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AVERAGES KILL (OR HOW TO SELL BUSINESS PROCESS SIMULATION)

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ABSTRACT

At one time or another we have all faced the doubters who wonder why they *need* to use simulation. We have wowed our potential clients with animation, left them in awe at our grasp on statistics, and preached on soapboxes to the multitudes about why they must hire *us*. More often than not, especially with new clients, we are turned away. This paper presents an approach to selling simulation to the doubters by letting them sell and convince themselves that they *need* simulation.

1 INTRODUCTION

At one time or another we have all faced the doubters who wonder why they *need* to use simulation. We have wowed our potential clients with animation, left them in awe at our grasp of statistics, and preached on soapboxes to the multitudes about why they must hire *us*. More often than not, especially with new clients, we are turned away.

The following sections will hopefully serve as a script for you to build your own "Averages Kill" demonstration in order to let your clients convince themselves that they must have your services.

2 THE COMPETITION

Before you can enter a market you must know who your competitors are, what are their strengths and weaknesses, and how your value proposition is more attractive to your clients than your competition's. However, this section is not referring to the firms you compete against for clients day in and day out. For this to be useful, you must focus on even more abstract competition. It appears in two forms on essentially every desktop in the world -- spreadsheets and process maps. While these two tools have undeniable strengths, when looking at an end-to-end business problem they fall far short of being the right tool for the job.

2.1 Spreadsheets

Perhaps the greatest strengths of spreadsheets are their ease of use and universal availability. Essentially, anyone can build spreadsheets and they are used daily throughout the business world. They are fast, and parameters can be changed quickly to test several what-if scenarios in a matter of seconds. Extremely complex formulas can be inserted into cells through computer-led dialog, and an imbedded macro language makes them extremely flexible and powerful.

However, they are not very dynamic (except perhaps through heroic, extraordinary measures or add-ins like Crystal Ball), which is more representative of today's business world. Spreadsheets cannot account for changes in the system over time and they neglect variability in any of its mischievous forms, e.g., arrival rates, processing times, travel times, resource schedules/failures, etc.

2.2 Process Maps

The greatest strength of process maps is their ability to easily convey a common understanding of how something is operating. These tools are also extremely easy to use and do not require any understanding of mathematics or programming. They, too, are universally available. While many process professionals have dedicated software to accomplish their process mapping, the market dominance of Microsoft® has placed this capability on essentially every desktop through Powerpoint®. While this tool may appear less rigorous than the spreadsheet, due to the absence of any mathematical analyses, it is perhaps the more difficult competitor to overcome.

The rigor, time, and group buy-in that must go into developing a detailed process map of an end-to-end business process convinces their developers that they can be used for significantly more than to convey a common understanding of an "as is" and "to be" process. A potential client has told me that their "as-is" process with a cycle time of 900 hours was going to be reduced to 150 hours just by looking at a process map! Statements like these actually get people promoted, but only when they are not held accountable for the actual "to be" system performance.

Like spreadsheets, these tools do not account for changes in the system over time or the variability inherent in every process. Hand-offs between different resources, rework loops, and opportunities for cross training are only identified; their true impact on the system's performance measures cannot be determined.

3 THE "AVERAGES KILL" DEMONSTRATION

Now that the competition has been identified, the question is "how to convince the client of a better way?" Answer: Exploit their weaknesses. All simulation professionals know the power that animation has in gaining credibility, buy-in, and understanding. So an animated demonstration model is a logical start, but what to model for the demonstration is another problem. It must be simple to build and modify (entity and resource pictures for the appropriate industry). More importantly, it must be extremely easy to understand. Finally, initial conclusions about the model must also be potentially solved using the competition. As you will see, the "Averages Kill" demonstration fulfills all of these requirements.

3.1 Set the Stage

The power of this demonstration model is its simplicity and dependence on audience involvement. It is also extremely flexible. By changing the resource and entity pictures, it is easily customized for any market segment. The model is small enough to build in front of them, in any simulation software package, while they watch. However, I caution you in attempting this. You leave yourself open for potential error and embarrassment with compile errors, etc. In addition, the goal is not to impress them with your ability to build a model, and it's definitely not to make them think that this is so easy that anyone can do this. In order to keep this simple and timely, the example completely ignores those statistical issues that all simulation professionals know are crucial to building and using a simulation model. These issues should be verbally addressed at the end. Here is the script for the model displayed in Figure 1.

Loan applications arrive at the mailroom every 10 time units (TU) for "office use only" processing. Note: Use 10 versus 1 because it makes the magnitude of the final results even more drastic which makes the conclusions more profound. When an application arrives, it takes 1 TU to transfer the application to the individual responsible for opening the envelope and partially processing the application. Once the first worker is available, it takes this individual 10 TU to process the application. When the first worker finishes working on an application, the incomplete application is transferred to the second worker for further processing. This transfer takes 1 TU. Once the second worker is available, it takes 10 TU to complete his portion of the process. When the second worker finishes, the incomplete application is transferred to the third and final worker. This transfer takes 1 TU. Once the third worker is available, it takes 10 TU to perform her portion of the process. When the third worker is finished, the application is complete and is transferred to the mailroom where it is sent to the customer with the approval or disapproval decision.

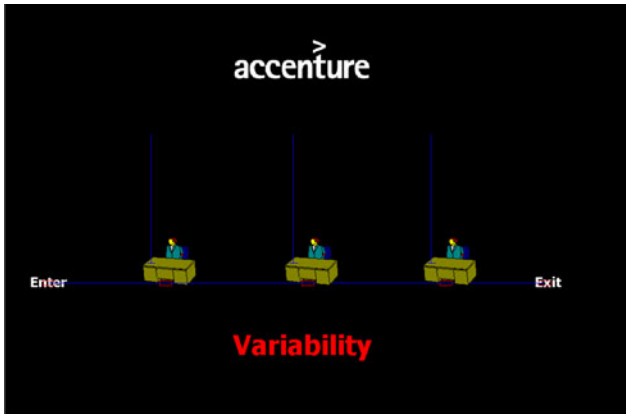

Figure 1: "Averages Kill" Demonstration Model

After describing the model in detail, quickly recap the transfer and processing times, highlighting that another application cannot be processed until the workers finish the applications they are currently working on. Finally, answer any questions the audience may have about the steps in the process.

3.2 Get the Audience Involved

Once you feel comfortable that your audience understands the model, role-play and get their involvement. Identify yourself as the decision maker and ask them to give you their best estimate for the minimum, average, and maximum times for an application to arrive at the mailroom, process through all 3 workers, and finally arrive back at the mailroom, exiting the system. A very few individuals will think this out and realize that all 3 of the statistics are exactly the same, 34 TU. Surprisingly enough, it has been my experience that the individual who realizes this is probably not the most academic or quantitative person in the room. The audience will argue with each other. The key is to control those who realize the estimates should all be the same. Keep them from explaining their answers or persuading the audience to follow suit. Animate the queues, cycle time, and as many other statistics as you desire, e.g., work in process, queue time, value added time, etc. Once their 3 estimates are written on a flip chart or a grease board, run the model.

Point out that the queues are not building, that the cycle time is not fluctuating, and the lack of any identifiable system problems. After they have a feel for what they are seeing, some will realize what their estimates should have been. Fast-forward the model to the end. Go over the final results, pointing out there are not any problems (other than an extremely high resource utilization) in this system and that everything is running very smoothly. Results should be similar to those displayed in Figure 2. Highlight how this is similar to using a static tool like a spreadsheet or a process map. Next, ask them if applications would ever arrive and if the office would ever work in perfect rhythm, like a rowing team moving according their coxswain's commands. Convey how spreadsheets and process maps completely miss the inherent variability that occurs in every day situations.

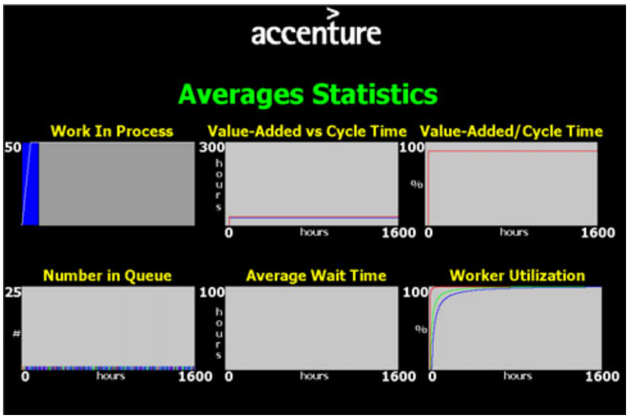

Figure 2: Output Statistics from No Variability Model

3.3 Explain and Add Variability

The next step is to add the variability. A very important point to continue to reinforce is that regardless of the distribution you chose, the *average* is still 10 TU for processing and interarrival times and 1 TU for transfer times. Make the comparison that averages are what spreadsheets and process maps are using.

As you know, a typical distribution for modeling randomness is the exponential. Describe some of its characteristics and use this distribution for all of the transfer times and the interarrival times, but point out the *average* is still 10 and 1 respectively. Describe the normal distribution, which most, if not all, will be familiar with. Use this distribution as the processing time for the first worker with a mean of 10 TU and a standard deviation of 2 TU. Once again, reinforce that the *average* is still 10. Describe the triangular distribution; this should also be easy for them to understand since its parameters are essentially, what's the fastest it can be done, what the longest it would ever take, and how long is it most likely to take? Use a minimum, mode, and maximum of 8, 10, and 12 respectively for the processing time of the second worker. Once again, reinforce that the *average* for this distribution is 10. Finally, describe the uniform distribution, which should also be easy to comprehend, and use a minimum of 8 and a maximum of 12 for the third worker. Don't forget to mention that the *average* is 10! Once you have explained all of the distributions and their parameters, answer any questions.

3.4 Involve the Client Again

Step back into the role of decision maker and request their estimates of the minimum, average, and maximum cycle time for this system. They will probably realize you are setting them up, but ask them for their "best" estimates. Many will sum up the minimums and maximums using + and – 3 standard deviations for the normal. Help them add these up and act as if they are on the right track. Put their estimates on the flip chart or grease board beside the estimates from the first run of the model and run the model.

Show them the first project moves right through, but after that the system goes from bad to worse rapidly. Point out the queues shown in Figure 3 and explain how the exponential distribution is extremely dangerous. Describe how the first time 2 applications arrive close to each other the queuing begins. Ideally, you'll have both models running at the same time so you can go back and forth between the output screens as shown in Figures 2 and 4. Fast-forward to the end and discuss the output statistics. The cycle time results from 1 replication of a 1600 TU run without a warm-up period are in Table 1. Typically, their estimate for the minimum will be close. Usually, their estimates for the average and maximum are significantly lower than they should be. This is an extremely enlightening experience. If you don't have their buy-in now you may never have it, but now is a good time to demonstrate the additional value and capability that you can provide.

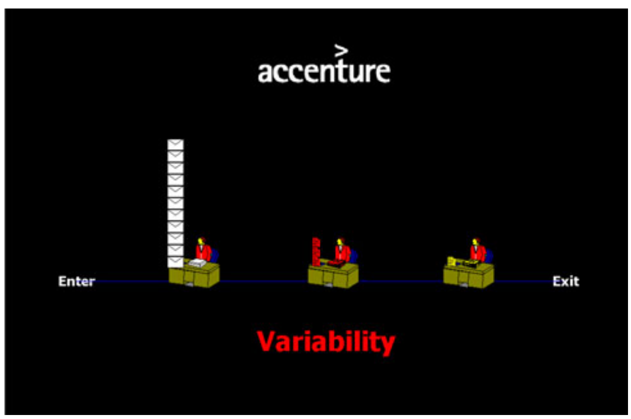

Figure 3: Animation from Variability Model

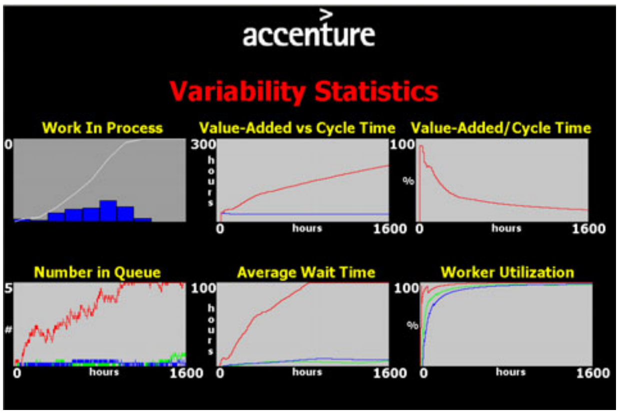

Figure 4: Output Statistics from Variability Model

Table 1: Cycle Time Statistics

Cycle Time	No Variability	Variability
Min	34	35
Average	34	203
Max	34	315

3.5 Further Demonstrate Your Capabilities

You have demonstrated that spreadsheets and process maps miss the underlying problems. Now what? A powerful extension is to add a front-end in order to do some experimentation while they watch. If you set up the example as I have above you can simply increase the number of workers at each position to 2, and this will alleviate the significant queuing. Use this opportunity to identify opportunities to use simulation to determine appropriate staffing levels. Another opportunity is to take advantage of the larger queue at the first worker. Just add one resource there in order to alleviate the bottleneck. All that should do is move the bottleneck to the second worker. So add one there. You get the idea. Use this to demonstrate that arbitrarily adding resources does not guarantee end-to-end process improvement. Finally, add a back-end capability, e.g., push the output to Excel ®. This demonstrates to the client that after you have transitioned the model to them that they will be able to use it themselves.

4 SUCCESS STORY

You may be wondering, "does this really work?" You bet it does! I recently met resistance from a client to build a new simulation model. The client wanted to know why I would need to develop an entire simulation. They wanted to do something much more high level and quicker, a spreadsheet perhaps. The clients agreed to meet me in their conference room for a 30-minute presentation on why it was important to build a simulation model to solve their problem.

The "Averages Kill" demonstration occurred exactly as I describe above. Their issue centered on a ground transportation problem. A discussion of how many things went wrong on their commute to work would probably have sufficed, but slight modifications were made to the model and the presentation began. Entity pictures were changed to trucks and stop signs replace the workers. One out of the four people in the room got the minimum, average, and maximum correct for the no variability case, but none of them were even close in the variability model. Once I completed a comparative interpretation of the output statistics, the client manager asked, "How soon can you start? And, How soon will it be done?" That's buy-in!

5 CONCLUSIONS

This simple example has so many possibilities, depending on the industry and what you are trying to sell. Its simplicity and ability to get the client involved are keys to eliminating simulation's competition - spreadsheets and process maps. Their processes will have significantly more complexity, rework loops, resource failures, cross training, competition for resources, etc. Using this demonstration gets their buy-in for using simulation modeling and helps them understand why it's important to account for the everyday variability that the other tools disregard. Now, go forth and sell your services. Your potential clients truly need what you have to offer.

AUTHOR BIOGRAPHY

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