Proceedings of the 1998 Winter Simulation Conference
D.J. Medeiros, E.F. Watson, J.S. Carson and M.S. Manivannan, eds.

APPLICATION OF BUSINESS PROCESS MODELING AT TIMBERLAND

Dan Grosz

Timberland Company
200 Domain Dr.
Stratham, New Hampshire 03885, U.S.A.

ABSTRACT

Process modeling and simulation was introduced to the Timberland Co. in order to help improve the company's increasingly complex and cross-functional business processes. Two case studies are mentioned, the sample room and EDI purchase orders. Process simulation was able to show the impact of different resource levels on sample room cycle times and helped convince management to hire additional staff to meet anticipated demand. The simulation also illustrated second and third order impacts of resource changes not anticipated by experienced managers. Simulation of EDI purchase orders was able to identify key "as-is" process issues and quantify process behavior. A number of initiatives were launched to address these. In both cases there were people issues to consider, ranging from training staff to properly build and analyze simulations to getting middle-management buy in. Results show the technical usefulness and power of good simulations while at the same time paying close attention to "softer" change management questions.

1 INTRODUCTION

The Timberland Co. designs, develops, engineers, markets, and distributes premium quality footwear for men, women and children and apparel and accessories for men and women under the Timberland brand name globally. Current sales are $821 million annually with sales growth averaging almost 25% per annum since 1993. Rapid growth is placing increasing stress on key business processes such as product development, manufacturing, the supply chain, and distribution which were implemented at a time when the business was not only much smaller but also far less complex. Using the Micrografx Optima process modeling and simulation tool, Timberland is beginning to identify key process issues and generate ideas for reengineered processes.

The tool is allowing managers to understand the dynamic behavior of complex, cross-functional processes and is providing answers to questions previously only vaguely understood: identifying key process bottlenecks, cost drivers, and activity-based costs. Additionally, running multiple simulation scenarios of the same process is showing promise in pinpointing, and hopefully avoiding critical process breakdown points.

Full implementation of the tool and Timberland's process modeling and simulation methodology is still a work in progress. The company's culture and history is not immediately receptive to the time, effort, and discipline required. However, by adopting a flexible approach, partnering with business users on a one-by-one basis, and demonstrating success, steady progress is being made.

2 CASE STUDY A: MODEL SHOP

Product development is one of the most important business processes at Timberland, and the ability to produce new footwear samples efficiently and in a timely manner is key to the entire process. With the rapid expansion of Timberland's sales and the growth of the company's new performance line, the ability of the model shop to keep up with demand became a real concern. The model shop is in effect a miniature shoe factory located at company headquarters that produces samples from basic materials on a customized basis. Completed samples are then sent to factories and are the basis for actual production. Basic model shop operations include leather cutting, prefitting, lasting, stitching, making, and finishing packaging.

The model shop was run by a manager with many years of experience in the shoe business. When faced with anticipated sample volumes forecast, he became concerned that existing model shop resources would be inadequate to meet expected demand. However, he had a hard time convincing senior management that this was a real issue.

Senior management decided that a process model and simulation of the model shop should be constructed as a way to validate the model shop manager's concern. However, being an "old shoe dog" the manager was initially very skeptical about the ability of a computer model to represent quantitatively a world that he knew instinctively.

To assuage the manager's concern, a detailed base line process model was constructed. Historical work volumes were fed in and the results compared to the manager's expectations. The model also had to account for the multiple construction types passing through the model shop, each having slightly different manufacture steps.

When the simulation was first run however, initial resource utilization data did not jibe with the manager's expectations (based on his observations of how busy his staff were rather than on quantitative data) but the model was carefully inspected to see if any task work tasks or schedules were improperly modeled. When several errors in the model were found and corrected, the manager's confidence level began to grow accordingly, especially as the simulation results were now jibbing more closely to his expectations. After several iterations, the manager began to actually take ownership of the model.

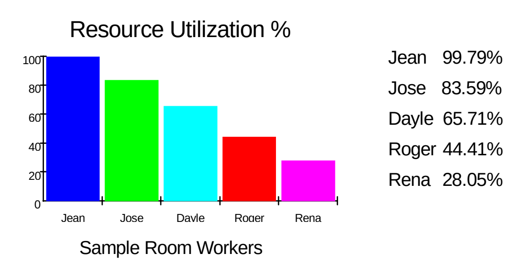

Figure 1: Resource Utilization Rates for "as-is" sample room

It is interesting to note that most managers expect utilization rates (total time working/total time available for work) for resources under their management to be highly utilized as a norm. For example, simulation results that show 75% utilization rates tend to elicit concern from inexperienced business users. In my experience most office workers are fairly utilized in the 75-85% range. This is because people are not machines and tend to take quick breaks, receive phone calls, and spend some percentage of time in unscheduled activities (such as exchanging company gossip). It is also worthwhile to note that any simulation will have some error, typically due to invocation of the 80/20 rule, where additional effort spent on constructing a more precise model is simply not worth the result. All this has to be carefully explained to business users for them to feel comfortable with the results.

The next step was to run forecast volume data through the simulation. To the model shop manager's delight, the simulation did confirm his intuition, and clearly indicated that a new stitcher (in addition to Jean) would have to be hired if bottlenecks were to be avoided Moreover, after a

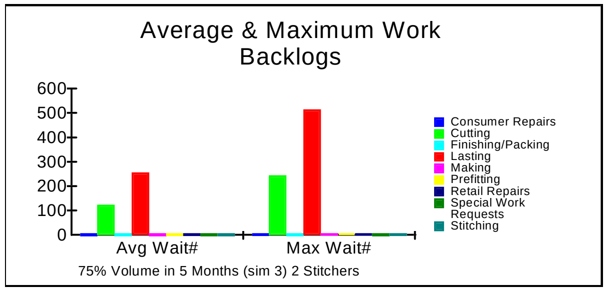

Figure 2: Backlog rates for sample room with additional stitcher shows backlog of work now accumulating at the laser/cutter

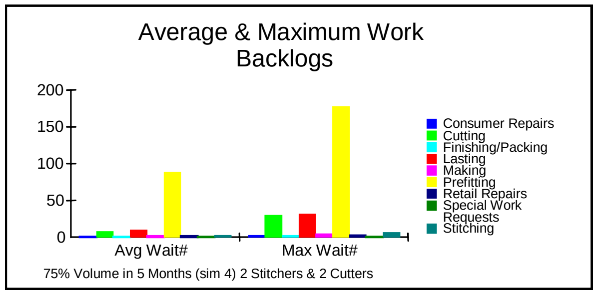

Figure 3: Adding an additional laster/cutter resource begins to reduce backlogs

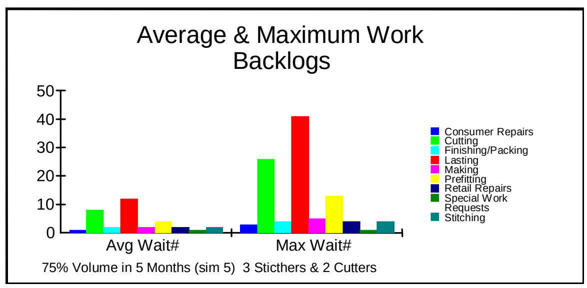

Figure 4: Increasing the resources by one additional stitcher (3 total) reduces backlogs even more

new stitcher was introduced into the simulation, the data showed that another downstream resource—the lasters/cutters (same resource does both jobs)—would now become a new bottleneck. The manager had not initially anticipated this second order impact. As shown in Figures 2-4 above, the simulation allowed us to play with various resource combinations in order to reduce anticipated backlogs to acceptable levels.

Over 60 simulations were eventually run using different resource/volume scenario combinations (see Figure 5). The result was a process sensitivity analysis that shows when a particular resource level becomes inadequate to support a given volume level. This kind of sensitivity analysis shows promise for any process analysis. As illustrated in Figure 5, the scenarios differed by production rates and resources. The graphs indicate that for each scenario, there is a point at which average cycle times grows disproportionately as a function of production rates. The results show that for the Timberland sample room, 3 stitchers and 2 cutters were needed to meet anticipated "surge volumes" of demand within acceptable cycle times.

3 CASE STUDY B: EDI INBOUND POs

Electronic (EDI) purchase orders constitute a sizable portion of all wholesale orders processed by Timberland. The orders are transmitted via standards based electronic messages and then picked up and processed by customer service representatives from their electronic mailboxes.

EDI has the potential to significantly reduce both Timberland's customer service lead times as well as the costs involved in processing orders. However, the EDI story only begins as orders are received. They still have to be processed, reviewed for exceptions and then passed on Timberland's order processing and distribution systems.

Exception processing of EDI orders makes a big difference in how well orders are fulfilled as well as how much it costs Timberland to process them. However, no hard data existed at Timberland by which the EDI purchase order process could be evaluated.

Consequently, a process model and simulation project was commissioned for this purpose. The project was interesting in that it was also used to train Timberland's EDI manager in process modeling and simulation. Quite a bit of work was involved in building the model.

Customer service reps at Timberland are very busy and it was difficult to get their time. Additionally, the EDI manager was not familiar with the precise, detailed work that needs to go into a good process simulation. He was sometimes frustrated in trouble shooting the model for errors, a process that is essential for validating a baseline model. In particular, as the model grew to several hundred process steps, scanning the model to find the specific problem point was challenging. However, with Optima's diagnostic capabilities and a learning what to look for, the EDI manager quickly came up to speed.

Before we presented our findings, we asked customer service managers 6 basic question relating to how they currently process EDI purchase orders:

1) On average, how many hours per day do individual CSRs spend on processing EDI orders?

2) On average, how much does it cost to process an EDI purchase order? How much is spent on an annual basis?

3) On average, how long does it take to process an EDI purchase order (i.e. make it shippable)?

4) What are the top 3 (EDI) cost drivers?

5) What are the top 3 potential bottlenecks in the current process?

6) If EDI orders increased by 70% next year, do we have the staff to handle the additional volume?

Their answers truly surprised us: they couldn't answer a single question. They did not even want to guess.

The process model and simulation was able to provide detailed answers. We had suspected that EDI orders were getting bogged down in back office "exception processing" activities but we were again surprised by the small percentage of clean orders, the extent of duplicate efforts, and the lack of cross functional coordination in handling complex issues. An example of a complex issue is when an EDI purchase order is kicked out because of a "special event" price (e.g. a sales promotion for a certain SKU) shown on the purchase order but not correctly set up in our customer order system. This requires a number of interactions between customer service, IS, and sales planning functions to resolve and could take up to two weeks. Furthermore, the process model and simulation showed a number of process areas where incomplete or incorrect orders are simply kicked out of the system and no effort at recovery is made. We rely on customers to re-submit orders.

As a result of the information provided from the process model and simulation, we were able to prioritize 3 projects that were directed to reduce cycle time by 50% as well as significantly reduce processing time and costs. These projects are still in process.

It is also interesting to note that the discussion of process issues stemming from analysis of the model resulted in no squabbling or finger pointing. Because we had detailed quantitative process information that was developed in collaboration with the people that actually did the work modeled (they signed a validation cover sheet before we considered the model complete), the results were universally accepted as fact-based and non-politically motivated.

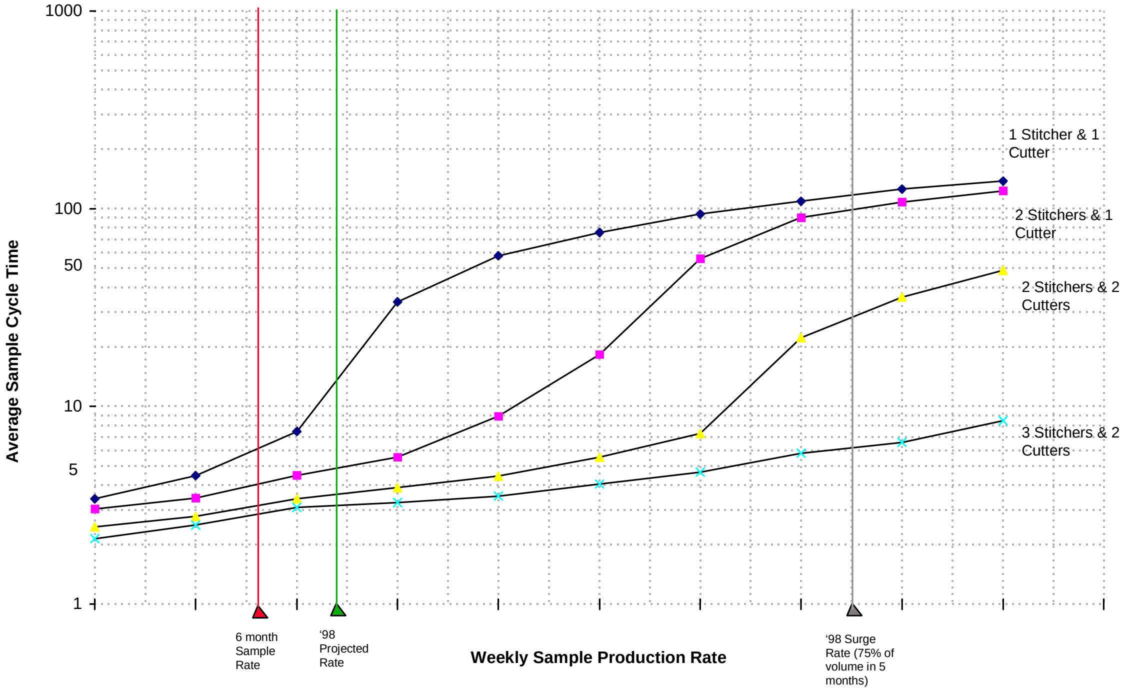

Figure 5: Results of 60 Simulations Showing Cycle Time Results for Each Simulation Scenario.

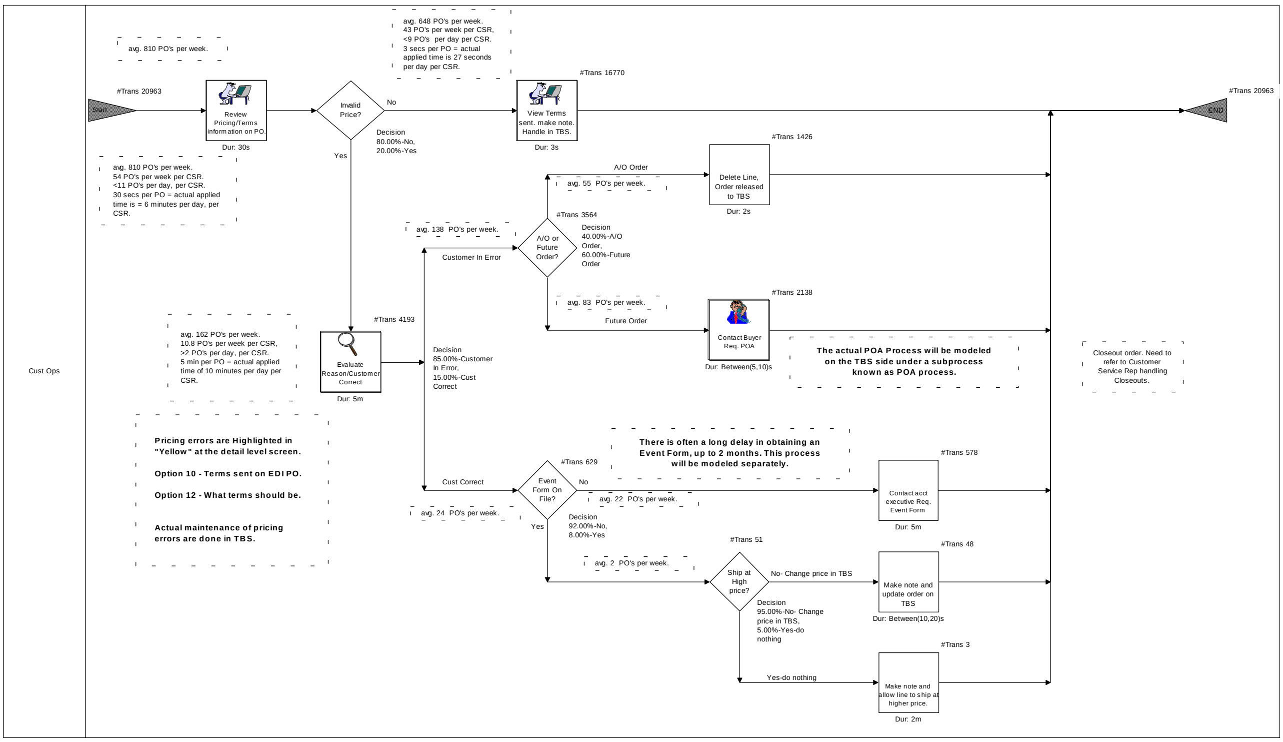

Figure 6: An example process from the EDI model which shows the complex processing involved in resolving an EDI purchase order that gets kicked out of the system as a faulty PO with pricing/terms issues.

4 OBSERVATIONS AND CONCLUSIONS

Currently there are about 10 regular Optima users at Timberland. Over 90% of the models being built are solely process models without simulation. However, initial success with the two case studies mentioned above has made an impact.

There are a number of hurdles yet to overcome. Process modeling and simulation is very resource intensive. The business resources required are inevitably in high demand because of their process expertise. Managers are reluctant to pull them away from critical business activities.

Second, the wealth of quantitative information provided by a good simulation can easily overwhelm traditional managers, who typically like to make decisions based on intuition rather than empirical data. These managers often also have concerns about loosing face if the simulation highlights gaps in their management capability.

Finally, the skill set needed to build and use process simulations is not one typically found in a company like Timberland. Consultants can always be brought in, and sometimes are, but they lack in specific business expertise. The best choice is to train experienced in-house resources but this takes time and effort. Both the model shop and EDI managers adapted well to the Optima tool but this may not be expected in every instance.

For the time being, process modeling and simulation is loosely supported by the central Timberland IS organization. As the tool becomes a standard part of IS and business methodology, a discrete business engineering unit may be set up. Already, Timberland's internal audit group which is often called upon to do extensive process audits has started to use Optima as a standard part of its tool set.

Further out, the skills needed to build and analyze a process simulation could be used to train managers how to run the business. For example, during the simulation validation phase, considerable effort goes into troubleshooting a model to find out which specific activities were not modeled correctly. A task may have too much work time causing a bottleneck in the simulation that is not reflected in reality. As a complex model may have several hundred tasks as well as many dozens of resources, techniques developed to trouble shoot a simulation for validation purposes could potentially also be used to troubleshoot and correct an actual business process. Once a valid model is in place, it can be scrutinized to find over utilized resources, bottlenecks, handoffs, etc. I believe that users trained in working with complex simulations will be able to zero-in on these far more quickly and accurately than those lacking these skills .

BIOGRAPHY

DAN GROSZ is director of business systems planning at the Timberland Co. Mr. Grosz has 18 years of international business experience at Bank of America, Coopers & Lybrand, and Xerox. His interests include process modeling & simulation, object oriented business engineering, IS enterprise architecture, supply chain, and project management. He has an MALD from the Fletcher School of Law & Diplomacy at Tufts University and a BA from Boston University.