AN EXAMPLE OF A BUSINESS PROCESS ANALYSIS SIMULATION FOR SOFTWARE CUSTOMER SUPPORT SERVICE

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ABSTRACT

This paper begins by discussing business process reengineering [BPR], its rationale and issues and proceeds to business process improvement [BPI]. The concept and need for business process analysis is discussed. Process Charter is introduced as a vehicle for business process formulation, simulation, analysis and improvement. To illustrate the features and operation of Process Charter and its application to business problems an example of the Customer Support process for a typical software development firm is presented.

INTRODUCTION

Many firms have pursued management initiatives to increase their competitiveness by making fundamental changes in how they create value for their customers. I view business process reengineering as a way to improve operations by seeking to eliminate those activities and tasks that add little value to the firm's outputs of goods arid services.

A business process, according to Davenport and Short (1990) is "a set of logically related tasks performed to achieve a defined business outcome." A process can be conceptualized as operating within a traditional function to achieve a narrowly "defined business outcome" or spanning across different, but "logically related" functions to achieve broad, strategically "defined business outcomes."

A process takes an input and uses the company's resources and personnel to produce a specific end-result or output, to either an internal or external customer. In a customer support process, for example, the input most often is a telephone call, and the output, in most cases, is either a resolved technical support problem or an order for a software product. The process might involve personnel from sales, accounting, purchasing, technical support, and/or software engineering -- each providing a piece of information so that the output can be completed.

Once the company's business processes have been identified, the next step is to understand how each process works and to ensure each process operates in a controlled way. (Fisher, 1996). That is, when it is consistently repeatable.

Business reengineering seeks to redesign work processes to enhance productivity and competitiveness. These processes were designed as sequential/manual with a strong efficiency orientation that pushed for optimal procedures and maximum control. Little attention was paid to effects throughout the organization or its customers. As organizations grew more people and procedures were added without modifying or updating these procedures.

As aging manual processes were automated there was an assumption that a degree of improvement occurred as well. In many cases the automated systems merely emulated the manual systems. Fragmented processes were masked by increased processing speed. A fresh examination, such as that provided by BPR, provides an opportunity to rethink the fundamental processes of the firm. Improvement resides in effectively redesigning processes by removing unnecessary activities and replacing archaic processes with cross-functional activities.

BPI is an approach to improve operating effectiveness through redesigning critical business processes and supporting business systems, as opposed to incremental improvement. I regard BPI to be either a subset of BPR or a logical extension. Process Innovation is a redesign of key business processes that involves examination of the fundamental process itself. It looks at the details of the process, such as why the work is done, who does it, where is it done and when. By focusing on examining the process of producing the output, it is an examination of the processes' ability to add value --- the customer focus.

The improvement effort is undertaken to achieve a number of specific goals. These most often include: reducing the overall process cycle time; reducing the overall cost; standardizing a process; integrating independent processes; error proofing a process; improving quality; and last but not least increasing customer satisfaction.

Business Process Simulation and Modeling

Computer simulation is well suited to identifying processing bottlenecks, understanding the dynamics of existing systems, and predicting the performance of new processes (Warren, et.al., 1994). While these activities could be based on intuition and experience, business simulation permits more rigor which could lead to more accurate decisions.

BPR tools are used to create a static representation of a business process. Although it may require several iterations to completely and accurately define the process model, once defined, remains unchanged.

A flowchart of the Customer Service system, for example, is a model. Such a model represents the system from the perspective of whatever is moving through the system (e.g. the Customer making a phone call and receiving assistance). The flowchart describes the series of steps involved and the decisions made when the customer's order is processed or his problem is resolved.

PROCESS CHARTER: A NEW FORM OF SIMULATION

Process Charter is a software product that combines flexible flowcharting tools with the ability to analyze the processes through an internal simulation, presenting statistics in both spreadsheet and graphical formats. Each time a process is modified or simulated, the statistics are automatically updated and stored.

The user first creates a process flow diagram consisting of objects, the elements of the process, connections and the relationships between the process elements. Resources are defined using the spreadsheet feature, which also contains information useful for analysis following the simulation. In the example that follows I employ a hierarchy of sub processes to depict the customer service process.

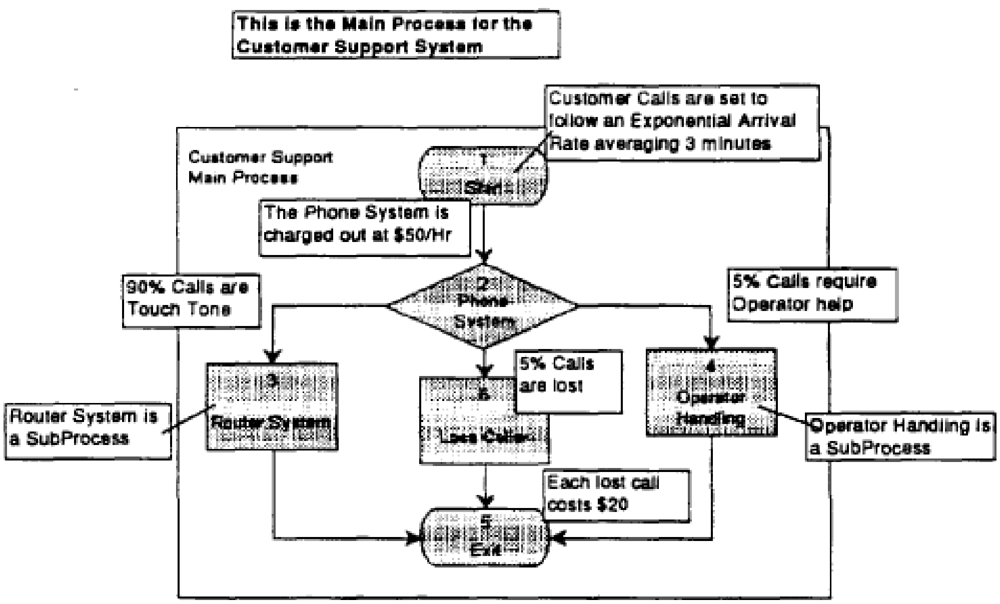
One of the unique features of the program is the live animation feature - the flow to the shapes/objects representing people, paperwork, phone calls and other objects can be seen flowing through the system. This is particularly helpful in visualizing bottlenecks -- these are depicted as red verses green, which indicates a normal flow. Results can also be gathered once a simulation is over. Each object's property folder, its flow, and the spreadsheet contain summary sheets that explain and display the results of the simulation.

A SAMPLE PROBLEM

Customer service-based processes present a major area of application for simulation because total waiting time may be as high as 95 percent of the total processing time in a typical service process (Tumay, 1996). Customer service processes can be telephonic services (call centers), service factories (restaurants, copy centers), service shops (hospitals, repair shops) and retail stores.

Simulation of customer service processes present a unique challenge because both the flow objects and resources are humans. Humans have much more complex and unpredictable behavior than products, documents, equipment or vehicles. For example, customers waiting in a line may balk, jockey or leave. Usually, service activity times are highly variable and customer arrivals are random. Therefore, the use of probability distributions are required for accurate representations.

The simulation process described here is shown in the figure that follows. It focuses on the customer support function for a software development firm. The company produces utility software for a variety of platforms including DOS, Windows, Windows 95, Windows NT, Unix, and Macintosh. Customer service consists of both Sales and Technical Support. Many of the firm's products are sold through re-sellers. They do not sell directly to the consumer market but will accept orders via the phone for products and upgrades. The sales staff support the customer service function by taking orders, and providing product and promotional literature.



The software engineering teams are assigned to specific platforms and on occasions are asked to respond to a customer technical support problem. The technical support team responds to problems related to all problems regardless of the platform. Specialized problems are handled by senior technicians. Typical customer service entry is through the phone system. Recorded messages guide the customer to select the appropriate service. In the event that the customer needs assistance or has trouble a human operator is available to process the customer's service request.

To examine and simulate the customer support problem using Process Charter I begin by constructing a diagram of the main process. It depicts the customer entry into the process via the phone system.

The router is invoked by the customers as they make a key entry. The sub processes include operator, tech support, sales support, call back and operator handling. I have assigned a cost of $50 per hour to operate the phone system. Unlike the lost customer cost, which is a fixed flow cost, the phone system is treated as a machine cost where I can measure throughput, idle time, blocks, queue size, and other statistics of interest.

In the Operator Sub Process the operator interprets the customer's call and decides how the call is to be routed. The routing is passed to some of the same sub processes as the router sub process -- specifically Tech Support, Sales Support and Call Back. I embedded the operator resources in the various sub processes.

The technical support sub process is designed to handle basic and special technical problems. Entry to this process begins with a tech support operator who screens the customer call and decides how the problem is to be routed. I assigned a processing time that is normally distributed with a mean of 2 minutes to this work path. The resources are entered using the spreadsheet folder. For the Tech Support sub process I entered three labor resources -- Tech Support Operator $15 per hour, Tech Support I $18 per hour, and Tech Support II $22 per hour. I assigned the path from the tech operator to the basic problem handler an 80% probability and special problem handling 20%. *if* the Tech Support staff in the path selected was busy (a 50-50 chance) the caller was given the option to wait or to have their call added to a call back list.. In the initial problem setup I assigned one Tech Support Operator, one Tech Support Ito handle basic problems and one Tech Support H to handle special problems. I assigned processing times that were normally distributed with a mean of 10 minutes and 15 minutes to the basic and special problem handling respectively.

The sales support sub process closely mirrored the technical support process with promotional literature and order taking being the two main processes.

Process Charter permits the user to associate a number of different calendars with the simulation. I elected to use the normal calendar (8 to *5* with a lunch break of 1 hour). The system calendar is based on dating and takes into account holidays, weekends, after hour, and any other factors that the user chooses to define.

I ran the simulation for a four-hour period from 8 to 12 on a weekday. As the simulation is running the time and cost are updated. The viewer has the option to see the simulation run, so to speak -- the flow of the customer calls can be viewed through the various paths -- a green color indicates smooth flow and a red color a bottleneck. The results of the simulation are displayed at the end in the form of a total cost.

In this example the total cost was $1009.81. This figure includes the fixed costs for lost calls and all directly charged time. The overall labor cost is not part of the simulation results. Instead the labor assignment is divided into active time and idle time. To view the idle time and more importantly queue size, average wait, active time, and other such factors the user has the choice of looking at any activity or flow at any level.

The properties associated with each of these objects contains three sections within the folder. By clicking on the appropriate tab I can view the summary statistics for the operation or activity. At the parent level this is essentially a summary of the in/out times and costs. At the basic sub process level I can see the exact resources expended and the customer waiting factors. For example, the Router sub process is an intermediate process and does not reflect idle time or customer queue problems. However it does show the total labor cost of *$558* used and the total effort of 34 hours and 41 minutes reflecting the sum of the various labor resources utilized.

To gain a better picture of what is happening within the system the user can examine processes at the basic level. - in this case the summary folder for the basic tech support problem handler activity. Here the cost is $68.84 reflecting the fact that the Tech Support I person was active 3 hours and 50 minutes and idle the rest of the time.

To see the customer queue statistics the user can view the spreadsheet folder. This folder contains sheets for the activities, resources, assignments, key values and flow objects. It shows the most telling statistics here. There is a significant problem with the basic problem handling activity. The average wait is 24 minutes with a maximum wait of 1 hour and 4 minutes. Obviously there is a significant problem there that needs to be addressed by assigning additional resources to the activity.

To illustrate the value of a process simulation whereby the user can change the setting of resources or activities and view a different scenario, I decided to assign a second Tech Support I person to the Basic Problem Handling and reran the simulation. In the second run the total cost of the process $1,136.04. The basic problem handling was reduced to an average wait of 7.7 minutes with a maximum queue of 4 and maximum wait time of *19.55* minutes.

CONCLUSIONS

The mission critical aspects of an organization must be taken into account -- we need to focus our process analysis on those processes that can affect or improve the value of our product or service. Simulation provides a forum for continuous process improvement. The modeling and approach presented and used with Process Charter establishes a database that reflects organizational objectives, procedural structures, performance indicators of key operations, and a dynamic model of the organization. This model could provide a baseline for future business process analyses.

Business processes describe how we work. Any company that ignores its business processes or fails to improve them risks its future. Companies can use many different approaches to process improvement without ever embarking on a high-risk reengineering project. (Davenport, 1995)

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