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Factory planning and production analysis using SIMFACTORY

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1. INTRODUCTION

The value of simulation to manufacturing is well known and well documented. Its importance has been espoused in many a presentation and case studies of successful projects abound. But as desirable as simulation is, there are often many obstacles that interfere with its application.

In many cases, these obstacles may actually prevent simulation from being applied to a problem. It is difficult to estimate how frequently this occurs; we only hear about the success stories. In other cases, even if obstacles do not prevent a simulation project from proceeding, they may prevent it from succeeding.

There are many different "roadblocks" to successful simulation. I wish to discuss specifically those that are inherent to manufacturing. They arise from the fast-paced nature of the manufacturing environment.

In addition to discussing the obstacles, I will discuss tactics for avoiding them. The most effective weapon in this campaign is to use a tool that permits development of quick simulation studies. I will discuss, in general terms, how such a tool can be used effectively and, in particular, how SIMFACTORY - a tool designed specifically for this purpose - can be used.

2. SEVEN OBSTACLES TO SIMULATION IN MANUFACTURING

I have identified below seven common "roadblocks" to simulation that pervade the manufacturing environment. These roadblocks are a natural consequence of the conditions under which industrial and manufacturing engineers must operate. Understanding these conditions helps to explain why, in many cases, simulation fails or is not used at all.

Obstacle 1: Simulation is a part time job for engineers

Industrial and manufacturing engineers have many, diverse responsibilities. Simulation comprises only a fraction of those responsibilities. While peddlers of simulation view it as all-important, engineers view it as no more important than many of their other responsibilities. Thus, from their point of view, simulation should only take a fraction of their time.

If simulation consumes too much of their time, engineers will simply not use it. Or worse, an engineer might embark on a simulation study and realize too late that there is not sufficient time to complete it. In this case, the results can be disastrous.

Obstacle 2: Engineers have many simulation problems

Engineers tend to have many small to medium size simulation problems along with a few large ones. Typically, they have very little time to spend on simulation at all let alone on any single problem.

Obstacle 3: Engineers need timely results

Industrial engineers operate in a frantic environment. Often, management questions arise that must be answered the same day. This is all but impossible if to do so requires spending a substantial amount of time to write a non-trivial computer program - in the face of other mounting deadlines for the day.

Obstacle 4: Engineers do not like "Specialist groups"

Engineers who must get things done quickly hate red tape. Consequently, they usually do not like dealing with outside groups, even within their own company. Unfortunately, in order to use a simulation language, it is often necessary to deal with an outside group of simulation specialists because they have the expertise to use a complicated language.

Furthermore, once a consulting group (outside the company or within it) develops a model, the users of the model remain dependent on the consultants for maintenance and enhancements. Given the choice, users would prefer not to have to depend on outsiders.

Obstacle 5: Simulation results must be communicated

Simulation is a decision support tool. But generally, the decisions are not made by the modelers. Rather, the modelers generate information that managers then use to make decisions. Thus, communicating the results is as important as obtaining the results. Results, in the more general sense, include the input and the model itself as well as the output. To communicate all this information can be very difficult if it is necessary to translate to and from a simulation language.

Obstacle 6: Engineers have little time for training

Not only is the time required to build a model an obstacle, but

so is the time required to learn how to use the simulation tool. The longer the training period is, the less likely the tool is to be used.

Obstacle 7: Often, resources are severely limited

In many cases, it is not even possible to use a consulting group within the company because one doesn't exist or is already too busy. If no other company resources are available, a user must either employ an outside consultant or not do simulation at all. For small, day-to-day decisions, using an outside consultant is not feasible and hence, no simulation will be done.

3. ELIMINATING THE SEVEN OBSTACLES

In general, avoiding or eliminating obstacles to simulation amounts to choosing the right simulation tools and using those tools effectively. The plural "tools" should be emphasized: no single simulation tool is right for every job. Further, it is not enough to know what should be done; it is also necessary to know what can be done feasibly.

Obstacle 1: Simulation is a part time job for engineers

For manufacturing simulation to be successful, engineers must be able to use it on a part time basis. Simulation "specialists" must recognize this and provide appropriate tools that can be used effectively. The requirements for such a tool are that it be fast, easy to use, easy to learn, and easy to understand.

These last two requirements are especially critical. It must be easy to learn because, due to infrequent use, an engineer may have to re-learn the tool for each job. Similarly, the tool must be easy to understand because an engineer will have to communicate the results each time it is used. In order to be most comprehensible, a simulation tool must be presented in terms that are familiar to an engineer.

Obstacle 2: Engineers have many simulation problems

There will always be some simulation problems that require considerable time to solve. But there will also be many others that do not. Engineers cannot afford to use a time consuming, detailed simulation tool for each simulation problem. Unfortunately, it may not be at all clear which problems require detailed analysis and which ones do not.

By first using a more expedient technology, e.g., a fast but perhaps less detailed modeling tool, a user can at least make a more educated decision about which problems to focus on. This technique, even if it means sacrificing some detail, can help an engineer to more efficiently allocate resources.

Obstacle 3: Engineers need timely results

Without a fast and easy simulation tool, this becomes an insurmountable obstacle to simulation. If the choice is either to perform a time-consuming, detailed study or to do nothing, the latter choice will be made all too often. However, if a capability existed to perform a fast, albeit rough, simulation, engineers would have a third choice. They might very well prefer this alternative to doing nothing at all.

Obstacle 4: Engineers do not like "Specialist groups"

The same characteristics that help to eliminate the first obstacle - namely, quickness, ease of use, ease of learning, and ease of understanding - also help to avoid this one. If a user has access to a tool with these qualities, he/she will be able to do many simulations without the aid of any outside group - either within or outside the company.

Unfortunately, consulting groups tend to be threatened by such simulation tools. This is ironic since as simulation becomes more accessible, its use will become more prevalent which will ultimately result in additional work for consultants.

Obstacle 5: Simulation results must be communicated

Communicating simulation results means more than just communicating output. It means communicating the model as well. This is difficult to do if one must translate the source code of a computer program to the audience.

This impediment can be avoided by using a simulation tool that does not require programming. But a tool is not truly a non-programming tool merely because it automates the programming task. Even if the user need only manipulate icons to build a program, he/she is still building a program. The resulting network of icons represents the program, not the factory.

A true non-programming tool is one which allows the user to manipulate data. Thus, the resulting network of icons represents the factory itself rather than a program.

Obstacle 6: Engineers have little time for training

Generally, any programming tool will require a great deal more training than any non-programming tool. And true non-programming tools that involve manipulating data will require less training than non-programming tools that involve manipulating programming constructs. This is worth keeping in mind when choosing a simulation tool.

Obstacle 7: Often, resources are severely limited

Resources may be very limited, especially for small simulation problems. It is usually not feasible to enlist the help of an outside consultant for a very small job. Internal consultants may be unavailable or non-existent. In such cases, the problem must be solved within the user's own department. Typically, this means that the user must solve the problem himself/herself. With a fast, non-programming tool available, this is quite possible.

4. HOW SIMFACTORY ELIMINATES THE SEVEN OBSTACLES

SIMFACTORY is a true non-programming simulation tool. It

therefore has advantages which can help to eliminate or avoid each of the impediments described above. The following points highlight these advantages.

1. Because SIMFACTORY is easy to use, easy to learn, and fast, it can be effectively used on a part time basis. It thus permits engineers to realize simulation just as they view it: as a part time job.

2. Given a number of different simulation problems to solve and limited time, an engineer can use SIMFACTORY to set up at least a rough model for each problem. He/she can then use the results of these models either directly or as a way to determine which problems require more detailed study, thereby permitting more efficient allocation of available resources.

3. Engineers can use SIMFACTORY to get results quickly. In some cases, the results may indicate that further study is required but at least some results can be obtained in time to be of value.

4. SIMFACTORY helps to reduce an engineer's dependency on outside specialists for modeling problems. This is because SIMFACTORY can be used on a part time basis without a lot of training, effort, or resources.

5. Because SIMFACTORY is a true non-programming tool, using it allows everyone to understand both the results and the model. It is not necessary to have a "translator" present in order to discuss the model.

6. As mentioned above, SIMFACTORY does not require a great deal of training. This makes it much less objectionable to people who have little time for training.

7. In many cases, modeling resources are very scarce. SIMFACTORY provides a modeling capability that can be used in such situations.

5. SUMMARY

There are many different products available for manufacturing simulation. These products come in a variety of forms. Some require considerable programming. Others are "non-programming" tools. Of these, some might more precisely be considered "automated programming" tools since they require the user to manipulate programming elements. This results in a network that represents a computer program. Other tools, such as SIMFACTORY, are true non-programming tools because they involve manipulating data. This results in a network that represents a factory.

Each of these products has its own strengths and weaknesses. It may be most cost effective in the long term for an organization to acquire more than one simulation product. By understanding their respective strengths, an appropriate complement of products can be acquired to provide the most cost effective solution to a broad range of simulation problems.