Developing Strategic Perspectives on Business Process Reengineering: From Process Reconfiguration to Organizational Change

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Successful business process reengineering (BPR) efforts in many firms have been reported to significantly improve productivity and reduce staff. However, as the reality of large-scale process change sets in and reengineering failures start coming to the forefront, more careful thought must be given to the change process itself, and it is important that senior leaders in the organization develop a high-level strategic perspective on this multifaceted change phenomenon. To help develop this perspective, a process reconfiguration model and a framework of organizational change in BPR are presented in this paper. The process reconfiguration model shows how various functional activities involved in a business process may be reconfigured through a reengineering initiative. Such fundamental reconfigurations may be facilitated by the application of IT as well as a number of innovative organizational changes. Building upon this process reconfiguration model, a framework depicting elements of organizational change associated with BPR is presented. The framework identifies the various sources of changes, elements of change implementation, and the direction of organizational change stemming from BPR. It is hoped that based on this framework, we may be better able to plan and implement the complex process of organizational change associated with BPR.

Key words—business process, reengineering, MIS, strategic planning, implementation, change management

INTRODUCTION

A powerful current is sweeping through organizations of all sizes. Traditional 'industrial age' structures based on functional hierarchy are changing into 'information age' structures that are oriented toward collaboration across functions and a focus on business processes. These business processes involve sets of logically related tasks performed to achieve defined business outcomes. In a typical organization, employees 'work for' a functional department rather than the business processes in which the department participates. Performance of departments not processes is routinely evaluated. In fact, few in the traditional organization ever worry about the effectiveness of processes or question their rationale. Under the banner of business process reengineering (BPR), alternatively known as business process redesign, many organizations have undertaken critical analysis and redesigned existing processes to achieve
breakthrough performance gains. Successful reengineering efforts in many firms have been reported to significantly improve productivity and reduce staff [14, 37, 73]. With the accelerated acceptance of the reengineering concept, however, comes the 'bandwagon' effect [23]. Many forms of management improvement efforts such as continuous quality improvement, systems analysis and industrial engineering, are now relabeled as 'process reengineering' [20], causing confusion as to what BPR really is or is not. While the initial calls for 'revolution' and 'obliteration' have helped in launching the BPR movement [35, 36], a number of researchers have questioned the 'myth' of reengineering's novelty. Davenport and Stoddard [23], for example, have traced the root of BPR in quality improvement techniques [40] and socio-technical design theories [62], that also adopt the business process as the unit of analysis. In fact, the use of IT (information technology) to facilitate the introduction of just-in-time manufacturing (JIT), which typically requires process redesign, had occurred on a wide scale all over the world well before the recent surge of interest in BPR. In this paper, we view BPR as a deliberate and planned change in business processes to achieve breakthrough improvements in performance. However, we acknowledge that reengineering projects attempted in the field may differ in scope (incremental vs radical changes) [23], depth (procedural vs organizational change), as well as breadth (intrafunctional to interfunctional and inter-organizational) [34]. While sharing some common characteristics with past operational and organizational improvement techniques, BPR differs from these approaches in that the concept represents a synthesis of such methods as quality improvement, systems analysis, organizational development and socio-technical design, and that these methods have never before been combined in a coherent manner [23]. Further, BPR often is enabled by IT [19]. As the cost of IT declines and its capabilities increase, there will be more opportunities and incentives for organizations to apply advanced computing and telecommunication technologies to fundamentally reconfigure a process, as demonstrated later in this paper. With increased acceptance and several years of field experience behind us, the BPR movement has passed its age of innocence and begin to face complex implementation problems. Davenport and Stoddard [23], for example, have questioned the clean-slate approach, IS (information systems) leadership, top-down design and other commonly accepted 'myths' of reengineering based on their field observations. Case studies conducted by Stoddard and Jarvenpaa [75] indicated that organizations often attempt 'revolutionary' process design but take an 'evolutionary' approach in implementing the design due to political, organizational and resource constraints. The set of BPR cases examined by Hall et al. [34] revealed the complex multidimensional change in the organization engendered by a reengineering project which includes roles and responsibilities, performance measures and incentives, organizational structure, IT applications, shared values (culture), and skill requirements. Factors found to be related to BPR failures, according to the research conducted by Bashein et al. [5], include the wrong sponsor, a cost-cutting focus, a narrow technical focus, and a number of other organizational conditions. Among leading BPR practitioners, issues in managing the complex organizational change have also become the focus of attention. Champy [15] has recommended a number of steps to improve 'reengineering management' including securing top management support and communicating the rationale for reengineering to employees. A recent empirical study conducted by Grover et al. [32] on 105 reengineering projects revealed that project participants regard change management problems as the most severe type, among a host of implementation problems. Thus, research and field experience have both revealed the multifaceted nature of the organizational change engendered by BPR. In the IS field, Keen [42] was one of the first to recognize the importance of organizational change in implementing IS. Citing Leavitt's [50] framework of organizational change, Keen [42] discussed the role of technology, structure, people and task in IS implementation. A process-centered framework, which was recently developed by researchers at MIT [71] for their Management in the 1990s program, suggests that in order to succeed in organizational change, balanced attention should be directed at five organizational elements: strategy, technol-
ogy, people (individual roles and culture), management processes, and structure. However, research results from the Management in the 1990s program suggest that lack of attention to the latter three, i.e. people, management process and structure, is the primary reason for IS implementation difficulties. In this paper, we will pay specific attention to these three dimensions of organizational change while attempting to examine the changes due to BPR.

Given the organizational complexity of reengineering, it is important that senior leaders in the organization develop a high-level strategic perspective on this multifaceted change phenomenon at both the business process level and the overall organizational level. To help develop this strategic perspective, a process reconfiguration model and a framework of organizational change in BPR are presented in this paper. The process reconfiguration model shows how various functional activities involved in a business process may be reconfigured through a process reengineering initiative. Such fundamental reconfigurations may be facilitated by the application of IT as well as a number of innovative organizational changes. Building upon this process reconfiguration model, a framework depicting elements of organizational change associated with BPR is presented. The framework identifies the various sources of organizational impetus leading to reengineering, strategies for change initiation, enablers of process changes, elements of change implementation, and the directions of organizational change stemming from BPR. Based on this framework, we may be better able to plan and implement the complex process of organizational change associated with BPR.

**BPR: A PROCESS RECONFIGURATION MODEL**

Many BPR methodologies have been formulated in the past several years, mostly by reengineering consultancies who would prefer to keep them proprietary. Outlines of the important steps, however, can be found in published sources (e.g. [44]). Guha et al. [33] have examined and synthesized a large number of BPR methodologies and identified these important stages: envision, inaugurate, diagnose, redesign, reconstruct, and evaluate. Emphasized in the beginning stages of almost all these methodologies is the importance of strategic directions from senior management in activities such as securing management commitment, discovering reengineering opportunities, identifying IT enablers, informing stakeholders, and setting performance goals, etc. One critical decision at the beginning of the BPR project life cycle is the overall strategy for changing, i.e. reconfiguring the process. While it is possible to reengineer business processes within limits of a particular functional department, maximum performance gains are typically achieved with processes that cross functional boundaries where the required activities are performed by personnel from several different functional units [34]. Therefore, it is important that we develop a proper understanding of how various functions of the organization are coordinated while participating in the same business process. To better understand this pattern of coordination and formulate a strategic path for process reconfiguration a functional coupling framework for business processes is presented.

**Functional coupling of business processes**

The way various functions are orchestrated while participating in a particular business process will be referred to as the functional coupling pattern of the process [76]. This pattern can be differentiated along two dimensions: degree of physical coupling and degree of information coupling. When a function is included in a business process, it typically develops input-output (I/O) relationships with other participating functions involving either transfer of physical objects or handoff of documents from one function to another. The extent of this flow of input and output among the participating functions is referred to as the degree of physical coupling of a business process. Essentially, this corresponds to the layers of intermediate steps before the process is completed. At one extreme of this dimension, referred to as the serial pattern, the process consists of a large number of sequential steps performed by different functions. An example of this pattern can often be found in business expense processing which requires many layers of management approvals, auditor evaluation, and filing of receipts. At the other extreme of the physical coupling dimension is the parallel pattern where several functions contribute directly to the process outcome without
intermediate steps. For example, both production and advertising functions are involved in the process of launching a new product, but the advertising function does not need to possess the product inventory or obtain authorization from the production function in order to advertise the product. Between the serial and parallel patterns, there are different degrees of physical coupling corresponding to processes with fewer serial steps and a mixture of both serial and parallel patterns.

Instead of relying only on tangible I/O to orchestrate their activities, some functions involved in a process may collaborate with each other through 'intangible' information exchange. This informational coupling between functions, which may be either formal or informal, constitutes the second dimension of our functional coupling model of business processes. The frequency and intensity of information exchange between two functions can range from none (completely insulated) to extensive (highly collaborative). Based on these two dimensions: degree of physical coupling and degree of information coupling, a functional coupling framework for business processes is

![Functional Coupling Framework](image_url)

Fig. 1. A functional coupling framework of business processes. (adapted from Teng et al. [76].)
presented in Fig. 1. For simplicity of presentation, the four extreme coupling patterns are shown: serial-insulated (Region I), serial-collaborative (Region II), parallel-insulated (Region III), and parallel-collaborative (Region IV). These patterns are illustrated with two functions, \( X \) and \( Y \), as they participate in a business process in producing a process outcome, labeled as \( Z \). Collaborations between functions are represented by two-way dotted arrows, and tangible I/O relationships are shown as solid one-way arrows.

**Changing functional coupling patterns of processes through BPR**

Many organizations have attempted reengineering through reducing the degree of physical coupling, i.e. the number of intermediate steps in a process. At Bell Atlantic Corp., for example, a customer order for hooking up to a long-distance carrier took 15–25 days and passed through 25 hands before it was filled. Through BPR, many serial steps were eliminated and the order can now be filled in just a few hours [74]. At Bank One, the serial flow of paper documents has been drastically changed through the use of imaging technology which enables many functions to perform different steps for the mortgage approval process on the same document in an essentially parallel pattern. As one bank officer examines the document to verify the applicant’s employment status, another can do credit scoring [57]. Thus, the high degrees of physical coupling for processes currently in Region I and Region II (see Fig. 1) may be significantly reduced through BPR and, as a result, shifted toward Region III and IV.

In addition to physical coupling, the information coupling pattern of a process may also be changed through BPR. At Deere and Company, for example, the new product development process before reengineering consisted of insulated functions that blamed each other whenever something went wrong. Failure to make a $1 change during product design could cost $100,000 to fix later in manufacturing. After a series of reengineering projects, new product development at the giant farm equipment manufacturer now involves a number of functions that collaborate in every phases of the process. This process change was brought about mainly through cross-functional teams with specialists from marketing, design, engineering, manufacturing, accounting, sales, and service functions [24]. According to experts, 60–70% of manufacturing quality problems start with the engineering function [53]. In recent years, many organizations have attempted to improve the collaboration between various functions related to new product development to shorten the development cycle. By enhancing collaboration between participating functions through information coupling, this type of BPR could lead to process changes and movement from Regions I and III (see Fig. 1) to Regions II and IV.

In addition to vertical and horizontal movements in the grid, it is also possible to move diagonally to change both the physical and information coupling levels of a process, thus relocating the process from Region I to Region IV. At Texas Instruments (TI), for example, new product developments are now conducted at locations in a number of different countries: India, Malaysia, Japan, and the USA [53]. The company’s global computer network enables design teams in different countries to achieve a high level of collaboration, while permitting them to work on different parts of the design in a parallel fashion without the time-consuming flow of documents.

The theoretical root of this functional coupling framework for business processes may be traced back to the work of Thompson [77] who identified several patterns of interdependencies among units in an organization. The sequential vs parallel distinction in our framework regarding physical coupling was described as “sequential interdependence” and “pooled interdependence” by Thompson. He also identified the “reciprocal interdependence” pattern. This pattern, where each unit has to constantly adjust to the other units’ activities, may be mapped to the informational coupling dimension of our framework. Thompson’s interdependence theory, therefore, is an important source for developing a theoretical foundation of process reengineering. Other sources of theoretical insight which need further development may be found in transaction cost theories [79] and agency theories [70].

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1It should be noted that the sequential aspects of the operation remain. However, the synchronization of parallel activities can now be facilitated by advanced group support technology. For a detailed treatment on this, see Ref. [25].
Strategic paths for process reconfiguration

The lateral, vertical, and diagonal movements in the functional coupling grid, as described above, can provide a strategic perspective on BPR at the process level. These alternative directions for changing the functional coupling pattern of a process may be evaluated by following the decision tree as outlined in Fig. 2. Based on an assessment of the process with regard to its potential for information coupling enhancement and the potential for physical coupling reduction, alternative directions for process reconfiguration can be identified and represented by the four branches in the tree. The environments for the various process coupling patterns are noteworthy. As indicated in the column labeled, 'typical candidates' the environment of the process in terms of uncertainty and other attributes should be evaluated in selecting a reconfiguration path. Many traditional business processes evolved in an environment with limited uncertainty, where the output of function X can be specified in advance to meet the input requirements of function Y, and the two functions can participate in the process without contacting each other and making adjustments. However, today's increasingly uncertain environment has rendered standardized rules and procedures too inflexible, and the penalty for an isolated function is the possibility that its output would be unsatisfactory or even useless to other functions in the process. To meet this challenge, functional coupling patterns of many traditional business processes are being modified or even radically altered to reduce physical coupling and enhance information coupling among the participating functions. It is important to note, however, that not all processes can and should be reengineered. As indicated in the first branch in the decision tree, the reengineering potential of some processes is restricted by mandate. Before marketing a new drug in the USA, for example, complete Federal Drug Administration approval is necessary which may take many years. Also, many processes with physical I/O flows are inherently sequential. If such processes operate in a stable environment without great need for collaboration, they can remain in Region I.

Such physical I/O flows in a process, as in a factory assembly line, can be contrasted to informational I/O flows, as in the issuance of a document from one function to another. This type of process may be reconfigured by storing the information being transferred in a common information resource, such as digitized images.

<table>
<thead>
<tr>
<th>Potential for Reducing Physical Coupling?</th>
<th>Potential for Enhancing Information Coupling?</th>
<th>Reconfiguration Path</th>
<th>Typical Candidates</th>
<th>Examples</th>
</tr>
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<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td></td>
<td>• Processes with steps that are, either inherently or by mandate, sequentially dependent, thus prohibiting reduction in physical coupling.</td>
<td>A mail survey must be completely designed before printing which, in turn, must be completed before mailing.</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td></td>
<td>• Processes with standardized physical I/O flows and relatively little need for information flows.</td>
<td>FDA approval is required before marketing a new drug.</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>Lateral movements in the grid to improve collaboration.</td>
<td>• Managerial processes with participating function in separate departments in an organization facing increasing environmental uncertainty.</td>
<td>Improved collaboration between engineering and production at Chrysler which has shortened the new product development cycle.</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>Vertical movements in the grid to reduce serial steps.</td>
<td>• Complicated operational processes with informational I/O flows.</td>
<td>The reengineered accounts payable process at FORD.</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>Diagonal movement from Region I to IV in the grid to reduce serial steps and to improve collaboration at the same time.</td>
<td>• Managerial processes with complicated steps</td>
<td>• The reengineered mortgage approval process at Bank One.</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td></td>
<td>• Complex operational processes in an environment of increasing uncertainty</td>
<td>The improved process of new product development at Texas Instrument and FORD where collaboration was enhanced through a global communication network. The physical coupling level was also reduced as different parts of the design can be worked on simultaneously by engineers at various sites.</td>
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or databases, to facilitate parallel operations of the various functions in the process. Such processes, as indicated by the third branch in Fig. 2, are often operational processes [21, 32] which typically have complicated mazes of serial steps making them good candidates for vertical movement in the grid. For relatively unstructured managerial processes, lateral movement to improve collaboration (see branch 2) may be necessary to absorb the higher level of uncertainty.

For managerial processes with limited processing steps, or operational processes with little or no uncertainty, straight lateral or vertical movements in the grid may be sufficient. Otherwise, as indicated in the last branch in Fig. 2, a diagonal path should be considered for those managerial processes with complicated serial steps, or operational processes that operate in a highly uncertain environment. Consider the new product development process. The process is undoubtedly a knowledge-intensive managerial process, and yet there are also many sequential I/O flows: product specifications from R&D to engineering, design blueprints from engineering to production, etc. For this process, therefore, great reengineering potential can be realized along the diagonal path. A case in point is the new car design process at Ford [21]. Relying on computer-aided design systems, members of the design team can simultaneously access a common design database across the Atlantic, removing the need for serial I/O of design documents circulating among the designers. In the meantime, exchange of criticism and opinions can be fully supported through the network among members who have never met face to face.

**BPR: ELEMENTS OF ORGANIZATIONAL CHANGE**

In selecting a path for process reconfiguration, the technical basis for the BPR endeavor should be firmly established. One must realize, however, that process reengineering takes place in the context of people and organization, and any attempt at BPR without appropriate plans for organizational change would greatly increase the risk of failure [5, 32]. The broad organizational focus and deliberate nature of process reengineering suggest a planned change in which a successful project requires securing management and stakeholder support, monitoring the dynamics of political forces, and nurturing new values and culture. A rich literature base exists within the broad areas of organizational change [51], innovation [18], organizational development [26, 66] and socio-technical design [8, 62] that generally deals with planned change. In addition, since BPR is typically enabled by IT, research in MIS planning and implementation can also be brought to bear on the planning and implementation of reengineering projects.

Drawing on the diverse literature as indicated above, various elements of organizational change associated with BPR are identified and presented in Fig. 3. In this model, elements of five broad phases of organizational change are depicted: sources of organizational impetus leading to BPR, initiating process change, selecting change enablers, managing change implementation, and directions of organizational change resulting from redesigned processes. While the middle three phases correspond to specific actions in managing the process change, the first and the last phase (shaded in the figure) represent the interface between the change effort and the rest of the organization in terms of input/causes (impetus of change) and output/influence (directions of organizational change). The remainder of this paper is organized around these phases of organizational change.

**ORGANIZATIONAL IMPETUS FOR BPR**

Process reengineering often involves substantial change to the status quo. The organization must give up the peace and comfort associated with the 'steady state' and embark on a potentially chaotic change process. As outlined in Fig. 3, several sources of impetus can facilitate the drive toward BPR [31]. The impetus may stem from existing conditions in the organization which favor the introduction and implementation of BPR, such as an innovative environment. If such conditions are lacking, efforts to improve and foster favorable conditions may generate the needed impetus. In addition to preconditions, impetus to reengineering may also come from specific measures and actions such as corporate and IT strategic planning to enhance the possibility of change.
Innovative environment and BPR initiatives

Process reengineering represents a drastic departure from the status quo and may be conceptualized as a form of organizational innovation. Organizational innovation is an important and well-researched area in management, and the extensive literature in this field emphasizes the process of innovation adoption and the organizational environment that fosters innovation [18]. While no empirical studies have been reported on patterns of BPR innovation, many reported reengineering cases corroborate central notions of organizational innovation such as those discussed below: championship, management support, cross-functional collaboration, and the facilitating role of 'structural overlay' [31].

The critical importance of championship has been extensively studied in general innovation adoption [18] and in the context of IT innovation [6]. To spearhead the reengineering effort, the role of a 'BPR champion' has been identified in many organizations [9]. This may be a closely knit group or a high-ranking manager with wide-ranging influence to stimulate interest in reengineering. Once enough momentum is gathered, this group or person will then exercise significant influence to mobilize resources necessary to launch the BPR initiative. The decisive influence of a BPR champion, for example, provided the initial impetus toward reengineering at Aetna Insurance. In 1990 Aetna’s president Ron Compton felt that the company had become a large self-satisfied behemoth, and too slow to respond to market and regulations. To reverse the trend, he challenged the business unit heads to break the cycle of mediocre performance and get involved in process reengineering [24].

Top management involvement and participation are critical to the success of all organizational change programs. In a field study based on 20 reengineering projects, Hall et al. [34] reaffirmed its critical importance to BPR initiatives. Process reengineering often involves radical changes. People are wary of change and will resist it unless top management is fully supportive of the change and there is adequate management of the change process [32, 34, 48]. One way to secure this support, for example, is through an executive orientation [5] on topics such as BPR introduction, how BPR enhances a firm’s strategic objectives, IT and organizational enablers of BPR, and reengineering techniques/methodologies.

An innovative organization has the capacity to learn and renew itself constantly [55, 63]. One of the most important characteristics of a learning organization is organizational

![Fig. 3. BPR: elements of organizational change.](image-url)
integration which refers to the extent of interdepartmental interaction such as the free exchange of ideas and participation in common projects. Integration in an organization is related to the idea of organic organization, one of the oldest and most intuitively appealing notions in innovation literature. In contrast to mechanistic organizations, organic organizations can be expected to foster a higher level of individual initiatives and innovative behaviors, as these organizations have more flexible work rules and encourage lateral communication between departments [12]. Besides having more innovative potential, firms with higher level of interdepartment integration can be expected to welcome (or at least offer less resistance) to reengineering initiatives which often involve business processes that cross-functional boundaries. Thus, if integration is lacking in an organization planning to launch BPR, steps should be taken to encourage cross-functional interaction and cultivate a more collaborative culture.

The idea of 'structural overlay' refers to the imposition of an 'organic overlay' such as venture teams on top of a 'mechanistic' organization, which typically relies on centralized decision making and formalized rules, to improve its innovative potential [67]. The depth and magnitude of organizational changes associated with reengineering often warrant the dedicated efforts of a 'venture group' in order to create and sustain an environment that is conducive to innovative changes. Cases of BPR venture teams abound. At Federal Express, for instance, a "Strategic Integrated Systems Group" was created within the IS function with explicit responsibilities for designing and implementing IT-enabled process changes [21]. Silicon Graphics created a process consulting group headed by a director [21]. At Hallmark, a formal senior position was established for reengineering which has since dramatically shortened new product development cycle time [73].

Corporate strategic planning and BPR initiatives

Prior to launching a BPR program in the organization, it is important to realize at the outset that BPR, being capable of achieving breakthrough performance, is a strategic endeavor, and the processes selected for reengineering should be critical to the firm's strategic objectives. In addition, as typical BPR projects involve cross-functional cooperation and significant changes to status quo, the planning for organizational changes is difficult to conduct without strategic direction from the top. Thus, BPR initiatives receive impetus from corporate strategic planning while attempting to identify and prioritize processes for BPR, to set reengineering performance goals consistent with strategic objectives, and to plan for organizational changes emanating from BPR.

While it is possible to identify candidate processes intuitively and quickly target certain processes for reengineering, many organizations prefer a more systematic approach to ensure a thorough linkage between BPR and corporate strategy. In a number of reported cases, this is facilitated by the development of a comprehensive 'business model' involving the identification of all business processes in the organization to establish the basis for a long-term BPR program. At Charles Schwab Corp., for example, top management undertook this strategic approach to BPR planning and identified 24 interrelated business processes representing every activity of the brokerage firm [4]. This strategic approach to BPR was also reported at Marion Merrel Dow Inc. where a steering committee identified eight enterprise-wide megaprocesses that are critical to the pharmaceutical company's success: customer processes, delivery fulfillment, revenue cycle, manufacturing cycle, operations, planning, demand creation, product development, and executive processes. These megaprocesses are then subdivided into 30 subprocesses [24].

One technique for delineating business processes in an organization is the value chain method proposed by Porter and Millar [68]. Comprehensive identification of business processes can be achieved by tracing from the 'upstream' processes associated with inbound logistics, through operations and those related to 'downstream' processes such as marketing, sales and services. Another method for process identification, the Core Process Technique [41], views a company's business as consisting of three or four core processes critical to the strategic directions and key problems in competitiveness.

Once a set of business processes for the firm are identified, strategic management techniques such as the Critical Success Factors method can then be applied to evaluate each process as to its
strategic relevance. This would help to identify a set of candidate processes for reengineering that are critical to the firm’s strategic performance. The prioritization ordering among these processes can then be determined by the magnitude of their strategic relevance. Union Carbide, for example, made a strategic decision to emphasize commodity chemicals rather than specialty products, which dictated the reengineering of its manufacturing process to achieve lowest possible cost and provide added value in delivery and service [74].

To appropriately apply strategic direction to reengineering, performance measures for redesigned processes should be consistent with the firm’s long-term strategic goals, not just short-term results such as sales volume. Typically, this involves setting performance goals related to service quality and customer satisfaction. Methods developed within the Total Quality Management (TQM) discipline such as QFD (quality function deployment) may be applied for this purpose [1]. Empirical studies conducted by Hall et al. [34] indicate that greater performance improvements can be achieved by setting multiple performance measures that are linked to strategic objectives of the firm. At Aetna, for example, the claim processing for its property and casualty business has a high level of customer dissatisfaction. The process usually took two days to get through to an agent, and over a week to fill a claim. In reengineering this process, performance goals were determined through benchmarking with the ‘best in class’ competitors. After a thorough study of customer needs, the redesigned process not only improved customer satisfaction but also cut costs. This was achieved through the closure of 120 local offices and providing 24-h a day 800-number service through 22 full service centers [24].

**IT strategic planning and BPR initiatives**

While the application of IT is not absolutely necessary for reengineering, it is a powerful enabler. As illustrated by the many examples cited previously, these BPR endeavors would be difficult to implement without IT applications such as imaging, database, and e-mail. IT strategic planning generates impetus for BPR through attempting to align IT strategies with overall corporate strategies, identifying IT enablers of reengineering, and developing an information resource architecture that facilitates BPR.

Many organizations are beginning to recognize the importance of IT-strategy integration to BPR. At PHH Corp., for example, this integration led to an overall assessment of IT use in the firm which revealed that “only 18% of the resources were focused on something other than keeping the lights on”. This prompted the $4 billion company to rethink its strategy in relation to IT, freeze investment in traditional automation of existing procedures, and redeploy the resources to redesigning age-old processes [31].

The identification of IT enablers of BPR depends on the participation of senior IT executives. Local area networks, client–server architecture, imaging and many other forms of IT that are important to reengineering are of recent origin. Because these technologies are rapidly evolving, with new advances appearing constantly, advice on their applicability to BPR should be sought from IT professionals. With the aid of specific guidelines and the use of brainstorming and other creative thinking techniques [16], a number of alternative information technologies can be identified as potential enablers for reengineering.

The actual implementation of the IT, however, requires careful evaluation to determine the ‘fit’ between the desired IT enabler and the current enterprise information resource architecture. This architecture reflects data and other information resources such as telecommunication and applications required by the various business processes identified in the business model discussed earlier. A particularly important element of this architecture is data, since properly designed databases can support cross-functional applications, and the database structure can remain stable while applications undergo changes. The significance of data architecture to BPR has been recognized by many firms including, for example, Continental Bank. Under the leadership of the bank’s CIO, a comprehensive information resource architecture was developed through examination of the overall strategies and the various functions delivering products and services critical to the strategies. The interactions between these functions and their shared data were also examined. This led to the design of an enterprise model which provided the base for their
technology strategy that included an IT platform, database design, and application development plan [2]. In cases where integrated databases are difficult to develop within a reasonable time frame, 'frontware' or 'composite' systems that pull data from various functional databases (or smaller extracts of those databases) may be developed. At Pacific Bell, for example, such an approach was adopted to support the case managers of its Centrex system operation [22].

INITIATING PROCESS CHANGE

Research on planned change was greatly influenced by the work of Lewin [51], who identified three sequential phases of the change process: unfreezing, moving, and refreezing. Creating a climate for change is central to the first phase, unfreezing, during which disconfirmation of existing behavior patterns is attempted. The moving stage entails analysis, design and installation. In the last stage, refreezing, change is institutionalized through reinforcing the equilibrium of the organization at a new level. A number of studies revealed that successful projects tended to conform more closely to the prescription of Lewin’s model than did unsuccessful ones [29, 80].

One stream of research and theory development that is particularly relevant to managing process change is the socio-technical systems approach which views a work system as an open system consisting of two interacting subsystems—the technical and the social. The goal of the socio-technical designers is to optimize the entire work system, not just the technical subsystems [8, 10]. In general, the resulting design incorporates major changes in the way work is done, emphasizing changes to human resources in light of altered tasks or processes. Thus, the socio-technical design approach shares many common elements with the BPR change program. Bostrom and Heinen [10] found that exclusive focus on the technical subsystems concerning task and technology variables in MIS systems design and implementation may have contributed to many MIS problems and failures due to neglect of the social subsystems. Mumford and Weir [62] recommend participation by those who are affected by a new system, which is supported by empirical research [39].

Building upon theories of systems change, socio-technical design and other related research, several critical elements for change planning and management are identified for initiating process change in a BPR project. These elements include analyzing change dynamics, formulating change strategy, securing stakeholder commitment, and structuring the change process. A number of change management techniques and methods are selected from the field of organizational development and socio-technical design theories to illustrate their applicability in process reengineering. More comprehensive treatments of these methods may be found in the works of French and Bell [26], Pasmore [66], and Berniker [8].

Analyzing change dynamics

In the absence of careful analysis of the change dynamics involved, prospect of well planned and coordinated change program in BPR will diminish. As BPR often involves radical change, level of resistance may be strong. In initiating major change programs, according to Kotter and Schlesinger [46], we should be aware of the four most common reasons people resist change: a desire not to lose something of value, a misunderstanding of the change and its implication, a belief that the change does not make sense for the organization, and a low tolerance for change. Markus [56] analyzes resistance to change in terms of the conflict among the participants for increased power. Based on Kling’s [45] work, Markus [56] proposes three implicit theories to explain resistance: people-oriented theory, systems-oriented theory, and interaction theory. One variant of the interaction theory is the political version which views resistance as a product of the interaction of system design features with the distribution of power in the organization. She suggests that this political perspective is most appropriate when: (1) organizational participants disagree about the nature of the problem that the proposed system is supposed to solve; (2) it is uncertain whether the system will solve the problem; and (3) the power bases involved are highly valued and in short supply. Thus, it is not surprising that political game playing is common in MIS implementation [30].

As process reengineering typically involves complex socio-technical changes with severe
impacts on many stakeholders' status and power base in the organization, careful analysis of the possible causes of resistance and political power dynamics are necessary in order to generate guidelines for formulating specific change strategy and securing management commitment.

Formulating change strategy

Results of the analysis as described above should provide useful inputs to the formulation of a specific change strategy. Stoddard and Jarvenpaa [75] discuss the distinction between evolutionary and revolutionary change strategy. In terms of the socio-technical perspective, revolutionary change strategy calls for simultaneous change of both technical and social systems, while evolutionary change may involve the choice of technical system first, social system first, or gradual staged socio-technical change [52]. If the forces of resistance are deemed to be very strong, the risk of revolutionary change strategy would increase. When an evolutionary strategy is adopted, change is adapted to the pace and capabilities of people, and frequent and open communication are considered essential [75]. Revolutionary strategy, on the other hand, requires a paradigm shift [28], and the existing structure must be dismantled and reconfigured to prevent the tendency for behaviors to migrate back toward the status quo once the change program is over. Generally speaking, radical outcomes involving broad and deep organizational changes warrant the consideration of radical change strategy. However, results from the change dynamics analysis as discussed above should be taken into serious consideration in selecting a change strategy.

In a large-scale case study, Nutt [64] identified four types of tactics used by managers in implementing planned change: intervention, participation, persuasion, and edict. In intervention, change agents become protagonists by creating rationales for action. For example, they would compare the organization's performance with comparable organizations, establish new standards to judge performance, or develop descriptions of how current operations could be improved. In reengineering terms, these correspond to benchmark analysis, setting process performance goals, and new process design. According to Nutt's research results, these tactics for change implementation were the most successful among the four types. Participation was the second most successful category of tactics. In this approach, a task force for change implementation was formed to include important stakeholders to help develop solutions to problems during implementation. As indicated earlier, we recommend the forming of a BPR project team with members drawn from the affected functional areas. If most important stakeholders are represented in the team, this should bode well for the eventual project success. The third category of implementation tactics in Nutt's taxonomy is persuasion, where experts or consultants are allowed to control the project with little or no management review. These experts would attempt to 'sell' the changes to the various stakeholders. As Nutt's empirical results indicate persuasion and edict tactics are much less effective than intervention and participation and the exclusive use of these two tactics in BPR project implementation would not be advisable. However, change agents should take advantage of the persuasion technique. Instead of letting consultants do all the convincing, project team members can 'win over' employees who resist the change process by following various strategies of influence [59] and communicating the rationale and benefits of reengineering to them.

Securing stakeholder commitment

A stakeholder is anyone with a vested interest in the business process. This includes not only employees involved in the process activities, but also suppliers and customers [19]. To build a solid foundation for the change program, commitment to change from these stakeholders must be secured. A number of approaches to securing commitment have been discussed in the literature. Prototyping the change process so the various stakeholders may develop a more concrete appreciation of how the new process works, is an effective means for facilitating communication and building commitment. Davenport [19] emphasizes the importance of open and honest communication at all levels and throughout the initiative. Another way to build commitment is the search conference (SC) technique [66], which brings all stakeholders into the same room to discuss the need for change and how to best achieve it. All stakeholders are encouraged to speak their
beliefs freely, and commitment to change may be nurtured through active participation and efforts to recognize the overall context of change.

Kotter and Schleinger [46] identified six methods for dealing with resistance to change: education and communication, participation and involvement, facilitation and support (e.g. training), negotiation and agreement, manipulation and co-optation (e.g. assigning resisters to key roles in the change process), and explicit and implicit coercion. Although some extreme conditions may call for possible use of methods such as manipulation and coercion, in these cases the likelihood of undesirable consequences in the forms of poor morale and even sabotage increases. For long-term effectiveness, the first three methods are recommended.

**Structuring the change process**

To help organize the BPR project, it is recommended that we bring some degree of control and structure to the otherwise chaotic process by explicitly recognizing certain critical roles and tasks for the change endeavor [19]. The roles of BPR project sponsor, process owner, and change agents are especially significant. The sponsor of reengineering projects plays a pivotal role in legitimizing and driving the change process. Senior functional or IS executives with transformational leadership abilities are good candidates for this role. A senior manager among employees affected by the project should be selected and appointed to the role of process owner by the project sponsor. Such a process owner should possess leadership skill as well as operational competence to achieve the process performance goals.

Change agents consist of project team members who must actually carry out the detailed redesign work and implement the change. Typically, members are drawn from multiple functional areas and provided with training in teamwork and group dynamics. To ensure timely attention to change management, a smaller, separate team dedicated to organizational change management may also be needed [19].

**SELECTING CHANGE ENABLERS**

The elements of change initiation in BPR, as discussed above, are critical in breaking the organizational inertia, and in launching and planning for process reengineering. To accomplish the specific BPR project objectives, however, it is necessary to select and implement a number of enablers of process change. These enablers are not restricted to IT. Successful implementation of BPR can be greatly enhanced if the social and organization aspects of process change are facilitated by enablers related to organizational structure, management systems and human resource development. As discussed earlier, these aspects of change were often neglected in IT-enabled change programs, severely limiting their prospect of success [72].

**Organizational structure enablers**

Research has shown that significantly better performance may be attained through cross-functional BPR efforts than projects confined within a traditional function [34]. To facilitate cross-functional cooperation, traditional organization structure based on functional specialization can be modified through structural enablers such as cross-functional teams, case managers, and process generalists.

The use of cross-functional teams has played a central role in many reengineering efforts. At Modicon Inc., a maker of automation-control equipment in Massachusetts, product development is no longer the sole responsibility of the engineering function. In the past, manufacturing would not get involved in this process until the design was brought into the factory when their suggestions on the design changes become very costly. Now, a team of 15 managers from engineering, manufacturing, marketing, sales, and finance routinely work together on the process. This cross-functional collaboration has eliminated many unnecessary delays and costly changes, helping to bring products to market in one-third of the time it would normally take [13]. The benefits of cross-functional teams can also be illustrated by attempts to reengineer the black-and-white film operation at Kodak. In 1989 before the reengineered process, called Zebras, began to operate, the operation was running 15% over budgeted cost, took up to 42 days to fill an order, and was late a third of the time. The reengineered process, which is centered around cross-functional teams, has over a period of 2 y brought the operation 15% under budgeted cost, cut response time by half,
and reduced late delivery to one out of 20 times [73].

Another structural enabler for reengineering is the establishment of a case manager who has access to the latest status information on a given transaction and serves as the single contact point for customers. At Pacific Bell, for example, providing a customer with a Centrex telephone service used to take 11 jobs and more than 5 business days. Service representatives had to update nine or more computer systems, causing frequent errors and rework, and required several consultations with the customer. After reengineering, a Centrex case manager handles all contact with customers. Using a computer workstation that interfaces with all nine systems, the case managers can usually provide the service in the same day [22].

While case managers coordinate work performed by many functional specialists, a process generalist can perform all their work and eliminate the need for the specialists altogether. Given proper safeguards against frauds, this may result in totally efficient 'cross-functional' coordination, as there are no longer separate functions to coordinate. At IBM Credit, the financing service division within IBM, a single generalist is now performing credit checking, pricing and other activities previously done by four different specialists in processing loan requests. This arrangement has reduced the application turnaround time from 6 days to just 4 h. With no additional workforce, the redesigned process is able to handle 100 times as many applications as before [36].

**Management systems enablers**

Structural changes in an organization such as those discussed above can help to ease the burden of ponderous hierarchies. These changes alone, however, will not usually be sufficient. In reengineering a process, there is typically a need to realign the fundamental basis of employees' work evaluation. Prior to joining a cross-functional team, for example, an employee may only care about the small piece of the work assigned to his or her department rather than the quality of the entire output. After taking part in the team, however, these narrow internally oriented performance objectives are no longer valid. Many successful BPR efforts are based on external performance objectives such as customer satisfaction and overall product/service quality. For example, at AT&T's Network Systems Division the traditional function-based performance standards are replaced by holistic external performance objectives. Employees are now awarded bonuses for higher customer satisfactions, rather than higher sales, higher inventory turnover or lower cost. In addition, the division no longer assigns discreet budgets for each functional department. Budgets are now set by processes [13].

With the spread of work teams and the realignment of performance objectives, it becomes necessary to return decision making power to the point where the problem occurs. This means employee empowerment without waiting for 'vertical' layers of approvals, which were the basis of the old functional structure and internal performance objectives. At Chesebrough-Pond's Inc., for example, factory line workers can now routinely scan online information on sales and stock availability to adjust the production schedules. Previously, these scheduling decisions were made by their managers [78].

**Human resource enablers**

We have outlined enablers for process change related to the organizational structure and management systems. However, it is important to realize that successful implementation of these BPR enablers requires well-orchestrated changes in human resource management since it is through people that these changes are carried out. In a traditional functional organization, it is sufficient for employees to rely on just one specialty for their entire career. To make a meaningful contribution to a cross-functional team, however, it is necessary to have at least some rudimentary knowledge of other functions in order to communicate effectively with personnel from other departments. This need for multiple skill and knowledge, of course, is even more urgent and evident if the organization wishes to install case managers and process generalists. Important human resource enablers for process reengineering include multiple skill development and rewarding team performance.

These changes in training, appraisal, and compensation have been implemented in many firms when attempting BPR. At GE's lighting business and the Government Electronics group in Motorola, for instance, peers and others
above and below the employee evaluate the performance of an individual in a process. Sometimes as many as 20 people are involved in reviewing a single employee. Reward is now based on team performance in addition to individual performance. Furthermore, these companies also altered the basis of work compensation. Employees are now paid on the basis of the skill they develop rather than merely the individual work they perform [13].

**Information technology enablers**

Conceptually, an organization should be able to redesign a business process without the aid of IT. However, many recent successes in BPR would be difficult to consummate without the enabling IT. One important impetus for the reengineering initiative, as discussed earlier, is the effort of information systems strategic planners to identify IT enabling opportunities. This identification effort depends on a proper understanding of the role of IT in facilitating process reconfiguration through BPR. This understanding may be furnished by the functional coupling model of business processes (see Fig. 1) and the guidelines for selecting process reconfiguration paths (see Fig. 2) presented earlier.

The reduction of physical coupling in process reconfiguration may be enabled through the application of shared computing resources such as database and imaging technologies. Many firms have successfully capitalized on the enabling role of IT and reconfigured their business processes from a highly serial pattern with many intermediate steps to a parallel pattern permitting several functions to proceed independently. In the well-publicized case at Ford Motor Corp. for example, the old accounts payable process involved three functions—purchasing, inventory, and account payable—which participated in the process serially with many intermediate steps and sequential flow of paper documents. With direct access to a shared database, the three functions now participate in the reengineered process in a parallel fashion, achieving a 75% reduction in the workforce required [35]. In addition to shared databases, the application of imaging technology may also reduce physical coupling in a process, as different functional personnel access the same digitized document simultaneously. In terms of the functional coupling framework portrayed in Fig. 1, the application of these shared computing resources move processes currently in Regions I and II to Regions III and IV.

While shared computing resources can enable process change through reducing physical coupling, the enhancement of information coupling is primarily enabled by the application of telecommunication technologies such as local area network and a variety of office systems products under the rubric of 'groupware'. Application of these technologies may greatly improve communication and collaboration between different functions involved in a business process. At Hewlett-Packard Co., for example, the sales process underwent significant change as 135 sales representatives began to use laptop computers to retrieve up-to-date inventory information from the corporate database during customer meetings [7]. In addition, they can now use the portable computers to communicate with their peers and superiors, enabling frequent exchange of sales intelligence among the salespersons as well as timely dissemination of corporate directives pertaining to promotion, pricing, and discounting. The results showed that time spent in meetings decreased by 46%, and travel time was cut by 13%. Meanwhile, time spent with customers increased 27% and sales rose by 10%.

We have discussed the role of shared computing resources in enabling process change related to reduction of physical coupling, and the use of telecommunication in enhancing information coupling. With the convergence of computing and communication technologies, however, it may be impossible to have one without the other. Thus, it is important to realize that the major enabler for vertical movement in Fig. 1 is shared computing resources, even though utilization of these resources may require communications technology. Similarly, the primary enabler for lateral movement in the grid is communication technology but its effective application often depends on shared computing resources.

Increasingly, many business processes can benefit from the diagonal movement in the functional coupling grid. A team of engineers, for example, can share a common design database. In the absence of telecommunication, however, they can not simultaneously modify different parts of the same object, nor are they
aware of each others’ changes. By combining both telecommunication and shared computing resources, a shared environment for team work may be developed. Currently, a number of emerging technologies, including workflow software and the popular CAD/CAM systems, hold great promise in providing this shared environment for effective team work [25]. The new product development at Texas Instrument cited earlier illustrate the benefits of this change. The company’s global network and advanced computing resources enable design teams in different countries to sustain a high level of collaboration, while permitting them to work on different parts of the design directly without sequential flow of documents. As a result, the development cycle time for various products decreased substantially. The time needed to develop a calculator, for example, declined 20% soon after design drawings began to be sent electronically in 1989, and a further decrease of 17% has been achieved since then [53].

MANAGING CHANGE IMPLEMENTATION

The selection of proper change enablers should help lay a solid foundation for the success of the reengineering project. However, to actually establish these enablers and carry forward other process design features requires careful management of the change implementation process. As amply demonstrated by the case studies conducted by Smith and Willcocks [72], change implementation requires flexibility and a multidisciplinary perspective, paying attention to a myriad of human, social, cultural and political issues, while not allowing a rigid BPR methodology and technical issues to subvert human and organization considerations. Several critical aspects of managing change implementation associated with BPR will be discussed here, including approaches to analyzing implementation problems, managing implementation politics, and applying implementation tactics.

Analyzing implementation problems

During the course of process change implementation, the dynamics of change may itself be altered from time to time. New sources of resistance not anticipated in the initiation phase may emerge later during change implementation. While it is reassuring to identify champions for the change initiative, counter-champions may emerge to frustrate the effort of the champion. To effectively manage change implementation, it is necessary to periodically assess and analyze the forces that are favorable as well as unfavorable to the change efforts. To facilitate this assessment, the force field analysis technique developed by Miller [60] may be applied. Aided by a pictorial representation of a ‘tug of war’, analysts using this technique would identify forces that are currently ‘tugging’ to the left of the center line in the direction of catastrophe’, and forces currently ‘tugging’ to the right toward the ideal situation. Cougar et al. [16] recommend this method as a creative technique for IS problem solving. Based on the ‘tug of war’ metaphor, the technique provides stimuli for generating solutions to implementation problems in three ways: (1) strengthen a currently present positive force; (2) weaken an already present negative force; and (3) add a new positive force.

Managing implementation politics

The force field analysis as described above involves mostly political forces. To strengthen, weaken or add forces requires active management of implementation politics through subtle actions on people’s perceptions and motivations. To strengthen a positive force, for example, the BPR team may attempt to communicate clear images of the future to organizational members, and to increase the level and extent of participation. Weakening a negative force, on the other hand, may require directing people’s attention to the consequences of not carrying out change and giving them time and ‘excuse’ to disengage from the present position [72]. Adding a new positive force normally involves the mobilization of power in support of the planned change through negotiation and coalition building [42].

Applying implementation techniques

As the field of organization development (OD) is concerned with planning and implementing change in organizations, many OD techniques may be readily applicable in BPR implementation, especially as tools for the management of implementation politics. For example, one common form of political problems in change management is conflict between individuals and groups. The organiz-
The mirror technique developed by French and Bell [26] may be applied to address this problem. The technique prescribes a set of activities in which one group gets feedbacks from a number of other groups about how it is perceived. These feedbacks would help to identify sources of the conflicts and develop possible solutions. Additional techniques for change implementation may also be found in Ref. [26].

**Evaluating implementation conditions**

One critical link in successful BPR change implementation is the continuous evaluation and monitoring of the conditions that the initiative is facing throughout the endeavor. Ex ante assessments should be taken prior to change implementation to provide a baseline for comparison and a basis for developing implementation strategies. During and after the BPR project, the evaluation efforts should encompass quantitative measures such as cycle time, cost, and defects. In addition, qualitative and intangible factors, such as employee morale and the political forces as discussed earlier, should also be monitored in order to obtain a sense of direction of and the ability to correct and modulate the implementation efforts.

**DIRECTIONS OF ORGANIZATIONAL CHANGE**

Is BPR a management fad of the 90’s or the start of something very big? Are we beginning to alter the very structure of organizations based on business processes rather than functional specialization? To help answer these questions, three dimensions of the possible organizational changes stemming from process reengineering are identified: the structural dimension, the management dimension, and the people dimension. These dimensions correspond to critical elements of organizational change identified by Leavitt [50] as well as the Management in the 1990s research program [71]. As indicated earlier, research results from the Management in the 1990s program suggest that lack of attention to three of the five elements identified in their change model—people, management process, and structure—is the primary reason for IS implementation difficulties.

While the process reconfiguration framework guides more and more business processes, as shown on the top of Fig. 4, from the serial-insulated cell to the parallel-collaborative cell, the organization will in the meantime undergo significant changes from an industrial age organization to an information age organization. Several salient attributes of this change are identified in Fig. 4 in relation to each of the three dimensions, and will be elaborated in the remainder of the paper. There are undoubtedly other important aspects to this complex organizational change process [47], but the intent here is to highlight the most significant trends. It should also be noted that the discussion focuses on changes within individual organizations; radical IT-induced changes to relationships between organizations, which have profound ramifications for corporate strategies, are not included.

**The structural dimension of organizational change**

According to recent research results [54], advanced IT applications would initially allow organizations to increase the amount and effectiveness of coordination with existing structures. Innovative use of advanced IT, however, would inevitably lead many firms to develop new, coordination-intensive structures. This can best be illustrated by the Frito-Lay case. With a sales force of 10,000, keeping the traditional hierarchical structure would lead to many layers of middle management in order to absorb the colossal amount of communication and coordination. At Frito-Lay, however, a coordination-intensive structure was developed to replace the traditional hierarchy with the aid of IT. A hand-held computer is given to each of the 10,000 salespersons to record sales data on 200 grocery products. Each night, the data is transmitted to a central computer which will send instructions back to the hand-held computers on changes in pricing and product promotions the next morning. In addition, weekly summaries and analysis are available to senior executives through an executive information system (EIS) [54]. In terms of the framework presented earlier in Fig. 1, the Frito-Lay case corresponds to Region IV, the parallel-collaborative cell. The shared database and hand-held computers facilitate the physical decoupling of serial procedures. The EIS and the electronic transmission of sales data and management directives intensify the
information coupling among the participating functions—marketing and sales.

Will the success in process reengineering create momentum toward coordination-intensive structures centered around basic business process? While it is premature to proclaim the death of the functional hierarchy, it is clear that the information age has been thrust upon us, and yet most organizations are structured to meet the constraints of the industrial age. How do organizations based on business processes differ from traditional hierarchies? While a full treatment on this complex issue is beyond the
scope of this paper [71], a few significant contrasts are identified in Fig. 4.

Networked organizations, according to Rockart and Short, "are usually conceived of as communication-rich environments, with information flows blurring traditional intracompany boundaries", which can be thought of more as interrelationships within or between firms to accomplish work than as 'formal' organizational design per se [69]. Thus, as an organization reengineers and improves its cross-functional processes, it will take on certain characteristics of a networked organization. For example, Chrysler Corp. has instigated a series of reforms since the late 80's to improve collaboration between functional departments. The product design function is now working closely with the engineering function and thus the functions no longer fight turf wars with each other [58]. Thus, one may say that Chrysler is evolving toward a networked organization.

A number of prominent firms, including IBM, Xerox and Hallmark, have adopted a reorganization approach centered around core business processes. At Hallmark, the traditional functional structure is undergoing an interesting transformation. Before the process reengineering efforts, the development of a new greeting card took 2 y because of a long list of serial steps in sketches, approvals, cost estimates, and proofs, which transversed many different departments. Since reengineering, specialists such as writers, artists, and designers from various departments work side by side in teams. As a result, the cycle time for new card development was cut by half. The company still has functional departments, but the departmental headquarters now serve mainly as 'centers of excellence' to which workers can return for training between projects. As such, they can be likened to the homerooms in high schools [73].

Further indications of movement toward the development of process-based organizations have surfaced recently. At Modicon Inc., for instance, many employees are involved in up to 30 teams that span several functions and departments. According to its president, "In five years, we will still have some formal functional structure, but people probably feel free enough to spend the majority of their time outside their functions". As a result of this cross-functional collaboration, the company is now able to bring products to market in one-third of the time it would normally take [13]. At Eastman Chemical Co., several senior vice presidents have been replaced by self-directed work teams. There is no longer a vice president for manufacturing. Instead, there is now a team of all plant managers [13].

In general, functional hierarchies depend heavily on rules, procedures and upward referral which invariably increase the tendency for them to become rigid bureaucracies. This tendency may be avoided when functional specialists participate in a variety of teams attempting to accomplish different business processes at different times. These teams are given the 'ownership' of the process and do not need to await several levels of approvals before making important decisions. This inherent flexibility is one of the most striking characteristics of an organizational form called 'adhocracy' which has the ability to readily create and disband ad hoc teams on an on-demand basis [61]. If the reengineering movement continues to gather momentum, many organizations would take on characteristics of adhocracies.

Since most traditional hierarchies are organized around specialized functional departments, it is almost against their nature to conduct 'cross-functional' endeavors. The hierarchical structure itself must be mobilized to ensure integration between functions, as these functions fulfill their assigned duties according to 'cross-functional' plans set by higher levels, sometimes without even knowing the objectives of the assigned duties. With most information flowing vertically to facilitate task assignments, lateral sharing and exchange of information related to common processes between functions is difficult in a hierarchy, and must be arranged through special efforts such as task forces and matrix structures [27, 49]. Furthermore, territorial battles are often waged between functions to the detriment of the overall organization. Such familiar patterns of organizational life can be expected to subside in a networked organization where cross-functional teams determine their own responsibilities, and proceed to execute these duties with full access to necessary information.

With all these expected advantages, how does one decide whether it is right to begin the transformation toward a networked organization? The most important questions to ask in
this regard is the organization's size and its capacity to effectively cope with the ever increasing level of uncertainty. If the firm is over sized, i.e. the revenue per employee figure is much lower than a comparable competitor's, or it is slower than its competitors in developing new products, and in drawing up new pricing and marketing strategies, then serious consideration should be given to reengineering and even restructuring. A prudent approach may be to reengineer a specific business process before attempting to mount an organization-wide restructuring effort.

The management dimension of organizational change

In the age of functional hierarchy, a set of 'management principles' based on line/staff, chain of command, task specialization, rules and procedures, span of control, and budget, etc. have been developed and perfected over the decades and centuries. While these principles have been fairly successful in managing mass production technology in a less turbulent era, limitations of these principles become increasingly evident as the service sector of the economy grows and global competition for traditional manufacturing intensifies. A number of prescriptions have been offered to 'fix' the hierarchy, including matrix forms, product-based (as opposed to function-based) departments, participative decision making, management by objectives, Theory Z, and so on.

What does the future hold for management if more and more organizations gravitate toward reengineering and networked organization? There is little doubt that reengineering is not a panacea for all the ills of the functional hierarchy, but there are strong possibilities that some of the age old organizational maladies will finally respond to treatment. One of the most persistent problems in a hierarchy, for example, is 'suboptimization' which results from the decomposition of overall organizational goals into subgoals for individual departments. A well-publicized case occurred recently at Sears Tire and Auto Centers. In an attempt to boost revenue quickly, sales quotas were established which prompted many centers to charge for unneeded repairs. Eventually, customers found out and complained to the authorities. As a result, Sears is mired in legal problems with consumer affairs departments in many states [43]. Another age-old problem of hierarchical bureaucracy is the tendency to 'pass the buck' to higher levels when exceptional situations occur. Many organizations struggle to 'decentralize' decision making in order to make the firm more responsive.

Such dysfunctional phenomenon as suboptimization within a unit and 'buck passing' in traditional hierarchies may be alleviated with process reengineering. One of the central principles of reengineering is careful calibration of process performance goals, linking to external objectives such as delivery time and customer satisfaction. At Kodak, for example, the 1500-employee black-and-white film operation was reengineered, and the performance evaluation is now based on customer satisfaction [73]. Since the process is extensive and complicated, it is divided into 'streams'. For those streams not having direct customer contact, internal customers were identified and their satisfaction measured. This calibration of process performance measures helped to improve the performance of the process dramatically, cutting response time in half. As the teams were given 'ownership' of the processes, i.e. the team members could jointly decide what to do when unexpected situations occur without asking the superiors in the hierarchy, the 'buck passing' syndrome may be alleviated.

One cannot help but wonder why networked organizations, with all the potential benefits discussed above, have waited a few centuries before descending upon us? One reason is limited access to information in the traditional hierarchies which may be intentional or due to primitive information technologies, or both. With the rapid diffusion of information technologies, access to corporate databases and freedom to communication more widely with e-mail are enhancing employees' ability to make more informed decisions with less reliance on formal vertical information flow [11]. Such 'informational empowerment' is in contrast to the position-based power in traditional hierarchies. At North American Aircraft Division of Rockwell International Corp., for example, the introduction of an EIS gave rise to additional reporting structures which were not included in the formal organizational chart [3]. The implications of this development for the conduct of management in the future are far
reaching. One may view this development as a form of 'creeping' reengineering of managerial processes: the process of management may change as a result of informational empowerment without blessing from top management. It is, therefore, very important for top managers to recognize this trend and map out a strategy for reengineering and organizational change, rather than allowing their organizations to drift with the tide of IT in completely unmanaged fashions.

**The people dimension of organizational change**

When the world entered the industrial age, the 'economy' of the assembly-line production forced millions of workers to repetitively perform extremely specialized tasks. Humanists cried out over the loss of 'meaning' in work, and longed for the by-gone era when artisans could complete a piece of work from the beginning to end and took pride in their work. The prospect of widespread process reengineering poses the question: what effects will reengineering have on individual workers? Will it accelerate the fragmentation process and push white-collar office work toward assembly-line style drudgery? Or will the movement help to emancipate the workers from rigid rules and put meaning back into their work?

While these questions will probably remain unanswered for decades, there are reasons to believe that the overall pattern of change may eventually lead to more 'people-friendly' organizations. With the spread of parallel operations and close collaboration with other functions, there will be a need for workers to broaden their portfolio of skills. In the Bank One example cited above, reengineering was achieved through cross training of employees in several related functions. At PHH, a $4 billion firm specializing in employee relocation and other business services, functional areas have shrunk in size as they have given up operational duties to case-management oriented processes [22].

With the division of labor being the *modus operandi* for Taylorian management in the industrial age, a departure from this principle can be expected as we enter the information age with the emergence of cross-functional teams to replace functional departments as the basic vehicle for accomplishing work in the organization. This requires making teams, not individual specialists, the focus of organizational performance and design [65]. To achieve effective team work, each worker should develop several competencies. The reward system in the team-based organization must be designed to reinforce not just individual skill development and performance, but also team performance.

As engineers, financial analysts, planners, and other knowledge workers in the organization participate in a variety of teams, an enormous organizational consequence will quietly emerge: their knowledge and expertise will become a shared resource to be tapped by the entire organization on an on-demand basis. The use of expert systems and e-mail (to communicate with remote experts) further amplifies the efficient and effective use of expertise throughout the organization. At PHH Fleet America, a division of PHH, the Driver Service case managers can rely on the skill they have learned and an expert knowledge base for answering most of customers' questions on their leased vehicles. They refer the more difficult problems to expert maintenance mechanics who can not only solve the problems but add it to the case managers' knowledge base [22]. Therefore, as the organizational change progresses, knowledge and expertise will be released from the 'functional cages' and synergistically utilized as an organizational resource. The networked firm will thus progress toward a 'learning organization' and become more intelligent and adaptive than its previous bureaucratic incarnation [38].

In summary, the people dimension of the coming organizational transformation involves a transition from individuals performing fragmented tasks to team members working together for a process, a shift from exclusive reliance on specialists to the development of generalists, and utilizing expertise as an organizational-wide resource rather than a functional specialty. It is important to realize that the performance gains from reengineering and organizational change stem not only from a more 'rational' process with fewer steps, but also from motivated employees who attach more meaning to their work. A case in point is the black-and-white film division at Kodak. In 1989 when the reengineered process began to operate, the 1500-employee operation scored lowest in Kodak's morale survey. The reengineered process, which is centered around self-directed teams, has over a period of 2 y
turned the situation around completely and achieved the highest morale in the firm [73].

CONCLUSION

Recent developments in process reengineering have taken many organizations down the path of unprecedented organizational change. To enhance the likelihood of success in this difficult endeavor, we have attempted to develop a strategic perspective on this change phenomenon—at both the business process level and the overall organizational level—through the development of a process reconfiguration model and an organizational change framework. The process reconfiguration model shows how various functional activities involved in a business process may be fundamentally reconfigured, through the reduction of physical coupling and the enhancement of information coupling, to achieve breakthrough performance gains. Based on this model, a suitable path for process reconfiguration may then be selected. As process reengineering takes place in the context of people and the organization, risk of failure would be great if it proceeds without appropriate plans for organizational change. To prepare for these changes, a framework for organizational change associated with BPR is presented. In this framework, elements of organizational change associated with process reengineering are depicted: sources of organizational impetus leading to reengineering initiatives, change initiation, selecting process change enablers, change implementation, and the various dimensions of possible organizational change resulting from redesigned business processes. In discussing these elements, we stress that process reengineering is much more than applying IT to streamline complicated procedures. It is first and foremost a multifaceted process of change involving organizational structure, management systems, human resource architecture and many other aspects of organizational life. The organizational change framework presented in this paper should prove helpful in gaining this high-level perspective and guiding the planning and implementation of BPR initiatives. Indeed, recent trends in research and practice have shifted from a narrow 'one-shot' redesign effort to an on-going 'process management' orientation which emphasizes the critical importance of human and organizational factors in not only the initial but the continuing sustainable success of BPR [20].

Reengineering initiatives involve multifaceted socio-technical change, and efforts to understand this complex phenomenon are only beginning. The models and frameworks presented in this paper, while offering important broad guidelines, need to be refined and extended with further theoretical and empirical work. Specifically, a number of limitations inherent in this research should be recognized while attempting future studies. First, future studies may be directed at empirically validating these frameworks. There is no simple prescription for organizational change, and the framework suggested in the paper has to be viewed in a contingency context. This is an important step as the evidence cited in support of our contentions was limited to specific examples which tend to illustrate simple ‘formula of success’. Further studies based on case studies, action research, and field surveys would offer opportunities to systematically examine factors underlying success as well as failures. Secondly, the frameworks and perspectives presented here represent general trends which need to be refined through contingency-based research approaches. The directions of organizational changes stemming from BPR, for example, may be extended through examining how these patterns of change vary in speed and scope for various types of organizations, and how different industries may involve different facilitating and inhibiting factors. Further, future studies may also consider the role of organizational learning [55] and quality of work life issues [17] which are closely related to the organizational change process and its ultimate success.

With the unrelenting pressure in the global competitive environment and rapid progress in IT, the reengineering movement will continue to gather force, and the 'art and science' of BPR attain further refinement and sophistication. The models and frameworks presented in this paper should contribute to this advancement through their explicit attention to the technical core (the process reconfiguration model) as well as the complex socio-technical context (the framework of organizational change) of reengineering initiatives. With future research as suggested above, prospects of success in process
reengineering will improve and the 'information age' organization will emerge.

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REFERENCES


64. Teng et al.--Developing Strategic Perspectives


