According to Davenport and Short (1990), although business process design and IT are natural partners but their relationship has never been fully exploited in practice. The authors define this relationship as a recursive pattern. On one hand, it is naturally expected that the choice of a particular way of conducting business in an organization will influence the design and structure of the information system to support this process. On the other hand, advances in IT can generate completely new opportunities for organizations and thus influence the design of specific business process.

2.1 INFORMATION TECHNOLOGY STRATEGY

An IT strategy can be defined as “a plan for directing IT resources and guiding the deployment of information resources” (Mitchell and Zmud 1995). Today, many organizations are moving from the reactive position of perceiving IT as a mere supporting function in competitive strategy to a more proactive perception of finding ways to exploit IT capabilities to transform their businesses, based on a more challenging strategy for competitiveness (McDonald 1993 and Meador 1994). Traditional planning approaches for IT strategy underplay IT’s role in leveraging changes to either the competitive strategy or to the underlying business processes and infrastructures (Luftman, Lewis and Oldach 1993). While the real IT competitive benefit is a reflection
of its effective architecture, the traditional belief was that the question of architecture comes after applications and their supporting data have been determined. IT infrastructure strategies are usually developed traditionally by either basing them purely on technology, creating business strategies without IT participation, using inflexible methods and metrics changing the IT infrastructure and processes in isolation from the business or redesigning organizational processes without involvement of IT staff.

Several studies discuss IT strategic alignment issues in general (Earl 1994 and Ives, Jarvenpaa, and Marson 1993) and for BPR-related change in particular (Henderson and Venkatraman 1993) identifies and compares five common approaches to information system planning namely,

- Business-led
- Method-driven
- Architectural
- Administrative
- Organizational approaches.

In the organizational approach, a firm focuses on a limited number of themes with clear outputs and establishes teams to identify business-change projects and required IT applications. This approach emphasizes the role of learning through implementation in creating effective strategies. It also follows an incremental implementation of IT strategy, the use of teamwork, the need for education, and the devolution of the information system function to the level of business processes. Meador (1994) describes IT strategy alignment as a link between a firm's available technologies and the competitive environment that brings success to the firm. He views the IT strategy-alignment process as
consisting of three major phases; strategy formulation, planning, quality improvement and innovation programs. Henderson and Venkatraman (1993) propose a model of strategic alignment that uses two types of linkages (strategic fit and functional integration) and refers to two contexts internal and external, Figure 2.1. While the internal context describes the organizational structure choices, the impetus for the redesign of critical business processes and human-resource management skills, the external context is concerned with the business environment in which an organization competes. The strategic fit should exist between the external and internal contexts of IT as well as business and the functional integration creates a link between the IT infrastructure and the organizational infrastructure. A top-down approach is adopted because it makes business strategy a driving force. Top management is considered to consist of a strategy formulator who provides commitment for the whole process of redesign and an information system manager who is responsible for designing and implementing the strategy.

Figure 2.1 IT Strategic Alignment model (Henderson and Venkataraman 1993)
Over all, there is a need for a two-way strategy alignment between business and IT (Earl et al. 1997). A higher level of alignment between strategy and structure provides an organization with greater competitive advantages. Glazer (1993) considers information as "the integrating agent between business strategy and IT strategy". However BPR and IT infrastructure strategies need effective alignment to ensure a successful change initiative (Grover et al. 1993).

Researchers consider that adequate IT infrastructure reassessment and development is a vital factor in successful BPR implementation. This involves an adequate understanding and identification of enabling technologies for redesigning business processes (Barrett 1994), proper selection of IT platforms (Guha et al 1993), effective overall system architecture (Jackson 1997), adaptable and flexible IT infrastructure, and proper installation of IT components. According to Broadbent and Weill (1997), Kayworth, Sambamurthy and Chatterjee (1997), and Ross (1998), an IT infrastructure consists of physical assets, intellectual assets, shared services and their links.

Primarily process-based thinking in the context of organizational change is a system design problem (Earl, 1994 and Davenport and Stoddard 1994). According to the information processing (Tushman and Nadler 1978) and decision making paradigms of organizational design, process can be viewed as collections of decisions models, each of which is identified by a type of design containing a sequence of processing tasks. These tasks are the smallest identifiable units of analysis and their optimum arrangement is the critical design variable determining the efficiency of the resulting structures (Orman 1995). According to model management approach, complex design decisions need to be made that may affect different dimensions of an organizations; its processes, its people, its strategy, its environment, its culture and its
information systems. A change in one aspect may have unknown or unexpected consequences on the others.

Data flow diagramming (DFD) is technique for graphically depicting the flow of data among external entities, internal processing steps, and data storage elements in a business process (Kettinger et al. 1997). Visual table of contents (VTOC) is another way to represent systems down into increasingly detailed levels (James A. Senn 1986). DFD/VTOC are used to document systems by focusing on the flow of data into, around, and outside systems basically in the focus of analysis.

Based on these foundations, it can be deduced the techniques that allow for modeling business components, experimenting with alternative configurations and process layouts and comparing diverse proposals for changes that would be highly suitable for organizational design and business engineering.

2.2 BPR APPROACH

Business process change has been the focus of attention of business researchers and corporates since the early 90’s. Many initiatives that have been identified have failed in their attempts to achieve the specified goals. Some of the reasons for the failure of these change initiatives include,

- Having a narrow focus, i.e., changing only a part of a business process
- Insufficient analysis of the redesign initiative (Hansen 1994)
• Insufficient understanding of costs and benefits of the changes and a lack of understanding of how to redesign related activities and
• Ignoring the human and behavioral aspects of process change (Davenport and Stoddard 1994).

Most of the research reports in BPR deal with case studies and conceptual works (Katz et al 1995; Guimaraes 1997; Gunasekaran and Nath 1997). Also discussed is the need for modeling business processes and reengineering, using various tools, such as operation research techniques, simulation, object-oriented programming, queueing theory, and AI techniques (Gunasekaran and Ichimura 1997; Jones, Nobel, and Crowe 1997). Engineering economics, operational research, management science methodologies and techniques have been applied to obtain performance data (e.g., lead time, productivity, cost, flexibility, product quality) from different configurations (Ranky 1983; Tempelmeier and Kuhar 1993).

A variety of BPR implementation approaches have been developed; however, many of them are not easy to use or understand and lack implementation guidance. Several different and independent streams of research have targeted and enhanced our knowledge about different aspects of coordination mechanisms in BPR, Table 2.1. Earlier process improvement and transformation models are:

• Moen and Nolan Strategy for Process Improvement Model (Moen D Ronald and Thomas W. Nolan 1987) which is an eleven step strategy centered on Plan-Do-Check-Act (PDCA) improvement cycle.
• NPRDC Process Improvement Model (Dockstader et al. 1988) is also a PDCA based model.
Table 2.1 Research works on BPR

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<th>Elements</th>
<th>Research Studies</th>
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<td>Measuring effectiveness</td>
<td>Tempelmeier and Kuhan (1993)</td>
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- LMI CIP Process Improvement Model (Brain E. Mansir and Nicholas R. Schacht 1989) incorporates the PDCA approach but also addresses the need to standardize processes and maintain comprehensive, up-to-date process standards.
- LMI CIP Transformation Model (Brain E. Mansir and Nicholas R. Schacht 1989) focuses on the organization and behavioral changes needed to instill and sustain a culture of continuous improvement in organizations.
- Edosomwan (1996) Production and Service Improvement Model (PASIM) is the only model for BPR implementation in manufacturing industries. PASIM requires common sense for finding the process improvement to reduce the production cost. The main drawbacks of the PASIM are the critical decisions are based on guesswork and there is no procedure to measure and control.