A Brief Guide to Purchasing an Advanced Planning and Scheduling (APS) System

How Will This Document Help?

A web search will show that there is a lot of information available about "planning and scheduling" organized around specific products, terminology, or technologies. The purpose of this document is to concisely summarize the information that matters, in a question and answer format, to someone who is considering the purchase and use of an APS system. The document is written to be vendor and product independent. This document will be updated from time to time so please email suggestions for improvement – such as additional questions to answer – to the address given at the end.

What is Planning and Scheduling?

The basic idea of scheduling is to determine the timing and location of activities that will be conducted in a process to meet a set of orders or demands from customers. The process to be scheduled consists of a set of equipment, people, materials, and other resources that must be coordinated to meet the demands of the customers. An order or demand to be scheduled is typically given as a due date and quantity of material or an end state to be achieved. A schedule must take into account what is currently being executed in the process, satisfy all the process requirements, and consider preferences of people who understand the business implications of making tradeoffs.

Planning refers to exploring the possible behavior of a process over a long period of time or under different conditions than those that currently exist. The planning process is used to answer what-if questions such as

- How will capacity improve if additional equipment is purchased?
- What are the implications of cross-training operators?
- Which options will best reduce overtime?
- What is the best due date to promise a potential customer?
- Where should research & development dollars be spent to best improve a process?
- Is there enough capacity to meet expected demand?

In fact there are literally hundreds of questions that can be addressed by an effective planning process. Many of these questions are best posed by people understanding the process and business details. Good answers to these questions can help to continuously improve a process.

Planning and scheduling are closely related and are best done using the same or closely related tools. This follows because plans must be able to be implemented in order to be effective. Scheduling determines what is actually implemented in the process, while planning explores what is possible. Plans have little value if they are inaccurate and cannot be implemented because they do not consider important process requirements. As such a state of the art APS system should support both planning and scheduling.

What is the Value of an APS System?

Hard data on the financial value of planning and scheduling is difficult to collect because people rarely conduct a controlled before-and-after experiment for an APS system installation. Also very few academic studies have been completed. As a result most success stories and customer testimonials are anecdotal in nature. Considering these caveats, the available data suggests that the estimated improvement attributable to effective planning and scheduling is 5% to 15% as measured by a decrease in process costs (e.g. waste, changeover, inventory reduction) and/or increase in process throughput. In order to achieve this performance an APS system must be used in an effective business process whereby the data used is reasonably accurate and schedules and plans must be executed with reasonable precision. To achieve consistent results the planning and scheduling process must be repeated when business conditions change appreciably. Finally since the cost of an APS system is usually small with respect to the capital and operating costs of a process, any improvement usually accrues directly to profit. As such an APS system that works can be a good investment.

What is an APS System?

Many definitions of an APS system are possible. Practically speaking an old-fashioned planning and scheduling system involves using planning boards, whiteboards, or pencil & paper. An “Advanced” Planning and Scheduling system is usually defined to be one that is computer based. Using this definition there is a wide variation in sophistication and cost of APS systems.

What is the Cost Range of APS Systems?

Spreadsheets are a very popular means of performing an APS function and are available for a hundred dollars or so. Low end APS systems cost on the order of several hundred or a thousand dollars. Mid-range APS systems cost several tens of thousands of dollars to install. The most expensive APS systems generally cost about $500,000 to install, where half to two thirds of the cost is consulting fees to customize the system to a particular process. In the near future, improvements in underlying APS technology will decrease the consulting costs required to install highly customized, high-end APS systems. The mid-range to high-end systems are designed for the most complex, large-scale, or money intense processes where savings justify the installation expense. Almost all mid-range to high-end systems require the payment of an annual license or maintenance fee. These fees are typically 10-20% of the APS software cost and depend on the level of product innovation and customer support.

Lower end systems generally cost more to operate and, for complex processes, will not usually capture the cost savings or performance improvements that are possible. This follows usually because lower end systems do not allow effective schedules and plans to be generated quickly enough to respond to business opportunities or a variety of what-if questions.

The cost of the system does not necessarily translate into a successful APS installation. There are some examples, although not well-publicized, of failed installations of expensive APS systems. Failures of APS systems are usually attributable to the underlying technology, whose effectiveness can vary greatly with the underlying process details. Failures of APS systems are also sometimes attributable to installation project management issues.

What Types of APS Systems are Available?

APS systems differ in philosophy, user interface, and underlying technology. The major differences in philosophy revolve around how the decisions are made in the APS system or "Who does the work?" Low end systems require the user to make most of the decisions about where and when activities are executed. There are often no indications from the lower end system when process requirements are violated. Low end systems are typically designed around an electronic Gantt Chart. With a completely manual electronic Gantt Chart the user moves boxes representing activity on the screen until all the activities appear on the right equipment at the right time. The determination of "right" is made by the user based on their knowledge of the process. High end APS systems differentiate themselves based on user interface and underlying technology. Since APS systems generally require manipulating large amounts of information the quality of the user interface is an important consideration. Information should only be entered in one place, facilities should exist for manipulating multiple schedules/plans, and analysis tools must be available to obtain many different kinds of reports.

Even without marketing and sales hype understanding the differences in the technology used by various APS systems is an intellectually intense exercise. Furthermore there is a wide variation in the effectiveness of various APS technologies across different processes. Process requirements, such as limited storage, cleanout, limited resources, complex labor patterns, material obsolescence, rework, recycle, periodic maintenance, and processes near their capacity limits are significant challenges to underlying APS technology. Furthermore, seemingly innocuous changes to the underlying process requirements can render a carefully customized approach useless. To ensure success of an APS system the product of interest should be tested using realistic scenarios and real data. Even better the APS system should be installed and used for some period of time before taking ownership. This will be impractical for some APS systems because of the enormous time and customization required for installation.

This large investment sometimes gives rise to a "buy-it and grin strategy" whereby a customer must use an APS system because so much has been invested.

Why Should I Buy an APS System?

As with any other process investment an APS system is purchased to obtain a return on investment. This return will come from making better decisions involving capital investments, repeatable process improvements, such as decreased waste or increased throughput, or by a time savings due to making the job of the planning and scheduling people easier.

How Long Does it Take to Install an APS System?

The length of time required to install an APS system is almost totally dependent on the amount of customization performed. Installation projects involving a high degree of customization can require six months to one year. In the near future improvements to underlying APS technology will shrink installation times, even with a high degree of customization to a process, to six to twelve weeks. APS installation times are limited as to how short they can be by the determination of process restrictions to be addressed and by customizing a system for inputting the necessary data. Note that inputting the necessary data, assuming the data is available, is usually a much easier task than determining which process restrictions will be addressed.

Is an APS System Hard to Integrate With My ERP or Plant Information System?

The purpose of an ERP or Plant Information System is to provide data to those needing it. As such technical integration of APS systems with data systems is usually straight-forward. In many situations, interfacing an APS system to a data system is no harder than interfacing a spreadsheet to a data system. However, the data needed to feed an APS system sometimes is not present in a company information system. In these cases data integration issues are more problematic and some provision must be made to update the information system or provide another means to supply the missing data. Also companies must put policies in place specifying who should have access to data and who should be able to modify data. These issues must be resolved as part of the process of installing the APS system and are no different than the data policy issues companies regularly address.

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