing (ABC) and improved cost accounting using a variety of analytical techniques.

   h.   **Effective Communication with Suppliers**. Using the electronic communications network with suppliers, a company can order raw materials or merchandise. For example, company may employ online databases with catalogs connected to the suppliers' computers. All a manager has to do is to go on suppliers' Web sites and place an order. In addition, all of the costs associated. With processing, signing and mailing documents are eliminated. Therefore, significant time and cost savings are achieved.

   j.   **Reduction in Time the Finished-Goods Inventory Wait in Stock**.   The   computerized CAIS helps companies reduce the amount of time finished-goods inventory wait in stock. If

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there is no sufficient amount of inventory on hand, a signal to produce required amount of inventory is sent to the production department.

k. **On-line Processing of Sales Orders via Computers.** The computerized AIS that use electronic selling systems help companies to offer the products to customers within the shortest time available. If sales staff is equipped with portable computers, they can immediately perform the transactions related to sales.

l. **Immediate Replenishment of Customer's Inventory**. In this case, when customer is about to run out of stock, network system sends a signal to company's production department to make the production of the required products. Then, production is made and finished products are sent to the customer.

m. **Real-Time and Accurate Recording of Movements of the Inventory**. Automated warehouse systems consisting of computers and bar-code scanners can reduce the time and cost of moving inventory out of the warehouse. For example, forklifts may be equipped with radio frequency data communication (RFDC) terminals to provide drivers with information about which items to pick next and where they are located. Therefore, manual accounting process for recording inflow of inventory is eliminated because computers perform the same tasks now.

n. **On-line Invoice Processing**. Manual invoice processing takes time. If companies switch to on-line invoice processing, they are sent to customers using electronic data interchange equipments. The use of EDI leads to quicker billing. EFT provides an opportunity for customers to send their payments electronically to the company's bank account.

n. **Reduction in Storage Cost**. All of these applications enable to move the finished-goods out of the warehouse to customers as soon as possible. In this case, all the costs related with storage of inventory are minimized.

o. **Easy Application of Pull Method**. The computerized AIS can keep track of raw materials on hand in the manufacturing area and automatically sends an order to the warehouse when these materials are needed. In addition, the computerized AIS can update related accounts quickly. For example, when raw materials are sent from a warehouse to a production department, the computer immediately updates raw-material inventory. Producer checks if it has enough inventories from inventory file via computer. Materials are received and production is completed Finished goods are sent to customer. Production department sends message to warehouse to send the materials, customer and work-in-process accounts. When a production department runs out of materials a signal is sent instantly to the preceding department. In this case, the preceding department can supply the needed materials at once. This means that automation of accounting system eliminates the causes of delays in the production process. Thus, risk of running out of raw materials even if sufficient quantities are available in the warehouse is minimized. As a result, the risk of late deliveries of products to customers is eliminated.

p. **Clean, Orderly Work Environment**. The computerized CAIS help companies in creating clean, orderly work environment. The use of computerized AIS can help companies to reduce the amount of paperwork and lead to the use of paperless offices which creates a clean and orderly work environment that requires less number of employees than before.

q. **Application of Total Quality Management (TQM)**. The computerized AIS helps companies to apply Total Quality Management (TQM) and increase quality. In a JIT environment, everything must be of high quality because there is no allowance for the stoppage caused by the poor quality raw materials and work-in-processes. Since the computerized AIS leads to clean, and orderly work environment, it facilitates the application of TQM.

r.   **Time and Cost Savings**. Use of computerized CAIS facilitates the application of JIT production system which means that, use of computerized AIS enables company to attain significant time and cost savings.

Discussion and Analysis

27.   BPR is a methodology that is adopted by organizations to obtain dramatic improvement and radical change in process. This requires increase in job functions, employees' knowledge and skills. Consequently reengineering requires long-time dedication, resources and effort which can't be achieved easily and successfully without the existence of some elements namely called enablers. Despite there are many enablers for BPR like: TQM, HR, and other Organizational aspects; IT considered the essential and most effective one that can really support the objectives of BPR in reducing cost, improving quality and satisfying customers. Also most rules that were set out by BPR paradigm can only be processed by using IT sophistications and infrastructure. By reviewing literature its obvious that the objectives of BPR in reducing cost and improving quality meet with the ability of IT infrastructure including both technical and organizational capabilities to do such a task. Many examples are mentioned in literature for success stories in many companies through the world. The detailed analysis of such projects leads to one fact that the positive role of IT was strongly clear. Aiming to discover why organizations go through BPR Whitman & Gibson,(1997) summarized these reasons in looking forward to improving inefficient business processes, being industrial leader, reorganize business functions, improving current industry position and dramatically turning the company's position around. At the same time using IT allows organizations to gain important improvements in cost reduction, accuracy in exchange information, avoiding human mistakes, saving time, eliminating delay, administrative intermediaries, integrating and coordinating several functions at once. Apart from BPR reform projects its clear that IT has its huge contributions in developing work and enabling business.

Results/Findings

28.   As a result of analytical review of literature, researchers suggest and conclude the following results:

a.   BPR is a relatively modern, vital paradigm that introduced a unique reform project that has its positive impact on organization culture and work performance.

b.   BPR project can't acquire its vitality, positive effect and ability to achieve its objectives without the aid of some enablers which one of the most critical among them is IT.

c.   BPR as a project was implemented very long time after the spread of IT infrastructure, which enhance the attitude that BPR may achieve its objectives better and faster with the existence and assistance of IT, i.e. BPR may gain success as a reform project without existence of IT, but not as successful as with the existence of IT.

d.   The principles of BPR are represented in combining jobs, hybrid centralization or decentralization and reducing checks and controls can't be easily applied without the aid of some software and hardware infrastructures to provide a level of automation to perform such tasks.

e.   Despite the critical role of IT in the success of BPR project, it should be clear that BPR employed IT correctly and efficiently and introduced a well defined strategies, action plans and programs to make the organization heavily extracts the benefits from such enablers with huge capabilities.

f.   It should be emphasized that change is driven by BPR not by IT, and the notion that IT may drive the change in organization is the first step in BPR failure. Moreover, IT is only one of an assembly of change enablers and it may be dis-enabler if it is used in an inappropriate manner. So technology should be applied in an understandable way when IT capabilities are linked to organizational change.

g.   Whereas, BPR represents a new approach for coordination through the firm, IT represents the most powerful tool for reducing the cost of such coordination. IT represented in an efficient information system may also introduce some valuable capabilities for BPR project to make it more effective and closer to success.

h. Critical analysis of companies' operation demonstrates that tractor industry is applying latest techniques to calculate cost of the product there by making effective use of IT. Through the use of BPR and IT, some of the tractor manufacturing firms have achieved approximately:-

(1). Consecutive production with no scrap.
(2). 50% Reduction in WIP.
(3). 20% Reduction in lead times.
(4). 90% Reduction in overtime.

Conclusion

29.   This research study provides an understanding of effect of application of Information Technology on BPR and its ultimate role in success of organization. By applying BPR techniques and technology, most of the companies in tractor industry have achieved reduction in waste in production (WIP), lead times and in overtime resulting into a lot of savings, thereby increasing the chances of success of manufacturing organizations. IT makes it possible to obtain improvements in BPR, though not just by it. Thus purpose of this paper was to answer some questions regarding efficacy of use of IT for BPR in tractors industry which all have been answered through objective study of literature and manufacturing companies.

Recommendations

30.   Findings of the study may also be useful for application in other manufacturing industries around the world in general having similar environment and in Pakistan in particular before going for any BPR adventure.

Limitations of the Study

31.   Quantitative method should have been used to answer the questions instead of qualitative research technique and literature review but, due to paucity of time and resource the same could not be done.
32.   Comparative study of two organizations, one being most effective using IT as BPR enabler and other not very effective due to non-use of IT as BPR enabler, should have been carried out.

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