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BUSINESS PROCESS MODELING WITH SIMPROCESS

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ABSTRACT

This paper gives an overview of business process modeling with SIMPROCESS, its applications, unique features, basic and advanced modeling constructs, and benefits.

1 WHAT IS SIMPROCESS?

SIMPROCESS is a hierarchical and integrated process simulation tool that radically improves your productivity for process modeling and analysis. SIMPROCESS is designed for BPR and IT professionals of industrial and service enterprises who need to reduce the time and risk it takes to service customers, fulfill demand, and develop new products.

Unlike other tools, SIMPROCESS integrates process mapping, hierarchical event-driven simulation, and activity-based costing into a single tool. The architecture of SIMPROCESS provides an integrating framework for ABC. The building blocks of SIMPROCESS, namely processes, resources, and entities (flow objects), bridges ABC and dynamic process analysis. ABC embodies the concept that a business is a series of inter-related processes, and that these processes consist of activities that convert inputs to outputs. The modeling approach in SIMPROCESS manifests this concept, builds on it by organizing and analyzing cost information on an activity basis.

2 HOW DOES SIMPROCESS WORK?

SIMPROCESS uses four easy steps to model your processes.

2.1 Step #1. Create Process Model

Creating a process model using SIMPROCESS is as easy-as 1-2-3. First, you graphically select activities and processes from the tool palette and link them using connectors to define the process flow. Second, you define the entities (or flow objects) and resources used in the model. Third, you customize the behavior of your model and create a realistic model of your business process by filling in the dialog boxes.

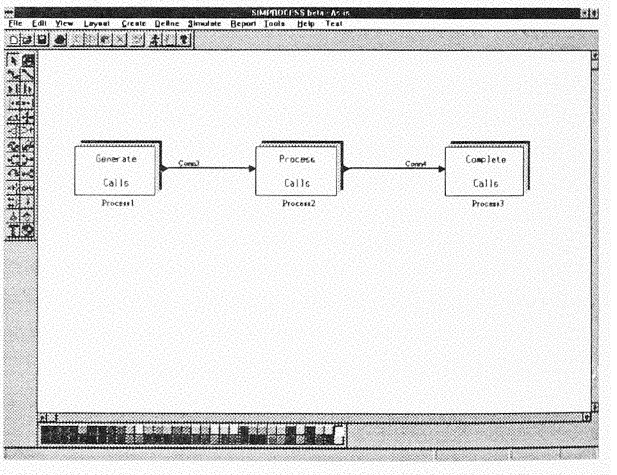

Figure 1: Create Process Model

2.2 Step #2. Simulate The Process

Before simulating your model, you select the performance measures of interest. For example, you may be interested in throughput and cycle time reports for entities, activity costs for processes, and utilization reports for resources. When you run the simulation, SIMPROCESS automatically verifies your model and begins advancing the simulation clock. During the simulation, SIMPROCESS provides you with an animated picture of the flow that helps you visualize your process in motion. You can also have SIMPROCESS generate real-time graphs, letting you view key performance measures, during the simulation.

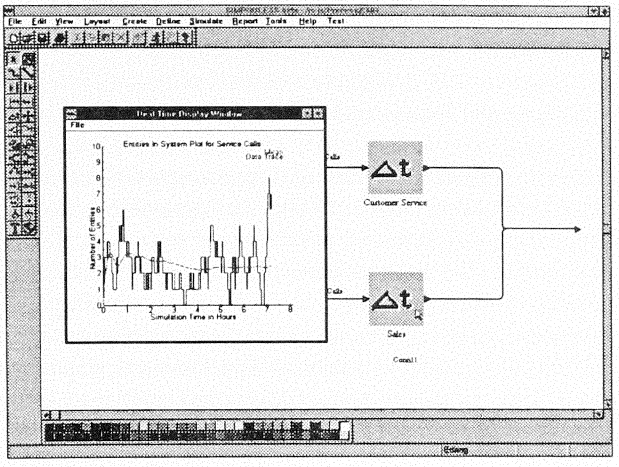

Figure 2: Simulate the Process

2.3 Step #3 - Analyze the Results

When the simulation is over, you can bring up your model results and analyze the performance measures of interest. In addition to the automatically generated cycle time, throughput, waiting time, resource utilization and cost reports, SIMPROCESS allows you to generate custom reports for tracking service levels or in-process inventory. All SIMPROCESS reports can be viewed in graphical or tabular form, and printed or exported to other software packages.

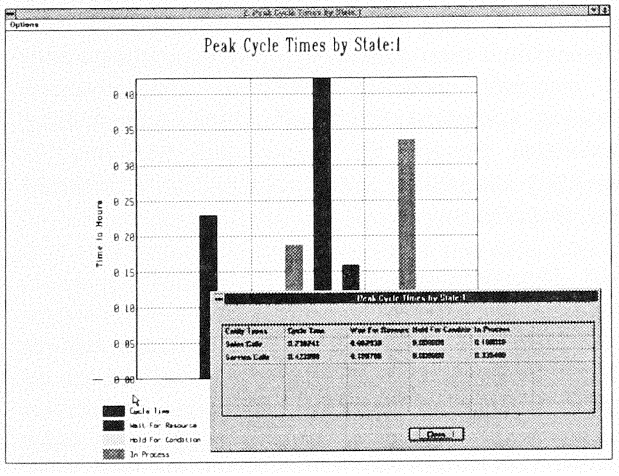

Figure 3: Analyze the Results

2.4 Step #4. Evaluate "Alternatives"

The primary purpose of using SIMPROCESS is to evaluate alternative business decisions. To facilitate this important decision support activity, SIMPROCESS provides two unique functions called "Alternative Sub-processes" and a "Design of Experiment". The "Alternative Sub-processes" function allows you to create alternative representations of a business process utilizing its object-oriented interface. The "Design of Experiment" allows you to define which parameters you wish to experiment with or compare. Using these powerful functions, you setup your business alternatives and let SIMPROCESS do the rest. When your simulations are run, you can compare the alternatives and choose the one that maximizes your service levels and profits.

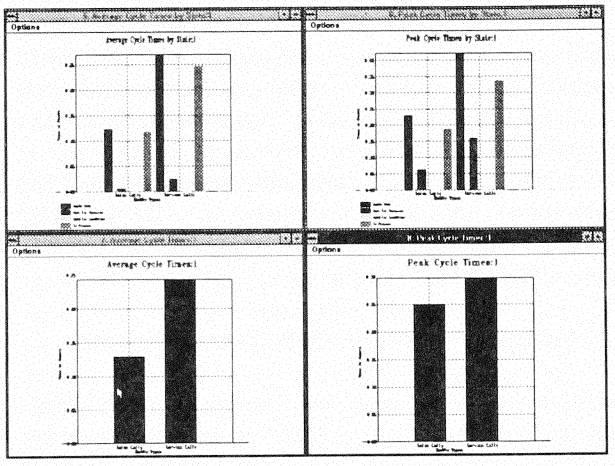

Figure 4: Evaluate Alternatives

3 WHAT MAKES SIMPROCESS UNIQUE?

SIMPROCESS is the first integrated tool that is specifically designed for business process modeling and analysis. SIMPROCESS combines process capture and event-driven simulation with activity-based costing. Here are some of the other features that distinguish SIMPROCESS from other modeling and analysis tools.

3.1 Hierarchical, Event-driven Simulation

A key distinguishing feature of SIMPROCESS is its hierarchical process modeling capability. SIMPROCESS is based on CACI's breakthrough simulation technologies MODSIM and SIMOBJECT. These underlying technologies provide hierarchical and event-driven simulation capabilities that had been previously unavailable for modeling large scale applications.

Unlike the hierarchical representations of processes using attached diagrams or files, SIMPROCESS offers

true hierarchy based on object-orientation. This enables you to decompose a process into as many levels of detail as required. The Process construct allows you to create the hierarchy. A process may have several sub-processes and activities. For example, an inspection process that consists of a BRANCH activity and two DELAY activities can be defined as a hierarchical process template.

3.2 Activity-based Costing

The breakthrough activity-based modeling paradigm and resource constructs of SIMPROCESS offer a natural fit for its powerful activity-based costing engine. Activity-based costing is designed into SIMPROCESS, unlike other simulation tools, giving you automatic cost reports. One of the major challenges in successful implementation of ABC is finding the appropriate level of detail for the business process analysis. The organization of business processes is critical to reorganizing the cost data into activity pools. The hierarchical modeling approach of SIMPROCESS facilitates this organization and accommodates varying levels of detail for ABC analysis.

3.3 Methodology-independent Process Modeling

Some of the process modeling tools force you to learn a new methodology such as IDEF or systems dynamics. SIMPROCESS provides you with a flexible process modeling environment that is adaptable to any methodology that you choose. The process documentation features of SIMPROCESS are far superior to typical flowcharting or simulation tools because it is specifically designed for business process modeling and analysis.

3.4 Activity-based Modeling

SIMPROCESS utilizes a breakthrough activity-based modeling paradigm. Activity modeling constructs are the objects at the lowest level of the SIMPROCESS hierarchy and they are used for modeling the behavior of a process. Activities are non-decomposable. The default SIMPROCESS palette bar contains 18 built-in activity blocks: Generate, Dispose, Delay, Assemble, Branch, Merge, Batch, Unbatch, Split, Join, Transform, Copy, Gate, Assign, Synchronize, Get Resource, Free Resource, Replenish Resource. These activities can be connected or embedded into processes using simple flowcharting techniques making process documentation quick and meaningful.

In addition, you can create your own re-usable activity templates and add them to your palette bar. You can even customize these built-in activity blocks to represent the operational characteristics of your own business processes.

3.5 Powerful Resource Modeling Constructs

Accurate resource modeling requires model building blocks that allow you to define the hierarchical, shared and consumable behavior of real-world resources. In the real world, the performance of business processes is usually constrained by the limited availability of resources or by resource interdependencies. SIMPROCESS allows you to define the costs, capacity, usage, and interdependencies associated with resources. It automatically keeps track of the resource's utilization and costs.

Another unique aspect of SIMPROCESS is its ability to represent the hierarchical nature of resources using Departments and Workgroups. Schedules and Downtimes can be modeled to mimic the dynamic behavior of resources.

3.6 Advanced Modeling Constructs

Most BPR tools that provide simulation functionality use simplistic modeling constructs. When modeling the dynamics of real-world business processes, powerful functions such as attributes, expressions, system variables, and IF-THEN-ELSE logic are needed. SIMPROCESS provides these advanced modeling functions and eliminates the limitations of simplistic tools. Advanced modeling functions are very important for realistically modeling the complex behavior of business processes. These functions of SIMPROCESS differentiate it from other BPR tools that are based only on simplistic modeling functions. The advanced modeling functions combined with programming capabilities provide the power and flexibility to accurately analyze the dynamic behavior of real-world business problems.

3.6.1 User-defined Attributes

User defined attributes allow you to attach tags to entities that travel through the model. Attributes can be used for conditional branching, sequencing, or decision making in expressions or logic. For example, order quantity may depend on which customer the order came from. Furthermore, order processing time may depend on the size of each order. By defining an attribute named "order quantity" and writing an expression that multiplies "order quantity" by "process time per order," you can accurately model the order processing delay activity in your model.

3.6.2 System Attributes

These variables keep track of the states of model elements so that expressions or logic can be written to deal with complex business situations. For example, the number of customers waiting for a service representative is a system-state variable that changes over time. In a typical service process, the number of servers would be increased if the customers in line reach a certain number.

3.6.3 User-defined Expressions

When modeling real-world business processes, you will inevitably come across situations which will require modeling functionality that is not built-into a BPR tool. SIMPROCESS provides you with the capability to write user-defined expressions and use them for modeling or customizing the performance measures. For example, service level may be an important performance measure for a business that is trying to fulfill orders within a 48 hour window from the time orders are placed. Using global variables, user-defined attributes and user-defined expressions, you can compare the cycle time for each order with the 48 hour target and calculate the service level of the process.

3.6.4 Built-in Programming Environment

Although the built-in functionality and the ability to customize models with attributes, expressions, and distributions offer plenty of power for modeling most business processes, there may be situations where you will need added flexibility that can only be achieved by a programming environment. For these complex business process applications, SIMPROCESS gives you a built-in, C-like programming environment.

3.6.5 Built-in & User-defined Distributions

SIMPROCESS provides you with 14 standard probability distributions and allows you to create your own empirical distributions based on raw data. One of the unique features of SIMPROCESS is its built-in data analysis (curve fitting) function. This capability allows you to feed a number of data points into the software and get the distribution that best represents the data set.

3.6.6 Reusable Modeling Templates

SIMPROCESS lets you create reusable templates from its basic building blocks and activities. For example, you can define an inspection process template using three SIMPROCESS activity blocks such as DELAY (inspection activity), BRANCH (probabilistic outcome of inspection), and DELAY (rework activity). Then, you can attach an inspection icon to represent this process on the palette and save the inspection template in a library file. Every time you need to model an inspection process, you simply load the library, click on the inspection icon, drop it in your model diagram, and double-click on it to customize its parameters. One extremely powerful use of this feature is in creating templates that represent the operational behavior of automated process equipment.

Customized libraries can be made available to a cross functional team for reuse. This capability is a tremendous advantage for organizations that want to capture and maintain the most valuable asset of a business -- the process knowledge.

3.6.8 Event Logs

Event logs are built-in features for tracking custom performance measures. Timestamp event logs can be used for monitoring statistics such as makespan and in-process inventory. Recorder event logs can be used for monitoring statistics such as arrival and departure rates.

3.7 Comprehensive Statistical Analysis

SIMPROCESS contains a comprehensive set of statistical tools. This suite of tools can be used to fit input data to a distribution, to design and run experiments, and to analyze the results from multiple simulation runs. They are fully integrated into the SIMPROCESS modeling environment so that you can conduct extensive analysis within a single tool rather than multiple software products from multiple vendors. You do not have to be an expert in statistics to take advantage of these sophisticated capabilities.

3.8 Design of Experiments

The Experiment Manager is an integrated tool for designing, executing, and analyzing statistical simulation experiments with SIMPROCESS. This tool facilitates the "what if" analysis by systematically modifying the factors that impact the performance metrics and evaluating the results on those performance metrics. For example, you can set up 6 experiments where the number of available resources are varied from 5 to 7 and the interval between calls are varied from Light to Heavy for a Help Desk. This approach ensures that you perform a complete analysis of the business processes and minimizes the time to find the optimum solutions to the business problems.

3.9 Data Analysis Tool

The integrated Data Analysis tool is powerful function to analyze data and select the best distribution to fit that data. For example, the random nature of calls arriving at a Help Desk or the random nature of processing times

can be captured by the Data Analysis tool and represented in your SIMPROCESS model. By modeling the data and representing the randomness associated with the data, you are more likely to increase the accuracy of your process analysis.

3.10 Multi-platform Support

SIMPROCESS is one of the few BPR tools that runs under Windows 95, Windows NT, and UNIX operating systems. Your models are fully compatible across platforms—giving you the flexibility to run large simulations on faster computers and take advantage of your existing hardware. As hardware and operating system technology moves forward, SIMPROCESS will take advantage of them and protect your investments.

4 SIMPROCESS APPLICATIONS

SIMPROCESS provides a rich array of integrated functions for modeling and analysis of business processes. From customer service to product development, from administrative to production processes, for every business process, SIMPROCESS allows you to visualize and evaluate the results of process changes before you commit expensive resources, time and money. Below are three applications where SIMPROCESS was used for effective business decisions.

4.1 An Order Fulfillment Application

A major Fortune 100 industrial enterprise was faced with a problem in one of its computer products business due to high inventory and low service levels. The proposed solutions included reduction of channel inventory and building product to order. SIMPROCESS was used in the reengineering project that resulted in a 50 percent reduction in inventory and a 63 percent increase in service level.

4.2 A Licensing Process Application

A State Government hired CACI to help reengineer its business processes that suffered from long service time and high cost per transaction. The proposed solutions included implementation of an automated workflow and imaging system as well as a full service counter. SIMPROCESS helped analyze the alternative solutions that increased throughput time from 80 days to 56 days, and reduced cost from $70 to $46 per transaction.

4.3 An Engineering Change Order Application

A major European automotive manufacturer was trying to shorten the time required for design changes in its product development process. The design changes originated in Europe and were implemented in South America. The business processes involved resources from designers to process engineers to purchasing agents. First, SIMPROCESS was used to create process maps and simulations of the AS-IS process. Then, TO-BE alternatives including policy changes and workflow automation were simulated to determine impact on cycle times.

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MAYA BINUN is a software developer for CACI Products Company in La Jolla, CA. She holds a BS degree in Chemical Engineering from Caltech and an MS degree in Engineering Sciences from UCSD. Prior to coming to CACI she has spent 5 years as a Process Engineer in pharmaceutical industry. Her efforts at CACI have been directed towards making SIMPROCESS an industry standard for business process simulation.