A Case Study in Business Process Reengineering

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Michael Hammer, a leading proponent of business process reengineering, believes that "as many as 70 percent of so-called reengineering projects fail". This article discusses such a failed reengineering project, analyzes why the project failed, and presents some principles for successful reengineering.

Business process reengineering, the comprehensive examination and redesign of an entire organization or a major organizational unit for the purpose of making order of magnitude improvements in organizational performance, has emerged as one of the hot topics of the late 1980s and early 1990s. Surveys and research conducted by Andersen Consulting and CSC Index Inc. show that reengineering business processes through the creative application of information technology is at the top of the list of concerns of senior information systems executives.

The growing concern over the redesign of fundamental business processes is understandable given:

- product life cycles that are growing shorter
- intense and increasing global competition
- customer demands for improved quality
- significant amounts of money invested in information technology without a corresponding increase in productivity
- senior business executives who have grown tired of continuous investment in information technology without seeing the promised benefits of that investment.

This project was initially conceived as a strategic information system project. However, as project manager I was convinced that little, if any, strategic benefit would result from a project focused on information technology unless the business processes affected by that technology were redesigned to fit with that new technology. We therefore expanded the scope of the project to include redesign of those business processes.

The subject of this case study is a division of a Fortune 500 company. The parent company manufactures and sells both consumer and industrial products. The division manufactures and sells pulp products to the parent company as well as to market customers. The international pulp business is cyclical — a sort of feast or famine business. The project was initiated by senior division management at the bottom of the cycle; pulp prices, revenues, and profits were all down. As a result, division management became very interested in the "promise" of a competitive advantage resulting from implementation of advanced information technology.

Why Undertake a Reengineering Effort?

Organizations undertake reengineering because the fundamental business processes can no longer cope with the demands of elements of the external environment — customers, suppliers, government agencies, and other stakeholders. Objectives to be accomplished through reengineering include any, or all, of the following:

- reduce costs
- reduce cycle times
- improve the quality of output (products, services, documents, information, etc.)
- improve responsiveness to requests from customers
- increase flexibility to enable the organization to more
quickly adapt to environmental changes

- increase the volume of work that can be processed, without adding staff
- develop the capability to perform work of a nature which could not previously be performed.

We undertook our project for the following complex, and interrelated, reasons:

1. Those employees closest to the customer — sales and order-taking personnel — did not have an integrated view of the data related to the order and customer service processes. They could not immediately answer questions from customers regarding:
   - order status
   - inventory levels
   - shipment or delivery dates
   - production schedules.

   They could not rely on computer-generated reports to be accurate. Customer support personnel had to make one or more calls to a plant, or in the case of the foreign offices, to an information intermediary at division headquarters (who then called the plant), to get the necessary information. Answering such customer questions often took two or more work days. Figure 1 depicts the customer’s view of this organization.

2. We were unable to confirm a ship date at the time the customer placed the order. As noted above, sales personnel had to make several phone calls and then call the customer back.

3. Order processing was batch, with no on-line validation. If a sales clerk made a mistake in entering the order, she/he did not find out about it until the next day. The entire order (all information) had to be reentered.

4. Documents sent to customers as a result of the sales transaction, such as bills of lading and invoices, frequently did not match. This frequently led to customers holding payment until the discrepancy was resolved.

5. Warehouse personnel did not have a good “view” into product inventory. Automated inventory records were rarely correct and never trusted. Personnel would often find product that had been moved (hidden? lost?) behind other product and was spoiled because the chemical composition had changed due to age or moisture absorption.

6. Technical support and quality control personnel had a difficult time investigating quality problems since information about the conditions under which a batch of product was made were manually recorded in log books on the plant floor, with no consistent format or data collection conventions.

7. International customers frequently received certificates of analysis (a statement of chemical composition and product quality) after the product arrived. Customers wanted the certificate before they received the product so they could better plan the receipt and usage of the product.

8. Customers did quality acceptance testing upon receipt of the product. They did not (could not?) rely on our product testing because of the uncertain timing of receipt of the certificates of analysis and because of the sampling techniques we applied in product testing.

The Customer Quality Service Project

We formed a steering committee to provide oversight and direction to the project team. This committee was composed of the senior division managers responsible for the departments included in the scope of the project — the controller, marketing manager, MIS manager, domestic and international sales managers, plant manager from the division’s most complex plant, and product development manager. The steering committee was chaired by the marketing manager, who was the overall sponsor for the project.

The steering committee named the project “The Customer Quality Service Project,” a name meant to communicate the underlying purpose of the project: to improve the quality of the total “product” provided to customers — bales of pulp as well as documents, information, and service.

The steering committee established three goals for the project:

- Provide easy access to any required information, by any employee of the organization, wherever that employee was located, in the form that information was required, when it was required.
- Users must love the systems developed by the project. This goal was important for the ultimate acceptance
of the systems, given that the users hated the current information systems.

- The systems developed by the project must give the division a sustainable competitive advantage.

As project manager I determined that the only way to achieve these goals was to expand the scope of the project beyond the development of information systems. Business processes had to be identified, analyzed, and redesigned based on the capabilities of advanced information technology.

**What is a "Business Process"?**

The steering committee adopted the following definition: A business process is a set of interconnected business activities necessary to accomplish a common objective or produce a significant organizational outcome or output.

The "customer" for the output of the process could be either an internal customer or an external (paying) customer.

**Project Approach**

We followed a conventional systems development life cycle approach in the conduct of this project, with three major phases: analysis, design, and implementation.

During the analysis phase we had not yet adopted a business process perspective. We still viewed our world through a functional lens. Five teams, one from each of the departmental functions included in the project scope, studied their respective departments. These teams were led by a functional department manager and were composed of both systems department and "user" department personnel. The five teams were:

- Manufacturing
- Product development
- Sales
- Sales accounting (credit, billing, receivables)
- Distribution.

In addition, we worked closely with a major European customer to better understand its requirements for product quality data. This ultimately led to an electronic data interchange (EDI) linkage with that customer to speed delivery of certificates of analysis.

During the analysis phase, the teams had three major responsibilities:

- To understand current business procedures and systems
- To identify opportunities for improvement
- To determine which opportunities to pursue further and to make appropriate recommendations to management.

At the beginning of the analysis phase, we taught team members to make use of basic total quality management tools including flowcharts, Pareto charts, fishbone diagrams, and histograms.

Analysis teams studied existing information systems, reports, procedure manuals, documents sent to customers, customer complaint reports, and any other available sources of data to help them accomplish their mission. The teams flowcharted all departmental activities. Several processes stood out as notable examples of
what happens when business processes are left to evolve without a plan or goals. We discovered that it took over 80 steps (not including the detailed manufacturing steps) involving all five departments for us to process and fill a customer order! Figure 2 is a summary process sheet for the flow of an order. We also found that process engineers and operators on the pulp mill floor recorded measurements, quality control notes and observations, and other readings in manual log books. They did not follow any standard formats or procedures. In addition, we had automated process control systems that captured numerous setting, flow rates, and other parameters. There were no processes to bring all of this information together from a quality control perspective. When a problem arose, engineers spent much valuable time trying to piece together the conditions under which
the problem batch was manufactured.

The primary recommendations coming out of the analysis phase were:

- To adopt a business process perspective during subsequent project phases
- To design new business processes for order processing, inventory management, shipping and distribution, and quality data acquisition
- To design new information systems to enable the operation of the redesigned business processes.

We identified three major processes to incorporate the business areas identified in the recommendations. Figure 3 shows these processes and their respective sub-processes.

The design phase began with a reorganization of project personnel. Three teams were formed, one for each of the major business processes. Each team was led by a manager from one of the departments included in the scope of the business process. As in the analysis phase, teams consisted of personnel from the “user” and systems organizations.

One of the major mistakes of the project was made at this point: failure to name process owners. A process owner should be the manager who:

- understands the overall operation of the process
- has the most to gain when the process operates in an effective and efficient manner and the most to lose when it does not
- is able to effect change in the process.

In essence the role of the process owner is to integrate the efforts of the organizational units involved in the process. The managers who led the design teams were not given authority as process owners and did not have the background to effectively integrate the departments involved. When process owners were finally named, they did not have a broad enough understanding of the process nor the authority to be able to effect change in the process.

The first major responsibility of the design teams was to design the business processes. In other words, each team had to answer the question: How do we want this part of the business to run? The following steps summarize our approach to designing business processes:

1. Identify the objective of the business process and each sub-process. What should they accomplish?

2. Identify or refine the boundary, or scope, of each business process to be redesigned.

3. Examine the activities included in the process. Does each add value, given the objective of the process? Do all of the activities belong in this process, or are some more appropriately included within the boundary of another process? Activities that do not add value to the process should be eliminated or considered for inclusion in another process. As Levitt so succinctly put it, “Nothing is more wasteful than doing with great efficiency that which should not be done at all.”

4. Where appropriate, determine the sequence in which activities must be completed. Determine what data or material must be passed from one activity to the next in the sequence. Specifications can be developed to document the quality of data or material desired by the receiving activity. We found annotated flowcharts to be a very good tool for process design and documentation.

5. To the extent possible, eliminate paper documents and the movement of paper between activities, individuals, and departments. Paper can be replaced with information technology to make information available to anyone who needs it, when they need it, in the format it is needed, irrespective of where the data reside or where the employees reside. Investigate the use of electronic data interchange or other inter-organizational systems to eliminate the flow of paper documents between your organization and suppliers and customers.

6. Design a feedback control mechanism to ensure that the business process remains healthy; that is, that it continues to operate as intended. This mechanism...
involves measuring targeted output variables and taking appropriate control actions. Targeted output variables are items which can be measured and monitored on a continual basis. When these items move out of a desired range, control actions are invoked to bring the targeted variable back in line or report the situation to a system user for that user to take the appropriate steps.

Harrington suggests four major aspects of the process which should be measured: 1) activities that have a significant impact on total process efficiency and effectiveness and thus affect external customer satisfaction, 2) activities that are not meeting internal customer expectations, 3) activities that require significant resources, and 4) activities that are critical for an individual's job performance feedback.

We developed the following list of variables for use in monitoring the health of our sub-processes:

- Accuracy of sales volume forecast (both short- and long-term forecasts)
- On-time shipment percentage
- On-time delivery percentage
- Age of open orders
- Customer satisfaction (based on formal surveys)  
  - Product quality
  - Product packaging
  - Service
  - Document accuracy and timeliness
- Changes to production schedules
- Inventory accuracy at time of physical
- Inventory age
- Time required to respond to customer inquiries.

7. When designing and implementing new business processes and information technologies, consider which individuals or jobs receive the primary benefit from the technology and which bear the primary cost of the technology. Individuals or jobs which bear the primary cost (such as entering data) should receive the benefit of access to valid, accurate, and timely data. Thus, activities such as data entry should be placed at the source of data capture and use.

Our process design teams found it very difficult to come up with creative ideas. Early attempts at process design looked much like the current state processes. Many team members fell into the trap of thinking that "what is possible is that which already exists" — that our business processes already reflected the state of the art.

We did several things to break this creative logjam and help team members get ideas on how to design new processes that would accomplish the goals set for them. We sent teams composed of users and systems personnel to visit companies that were seen as leaders in customer service and support. We also visited several companies in our industry that had recently implemented the type of systems that we were considering. In addition, we reviewed the functional capabilities of commercial software and discussed how these capabilities might affect our processes. We also held numerous facilitated team meetings to brainstorm ideas on how to improve the processes.

The second major responsibility of each design team was to design the information system(s) to enable the business process to accomplish its objective(s) in an efficient and effective manner. This included use of information technology to enhance coordination of activities and/or personnel within the business process. We felt strongly that the business process should be designed to take advantage of the capabilities of advanced information technology and the information technology should be designed to enable the new business process to accomplish the goals set for it.

After we designed the business processes and the enabling information systems, we evaluated package software. Our intention was to purchase software and modify it to the extent necessary to meet the needs of our redesigned business processes. We used our information system design as the basis for a request for proposals from software vendors. Ultimately, we selected a vendor who made use of a "semi-custom software" approach and who had extensive pulp and paper industry experience. A semi-custom software approach involves a core information system incorporating generic processing logic of relevance to that application, use of logic driven by parameters and tables, and use of rapid application development tools to create the custom system functionality required to implement a specific company's business process.

At this point the project began to flounder. We never did implement the new business processes or
1. Senior management must play a visible role in leading the reengineering effort, recognizing that significant organizational changes may be required to accomplish the objectives.

2. For business reengineering to be successful, the organization must challenge the validity of its fundamental assumptions regarding the external environment (customers, suppliers, markets, government, competition, etc.) and the internal environment (distinctive competencies, products, technologies, structure, processes, etc.). Peter Drucker calls these assumptions the “business theory” of the organization. The business theory must be reengineered to fit with environmental realities; and then business processes can be redesigned to implement the business theory.

3. Customers of and suppliers to the process must be included in the reengineering effort. This applies to both internal and external customers and suppliers. The input of these business partners is essential if the reengineering effort is to be successful. An understanding of customer requirements and supplier capabilities should drive the reengineering team.

4. The owner of a process (or sub-process) should be someone who satisfies the following criteria:
   a. understands the overall operation of the process (or sub-process),
   b. has the most to gain when the process (or sub-process) operates in an effective and efficient manner and the most to lose when it does not, and
   c. is able and authorized to effect change in the process (or sub-process).

5. Business processes and information systems should be designed in tandem, to complement each other. Business processes should be designed with simplicity in mind, focusing on the value added by each step in the process. Information technology should be applied to enable the redesigned business processes to accomplish their objectives.

6. Business processes should be designed so that data are captured only once, at their source. This implies that information support systems should be designed from an integrated perspective, using shared data bases.

7. All personnel should have immediate access to the data needed to do their jobs. Data should be available when needed, and in the form needed, irrespective of where the data are stored or where the people are located geographically.

**Why Did This Project Fail?**

I have identified six major reasons for the failure of this project. First, senior division management failed to provide the leadership required by such an integrated effort as this. They failed to sell the concepts upward to senior corporate management, and failed to gain buy-in and support for the effort, and resulting changes, across the division. While the steering committee should have helped with this, they did not do so. Instead, the steering committee and senior division management attempted to delegate this leadership role to the project manager and process design team leaders. Unfortunately, without strong and visible leadership from the top, reengineering will not happen.

The second major reason for project failure was that we did not involve our external customers. While we did work on a prototype EDI application with one customer, we limited the involvement of that customer to the electronic transmission of quality data. Our senior management determined that our sales force knew enough about external customer requirements to represent their interests. In addition, management did not want to involve customers in the project because such involvement “might raise the expectations of our customers.” While this might sound good on the surface, such thinking is counter to the principles of total quality management, which we were adopting at the same time. In addition, customer involvement is absolutely essential when redesigning the core customer service processes and systems.

The third major reason for project failure was that the wrong people were picked as process owners. The individuals chosen were not at the appropriate organizational level. The owner of the customer service process was a regional salesman in the domestic sales organization. The owner of the pulp supply process was the systems manager for one of the pulp mills. The owner of the process and product data management process was a customer service engineer. These “owners” were not given authority to make decisions about the processes without permission from the functional hierarchy above them. They did not really understand the whole process, only that part in which they had worked. They were not the real process owners.

The fourth major reason for project failure was a loss of a sense of urgency on the part of management. As mentioned earlier, this project was initiated at the bottom of an economic cycle. As the project progressed,
the pulp market improved dramatically. World demand for pulp grew tremendously as the economy improved; yet world pulp inventories were low. Capacity was strained. Prices shot up to record levels and earnings and profits for our division followed prices up. Why invest in the future when you are making record profits and selling everything you can manufacture? Unfortunately, the pulp market is cyclical and the boom was followed by another bust. Recently the division was put up for sale by its parent because pulp prices had dropped 35 percent and earnings were severely depressed.

The fifth major reason for the failure of this project was the “ambassador syndrome.” Process improvement team members had to continually check with others (management and peers) on improvement ideas. Even though management talked much about employees being empowered to make improvements, team members were not empowered.

The sixth, and final, reason for the failure of this project was an inappropriate application of the “Pygmalion” principle. Management frequently made speeches telling employees that we, and our organization, were “the best.” Why would anyone want to change that which is already the best? How can you improve on perfection? Clearly, with over 80 steps required in the order process and an inability to produce a matching set of documents related to the order transaction, we had much room for improvement.

So, what should an organization do to improve its chances of accomplishing the objectives established for a reengineering effort? Figure 4 details what I consider to be the fundamental principles of business process reengineering.

Business process reengineering and the effective assimilation of information technology involve difficult choices and a willingness to honestly assess organizational strengths and weaknesses in light of marketplace realities. Input from external customers is important to such an assessment, but involves significant risk. Dramatic improvements in productivity and organizational performance are within the reach of managers willing to face these challenges. Competitive position and even the long-term viability of the organization are at stake if managers fail to do so.


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