The IS Manager's Enabling Role in Business Process Reengineering

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Payoff

Business process reengineering seeks to create significant performance improvement by radically redesigning the business. Information technology is a major enabler of these new forms of organization that include cross-functional relationships and processes. This article gives a six-stage methodology for IS managers who must actively participate in reengineering projects. The issues discussed range from identifying reengineering opportunities to redesigning the human resources architecture to measuring the newly configured processes.

Introduction

The results of reengineering efforts have surfaced among numerous organizations, including Ford Motor Co., Eastman Kodak Co., AT&T, and Digital Equipment Corp. These companies report increases in productivity and decreases in staff after business reengineering. Digital Equipment has successfully consolidated 55 accounting groups into five, eliminating 450 jobs. CIGNA RE Corp. saves $1.5 million each year in operations costs and has improved access to data with its $3.2-million reengineering effort.

Increasingly, IS departments are being asked either to facilitate or to lead the organization's reengineering efforts. The use of a methodology can better enable an organization to capitalize on reengineering. This article introduces a comprehensive framework to help IS managers and their departments accomplish significant improvements in business processes.

Reengineering and Dynamic Organizational Structures

Business reengineering seeks to redesign work processes to enhance productivity and competitiveness. The demand for reengineering has been fueled by the fact that much of the business-process logic currently in use is 40 or more years old. These processes were usually first designed as sequential manual procedures and stemmed from a strong efficiency orientation that pushed for optimal procedures and maximum control within departments or functions, with little attention paid to organizationwide or customer effects. Although organizations grew, and more people were added and procedures modified to meet immediate needs, the basic process usually followed the original logic.

As aging manual processes were automated, there was an impression that some degree of improvement occurred as well. In reality, these systems were often designed to support already fragmented processes, and automation only masked the problem by increasing processing speed. This localized, incremental approach has created extremely complex processes that contribute little to the overall effectiveness of organizations operating in today's business environment.
Role of IS in Cross-Functional Teams

Increasingly, successful organizations are envisioned to be networked across functions and designed around business processes rather than functional hierarchies. Achieving this dynamic structure takes more than the latest technology applied to the existing procedures; most companies realize it requires a rethinking of business fundamentals. The solution lies in effectively redesigning processes by removing unnecessary activities and replacing archaic processes with cross-functional activities that support parallel processing, speed, service, quality, and innovation. These richer processes must be supported by enterprisewide information access and communication.

Business reengineering usually involves a fundamental analysis of the organization and a redesign of organizational structure, job definitions, reward structures, business work flows, control processes, and in some cases, a reevaluation of the organizational culture and philosophy. Many corporations are completing such reengineering projects or are currently beginning one. In essence, the reengineering of business processes has been suggested as a new paradigm of organizational change necessary in maintaining flexibility and competitiveness.

Professionals in the IS field are faced with developing new design techniques to address the changing role of IS in the age of reengineering. Because reengineering projects are usually designed around business processes that transcend functional units, there is a need for greater lateral systems planning and interaction between IS designers and users than IS has been accustomed to in the past. Rather than functioning as the sole developers, IS professionals may be asked to act as coordinators or colleagues on a multifunctional team made up of operating staff from many functional departments. In this scenario, the operating staff provides direction as to what needs to be reengineered and IS staff members are asked to provide direction concerning how to conduct the reengineering. In other words, are there tools available to handle the job?

The Process Reengineering Life Cycle

Although there is no standard methodological approach that ensures success in reengineering efforts, commonalities among approaches are present. This article proposes a more complete reengineering approach, referred to as the Process Reengineering Life Cycle (PRLC). This approach, shown in Exhibit 1, offers a detailed examination of the six major stages in a reengineering project. The activities within each stage are discussed throughout the remainder of this article.

Six-Stage Process Reengineering Life Cycle

Envisioning New Processes

Reengineering is so revolutionary in nature that nothing short of championship from the top can activate such a venture. The organization's leaders start by examining how they would run their company if they had no constraints. This requires a creative reexamination of how work is done as opposed to how it could be done. This initial Process Reengineering Life Cycle stage involves the crucial component of aligning corporate goals and strategies with the reengineering effort. It is within this stage that management commitment is secured, vital business processes are identified, and IT enablers are examined.
Commitment from Senior Management

The CEO, president, and leaders of all the major functional departments must realize that their efforts are required in guiding the direction of the new processes and in selling the project to employees. The proponents of a redesign project face a formidable task, however, because those in control of a business most likely have spent large parts of their lives working with the current methods; it may be extremely difficult to convince them that any rethinking of internal processes is needed. The major task, then, is to present the potential benefits and costs to senior management.

For example, improving cycle time may be an important objective of the reengineering project. The faster information, decisions, and materials can flow through a company, the faster it can fill orders and adjust to changing consumer tastes and competitive conditions. Implications of decreased cycle time are that:

· Costs are generally reduced as time is pared from processes.

· Cash is generated because less capital is tied up in work-in-progress inventory.

· Customer service improves as a result of improved lead times.

· Quality is higher because a process is not allowed to be accelerated until it produces first-rate products.

· Organizational learning is enhanced because rapid new product development cycles keep the company in close touch with customers and their changing needs.

· If productivity is defined as output per time unit, then it also inextricably relates to cycle time.

Identifying Reengineering Opportunities

When confronted with the large number of processes in a typical business, the problem becomes deciding which ones should be investigated for redesign. A useful definition of process may help in this matter.

A process is a set of activities or logically related tasks that must be performed to accomplish a business objective. Processes to be reengineered should have high potential impact on the business. Usually, these processes have an identifiable owner and customers and may span multiple internal and interorganizational boundaries. Known defects in a suspect process should be identified and anticipated performance-improvement benchmarks should be isolated.

Thinking in terms of process types is helpful in gaining a broader understanding of what the given value chain means to the company. Specific dimensions of a process can be categorized as entities, objects, and activities. Within this scheme there are three levels of processes:

· Interorganizational processes. The means by which companies along the same value chain interact.

· Interfunctional processes. Those that cross functional boundaries within one organization.
· **Interpersonal processes.** Those that occur between people within one functional group.

The objects with which a business process deals may be either physical or informational, or they may contain elements of both. Activities involved in a process can be classified as operational or managerial, and such demarcation can simplify the redirection of responsibility and accountability across the entire process. By defining an organization's processes, the reengineering project can identify problems and begin to develop a baseline against which new processes can be compared.

Certain planning tools, such as value chain analysis, Business Systems Planning, and critical success factors, may be used in the identification of business processes. Either a comprehensive or a targeted method can be used to define processes.

The comprehensive approach attempts to identify all the processes within an organization and then rank them. Charles Schwab Corp. adopted this approach and identified 24 business processes that would streamline operations with the intent of a 20% annual revenue growth in the next 10 years. Although the comprehensive approach can provide an unparalleled opportunity to consider the organization as a whole, collecting the data can be time-consuming and may divert the team's attention from the true goal of reengineering. The targeted approach defines those processes known to be most vital to the organization, as determined by reengineering team discussions, managerial workshops, or managerial interviews.

**Identifying Enabling Technologies**

New technical capabilities of data and communications technologies are moving IT to the forefront in its potential to induce business reconfiguration. More than just a tool, these new technologies are accelerating the pace of change at corporations by establishing new organizational forms and performance standards. The reengineering project must identify enabling information technologies that provide the opportunity to improve internal efficiency, satisfy customers, and allow organizations to ignore geography. Technologies such as local area networks (LANs), client-server architecture, Electronic Data Interchange, and executive information systems (EISs) are allowing organizations to achieve performance gains.

**Aligning with Corporate Strategy**

After process reengineering opportunities have been discovered and IT enablers identified, the next step is to compare these with strategic goals to ensure that both external (e.g., market) and internal (i.e., efficiency) strategic arrangements are in sync with the present or potential IT competencies and the infrastructure of the organization. Strategic vision to leverage structural differences or distinctive competencies of an organization with IT, relative to industry competitors, may be the basis for changing an organization's competitive position. Reengineering efforts may differ greatly depending on varying strategic directions—for example, low cost competition, entry into new markets, seamless buyer and seller relationships, and high-quality production. A review of strategic alignment should identify needless reengineering efforts that either do not have strategic significance or for which an IT base does not or cannot exist.
Initiating Change

The initiation stage ensures that careful preparation is conducted in anticipation of organizationwide radical change. Reengineering projects must be staffed by the right team members to sustain the effort. The project should have definite performance goals that can later provide the metric for judging success, and these goals should be justified against anticipated costs. An in-house public relations campaign can be organized to inform employees of the redesign project. A message from the CEO or president addressing the need, scope, commitment, and leadership of the project should be communicated to the employees.

Organizing the Reengineering Team

Because the process of reengineering involves organizational design around processes rather than functional hierarchies, multifunctional teams with members from various parts of the company are the most likely agents of change. The skills of team members should be broad and should traverse functional units.

Management should first appoint a director of the reengineering project who is responsible for the project’s conduct and accountable for its results. One of the first tasks this person must perform is to assemble and assign several task groups. One method of assembling a team is to follow the announcement of the reengineering project with a memo to managers at all levels, further describing the redesign project and the need for team volunteers. Candidates include those who are knowledgeable in functional areas and can dedicate significant amounts of their time. At least one member must be knowledgeable about the current state of IT, especially communications networks and data bases.

Some companies use multiple teams of varying composition and specialization for different stages of reengineering; in general, however, members usually include executives from the IS department and other major departments (e.g., finance, marketing, and manufacturing) as well as key staff and line managers from the areas under study. An alternative approach is to assign a team to study one process from its starting activity to its end activities, which may in all possibility extend beyond the organization's external boundaries.

Because reengineering is new and unknown to many companies, companies often enlist the help of consultants. Hiring those who have helped other companies adds valuable experience to the team and brings in an outsider's viewpoint and creativity.

Setting Performance Goals

To determine the level of success of the reengineering project, the performance of the new process must be measured and compared to that of the processes replaced. Circuit-Switched Cellular Index, Inc., a management consultancy, identifies three measures of reengineering benefits: time, cost, and number of defects. A study of 15 of its clients produced an average reduction of 48% in cost, 60% in defects, and 80% in time. Nolan, Norton & Co., another major reengineering consulting firm, recommends the use of a balanced scorecard that measures four dimensions of performance. These measures reflect the structural assumptions of organizations of the future and seek to create shareholder value. The four dimensions are: financial success, customer satisfaction, internal processes, and organizational learning. Goals must be ambitious, radical, and highly optimistic in nature. It is not unrealistic to set performance goals of 50%-60% improvement in cost and productivity or reductions in staffing by one-half. Many reengineering consultants suggest
that lofty goals must be the target of reengineering efforts to create the organizational momentum necessary to depart from the status quo.

**Diagnosing the Processes to Be Reengineered**

With the staffing issues and performance goals determined, the multifunctional team begins an in-depth investigation of the business process selected for reengineering. The diagnose stage is critical because it clarifies the existing process and uncovers hidden pathologies.

**Documenting the Existing Process**

To redesign a business process, the organization must clearly understand how the existing process works. In documenting an existing process, the following criteria must be met:

- Depict the process from start to finish, which may cover several functions, departments, users, and external linkages.
- Identify components of the process (e.g., IS, human, physical, and other process resources).
- Document the performance of the existing process in terms of customer satisfaction, inventory turnover, cycle time, waiting queues, defect rates, activity times, transfer rates, priority rules, and other relevant measures.
- Decompose a large process into a set of subprocesses and assign team members, according to their expertise, to the appropriate subprocesses.

**Using Appropriate Performance Measures**

The participants in a process should be interviewed to reveal the flow of information and linkages. The value added may be determined by the nature of the information being processed, how it is processed, and the resources used during processing. The time required for information processing, moving, and waiting should be recorded to indicate costs and to act as a benchmark against which improved processes can be measured. The performance measures of the existing process should reflect the organization's goals and missions. For example, a leading automotive service chain used revenue quotas as its performance measure; as a result it alienated customers with needless repairs and, ultimately, decreased customer satisfaction and return business. A sound choice of a performance measure based on reengineering principles would have been service quality as evaluated by its customers.

**Uncovering Pathologies**

Process pathologies may be defined as work-flow activities, business policies, bureaucracies, and non-value-added roles that hinder and fragment the overall effectiveness of a business process. To uncover such pathologies, a critique of the existing value and non-value-added work-flow activities should be conducted. For IS personnel, this action involves:
Identifying undesirable sequential activities and unnecessary bureaucratic steps.

- Identifying functional information systems that can be integrated into a single processwide system.

- Questioning the need for various forms, approvals, and reports and identifying all paper float and redundancies.

- Identifying dysfunctional policies and rules, formal as well as informal.

One way of uncovering such pathologies is to graph the performance variables set in the initiate stage for each activity in the current process. For example, if the goal is to reduce time and cost, it is beneficial to draw the incremental costs, elapsed time, bottleneck delays, labor requirements, and other qualitative measures along each activity of the process. Such performance measure charts may be used for comparison with the redesigned process in the next stage, that of monitoring the project, to allow reengineering teams to select the optimal process configuration.

Many organizations use process design tools that generate PERT charts or process-activity network diagrams. Such techniques, which have been in use in manufacturing process design, may be applied in analyzing business processes and their input used to develop simulation models of the process. Numerous products are available that allow the development of unified data, process, and logic models. Reengineering teams can then use these models to create business solutions and specifications for the design and implementation of information systems during the redesign and reconstruct stages.

The Redesign Stage

A business process can be redesigned to achieve performance improvements in the areas of time, cost, productivity, quality, and the amount of committed capital. In pursuing such improvements, the reengineering team should not be bound by existing concepts of organization or process designs. Brainstorming is often promoted to uncover sometimes wildly different procedures that employ IT in ways that increase efficiency and effectiveness. A systematic approach that uses the input from the diagnose stage to eliminate pathologies and that redesigns effective process configurations is described next.

Exploring Alternative Designs

Exploring process design alternatives involves creativity and a radical approach that questions every procedure and principle that currently governs task activities, approvals, and work flow. The reengineering team should develop and investigate alternative process redesign solutions and consider IT applications that may support each alternative. For example, an imaging system for credit transactions and authorizations using expert system and work-flow automation may provide one means for handling forms processing, routing, distribution, and approval. An alternative is to consider a Wide Area Network application tied into the corporate Structured Query Language server to allow immediate approvals online by remote sales personnel.

Each of these solutions entails different work-flow activity, staffing, and cross-functional support. The IS reengineering team members should be continually educating and communicating to fellow team members about the opportunities that IT may provide for alternative designs. The best process design can then be considered before the final
selection of a supporting technology. Without this step, the result could be force-fitting new technologies to existing procedures.

**Designing New Processes**

The key to successful redesign is to constantly question why a certain task is done, what are better ways of doing it, who should be responsible, and which information technology best supports the redesigned process. Most of these questions are answered during the course of uncovering pathologies in the diagnose stage. Fundamental elements that must be considered in selecting the redesigned process include:

- **Pattern breaking.** Breaking age-old principles and rules (e.g., in this company, travel request must be approved at the unit, departmental, and divisional levels).

- **Aligning with performance goals.** Ensuring that the performance goals set earlier are truly aligned with process outcomes.

- **Job assignment.** Designing a person's job around the goals and objectives of the process, not a single task.

- **Elimination of hierarchies.** Replacing bureaucratic hierarchies with self-organized teams working in parallel.

- **Elimination of identified pathologies.** Questioning the activities and roles used simply to relay information if these can be handled with information technology.

- **Improving productivity.** Moving focus from work fragmentation and task specialization toward task compression and integration.

- **Appraising information technology.** Considering the appropriate IT configuration that can support and enable the redesigned process.

Redesign focuses on leveraging time. Processing, transporting, and waiting time may all be improved with a redesigned process and the application of IT. Vast amounts of time can be saved by eliminating multiple approval levels and noncritical control checks, by integrating data processing into the work that produces the information, and by eliminating wait buffers and integrating multiple tasks.

An important redesign possibility involves the substitution of sequential activities for simultaneous ones. This reduces the waiting time involved in processes and can be achieved by applying online data bases and information networks across the process so that concurrent information access occurs at every node.

Separate tasks within processes should be integrated as much as possible into one job description to keep important information from being lost as responsibility transfers across interorganizational boundaries. In redesign, appropriate information, including immediate feedback on performance, should be provided to line workers directly so that problems can be resolved immediately. Through use of IT platforms that support enterprisewide information access, individual jobs can be designed to conduct parallel tasks and to allow workers to make more informed decisions.
Designing the Human Resource Architecture

Reengineering a company is not limited to just its processes; the organizational structure of a business should be considered fair game during reengineering. Indeed, the subunit divisions of an organization should support the processes as much as possible. Reorganizing subunits to minimize unit interdependencies holds potential for reducing costs and improving productivity. Confrontations that consume time and money can be bypassed. Minimizing interdependencies between subunits can be accomplished by improving the alignment of objectives, tasks, and people within a single subunit. Where possible, a designed human resource architecture should support a free exchange of information and a refocusing of decision making and actions at the individual and work-group levels.

Inevitably, reengineering may cause significant change in organizational structure and human resource architecture. The redesign stage should include a human resource component that incorporates the following:

- Redefinition of job titles and positions affected by changes in cross-functional processes.
- Team-based management techniques, such as the establishment of self-motivated teams assigned to specific business processes on the basis of unique skills individuals possess.
- Continual organizational learning through on-the-job training with emphasis on quality, time, and output.
- Performance evaluation based on team productivity and measured by group effectiveness.
- Incentives and reward structures based on group performance and an individual’s contribution to the team.
- Modification of management structures that require managers to be leaders as well as equals to team members.
- Continuous reengineering project communication to all employees who provide feedback on progress.

Prototyping

Prototyping has been widely used in traditional systems development because it creates rapid feedback that helps determine systems requirements. Prototyping techniques are extremely useful for reengineering projects because they can be used to demonstrate proposed redesigns that would otherwise be difficult for people to comprehend. Computer-Aided Software Engineering tools have the capability to develop rapid prototypes. The US Defense Department adopted a comprehensive business process reengineering plan that made extensive use of rapid prototyping. The result: a reconfiguration of existing methods and a reduction of command-wide systems from 80 to 43. Prototypes should be reviewed and evaluated by the reengineering team; they provide management with a vehicle to make judgments toward a final process design choice.
Selecting an IT Platform

Integration, cooperation, ease of migration, adaptability to new technologies, and enterprisewide information access and sharing are factors that influence the selection of an IT platform to support the redesigned process. The IT base must be able to support communication between corporate systems and decentralized divisional systems, as well as tie suppliers, vendors, and customers using wide area network (WAN). The need for cooperation may result in downsizing mainframe-based systems to LAN-based open systems using object-oriented technology. Some reengineering consultants believe that only an object-oriented infrastructure will allow developers to integrate and implement systems fast enough to meet the reengineering time frame.

The critical need for information sharing and access determines the corporate data base design requirements. This may lead to the decision to develop an enterprisewide information architecture or distributed data bases. The IT platform selected must outline hardware decisions (e.g., mainframe, minicomputer, or workstation-based configurations), software decisions (e.g., operating systems), and a data architecture at all levels of systems implementation. It must also detail the appropriate software systems to be implemented at every level—for example, development of a Decision Support System at the executive level and several integrated work-group applications for Transaction Processing. Decisions must be made regarding IT deployment of third-party software, in-house software development kits to support applications development, software reengineering plans, documentation, and training plans. The selection of an IT platform for a particular process can be related to the enterprisewide IT architecture.

Reconstruction

As with any major organizational change, a methodical process should be adopted that takes advantage of small-scale pilot projects, user training, and extensive user feedback. When problems arise in this stage of reengineering, those involved must retain their commitment to the main ideas generated during process redesign yet must be amenable to changes required to facilitate the installation.

Installing IT

A major effort that is undertaken in the reconstruct stage is the deployment of new systems to support new processes.

Downsizing and Software Reengineering.

In the extreme case, the existing systems and technology are replaced entirely with new hardware platforms and application programs. For example, several companies have downsized their mainframe-based information systems with more flexible and cost-effective LANs and client-server architectures.

The second option is software reengineering, which is the process of redesigning and reusing existing system code for migration to more effective hardware and software platforms. A major direction in systems development is the reverse reengineering of object code to produce recyclable source code. This source code may then be used in forward-engineering techniques using Computer-Aided Software Engineering tools for added capability and restructuring of current systems. Software reengineering can help to improve the reuse, redesign, analysis, and performance of software systems.
Several companies have chosen to radically overhaul current systems with new technologies that provide improved connectivity and cost/performance ratios. Migration to LAN-based platforms and groupware applications based on Object-Oriented Design have shown success, and several vendors have developed groupware products based on open systems to allow organizations to develop easily integrated applications.

Reorganization Activities

A crucial element for reengineering success is the design of a new organizational structure consistent with the newly defined process. The human resource architecture outlined in the redesign stage must be thoughtfully executed to minimize any disruption to employee morale. This stage focuses on a smooth transition to a new organization design that incorporates such improvements as subunit reorganization, job rotation and staff reduction, the empowerment of remaining employees through training and educational programs, and in general, improving the quality of work life.

Empowering workers means placing decision points where work is performed—in essence, allowing individual workers to control the process. This basic assumption contradicts traditional bureaucratic theory that states that people doing the work have neither the time nor the inclination to monitor and control their own work performance. Building control and accountability into the work process is accomplished by making those responsible for producing information also accountable for its processing. Properly reorganizing the process and related organizational structure should allow empowered employees to use discretion in judgment and significantly increase the possibility that their work can be a rewarding experience.

Training of personnel in a newly installed process-based environment is critical. Because the major doctrine of business reengineering involves the elimination of functional hierarchies and the development of organizational structures based on processes, team-based management techniques are at a premium.

Performance evaluation takes a new twist as team performance rather than individual performance becomes the primary metric of success. Incentives and reward structures must be redesigned according to group performance. Individual reward structures need to be redefined according to the individual's contribution to the team. The changes brought on by reorganization may cause resentment that must be addressed by continual communication between the reengineering team and employees. In the long term, however, the combined people and process changes should produce an organization better able to change and learn.

Monitoring the Newly Constructed Processes

This stage has two distinct components that focus on performance measurement of the process and quality improvement.

Performance Measurement

To determine the level of success with the reengineering project, new processes must be measured for time, costs, productivity, quality, and capital, then compared to the processes they replaced. To ensure the fulfillment of performance improvements, a wide spectrum of monitoring must be attempted. Several aspects of the organization must be continually assessed and controlled. Examples of hard measures include:
· **Process performance.** Cycle time, customer service, and quality.

· **IT performance.** Software complexity, information rates, downtime, system use, and paper reduction (e.g., through E-mail or an Executive Information System).

· **Productivity indices.** For the performance of employees and production and service operations.

Monitoring should be based not only on such hard measures but also on soft measures, such as morale and customer good will. This multidimensional approach to performance monitoring is essential because of the depth and breadth of the changes caused by the radically reengineered business process.

This all-encompassing scope of performance monitoring requires the attention and active endorsement of senior management and marks a major departure from the technicalities of EDP auditing. The new measure for process outcome is directly tied to overall corporate performance. If thoughtfully and thoroughly carried out, these monitoring and integration efforts lay the foundation for the continuing success of the redesigned process and the further diffusion of the reengineering approach to other areas of business.

**Links to Quality Improvement**

Reengineering goals differ radically from quality programs such as Total Quality Management that aim at incremental gains. The fundamental difference between quality programs and reengineering is the focus on continuous improvement as opposed to goals that are preset before the reengineering project has begun. The monitoring stage provides a fundamental link between the radical focus of reengineering and the continuous incremental improvements of total quality management (TQM).

Continual monitoring of the redesigned processes is essential, especially in the early stages of deployment. There must exist an efficient feedback loop between the monitoring stage and the diagnose stage (see Exhibit 1). Such a loop provides an audit of the performance of the redesigned processes and identifies processes that are candidates for further redesign to adapt to change. It may be necessary to fine-tune certain aspects of the new process and associated IT until acceptable performance gains have been achieved. If the first reengineering project is a success, senior management may direct the reengineering team to focus on another process for redesign.

**Conclusion**

Corporate management is looking for ways to exploit organizational competencies, to regain competitiveness, and to achieve long-term sustainability. Reengineering has captured the imagination of these corporate leaders. IS professionals are being called upon to take part in the challenging assignment of achieving major performance gains. Their participation in reengineering is vital.

Although the need for change is universally recognized, there has been no widely accepted execution plan or methodology available to support such change. The Process Reengineering Life Cycle presented in this article may fill this void. This plan provides the new generation of systems professionals with a detailed framework indicating the stages, roles, and execution guidelines for achieving large-scale organizational change.

**Bibliography**

Author Biographies

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