CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In today’s competitive business environment companies are looking closely at ways to increase their efficiency by reducing cost, while providing the products and services that customers want and when they want them. Business Process Reengineering (BPR) is an approach that is most often used to radically alter the processes of a company and generate new and better ways to run a business. BPR is concerned with the fundamental rethinking and radical redesign of a business process to obtain dramatic and sustained improvements in quality, cost, service, lead time, flexibility and innovation. BPR focuses on the whole process starting from product conceptual stage to final product design. It provides the opportunity to reengineer the process or to reduce radically the number of activities it takes to carry out a process with the help of advanced Information Technology (IT) (Hammer, 1990; Hammer and Champy, 1993).

In a volatile global world, organizations enhance competitive advantage through Business Process Reengineering (BPR) by radically reengineering whole processes. BPR implies transformed processes that together form a component of a larger system aimed at enabling organizations to empower themselves with contemporary technologies, business solutions and innovations. In realizing the importance of BPR, this chapter goes on to review the literature on it. It explores the advantages, disadvantages, success factors, obstacles of BPR and presents the use of BPR case tools in business organizations.
2.2 A Brief History of BPR

BPR was first introduced to the business world by Frederick Taylor when he published his article ‘The Principles of Scientific Management’ in the 1900s. Following on from the earlier ideas of Time and Motion Studies pioneered by Frank and Lillian Gilbreth, Scientific Management was the first step to the introduction of BPR. It turned out to be unsuccessful due to the many issues which were not resolved. During Taylor's time, not many knowledgeable workers were employed in the manufacturing workforce, which at the time was the main wealth generator (Hammer, 1990).

Scientific Management involves breaking the manufacturing process down to simple sequences which are to be carried out in the least amount of time possible with the minimum amount of effort. This often raised the factory workers' salaries but also caused the workers to work just as hard in back-breaking manual labour. This practice of improving efficiency in manufacturing often raised the concern of "dehumanization of the workplace" (Kock, 2002).

The Scientific Management method gave birth to Total Quality Management in Japan after World War II, which eliminated many of the discrepancies in the previous method of improving the business structure. William Deming and Dr. Joseph Juran helped Japan become a super economic power by taking over market share from North American businesses with quality goods and services (Bergner, 1991; Chapman, 1991; Deming, 1986; Juran, 1989; Walton, 1989). Total Quality Management's main goal is to improve the manufacturing operations. In the 1990s, Michael Hammer and James Champy introduced their book ‘Reengineering the Corporation’, which gave birth to the term business process reengineering.
BPR gained immense and unexpected popularity due to the early articles of Hammer (1990) and Davenport (1993). Many conferences and seminars were organized by many agencies to spread the concept of BPR to business organizations. After realizing the BPR benefits, Peter Drucker, in an article described BPR as “Reengineering is new, and it has to be done” (Hansen, 1994). Consequently, BPR has become the hottest management trend. European countries and United States of America are the early countries which implemented BPR in their organizations. However, European firms have responded to BPR differently than U.S.A for the simple reason that European business culture is different from that of the U.S.A. Many companies in U.S.A have succeeded in their BPR project like Cigna Corporation and Ford Motor (Deakins and Makgill’s, 1997).

The BPR concept was also introduced in Malaysia in the 1990s and gained popularity when Malaysia’s famous Vision 2020 was revealed by former Prime Minister, Tun Dr. Mahathir Mohammad in the year 1994. Malaysian government has successfully implemented many reengineering projects such as MyKad - a multipurpose digital application card for all citizens over the age of 12, Public Services Network (PSN) - an online network application system that enables user to make payment or renewal of various Government agencies' services at the Post Offices and E-Government (began in 1997 with the launch of the Multimedia Super Corridor’s (MSC) E-Government Flagship Application) for the sake of the public and the country by changing the way government interacts with citizens and businesses through new ways of the government’s operation.
2.3 The Motivation of BPR

Business Process Reengineering can be defined as "the analysis and design of workflow and processes within and between organizations" (Hammer and Champy, 1993). BPR has three key target categories:

- **Customer Friendly**: To get a competitive edge and that can only be gained by providing the customers more than what the others in the market are asking for.
- **Effectiveness**: How effective is the product or service that the business or manufacturing company is providing the customer?
- **Efficiency**: How efficient is the company that is manufacturing the product before introducing it to the market to minimize costs? Efficiency is not just about being efficient at the production floor level but also the management level.

Besides these, the rapidity of technological change also promotes innovation and improvements in business processes. Through advanced technology, companies are able to diminish the time available to develop new products and introduce them to the market. Change management will also encourage an organization to reengineer its business processes because different management will have different policies and principles (Hammer and Champy, 1993). Moreover, politics, economics, legislation and regulation dimensions determined by government agencies and other non-government organizations for a variety of reasons are also encouraging organizations to reengineer their business processes. Furthermore, economic fluctuation and government policies may also bring enormous impact to business processes and subsequently will lead an organization to reengineer its business processes.
2.4 BPR Success Factors and Failures

The execution of BPR claims remarkable results on performance improvements and is capable of producing a broad range of results for organisations (Attaran and Wood 1999; Choi and Chan, 1997). Several organisations achieved large cost reductions, higher profits; improved quality and productivity, faster response to market, and better customer service (Attaran and Wood, 1999). Factors that lead to successful outcomes for reengineering projects include (www.prosci.com):

- Top management sponsorship.
- Strategic alignment with the organisation's strategic direction.
- Compelling business case for business change with measurable objectives.
- Proven methodology.
- Effective change management that addresses cultural transformation.
- Line management ownership and accountability.
- Knowledgeable and competent reengineering teams.

Not every BPR project is successful. An estimate, reinforced by Hammer and Champy (1993) indicated that 70 percent of organisations failed to achieve benefit from reengineering efforts. Findings of a survey performed on the experience of Fortune’s 500 companies and large British companies with 34 reengineering strategies revealed that executives were only partially pleased with the reengineering results (Berman, 1994). Reasons for failure are (Peltu et al., 1996):

- Unclear concepts – too many terms and definitions as well as the misuse of terms.
• Pursuing a restructuring or downsizing strategy rather than a reengineering approach.
• Lack of well-established methodology – problems with redesigned methods and approaches.
• Unrealistic expectations.
• Misinterpretation of BPR.
• Skills and resource shortages.
• Resistance and lack of top management commitment.
• Fear of downward decision – making authority.
• The best people not seconded or dedicated on BPR design teams.
• Lack of corporate information systems and inadequate attention to provide appropriate new IT-based business systems.
• Incorrect objectives, scope and process selection – reengineering the wrong processes, without sufficient process improvement.
• Incapable of recognising the benefits of BPR.

2.5 BPR Methodology

Reengineering is inherently highly situational and creative. The methodology originally prescribed by Hammer and Champy (1993) is a top-down approach, which suggests that the BPR team should focus on determining how the strategic objectives of the organisation can be met without letting its thinking be constrained by the existing process (Facilities Operations and Maintenance, 2005). The emphasis is on the to-be process, and is consistent with the step-change philosophy that the authors presented.
The more incremental change methodology outlined by Harrington (1998) is a bottom-up approach which advocates modeling the existing process to gain understanding of it, and then streamlining it appropriately to meet the strategic objectives. The focus is on changing the As-Is process by identifying opportunities for improving it (Facilities Operations and Maintenance, 2005).

In practice, a BPR team will ordinarily need to adopt a mixed approach. If the top-down methodology is used as the basis, there is still a need to understand the current functionality and to define carefully the transition path from the current to the preferred future process. With a bottom-up methodology, BPR teams can spend too much time on detailing the current process and lose innovative thinking. A mixed approach would encourage the team to consider high-level changes without being cluttered by the details of the current process. It is important to recognise that an initial BPR study may lead to recommendations for a number of more detailed projects on improving sub processes, which may only require relatively small changes (perhaps to remove some bottlenecks).

The complete BPR initiative will involve five phases (Facilities Operations and Maintenance, 2005); Project Planning, Map As-Is Processes, Design To-Be Processes, Implement New Processes and Continuous Improvement. Figure 2.1 depicts each phase in the project life cycle and a sampling of major activities proposed for each phase.
Figure 2.1 BPR Lifecycle

Source: (Facilities Operations and Maintenance, 2005)
2.5.1 Project Planning

This phase begins with establishing management consensus on the scope of the BPR Project. In addition, customer-driven objectives are identified to establish quantifiable and qualitative goals for the project. A detail Project Work Plan in Gantt chart format should be created that identifies the tasks to be completed, deliverables to be produced, and named resource assignments. This plan is dynamic and will continue to be refined in the course of the project. Project teams will be identified and assembled.

2.5.2 Map As-Is Processes

Before the Project Team can proceed with developing new business processes, a clear understanding of existing workflows needs to be achieved. While arguments can be made against analyzing the current enterprise, most organizations, need to develop a common understanding on how the business works to establish a baseline for future improvements and avoid repeating old mistakes. In addition, confirmation must be made that current business processes support defined functional business requirements. There is a real risk in modeling current processes if they do not properly support the operational and administrative requirements.

“As-Is” Process mapping will involve a high-level review of business to evaluate and possibly redesign the organization’s core business processes. While a historical perspective on how we once accomplished our work is important, its value comes later in the project when we develop alternative approaches to how we can best perform our jobs. The focus in this phase must remain the current business processes.
After mapping core processes, a decision needs to be made regarding which ones need to be redesigned, and in what order. Generally these choices will be based on three criteria:

1. **Dysfunction**, e.g., which processes are not functioning at optimal levels;

2. **Importance**, e.g., which are the most critical and influential in terms of customer satisfaction; and

3. **Feasibility**, e.g., which processes are most likely to be successfully redesigned.

At the same time, a balance needs to be maintained between the processes selected for improvement and available resources to redesign and implement them in a timely manner.

### 2.5.3 Design To-Be Processes

The purpose of this phase is to produce one or more alternatives to the current business process that satisfy our customer-driven goals. One approach is to “benchmark” the performance of business processes and the way these are performed against relevant peer organizations to obtain ideas for improvement. Another approach is to conduct “brainstorming” workshops with appropriate personnel to develop new approaches on how we conduct our business. Innovative practices can be adopted from anywhere or anyone, no matter what source.

Having identified potential improvements to existing processes, the development of To-Be Process models is accomplished by developing activity diagrams that illustrate the improved workflow. It is important for the Project Team to simulate each process, and conduct an Activity Based Costing (ABC) analysis to determine the inherent time and cost factors. It must be noted that this modeling activity is an iterative process. Following the completion of the To-Be Design a Scope of Work estimate will be completed for process planning.
slated for implementation to provide a better understanding of the effort and resources required to implement the new and/or redesigned process.

2.5.4 Implement New Processes

The implementation stage is where the project will meet the most resistance and hence it is by far the most difficult one. It will be important to develop a comprehensive transition plan to support introduction of the redesigned process. This plan must align the organizational structure, information systems and the business policies and procedures with the redesigned processes.

Implementations of information systems that are required to support the newly designed business processes are critical to the success of the BPR project. The process models created in the “Map As-Is Processes” phase will be mapped to those created during the “Design To-Be Processes” phase and an initial list of change requirements generated. Using prototyping and simulation techniques, a transition plan will be developed and validated to guide the implementation of the new processes.

2.5.5 Continuous Improvement

Any given part of our business cannot be redesigned overnight. An important part in the success of this project will be a continued effort to improve business operations. Important to the success of each new process deployed is for the Project Team to conduct a post-implementation review to determine how much more customers, both internal and external, are informed, and how much more commitment is shown by the management. This can be achieved by conducting customer surveys and focus group discussions with those initially not directly involved with the change but who have a vested interest in the outcome.
2.6 The Use of BPR Case Tools in Business Organizations

When a BPR project is undertaken across the organization, it can require managing a massive amount of information about the processes, data and systems. If there is no excellent tool to support BPR, the management of this information can become an impossible task. BPR case tool can help to analyze, document and improve complex business processes. It could enable the user to clearly document important factors such as which activities are needed, how they are performed and controlled and what resources are needed to perform them. This provides an integrated picture of how the organization accomplishes tasks, from small department workflows to complex organizational functions.

The use of a good BPR tool is vital in any BPR project. Generally BPR tools should have the following attributes:

- Graphical interface for fast documentation
- Supports "Object oriented" technology, so that changes to data (eg: job titles) only need to be made in one place, and the change automatically appears throughout all the organization's procedures and documentation.
- Drag and drop facility so that we can easily relate organizational and data objects to each step in the process

The availability of appropriate BPR tools that help in reducing BPR risks can greatly benefit organizations that undertake BPR. Given an existing or a new business process, a typical BPR tool supports its modeling, analysis and evaluation, and the simulation of its probable behaviour.
2.7 Previous research on BPR

BPR is the term often used to describe the collection of techniques which are used to model existing and develop new business processes and has been used successfully by a number of organizations to restructure the way they perform the work. Since the business process has become a key organizing principle of the new organization style and the primary means by which the organization executes its strategy and delivers value to its customers, lots of research has been done on BPR. Below are the different researches done on BPR:

2.7.1 Business Process Reengineering: A survey of International experience (Majed Al-Mashari et al., 2001)

Despite the widespread adoption of BPR, it has in many cases repeatedly failed to deliver its promised results. The lack of integrated implementation approach to exploiting BPR is seen as one of the important reasons amongst others, behind BPR’s failures. A survey was therefore designed to collect data from a sample of organizations in the USA and Europe. The survey assesses the level of importance placed on the essential elements of integrated BPR implementation. The study also identifies the level of maturity of BPR concepts within organisations.

Table 2.1 illustrates usage levels of 11 major groups of techniques and tools in BPR efforts. The overall results show that eight techniques were used moderately, while the other three being below average.
Table 2.1 Ranking of usage of techniques and tools in BPR efforts

<table>
<thead>
<tr>
<th>Technique</th>
<th>Overall</th>
<th>USA</th>
<th>Europe</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Rank</td>
<td>Mean</td>
</tr>
<tr>
<td>Project management budgeting</td>
<td>3.50</td>
<td>1</td>
<td>3.25</td>
</tr>
<tr>
<td>Process capture and modeling</td>
<td>3.45</td>
<td>2</td>
<td>3.31</td>
</tr>
<tr>
<td>Problem solving and diagnosis</td>
<td>3.27</td>
<td>3</td>
<td>3.38</td>
</tr>
<tr>
<td>Organisational analysis and design</td>
<td>3.19</td>
<td>4</td>
<td>3.03</td>
</tr>
<tr>
<td>Customer requirement analysis</td>
<td>3.16</td>
<td>5</td>
<td>3.09</td>
</tr>
<tr>
<td>Business planning critical</td>
<td>3.13</td>
<td>6</td>
<td>3.06</td>
</tr>
<tr>
<td>Process measurement</td>
<td>3.03</td>
<td>7</td>
<td>3.37</td>
</tr>
<tr>
<td>Creative thinking</td>
<td>3.00</td>
<td>8</td>
<td>3.03</td>
</tr>
<tr>
<td>Change management</td>
<td>2.43</td>
<td>9</td>
<td>2.50</td>
</tr>
<tr>
<td>IS systems analysis and design</td>
<td>2.19</td>
<td>10</td>
<td>2.34</td>
</tr>
<tr>
<td>Process prototyping and simulation</td>
<td>2.08</td>
<td>11</td>
<td>2.28</td>
</tr>
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</table>

| Note: Scale 1 = Very low  Scale 5 = Very high |
| Source: (Majed Al-Mashari et al. 2001, A Survey of International Experience) |

“Project management” techniques that are used for budgeting and scheduling, such as PERT, CPM and Gantt charts, were ranked highest. This is probably because organisations consider project planning activities as the most critical task in managing a BPR programme. The next most used techniques were “Process capture and modelling”, followed by “Problem solving and diagnosis”. The results revealed that the organisations made least use of process prototyping and simulation techniques. This can be put down to the complexity frequently associated with them, the prerequisite minimum level of familiarity, the variety of approaches for making use of them, and the conditions that need to be met to ensure feasible use of such techniques. The techniques related to “IS system analysis and design” were also ranked below average. One possible justification for this may be that these techniques are usually used at lower levels, where further stages of the detailed design of the software system are taking place. Furthermore, many organisations choose to outsource the information system (IS) components rather than develop them internally and, therefore, they do not need to go deeply into the detailed design. “Change management” techniques, such as persuasion and assumption surfacing, were not rated
highly, possibly because, as Malhotra (1996) noted, there is a lack of software tools and established techniques which can deal effectively with the human side of change.

The overall findings of this study confirm that BPR implementation issues are generic. Clearly, they do not differ in terms of organisation nationality, and that US organisations are generally somewhat ahead in the level of awareness and familiarity with various tools and techniques of BPR or due to the longer experience they have had with it.

2.7.2 Exploring the relationship between information technology and business process reengineering (Attaran, 2004)

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. This study provides a summary of IT roles in initiating and sustaining BPR and examines several companies that have successfully applied IT to reengineering. The study also addresses barriers to successful implementation of reengineering and identifies critical factors for its success.

IT roles can be categorized into three phases:

i) Before the process is designed

ii) While the process design is underway,

iii) After the design is complete.

Attaran (2004) provides a summary of IT roles in initiating and sustaining BPR and this is depicted in Table 2.2.
Table 2.2: IT roles in initiating and sustaining reengineering

<table>
<thead>
<tr>
<th>Before the process design</th>
<th>During the process design</th>
<th>During the implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Create infrastructures and manage information that support evolving organization</td>
<td>• Bring vast amounts of information into the process</td>
<td>• Create a digital feedback loop</td>
</tr>
<tr>
<td>• Foster process thinking in organizations</td>
<td>• Bring complex analytical methods to bear on the process</td>
<td>• Establish resources for critical evaluation of the reengineered process</td>
</tr>
<tr>
<td>• Identify and select process for redesign</td>
<td>• Enhance employees’ ability to make more informed decisions with less reliance on formal vertical information flows</td>
<td>• Improve IT processes to meet increasing needs of those divisions that have gone under reengineering processes</td>
</tr>
<tr>
<td>• Participate in predicting the nature of change and anticipate the information needs to support that change</td>
<td>• Identify enablers for process design</td>
<td>• Institute a program of “cleanup” and damage control in case of failure</td>
</tr>
<tr>
<td>• Educate IT staff in non-technical issues such as marketing, customer relationships, etc.</td>
<td>• Capture the nature of proposed change and match IT strategy to that change</td>
<td>• Communicate ongoing results of the BPR effort</td>
</tr>
<tr>
<td>• Participate in designing measures of success/failures of reengineering</td>
<td>• Capture and disseminate knowledge and expertise to improve the process</td>
<td>• Help to build commitment to BPR</td>
</tr>
<tr>
<td></td>
<td>• Communicate ongoing results of the BPR effort</td>
<td>• Evaluate the potential investment and return of reengineering efforts</td>
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<td>•</td>
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</table>

Source: (Attaran 2004, Exploring the relationship between Information Technology and Business Process Reengineering)

i) **IT roles before the process design of BPR efforts are as follows:**

a. The opportunity IT provides is to utilize newer and better technology to develop a strategic vision and to help improve the business process before it is designed. For example, an important Wal-Mart vision was to eliminate unnecessary distribution steps and cost and to provide value to customers. To accomplish this, Wal-Mart developed a strategy that included linking its suppliers to its retail stores. IT eventually enabled Wal-Mart to implement this strategy. An enterprise-wide information system was developed that directly
connected all retail locations, distribution warehouses, and major supplies (Furey and Diorio, 1994).

b. The capabilities of IT to track information and break down geographic and organizational barriers are useful in understanding the company’s strengths and weaknesses, and market structure and opportunities. Communication technology helps to overcome geographic barriers and thus enable broader acceptance of the process change. At General Electric e-mail systems are used to speed analysis and design sharing and to hold frequent virtual meetings between group from different regions and overseas.

c. The focus is on finding different approaches to manage a process. These approaches can be found and be adapted from practices of companies outside of the industry. The organization should benchmark against other industries and combine it with the experience and expertise of the team members to adopt an entirely new process technology.

d. BPR requires a flexible organization design. The existing rigid infrastructure of the organization must be altered to facilitate cooperation between various departments by using cross-functional teams instead of individuals working in isolated departments. Flexible infrastructures adapt to changing external drivers. Therefore, the flexible infrastructure includes processes for continuously evaluating existing tools to see what should be removed, and continuously seeking user input about what works or does not.

e. To achieve effective teamwork, each worker should develop several competencies. The IT organization is no exception. The demand for close collaboration with other functions dictates the need for IT staff to broaden their portfolio of skills especially in nontechnical issues such as marketing, customer relationships, etc. The combination of the Internet and the intranet services allows a collaborative team effort from around the globe.
f. Alliances and other methods of cross company coordination are becoming common place. In an attempt to gain market shares, many firms are teaming and collaborating with suppliers and distributors.

ii) **IT roles while the process is being designed of BPR efforts are as follows:**

a. IT can facilitate the reengineering design process through the use of project management tools. These help identify, structure, and estimate BPR activities and help to control contingencies that arise during the process. Project management tools along with electronic communication enable ongoing communication of the reengineering process between users and facilitators.

b. Gathering and analyzing information about the performance and structure of a process is an important step in identifying and selecting process for redesign. Mapping or flow-charting the existing process and then measuring the results in terms of cost, quality and time are the most successful. IT can facilitate this step with the use of tools that provide modeling and flow simulation, document business processes, analyze survey data, and perform structuring evaluation. Technologies such as computer-aided systems engineering (CASE) are designed primarily to draw process models. The ability to draw models and make changes rapidly speeds redesign and facilitates the ‘‘process’’ of process design. At Xerox, for example several divisions are moving directly from process modeling to automated generation of computer code. They report high user satisfaction and improved productivity with the resulting systems. In addition, IT is capable of storing and retrieving unstructured, multimedia information that can be useful for developing process prototypes. The maintenance and operating workers at Union Carbide’s plant in Taft, Louisiana used
flow-charting to redraw their old process and create new ones. The results were a saving of more than US$ 20 million (Stewart, 1993).

c. Computing technologies have facilitated a process oriented approach to system development where a database is shared in different functional units participating in the same business process. Ford Motor Corporation, for example used databases in its accounts payable process to cut down many intermediate steps and to overhaul a sequential flow of paper documents among involved functions. As the project progressed, the reengineering efforts achieved a 75% reduction in the workforce. In addition to shared databases, imaging technology has facilitated a process-oriented approach because in processing loan applications, for example the digitized image of an application can be worked on by several employees directly.

d. Telecommunication technologies such as LANs, groupware, etc. have improved collaboration among personnel of different functional units in their efforts to accomplish a common business process. At Texas Instruments, for example, the process for new product development was dramatically improved when a design team in different countries used global network to work on design directly without sequential flow of documents. As a result, the development cycle time for various products decreased substantially (more than 30% in some cases) (Magnet, 1992).

e. Making data digital from the start can provide a whole range of positive results. When figures are in electronic form, employees can look at them in any detail or in any view they desire. Moreover they can study them and pass them around for collaboration. For example, Seven-Eleven Japan used IT to not only improve inventory control, but to provide key information to management and improve quality of sales information to make
better operation decision on a regional basis. In 1979, the company established an on-line network and from there introduced the Electronic Point of Sale (EpoS) system in 1982 (Sutherland, 1995). At Hewlett-Packard Co., the sales process improved drastically as 135 sales representatives were trained to use laptops to retrieve up to date inventory information from the corporate database during the customer meetings. In addition, sales persons used these laptops to communicate with their peers and superiors. As a result, time spent in meeting decreased by 46%, travel time was cut by 13%, time spent with customers increased by 27% and sales rose by 10% (Berger et al., 1987).

f. Input from employees and information on customer requirements is essential in reengineering. IT applications allow organizations to build a data base to track customer satisfaction, analyze complaints, and obtain employee’s feedback for ways to improve customer satisfaction. At Frito Lay each of the 10,000 salespersons uses a handheld computer to record sales data on 200 grocery products, reducing many clerical procedures. The data is transmitted to a central computer, which, in turn send instructions (such as changes in pricing, and product promotions) to all salespersons through their hand-held computers. This process greatly enhances collaboration between marketing and sales and also makes weekly summaries and analysis available to senior managers (Malone and Rockart, 1991).

g. IT capabilities are used for information exchange and to improve inner organizational collaboration. For example R.J. Reynolds Tobacco Co. used Electronic Data Interchange (EDI) technology in conjunction with varied technologies of electronic commerce such as document imaging with electronic work queues to reengineer its accounts payable function (Attaran, 2004).
h. IT can also be used to help identify alternative business processes. IT can help companies to achieve multiple objectives in redesigning processes. Expert systems and technological databases can provide information on current and future capabilities of technology, human resources and organizational change. American Express improved quality, cost, and time of its credit authorization process with an “Authorizer’s Assistant” expert system (Attaran, 2004). The successful redesign led to 25% reduction in the average time for each authorization, a 30% reduction in improper credit denials and a 7 million annual reduction in costs due to credit losses. IT makes it possible to develop much richer processes.

iii) **IT roles after the design is complete (as an implementer) of BPR efforts are as follows:**

a. Implementation of the new process is done through the use of project management and process analysis tools. These help identify structure and estimate all associated activities. They facilitate tracking and managing employee’s expectations against commitments. Contingencies and problems that arise during the implementation phase can be handled and controlled.

b. Electronic communications enable ongoing and real time communication of the process between users and facilitators. IT helps to overcome geographic barriers.

c. Evaluating the potential investments and returns of the reengineering efforts is absolutely essential. How can the value of any specific reengineering process in the company operation be objectively questioned? The reengineering team or management should have enough information to determine the value the new process contributes to the overall performance. Pacific Bell developed process value estimation (PVE) methodology
to compute the amount of value-added by a given process before and after BPR effort. Pacific Bell management uses the methodology to target the “right” process for reengineering and to evaluate the changes that have been made and the returns of the reengineering efforts (House et al., 1994).

d. A fundamental source of difficulty is the fact that processes are reengineered but infrastructure is not. The rigid infrastructure of the organization must be altered to facilitate cooperation and to cross functional barriers between departments. Cross functional teams must replace individuals working in isolated departments. Recently, there has been a significant growth in collaborative computing products. These range from software for conducting meetings on-line to complex programs that enable a number of users to collaborate in real time, sharing documents, managing projects and handling different tasks. These include idea generation, brainstorming, group outlining, voting, teleconference, meet-me-service, etc.

e. As other business divisions undergo reengineering process, IT organizations should be improved to meet their increasing needs. For example, in 1993 CIGNA implemented reengineering of its 1000 persons in IT department CIGNA Technology Services (CTS). The main reason was to meet the increasing needs of the business divisions. A team based structure resulted, and the benefits included a major change in the philosophy of the unit. Where the unit was previously technology focused, reengineering brought about a focus on using technology to meet business strategies. Management style changed from control-based and functional, to leadership-based and team-oriented. The hierarchy was flattened, increasing flexibility (Bower et al., 1994).
f. “Digital feedback loop” makes it possible to have a specific definition of success, a specific beginning and end in terms of time and tasks, intermediate milestone and finally a budget.

2.7.3 Process analysis tools for process improvement (Jay Bal, 1998)

Business process reengineering emphasizes the benefits that a process orientated view of company operations can bring. Acquiring a clear definition of the “As-Is” business process and developing an understanding about how the process may be reengineered is a crucial stage in any business process reengineering project. This early phase normally has three objectives: to achieve a full understanding of the process to be reengineered so as to clarify its objectives and characteristics; to create a shared vision and understanding among the reengineering team; and to have a basis for starting the redesign. To support this phase, there are a range of tools which are traditionally used to help in the activities of process definition and analysis. This study describes some of the approaches. The product introduction process is examined in a general sense, and specific examples from the automotive industry are taken as a basis for evaluation of the available tools and applications. Table 2.3 provides an overview of some of tools and their functionality.
Table 2.3: The various tools used in BPR approach

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>ABC Flow Charter 7</td>
<td>It provides 12 shape templates for different job classifications. Jobs such as quality control, network management and auditing. Contains a special feature known as sensible lines. These lines can be attached to certain shapes or can be totally independent. It also features sensible text, lets user to type even if the shapes are too small. It hides the text. It includes a word processor.</td>
</tr>
<tr>
<td>The Roderick Manhattan Group, London, UK</td>
<td>The program lets user to define business logic in an easy to understand English syntax. It can then, if required generate 3GL code for clients and servers in mixed client server environments. Complex business processes can be built and they can be linked to a user interface of user’s choice and also to relational database management system tools.</td>
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<tr>
<td>Business Process Generator Quondam, Dorrington, UK</td>
<td>This tool addresses the entire BPR life cycle, including data capture, process modeling, simulation, implementation and continuous improvement.</td>
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<tr>
<td>BPWin Logic Works Inc., Princeton, NJ, USA <a href="http://www.logicworks.com">www.logicworks.com</a></td>
<td>It helps analyze and reengineer business processes. Describes business processes in terms of inputs (items required by the process) and outputs (items produced by the process). The effect of the information on the outcomes can be seen as well as the flow. User can determine whether processes would benefit from reengineering and by what degree. Utilizes the IDEF0 process modeling standard. It basically allows the analysis of complex business processes and uncovers potential areas for process improvement and redesign.</td>
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<tr>
<td>FlowModel 2.0 Systemstar SoftTools</td>
<td>Charting tool that not only allows the creation of charts and diagrams but lets user to integrate data into the diagrams. Offers ten graph templates with pick and place symbols. Data can be given to each of the symbols. The symbols and data can be exported to other programs if required, e.g. spreadsheets and databases. User can also define their own symbol if it is not already present.</td>
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<tr>
<td>Process Charter Scitor Corporation, Menlo Park, CA, USA <a href="http://www.scitor.com">www.scitor.com</a></td>
<td>Has the ability to analyze processes through simulation. User to define a process structure by flow chart symbols, assign the necessary resources for each of the steps in the process. Then execute the process simulation and analyze the effects of process changes by studying the resulting charts and statistics the program generates.</td>
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<tr>
<td>Octave Process Manager TOP-IX Business Systems, 4 Buckingham Row, Wigan, Lancashire, UK <a href="http://www.Top-ix.com">www.Top-ix.com</a></td>
<td>Octave provides a centralized repository as a database of best practices. The specific users can model their respective processes and submit the changes or new models to the centre. The software provides a mechanism for modeling a process from a business level to an operational level (hand and eye motion). It provides analysis reports indicating the value added content, also indicates the least cost path, longest path etc. of a process. It also has another module called TOPMAN which is useful for staff resource planning, preparing activity based cost budgets and enables performance reporting.</td>
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<tr>
<td>ProSLCSE Process Simulator International Software Systems Incorporated, Austin, Texas, USA <a href="http://www.issi.com">www.issi.com</a></td>
<td>The ProSIMULATOR tool in the ProSLCSE product line is a powerful graphical tool that can be used for understanding, debugging and refining the process. It can play a critical role in assessing a new process before implementation. Beneficial for training staff in new or revised processes.</td>
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<tr>
<td>Process Model ProMODEL Corporation, Orem, Utah, USA <a href="http://www.processmodel.com">www.processmodel.com</a></td>
<td>It is a flowcharting and simulation tool that provides businesses with a means to diagram, analyze and improve their processes. It has some key features like, live animation, one step modeling and visual staffing. The key advantage of this tool is the visualization it provides.</td>
</tr>
<tr>
<td>Workflow Analyser Meta Software Corp.,</td>
<td>This tool addresses the entire BPR life cycle, including data capture, process modeling, simulation, implementation and continuous improvement.</td>
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Graphical language is used to express complex data sets pertaining to budgets, staffing and equipment requirements. The software enables users to test assumptions, analyze alternatives and measure results.

This simulation tool is designed for business process modeling and analysis. When used in conjunction with the company’s object-oriented simulation languages, SIMPROCESS can help reduce the time spent on mapping reengineering components.

Gensym Corp. in Cambridge, MA, has combined object-oriented technology with interactive graphics to produce a BPR tool that provides user friendly modeling and simulation. The software helps users monitor process performance and manage real-time operations.

This process improvement software is an easy-to-use Windows application that features process modeling, simulation and reporting capabilities. The program, designed for the front end of reengineering projects, helps users quickly create and edits presentation-quality process maps.

This software package includes 90 pre-built blocks to help users create reengineering models. The program, which supports five types of operating systems, features drag-and-drop modeling, animation, spreadsheet connectivity and customized reporting.

Popkin Software’s comprehensive integrated tool supports the federal information processing standards for function and data modeling. The package analyses what controls the execution of a function, which performs the function, and what objects or data are produced by the function. It features a built-in reporting language with a graphical-user interface for creating customized reports.

This tool enables organizations to use model-driven development to rapidly design, build, test, install and maintain reengineering applications. Composer supports variety of computer platforms and databases.

This knowledge based system has helped to create industry standards for BPR modeling and analysis. The company’s software distributes information into a central data repository that can be simultaneously accessed by a suite of eight modular BPR tools. Those tools enable users to tailor the Framework program to individual reengineering needs. Integrated modeling helps identify redundancies and non-value-added activities, and creates a better understanding of relationships.

This offers an integrated set of object oriented tools that enable users to create interactive blue prints of business processes. Software code can be generated from the hierarchical layout providing rapid and consistent application development.

This business process modeling and simulation tool incorporates object oriented technology. The software provides reporting and analysis on static and dynamic states of BPR models. Also included are export and import capabilities, in addition to workflow connectivity.

(Source: Jay Bal, 1998, Process Analysis Tool for Process Improvement)
2.8 Previous research versus this research

There are numerous researches, papers and journals about BPR concepts, initiatives and issues available. This research was mainly targeted to capture basic ideas to develop the first phase of the BPR tool which is the modeling of As-Is process and analysis component of a web-based BPR case tool. An important feature that business users want to see is a graphical representation of their business process or processes. BPR4U with generic shape is used to ease the standardization, storage, and sharing of diagrams for the purpose of improving the business processes.

In an attempt to develop a web-based BPR case tool which is mainly targeted at small and medium organization users, a comparative study on three existing stand alone BPR case tools was incorporated. The analysis of the tools will be done based on process characteristics, six main categories as identified by Bradley et al. (1995) and Hansen (1994). These are:

- hardware and software features;
- user features;
- modelling capabilities;
- simulation capabilities;
- analysis capabilities;
- integration capabilities.

Besides studying existing BPR tools, the researcher would develop a prototype of the modeling of As-Is process and analysis component of a web-based BPR case tool which enables small and medium organizations to utilize the tool from anywhere with no cost.
2.9 Conclusion

In this chapter, the researcher firstly explored the history of BPR. Secondly, the researcher discussed the motivation of BPR and its success factors and failures. It is found that, though BPR is widely practiced the worldwide number of failures is large. Thirdly, the researcher discussed the methodology of BPR and its lifecycle. The researcher has pinpointed the use of BPR in business organizations. Fourthly, previous research from different scopes on BPR has been highlighted. Finally, the researcher explains how this research will differ from other research done previously. After reviewing the literature, the researcher has an in-depth understanding on BPR and its essential elements.