

Are Packaged Planning Solutions Always Appropriate?

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Keywords

Supply Chain Management, Planning, Scheduling, Risk

Summary

These days, the prevailing wisdom is that packaged planning and scheduling applications are always the most appropriate choice. Yet there are

Managers Should Consider a Custom Planning and Scheduling Solution When:

- Multiple modules are required to create a plan
- Risk versus reward is an important trade-off
- Your industry has relatively few participants

cases and types of problem, where a customized solution delivers superior value.

Analysis

There are many packaged applications available today for optimal planning and scheduling for supply chain, manufacturing and transportation.

But, managers still need to decide whether a packaged application is the most appropriate solution for their situation. In some cases, a custom, bespoke solution should still be seriously considered in order to achieve required performance levels or as an opportunity to deliver superior value.

For the majority of cases, packaged applications are probably the most appropriate solution. They can provide adequate plans and schedules at the least cost and be easier to maintain, with the supplier managing upgrades and bug fixes. The cost of a custom optimization solution is not necessarily prohibitive. But, if the problem only requires a relatively simple linear programming optimization, the initial cost of a packaged application may be 25% less than a custom solution, assuming the package solution costs around \$250k. On the other hand, if multiple optimization methods are required, a custom solution can be up to 3 times more expensive than a packaged application.



But cost should not be your only criteria. Solutions are implemented to improve performance and the value created by a better plan or schedule may far outweigh the costs of implementing a custom solution. For example, a packaged application approach may force you to perform planning in stages, optimizing each area individually, instead of creating a single, global optimum across multiple, related areas. The difference in some cases can be quite significant. Another example is the benefit one may receive by having the ability to perform more flexible analysis of alternative plans to evaluate the trade-off between risk and reward for different plans. Your company may prefer a scenario other than the one assumed by the packaged application developers (e.g. maximum profitability at any risk). Good packaged solutions may not even be available for some industries, like those with few participants, where packaged application development is hard to justify. Finally, packaged optimization solutions may not give you the flexibility to determine such things as the objective function being used to drive the plan.

Single Global Optimum versus Multiple Packaged Applications

If creating a plan or schedule requires the sequential use of two or more modules from a packaged application, there is a good chance that the overall plan will be suboptimal. The optimal solution for the first problem constrains the solution space for the second package. Doing the best possible within this reduced space is quite different than finding the best solution overall, simultaneously considering all parts of the problem. And the difference can be quite significant in certain applications. A custom solution offers the possibility for developing a combined solution that can find the true global optimum.

Combined Production and Transportation Scheduling

Production and transportation scheduling is often performed independently, with separate optimization applications. In many cases, like those with substantial inventories buffering these activities from each other, this works just fine. However, in some cases these business processes are tightly linked. For instance, Ready-mix Cement must be poured on the building site within hours of manufacture. Consequently the production schedule for the differing mixes needs to be integrated with the transport routings to ensure the appropriate mix arrives on site at the scheduled time.

Another example comes from one of the world's largest breweries, where the packaging line directly feeds outbound distribution. Each day, about 150 trucks and rail cars leave this facility, and due to the tight integration there is now minimal handling, and little finished goods stock. An optimum production schedule, that minimizes set-ups and changeovers, does not necessarily suit the transportation schedule. Similarly, an optimized transport plan would not necessarily minimize manufacturing costs. But a custom solution that optimizes both together does minimize costs across both production and transportation.

Production Planning and Scheduling

Many packages optimize campaigns, assignments or sequences. Yet, few packaged applications allow campaigns, assignments and sequences to be optimized together in one module in a single pass.

At one chemical company, marketing determined the production plan for the twelve intermediates, aiming to minimize intermediate inventory. Production then found the best assignments and sequences for the manufacture of around 100 end products. Once the campaigns were fixed, the production schedule had limited freedom to determine the assignments and sequences that minimized total production costs. Optimizing campaigns, assignments and sequences in one pass with a custom solution not only enabled production to find a lower cost production plan, but also a shorter planning cycle enabled a faster response to demand changes.

Optimizing Risk versus Reward

A typical example of the value that one receives in having the flexibility to evaluate risk versus reward comes from BASF in the chemicals industry. Their problem involved an intermediate product, for which peak sales forecasts ranged from +20% to -60%, over a 10 to 30 year timeframe. The market was volatile, seasonal, and weather dependent. Each country required its own formulation and production lead times were about a year.

The question was which of the following options was best: The company could build a dedicated plant, and add capacity later. Alternatively, it could build a more expensive, multipurpose plant. The third option was to outsource production, and so delay building the plant until market demand was more certain, but costs would be higher than the second option.

This fairly typical capital investment problem, where there are multiple scenarios, multiple options, and each option has recourse actions that depend on which scenario unfolds, is rarely supported by packaged applications. Yet there will be a growing need for business planning based on uncertain information, due to increasing volatility in quantity and prices, and buffering uncertainty with inventory is no longer an acceptable solution.

Industries with Few Participants

Many capital intensive industries attract few participants. The economies of scale and large capital requirements to get to these levels create a substantial barrier to entry. While competition may be limited, the need to optimize use of these complex facilities remains a paramount concern. And, many of these facilities have complex production processes that demand industry-specific solutions.

Packaged application suppliers are driven by the number of solutions they can sell and these markets are simply not large enough to justify the development of required solutions. In addition, development of these kinds of solutions requires extensive input from knowledgeable end users, who would not allow the application developer to sell the solution to competitors. Thus, the unique characteristics of some industries, e.g., tire manufacturing, ready mix cement supply, are not well supported by packaged planning solutions.

Varying the Objective Function

Not all packaged optimization packages allow planners to modify the objective function, yet this can be useful. Usually, the objective function maximizes profit, or minimizes cost. But there are many situations when this may not be the best goal for the company. For instance, when raw materials are in short supply a more appropriate business objective may be to ensure that the most profitable, long term customers get deliveries, rather than those customers who usually do business with competitors. Alternatively, at the end of the year, the objective might be to minimize (or maximize) working capital.

Other Opportunities

There can be many situations within a company's supply chain where they might benefit from the implementation of custom optimization solutions.

One way to find these opportunities is to walk backwards along your supply chain, from customer delivery, back through finished goods stock, manufacturing, and incoming materials, looking for: double sorting/handling; employees who complain about inefficient task lists/job sequences; and, operations that require surprising skill, experience or intellect.

Often packaged optimization solutions don't support all of the necessary constraints. Shelf-life, for instance is rarely supported. Planners often deal with this by “tweaking” the plan to get a real, feasible solution. This not only results in sub-optimal plans, but it lengthens the planning cycle which can reduce a company’s agility. Addressing these issues with custom planning solutions can therefore help you improve your agility and enable you to deal with increasingly volatile demand and requirements for optimal asset utilization at all times.

Recommendations

- Do not automatically discount the use of custom developed planning and scheduling solutions purely on the basis of initial cost. These solutions can improve performance enough in certain situations to easily offset implementation cost differences.
- Multiple modules within a packaged application don't always deliver a truly optimum solution, and may leave value on the table.
- Few packaged applications support risk/reward analysis, not all allow the objective function to be modified, and some, capital intensive industry specific constraints and processes are not widely supported.

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