

INTERNATIONAL JOURNAL OF INFORMATION TECHNOLOGY & MANAGEMENT INFORMATION SYSTEM (IJITMIS)

ISSN 0976 – 6405(Print)

ISSN 0976 – 6413(Online)

Volume 4, Issue 3, September - December (2013), pp. 85-95

© IAEME: <http://www.iaeme.com/IJITMIS.asp>

Journal Impact Factor (2013): 5.2372 (Calculated by GIS)

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IT ENABLED BUSINESS PROCESS REENGINEERING

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ABSTRACT

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. Business Process Reengineering (BPR) is known by many names, such as 'core process redesign', 'new industrial engineering' or 'working smarter'. All of them imply the same concept that focuses on integrating both business process redesign and deployment of information technologies (IT) to support the reengineering work. Among the potential enablers of BPR is information technology (IT). This paper presents a case study of "Hindalco, Hirakud" employing business process reengineering techniques and the benefits that it gained from it. The main objective of this paper is to present the impacts of information technology (IT) in business process renovation.

Keywords: Business Process Reengineering, Information Technology (IT), IT Enabler.

I. INTRODUCTION

BPR was first introduced in a research program at MIT (Massachusetts Institute of Technology) in the early nineties. The term was used in the description of Davenport and Short's 1990 research project. They found out that the implementation of modern information technology in organizations means not only automation of managerial and production tasks but that it also has a direct effect on the quality of the work done. Davenport (1993), one of the fathers of BPR describes 'business process redesign' as:

...the analysis and design of workflows and processes within and between organizations. Business activities should be viewed as more than a collection of individual or

even functional tasks; they should be broken down into processes that can be designed for maximum effectiveness, in both manufacturing and service environments. It is argued by some researchers that there is no commonly agreed definition of BPR. However, the book *Reengineering the Corporation: A Manifesto for Business Revolution* by Hammer and Champy (1993) is widely referenced by most BPR researchers and is regarded as one of the starting points of BPR. The following is their definition of BPR:

[Reengineering is] the fundamental rethinking and radical redesign of business processes, to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed. (p. 32)

Dr. Michael Hammer is the primary originator and leading expert of the concept of business reengineering and the founder of the reengineering movement. This point was further discussed and developed by Hammer in his "Reengineering Work: Don't automate, Obliterate", Harvard Business Review, 1990.

BPR simply means transformation from function based to process based. The radical redesign of a process is easily achieved by involving information technology (IT) in business processes and hence the prominence of IT in BPR. IT is accepted not only as just a BPR enabler (Hammer and Champy, 1993) but also as an essential enabler of BPR (Davenport and Short, 1998). There exists a curvilinear relationship between BPR and IT which can be utilized for thorough process change. In the modern times and due to rapid proliferation of computers in the business arena, BPR through IT is getting a big boost. BPR using IT emanated from gradual progression in the use of computers from routine clerical job processing to IT-based decision making. Many corporations reaped benefits by re-engineering their processes at various stages of IT development. At the same time, re-engineering cannot be planned and achieved in small cautious steps for any corporation (Hammer, 1990). In this era driven by fierce competition, companies endeavour to shorten cycle time and improve quality and customer services by adopting newer-process oriented techniques like BPR. Radical BPR and revisionist BPR have been differentiated in the literature (Valentine et al., 1998; Simpson et al., 1999). Business re-engineering or radical BPR is to reshape the entire organization. Revisionist BPR is to focus on smaller scope of change under a process management framework.

2. LITERATURE SURVEY

There have been some attempts in the past to study the effect of Business process Reengineering (BPR) and the interdependency between Reengineering and IT. Some of the prominent studies relating roles of IT in BPR for organizations and challenges on organizations when implementing the BPR are mentioned below:

Ya-Ching Lee, Pin-Yu Chu, Hsien-Lee Tseng (2009), in their study on "Exploring the relationships between information technology adoption and business process reengineering" investigated the impacts of information technology on business process reengineering from intra- and extra-organizational perspectives. Their research proposed a framework for facilitating business process reengineering efforts towards competitive organizations. The framework was tested using data from a sample of 382 chief information officers or senior information systems managers, each of whom completed a survey. The survey results indicated that organizational innovation, market pressure and competitive intensity positively affect information technology adoption, which in turn trigger changes in business process in terms of workplace, workforce and business structure.

The paper titled "IT Enabling of Business Process Reengineering in Organizations" by Joseph Sungau et al., (2011) highlighted that Business Process Reengineering (BPR) is a management approach used to improve organizational performance through restructuring production activities of the core services for the purpose of enhancing their efficiency and effectiveness. It has focused on the concept that, although BPR improves the efficiency of processes, it can hardly be applied in its own and thus it needs to be complemented with other concepts from other disciplines. Information technology (IT) tools are seen as accuracy and effective enabler of BPR approach in restructuring activities. Their paper focused on analyzing on how IT can be an enabler of BPR approach to restructuring processes in an organization for the purpose of enhancing the effectiveness and efficiency of processes. The paper presented the roles of IT in BPR for organizations and challenges on organizations when implementing the BPR.

Ganesh D. Bhatt, (2000) in his work "Exploring the relationship between information technology, infrastructure and business process re-engineering" has said that Information technology (IT) plays a critical role in BPR. The present study examined the links between IT infrastructure and BPR. The moderating effects of industry type, and information intensity of the firm are also analyzed. Data for the study were gathered through a survey of Fortune 500 US firms at divisional levels. Out of 1,200 questionnaires mailed to Fortune500 firm-divisions, 124 responses were received. Out of 124 firm-divisions 73 firm-divisions were found to be adopting BPR techniques; 39 firm-divisions were found to be adopting incremental improvement approaches. The rest of the responses were incomplete and could not be used. For data analysis, therefore, only 73 firm-divisions were considered. The results of the study support the hypotheses that network infrastructure affects the dimensions of BPR (process improvement thrust, and customer focus), but data integration was not found to be significantly affecting the BPR dimensions. The moderating effect of industry type was found to be significantly affecting the relationship between network infrastructure and BPR dimensions. Other relationships were not found to be significant.

DejanStojkovic, RatkoDjuricic(2011), in their research entitled "International Symposium Engineering Management and Competitiveness" analyzed the internet age, of ever faster, dramatic, complex and unpredictable changes, which have various names : age of information, the age of third informatics revolution, new economy, digital economy, digital revolution, web economy, economy of knowledge, information economy, etc. Internet requires new ways of modern business, and the concept of Business Process Reengineering (BPR) is a tool that can be achieved if the company had not applied the concept of BPR and hasn't strong reengineered business processes its electronic business will be a nightmare, not a perfect ideal .

Marta Fossas Olalla (2000) in his work "Information Technology in Business Process Reengineering" have pointed out the importance of Information Technology in business process reengineering. His work has demonstrated the importance of IT in one of the most prominent methodologies. He has concluded that Enterprises can make their tasks easier, redesign their organization, change the way they work, and achieve spectacular improvement using, among other enablers, IT.

PeymanAkhavan, MostafaJafari, Ali R. Ali-Ahmadi, in their study titled "Exploring the interdependency between reengineering and information technology by developing a conceptual model" in the year 2006 investigated the role of information technology (IT) in business process reengineering (BPR) and their interdependency in the organization. Their study examined the current perspectives of BPR regarding IT and provided a general framework for the study of BPR and IT. They provided a conceptual framework that clarified

the interdependency between IT and BPR and also presented the major IT functions in different areas in the organization during the change program. The authors also suggested further research studies in case-based studies implementations and analysis.

By undertaking an empirical study, Bernroider et al. (2008) in their work “IT governance for enterpriseresource planning supported by the DeLone–McLean model of information systems success” pointed out that ERP success increases if firms have explicitly defined Information Technology/Information Systems strategies and employed a participative form of decision making. On the contrary, ERP success decreases if a project team is dominated by business unit.

3 .BPR AND INFORMATION TECHNOLOGY

In any organization worldwide IT is the biggest enabler and driver of BPR. BPR aims at enhancing customer service by improving productivity, eliminating waste and reducing the cost. The driver for BPR is to realize dramatic improvements by fundamentally rethinking how an organization work should be done instead of mere process improvement that focus on functional or incremental improvement.

Reengineering involves “radical improvements” and not only incremental changes. In this sense, reengineering without an IT support is nearly impossible. The evolution of IT provides multiple options for process execution that were not possible erstwhile, which opened the possibility of reengineering in first phase. 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 process
- g) Capture information once and at the source

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. This alignment of IT infrastructure and

BPR strategy are needed to ensure the success of the BPR initiative.

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. Figure 1 shows the multidimensional nature of BPR.

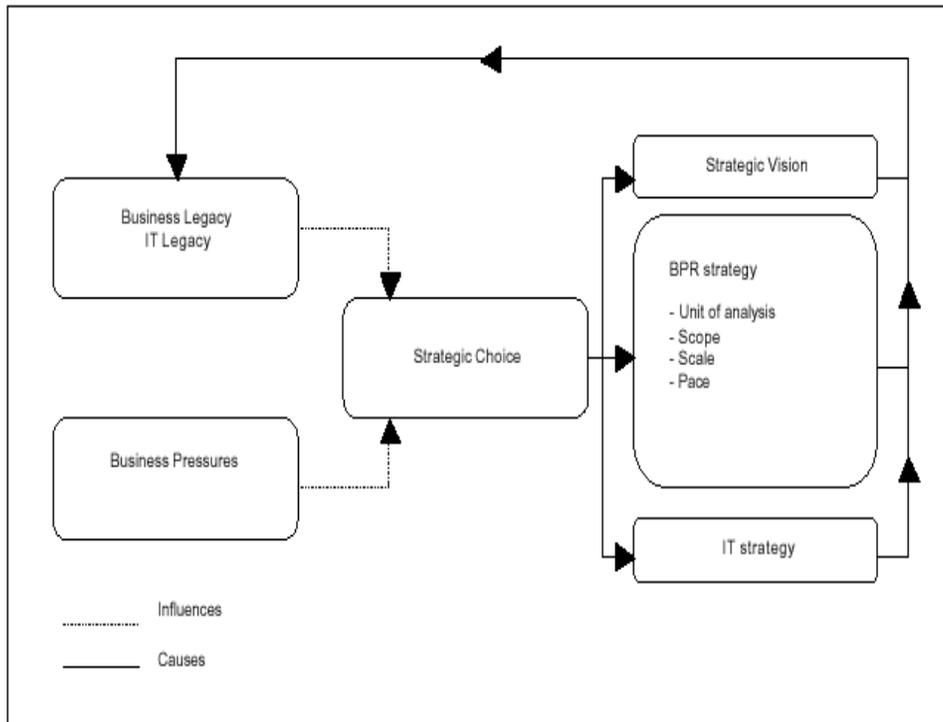


Figure 1. Multidimensional View of BPR (Light, 2000)

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 a 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 as the extent of information exchange and mutual adjustment among functions when participating in the same process. In this framework, information technology is critical in reducing the Degree of Mediation and enhancing the Degree of Collaboration. 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. Such structures may raise the organization's capabilities and responsiveness, leading to potential strategic advantages.

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. IT enabled BPR ensures achieving larger targets, reducing risk and providing measures in sustaining results over a long time.

3.1 Factors related to IT infrastructure

Building an effective IT infrastructure is a vital factor in successful BPR implementation. An adequate understanding of technologies for redesigning business processes is necessary for proper selection of IT platforms. Effective overall system architecture, flexible IT infrastructure and proper installation of IT components all contribute to building an effective IT infrastructure for business processes. The IT infrastructure and BPR are interdependent in the sense that deciding the information requirements for the new business processes determines the IT infrastructure. In addition, recognition of IT capabilities provides alternatives for BPR. Building a responsive IT infrastructure is highly dependent on an appropriate determination of business process information needs. This, in turn, is determined by the types of activities within a business process, and the sequencing and reliance on other on other organizational processes.

An effective IT infrastructure follows a top-down approach, beginning with business strategy and IS strategy and passing through designs of data, systems and computer architecture. Linkages between the IT infrastructure components are important for ensuring integrity and consistency among the IT infrastructure components. IT standards also have a major role in reconciling various infrastructure components to provide shared IT services that are of a certain degree of effectiveness to support business process applications. The IT infrastructure shared services and the human IT infrastructure components, in terms of their responsibilities and their expertise, are both vital to the process of the IT infrastructure composition.

3.2 Selecting an IT Application

One main objective of BPR is to use IT to support radical change. Some authors view IT as the central implementation vehicle of BPR. However BPR has not really worked as its proponents expected. Davenport and Short (1990) attribute this problem to a lack of understanding of the deeper issues of IT. They claim that IT has traditionally been used to

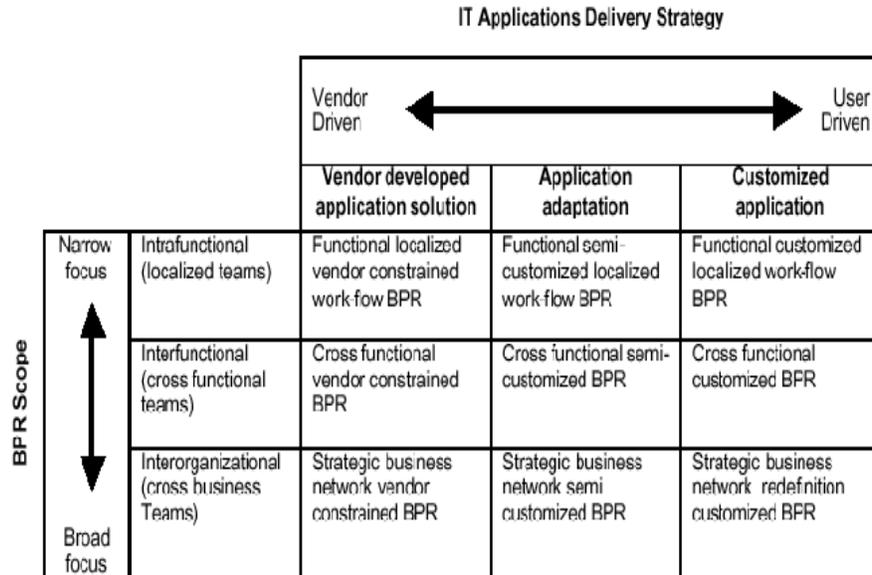


Figure 2. BPR Strategies (Light, 2000)

increase the speed of work but not to transform it and BPR is about using IT to do things differently. Therefore, IT plays an important role in BPR. Properly implementing IT can improve the competitive position of organizations. But inappropriately implementing IT may create barriers to responding to the rapidly changing business environment. Further, simply picking IT packages cannot achieve successful BPR if it is simply used to speed up the process rather than reengineer it. As Davenport (1993) contends:

... information and IT are rarely sufficient to bring about the process change; most process innovations are enabled by a combination of IT, information and organizational/human resource changes.

IT can continuously reflect and reinforce bureaucratic and functional structures or IT can help to create a leaner, flatter and more responsive organization. For example, IT tools that are designed for functional hierarchies are primarily designed to support incremental improvements and cannot achieve the radical change in BPR projects. While information systems provide fast processing and response, they often fail to provide the flexibility for human communication, which can lead to serious consequences. This means IT may sometimes have a negative impact by merely automating the existing processes. However, it could also have a positive impact if it is deployed correctly in conjunction with the organization's goals. IT is the enabler to reengineer processes and is an important driving force for business transformation.

3.3 Commonly used IT-based BPR tools

Some of the commonly used IT tools for re-engineering are ERP systems, outsourcing, consulting firms, enterprise software, internet, intranet, electronic data interchange (EDI), and legacy systems (Peng and Land, 1999). ERP systems allow sharing of real-time information between manufacturers, customers, and business partners. It is ideal for small companies and medium-size companies to effect better supply chain management (SCM) and better cost and operations management the quote to shipping time gets reduced considerably

from several weeks to few hours after ERP implementation. Outsourcing systems or employing consulting firms during planning and implementation stages rarely works due to conflicting views that cannot be accepted internally by the enterprise personnel. Moreover, there is a limit to which consulting firms can be involved in internal decision-making process of the enterprise. Use of internet is acceptable from the point of view of increased productivity, better communication, and cost reduction. Security and support are just a few IT concerns in such cases. Intranet provide sophisticated security, than internet, as it is local only to the enterprise. EDI works by transmitting barcode information to control purchasing and inventory. Value-added network is a must for EDI which makes it a costly tool. Now the trend is to integrate EDI with internet which is catching up as a cost effective solution. Legacy systems or mainframe-based systems which were used widely before, either support or, are getting phased out by the modern day client server-based systems.

4. EAM AT HINDALCO - A CASE STUDY

Till date, studies carried out in the field of Enterprise Resource Management clearly indicates that very few studies have been conducted in India as regards to success of ERP in integrating the different elements of business; the interlink between different aspects of manufacturing industry with purchase and inventory function, the success and the hurdles faced while implementing in an organization with varied functions such as the case with Hindalco.

Hindalco Industries Ltd. presently, one of the Aluminium Smelters of Aditya Birla Group and the oldest smelters of India, is located in the near vicinity of Sambalpur. The case highlights the processes, aimed to integrate the different elements or functions of the business using ERP at HINDALCO. The present case covers the requirements of Hindalco and study has been carried out to make ERP compatible to the customer requirements.

While no “out-of-the-box” ERP system can meet the needs of every customer, Oracle Applications flexibility is an attribute that has drawn many companies into its fold. Oracle’s offering also shines in several areas with regard to extensibility – Web applications, work flow and reporting.

Oracle’s maintenance module is another example of incredible configurability of Oracle’s web applications. Hindalco has used this portion of Oracle applications to streamline their business processes associated with maintenance of plant equipments.

Hindalco Industries Ltd. had all the Plant Maintenance processes and Logistics (Purchasing and Inventory Management) planned manually. By doing so, it had the limitations of integrating its Maintenance activities and Logistics (Purchasing and Inventory Management) to its cost centers. The plant had already implemented Oracle Finance earlier. Further, the maintenance planning was not fully successful as the inventory management couldn’t support the maintenance management system during breakdown of equipments. Also, due to the increase in the number of equipments with the increasing size of the plant, the preventive maintenance frequency of the equipments was badly hampered which was difficult to plan manually. Hence, the need for implementation of ERP to have a control on the maintenance management and inventory management function for the better life of the equipment and better productivity of the plant. By implementing Enterprise Asset Management (EAM) for Plant Maintenance and Logistics, all the Plant Maintenance activities has been directly linked to the cost center, which can help the plant to automatically calculate the cost of production per unit weight of metal manufactured.

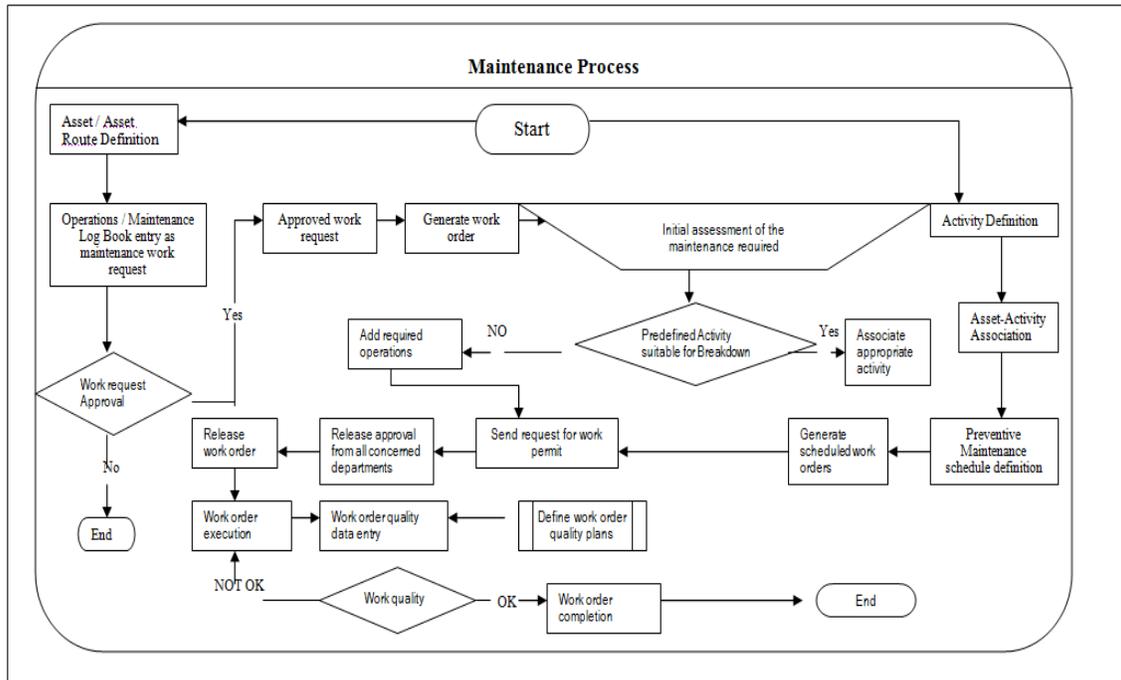


Figure 3.Schematic Diagram for Maintenance Process

Necessary work has been done to align the requirements of Hindalco viz. Purchase module has been reworked to meet the requirements of the maintenance requirements which covers the cost of company in terms of spares, manpower which includes involvement of permanent staff and contractor manpower. Similarly Maintenance module covers not only the planning of manpower (skilled and unskilled), but also looks into the availability of the equipment to take into maintenance after ensuring the availability of requisite spares. The ERP has been implemented which provides the procedures to be followed for schedule maintenance and the procedures to be followed for breakdown maintenance. In case of a breakdown maintenance which is inevitable, the system alarms for the critical spares to be maintained. The present maintenance system at Hindalco, HiraKud highlights the advantages in implementing ERP in a manufacturing industry. The process flow diagram of the maintenance is shown in the **Figure 3**. With the implementation of ERP, it has been found that the working functions have drastically improved and a clear flow of elements was found which has helped the organization in optimum utilization of resources (manpower and material) and also time management. The process has also helped the organisation in reducing the breakdown time and cost of equipments and hence increasing the productivity as a whole.

After implementation of ERP (maintenance module), a survey was carried out across different section of maintenance department at Hindalco, HiraKud to get a feedback on the effectiveness of ERP system. Based on the user feedback, it can be concluded that implementation of ERP system enabled to highlight the criticality of the spares and manpower for the equipments affecting the productivity of the plant. Further, after implementation of ERP the system enabled the organization to monitor the lifecycle of the critical equipments and the frequency of wear and tear. The system also helped to monitor the cost impact on the productivity of the plant and the direct impact of the downtime of equipment on metal cost.

Hindalco has witnessed significant improvements in data quality and integrity, reduce lost production volume and reduced number of breakdown from past year. Based on the feedback received from the case, we conclude that some salient benefits of ERP system can be following:

Benefits:

1. Provides up-to date database with maintenance and equipment information
2. Help us maintaining lower running cost of the plant
3. Improved availability and reliability
4. Proactive rather reactive approach of solving problem
5. Higher profits and customer satisfaction
6. KPIs and Scorecards to monitor performance

5. CONCLUSION

It is not possible to reengineer without IT support. IT is not only an enabler for reengineering, it has also become an essential and integral part of all reengineering efforts. In the implementation of reengineering, IT is crucial and it provides the skills and tools that are needed to effectively reengineer. With IT advancing at a rapid rate, everyday the future role of IT in reengineering becomes more critical.

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