

BUSINESS SOLUTIONS USING WITNESS

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ABSTRACT

The paper will describe how the Lanner Group's WITNESS Visual Interactive simulation tool supports different methods of simulation solution deployment. Two alternate methods of simulation deployment are described, both of which have proved successful in promoting the benefits of simulation within organizations.

WITNESS provides significant functionality to support each method of deployment. This functionality is described in detail and related to real-world examples when possible.

1 INTRODUCTION

One of the major questions that an organization addresses when introducing simulation is, "Who should be doing the simulation work?"

The decision usually depends upon a combination of the organizational structure, where in the structure the current simulation advocate sits, the skills of available staff, and whether or not outsourcing the modeling work is considered.

2 SIMULATION MODELING APPROACHES

The simulation model building approaches adopted by large companies can be broadly classified under two structures or a combination thereof. These approaches are listed below as follows:

1. Internal Consulting approach, where there is a centralized department of simulation experts acting as consultants to the rest of the users in the company. These users analyze the models built by these internal consultants, and implement the solutions derived.

The second structure follows a distributed approach. Here many modelers build and analyze simulation models, in addition to implementing the results.

3 INTERNAL CONSULTING APPROACH

The advantages of the internal consulting approach are:

1. The internal consultants become tool experts and this shortens the model-building phase of a project significantly.
2. The methodology and statistics used in the project are more likely to follow good practice e.g. warm-up periods, number of stochastic runs.

The disadvantages of the internal consulting approach are:

1. The consultants need to be educated by the process experts as to how the real world system works.
2. The consultants often depend upon their internal customer to provide the data to support the model.

Those organizations following the internal consulting approach can make very flexible models by following the stages shown in the figure 1.

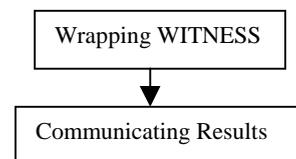


Figure 1: Modeling Stages

3.1 Wrapping WITNESS

This technique lets the model builder wrap the completed model within a shell that allows the users to feed and change the data, creating varied business scenarios without having the need to access the detailed simulation code. The model can be wrapped with data providers as shown in Figure 2.

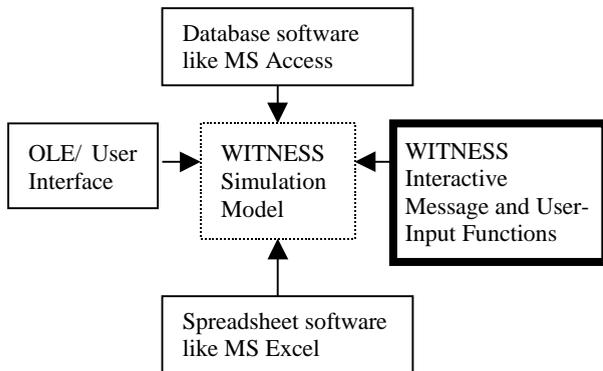


Figure 2: Wrapping WITNESS simulation model

3.1.1 WITNESS Interactive Message Functions and User-Input Functions

WITNESS is equipped with various functions, which can be used to accept input from the user. WITNESS accepts the input and modifies the model accordingly. The user can therefore modify the model and do “what-if” analysis without being proficient in WITNESS, or even simulation literate. The input boxes are very flexible and allow choices from drop-down lists as well as numeric entry fields.

For more elaborate front and back-end development WITNESS may be used as an OLE automation server. Data may be passed to and drawn from WITNESS as the simulation model is running. Many OLE methods are provided to interact with the model including the ability to gray menus, run other applications from WITNESS, and open and close animation windows.

System functions allow the user input to configure the model. Simple commands such as

SET QUANTITY OF DRILL TO X

or

SET CAPACITY OF STORE TO Y

are supplemented by other commands that can change any aspect of model behavior. This would include, for example, the breakdown characteristics of a machine, the shift

pattern of a worker, or whether or not a conveyor should accumulate parts.

Lanner has completed many projects using the above approach to provide a custom solution for clients. Recent examples have included call-center and health-care applications. In extreme cases the end-user is not even aware that WITNESS is being employed to solve the problem.

3.1.2 Communicating Results

The internal consulting approach demands that model results are communicated effectively and that the model “sells itself”. Some of WITNESS capabilities to support this communication are listed below.

1. Virtual Reality
This is the ability to simulate within a virtual environment. 2-D graphics are supplanted by a world that may be walked through using the mouse or thumb-wheel controls. Cameras may be placed on workers’ heads or on parts so that the user can “ride” through the model.
2. AVI files
WITNESS provides the ability to record both the virtual reality and 2-D simulation runs to a windows video (.avi) file format. These files may then be distributed, for example, for use in presentation tools.
3. Backward Simulation
WITNESS is unique in its capability to go backwards to any previous point in a simulation run at any time. This greatly facilitates group problem solving. The question “Why did the patient waiting time suddenly increase?” can be answered by taking the model back to a couple of hours earlier than the noted result and viewing the model running again.
4. Process View
This provides a flow-charted view of the model in addition to the more typical “geographic” view of a simulation model. In certain environments, e.g. internal modeling of computer networks or paper-flow modeling, this type of view provides better client communication.
5. Reporting
The end-user of the simulation model needs easily accessible, flexible, graphically attractive, and self-explanatory reporting capabilities.

The WITNESS reports are built-in, automatically generated, and present the results in a standard grid format. A variety of chart and graph options are available.

4 DISTRIBUTED MODELING APPROACH

This approach to using simulation relies on a large number of engineers or analysts being empowered to use simulation to solve some of the business problems they observe on a daily basis.

The advantages of this approach are:

1. They have excellent local process knowledge.
2. The models tend to be smaller and focused on quicker results.
3. Simulation is just one of a number of techniques that the engineer or analyst can employ. There is less incentive to “force” a simulation solution onto an unsuitable problem.

The disadvantages of this approach are:

1. The occasional modeler is likely to have less tool knowledge and will probably take longer to create a given model.
2. It is difficult to avoid having modelers continually “re-inventing the wheel” by building similar models from first principles.

The challenge is to provide the correct tool functionality and modeling environment to negate the disadvantages and allow the advantages of the distributed approach to come to the fore.

The WITNESS tool provides significant functionality to support a distributed modeling strategy.

4.1 Designer Elements

These template elements, customizable by organization, allow the modeler to point to a recognizable piece of equipment and introduce it into a model.

Combinations of elements, for example a manufacturing cell or an operating theater, may be captured into a designer element module to be re-used as necessary. Entities may be routed to the cell or the theater or to any element within the cell or theater.

4.1.1 Modules with Password Protection

An extension of the idea of a designer element module is to allow the module to be password protected. This allows a wide variety of different users with different experience levels to use exactly the same elements to create a model.

For example, a breakfast cereal packaging line can be built, tested, encapsulated as a model, and password protected. Every engineer within the cereal company gets to use the same identical packaging line or ideally chooses from several pre-built configurations. In either case they do not need to build the line from first principles.

The modeler can input certain characteristics, for example the speed of the line, breakdown characteristics, or cereal box sizes, *even if the module structure is password protected.*

4.1.2 Detail Forms for Elements

The behavior of each element within a WITNESS model is described on a detail form. An example of this is presented below in figure 3.

Every form is designed to be completed in the same logical order that an engineer or analyst would typically think of a process. The form flows from left to right from “where do I go to get my part?” to “what do I do with my part when I have got it” to “where do I put the part when I have finished working on it”.

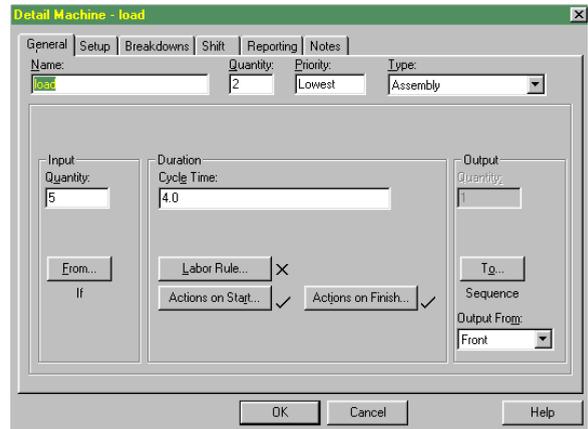


Figure 3: Machine Detail Form

Secondary information such as breakdowns, set-ups and shift patterns for the element are available on different tabs that take the user to secondary input fields.

The complete behavior of a WITNESS element is outlined on the same form. This includes the element quantity, part routing, cycle times, labor requirements, set-ups, breakdowns and shifts. This is very beneficial to the less experienced modeler who does not need to navigate into many areas to describe different parameters of the same element.

5 SUMMARY

WITNESS provides functionality to support two alternate methods of deploying simulation technology within an organization.

An incorrect answer to the question “Who should handle simulation projects?” can lead to two commonly observed problems as follows:

1. Relatively complex simulation tools are placed in the hands of engineers or analysts without the necessary time and \ or training to make the best use of the technology. Simulation becomes “shelf-ware” within the organization with analysis reverting back to spreadsheets and the backs of envelopes.
2. Internal simulation consultants try to justify their existence by simulating everything in sight. Problems that could be solved using a simple calculation are magnified into large undertakings with extensive data requirement draining the resources of the organization.

The WITNESS simulation software does not force a deployment strategy onto an organization, but has the flexibility and breadth to operate very successfully under both strategies.

AUTHOR BIOGRAPHIES

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