Proceedings of the 2009 Winter Simulation Conference
M. D. Rossetti, R. R. Hill, B. Johansson, A. Dunkin and R. G. Ingalls, eds.

COMMUNICATING WITH MANAGEMENT ABOUT THE BENEFITS OF BUSINESS PROCESS SIMULATION

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ABSTRACT

While good simulation methodology is a necessary condition for the success of simulation projects, such projects cannot even begin unless the modelers successfully communicate benefits to management in advance of starting the work. Managers are reluctant to commit resources, especially the precious time of their own staff, unless they have hard evidence that they will see clear improvements to their business performance. This paper describes the challenges and strategies that can be helpful in communicating with managers. We report on a specific situation in which we used the strategies and succeeded in that communication process.

1 INTRODUCTION

Maybe the most unusual feature of this paper is that we are not at liberty to reveal the name or business of the client for which this work was done. As an alternative, we describe the type of work that is done by this organization and, as much as we can without revealing the specific organization, the major business challenges facing this organization. To simplify discussion, we refer to this client as Orgex (as shorthand for Organization X).

Orgex has a large operational challenge to perform the review of applications for a specific type of benefit or service. Orgex receives approximately 7 million new applications annually. The applicant submits a paper application form along with various forms of background materials and evidence that are used to determine the outcome of that application. Except in a very small number of cases, the entire process is paper-based. Orgex creates a paper file when the application arrives, and it then moves that paper file through the system, including the work of transporting carton loads of paper files from one facility to another throughout the country at various stages of the process. Every Orgex facility has large storage rooms full of files on racks and racks of shelves. In many cases, the files are moved from one location to another location within the same facility as that application winds its way through the decision process. The process is much slower than it needs to be, and is certainly not the state-of-the-art in such decision processes in other organizations.

Orgex came to the conclusion that it needed to transform its business. The primary drivers behind this decision were to lower the cycle time for decision-making (and the related "backlog" of cases in the system), to lower costs, and to reduce staff. Moving to a fully electronic system was the obvious solution, and this transformation is basically the creation of a case management system that will eventually eliminate all of the paper that currently drives the process.

Among the questions that Orgex wanted to answer were:

1. Which parts of the transformation (technology, process changes and/or people changes) needed to happen first?
2. What are the expected improvements in performance? (measured in the standard performance metrics such as cycle time, backlog, variation in cycle time, etc.)
3. How much can the organization expect to save in reduced manpower costs?

We needed to convince Orgex management that it was worth their while to expend time and resources to answer these questions by building a discrete event simulation model. As those familiar with such projects know well, substantial data is needed to drive such models. At the outset there was little or no administrative data, but there were some experts in the process who could be relied upon to provide reasonable judgments about key data items (individual cycle times, intermediate outcome distributions, number of resources currently assigned to various tasks, etc.) Therefore, the basic approach we took was to build a "quick and dirty" prototype model with totally subjectively obtained data. Our budget was low and our time

was short, but the goal of this prototype activity was to convince management that, if they invested in the full modeling activity, they would be able to accurately answer the questions listed above, and many more questions that would certainly come from this activity.

2 CHALLENGES

In communicating the benefits of Business Process Modeling (BPM) to the management, several challenges were encountered and overcome by deploying various approaches.

The first challenge to arise involved the scope of the modeling and simulation activities. As is frequently the case, the first instinct of management was to expect a detailed "as-is" model covering the entire array of entities and the associated activities. The expectation, therefore, was emulation not simulation of the business processes. To address the challenge, we proposed to build a prototype of a "to-be" model to simulate the future-state business processes for Orgex with the highest visibility. We explained that developing an "as-is" model would not be a wise use of limited resources and time since the modeling effort was not geared towards making operational decisions or realizing incremental improvements on existing processes. Instead, the aim was to achieve a quantum leap business transformation which could be modeled and evaluated by directly developing the "to-be" models. As Tan and Takakuwa (2007) pointed out, "In many simulation studies, the "to-be" model is developed by modifying the "as-is" model, for example, changing some parameters on the basis of the "as-is" model." Tan and Takakuwa (2007) further elaborate, however, by explaining that they decided to develop the "to-be" model afresh since the changes of the business process between "as-is" and "to-be" were too intense. Another supporting argument we put forward for bypassing the "as-is" modeling was that baseline output metrics to be used in measuring the merit of various "to-be" alternatives could be readily obtained from existing processes without modeling and simulating them. By limiting the scope of the effort to a "to-be" prototype model with a portion of the application workload, we not only were able to construct the model and perform what-if scenarios in the limited time that we had, but we also avoided shifting the focus from demonstrating the simulation modeling capabilities and benefits to scrutinizing the simulation model validity. The message we wanted to convey was that discrete-event business process modeling would capture stochastic, dynamic and interdependent events and reveal the inefficiencies brought about by inherent process variation. By developing a prototype rather than a full-scale model, we were able to more effectively illustrate the impact of various configurations and input variables on output metrics such as the end-to-end cycle time, backlog levels and resource requirements. While we simplified our approach to avoid getting our message lost in the details, we pointed out that the prototype was not entirely realistic as it contained activities and resources shared by excluded entities. Nevertheless, we emphasized the fact that by capturing the prominent characteristic of a process in a limited scale, one could more effectively communicate the benefits of BPM.

The second challenge we faced was directly related to the first in that it involved lack of access to operational data and the commitment of management (at this early stage) in expending resources to obtain that data. Furthermore, the input data for the "to-be" model would need to be extrapolated even if we did have current state process data. Finally, operational data without direct observations would be unreliable since the reality and the expected standard operating procedures rarely coincide. To overcome the challenge we assembled a group of subject matter experts (SMEs) and solicited information and best judgment on inputs such as the process flow, entity arrival patterns, activity durations, resource allocation and business rules in general. We modeled entity arrival and activity durations, for example, by utilizing Exponential, Triangular, or Erlang distributions, respectively, to capture the impact of variation on the outcome. In that way, we focused the SMEs on estimating parameters of these distributions rather than trying to fill in an entire distribution from their experience. Furthermore, we presented the output metrics as probability distributions to illustrate the importance of variation on quantifying the level of risk. For example, Figure 1 displays the end-to-end cycle time as a probability distribution and illustrates quantifying the risk of exceeding the upper customer specification limit.

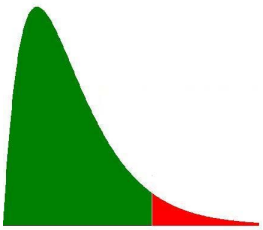

Figure 1: Red area quantifies the risk of exceeding customer specification limit.

In addition to receiving SME opinion on simulation input parameters, we also engaged the management in verifying the model assumptions and adjusting inputs before experimentation. By doing so, we established credibility with stakeholders, particularly the key decision-makers, before we began to examine the findings. As Law (2006) points out, "A simulation model and its results have *credibility* if the decision-maker and other key project personnel accept them as *correct*." Law (2006) further explained that a credible model was not necessarily valid and vice versa. During the what-if analysis, we frequently reminded management as well as the SMEs, who assisted with input data, not to focus on absolute values of the output metrics, but instead the relative sizes of these metrics.

3 APPROACH

Once the scope and the data challenges were addressed, it was time to select a simulation modeling software to develop the prototype. Use of enterprise architecture modeling software with simulation capabilities was initially favored by management because the team developing the IT architecture had already planned to develop business process maps using that type of software. This approach lends itself to modeling and simulating high-level business processes in a way that is familiar to the management. Moreover, such tools would later be used to implement IT solutions as well as monitor and control the daily operations. The drawback of using the available enterprise architecture modeling software involved its limited simulation capabilities. For example, standard output metrics were only expressed as averages rather than having the capability to dynamically export raw output data to external files for further analysis. Another difficulty involved not being able to develop complex yet efficient business rules to direct entities and allocate resources. Given these limitations, we turned our attention to discrete-event simulation modeling software tools. We decided that it was more important to communicate the importance of variation and the impact of business decisions than to consider implementation and monitoring of the future-state process at this time. Therefore, we moved forward with developing the prototype by utilizing a reliable and flexible discrete-event simulation modeling software. Even though we made every attempt to make the animation as realistic as possible, we only spent less than ten percent of the time viewing animated simulation runs. Instead, we focused a significant portion of our time on analyzing the data and communicating the importance of capturing variation in inputs and outputs in order to arrive at reliable and objective conclusions, reducing the risk of implementation. As Avni (1999) pointed out, "Simulation modeling, with its ability to predict impacts, provides some comfort and reduces anxiety when change must be undertaken." By choosing to utilize a discrete-event simulation modeling software rather than an enterprise architecture modeling software with limited simulation capabilities, we were able to quantify risk and reduce management anxiety about what laid ahead.

4 FINDINGS

Before we presented the simulation what-if scenario findings, we explained the inner workings of the model and how it represented the process by conducting animated simulation runs. It was important to depict entities, activities and resources in a realistic manner to establish credibility with the management even though such representation had no impact on the output. For example, we represented entities received electronically and manually by using different icons that were comfortable for managers. We also illustrated entity queuing at critical activities by dynamically showing entity accumulation and depiction at inbox trays. Moreover, we pointed out the dynamic changes in activity icon colors as the simulation progressed which explain various states they represented such as idle, busy and waiting for the required resource. Finally, we represented various resource categories attending specific activities using unique icons. We enabled resource icons to move across the screen during the animated simulation runs to illustrate work attendances, idleness, break and off-shift states.

Having captured the attention of the management with the animated simulation runs, we proceeded by focusing on sharing the simulation findings. We presented the findings in simple yet effective ways and articulated the benefits of utilizing BPM in evaluating future-state alternatives without losing credibility by attempting to defend an "as-is" model as compared to actual performance metrics already known to management. Moreover, we made use of Lean and Six Sigma concepts, which are an integral part of any business transformation, to complement our findings.

Since the end-to-end cycle time was one of the most important metrics under consideration, we utilized a Pareto diagram to highlight major constraints. By using a Pareto diagram, the 80/20 rule can be applied to prioritize improvement efforts. Figure 2 illustrates a typical simulation model output which was used to point out problem areas. Although the findings displayed in Figure 2 do not follow the Pareto rule, it is still useful to note that the first three backlog delays make up more than fifty percent of the end-to-end cycle time. This finding resonated very strongly with those ultimately making the decision to build a detailed model.

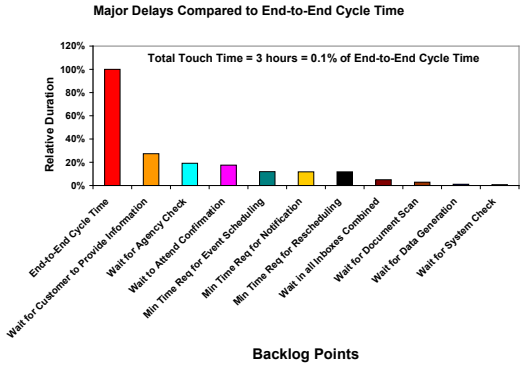

Figure 2: Red area quantifies the risk of exceeding customer specification limit.

Instead of displaying absolute metric values, we chose to show the factor and response relationship in a relative manner. Critical input factors were identified and altered in each simulation run and the output metric / the response was recorded. The relationship was then displayed in an x-y plot similar to the one in Figure 3. Avoiding the use of absolute metric values avoided a time-wasting discussion about the accuracy of the model (especially since we did not have access to the data required to bring more accuracy into the modeling activity).

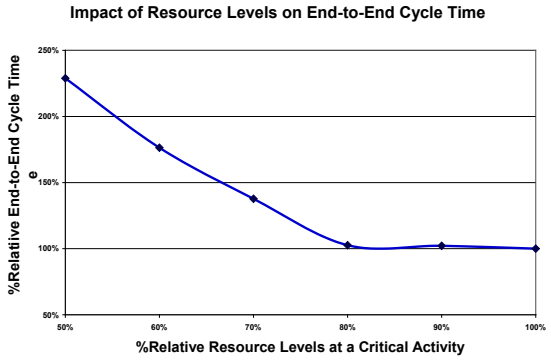

Figure 3: Relative relationship between resource levels and end-to-end cycle times.

The BPM analysis was also blended with Lean Six Sigma concepts and the findings were presented to enhance awareness of potential improvement opportunities. As one of the primary Lean methods, Value Stream Analysis was performed to determine the efficiency of the end-to-end process. Value added activity is performed when the entity is being worked on and the activity is performed correctly the first time. Otherwise, the entity experiences non value-added activities such as waiting to be processed. Our findings showed that a fraction of a percent of the end-to-end cycle time was spent on value-added activities. It was noted that by streamlining the process and balancing the work content, the desired outcome could not only be achieved but validated with BPM before implementation. As Avni (2007) explained, "significant improvement opportunities can be identified using Value Stream Mapping in a matter of days, and the future impact may be verified with Simulation Modeling in few weeks." Six Sigma, on the other hand, focuses on reducing process variation to eliminate defects as defined by customers. Care was exercised to present simulation findings in the form of probability distributions rather than single point estimates to highlight the importance of process variation.

5 LESSONS LEARNED

The core lesson learned was to obtain management buy-in, practitioners of simulation need to put directly in front of decision-makers a version of the model that they want to build, even if this version of the model is created almost entirely with "subjective" data.

In more detail, we found it useful to create this "prototype' model so that it is:

- Consistent with that organization's processes and procedures (i.e., it appears to management that this simulation model actually captures their business processes and flows)
- Visual. At least, in part, the communication process with management must include some animation. This is not a new concept, and it is the reason why all of the major discrete event simulation tools have robust animation capabilities. In simple terms, managers often do not "get it" unless they "see it."
- Clearly communicated in simple management and business terms. The outcomes must show savings of key metrics (such as cycle times, cost, and staff levels) that the client agrees are those that drive their business. We used management terms, such as "business case" to describe our findings, and we sought to quantify the return on investment by comparing the cost of building the model with expected savings.

The outcome of this exercise was quite successful in that Orgex did in fact choose to make the full investment in building a robust simulation capability. This capability is planned to accompany the entire business transformation, will be used to answer all of the questions mentioned in Section 1, and will certainly be expanded as the managers see the value of its use.

ACKNOWLEDGEMENTS

The authors are pleased to acknowledge the contribution of James F Hauschild who did a very careful reading and editing of this paper.

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