



Holistic Optimization

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Before we delve into what holistic optimization means, let's discuss the issue of why optimization? With any optimization problem the underlying motive is to optimize a specific set of objectives. In many cases, it is difficult to decide exactly what the objective is since, the objective could be conflicting and difficult to decide which weighs more than the other.

More specifically, with supply chain management techniques, the objective is to maximize earnings per share or increase market share. Equally as important is to have the ability to change the objectives at different points in time and be able to view different scenarios. An example of such changing and conflicting objectives is: product introduction or loss leaders, where the margins are sacrificed in the short term in order to gain longer term performance. As business conditions change, we need to have the ability to understand the implications of different decisions and be able to make an intelligent decision.

In addition, with any optimization problem, there are two main components that need to be considered: The representation of the problem has to be good enough to reflect the real world as dynamic as it may be. The second component is the ability to solve the problem in a manner which is both optimal and fast. Fast, meaning real-time!

One important aspect of optimization problems, especially as applied to SCP, that is often overlooked, is the ability or means by which a solution can and should be

executed. It is often easy to generate any plan, however it is even more important to have the ability to refine the plan such that the expected outcome results. The ability to plan (in an optimal manner) and execute the plan requires a *holistic* approach.

Why a holistic approach? Every organization, every community of supply chain partners, every enterprise, every factory is a combination of smaller components which are tightly inter-related functions. Each component by itself is a microcosm of the entire organization. Any system that represents such an organization has to be able to accurately reflect this structure. Very often this issue is confused with Global optimization. Global optimization implies only a high level and aggregated view of the Supply chain representation. A holistic optimization represents a recursive definition of the supply chain community that enables one to view the supply chain community from many different angles: The entire supply chain, every site, every resource, every trading partner and so on. But even more importantly, a holistic representation allows definition of relationships between these components. For example, when a plant goes down for a shift, how can this impact the ATP, the EPS, the downstream consumer plants and suppliers' deliveries that are not needed anymore.

As another important element of holistic SCM, one needs to consider how plan and execution of the plans are synchronized. Plans deal with *predictability* or

responsiveness of the supply chain. *Execution* deals with *reactivity* of the supply chain. Like any other living organism, supply chain representations need to be both predictive and reactive. The former makes them responsive and the latter makes them reliable. A holistic approach will give them both responsiveness and reliability.

Traditionally, there is a disconnect between front office and back office operations. Marketing and manufacturing have different priorities and incentives. From marketing prospective, manufacturing is not meeting their requirements fast enough. From Manufacturing prospective, marketing can never deliver good forecasts. In the process customers get sub-optimal service and suppliers get jerked around. This simple example illustrates how these conflicting and different components need to be tied together.

The problem is magnified many times more in case of multi-nationals with facilities in different corners of the world, fluctuating demands, hundreds of sales people, regions and channels and many variations of end items, hundreds of suppliers and customers. A holistic approach allows and provides for modeling and operation of these components both horizontally and vertically. Very often integration is used as the key word that is used to tie front office and back office, corporate to factory, sales to manufacturing and design to delivery. We believe, with a holistic approach, integration is inherent in the system because of all of these functional units work off the same underlying model. Any changes from one end can be effectively communicated or is transparent to other functional units. A holistic approach removes the traditional silos and divisions. At the same time, it allows different views of the environment depending on the function. Thus Suppliers will have their own view, customers have their own view and

set of functions, so would sales and manufacturing individuals. A commitment in sales would be appropriately reflected in manufacturing, if so needed. A predictable sale (consumption from allocation) may not have as much as an impact as a cancellation or modification of an existing order. Communication of these changes to suppliers as well as customers is an integral part of a holistic approach.

A holistic approach, as will be illustrated later, will have benefits that are immediately visible:

Integration cost, repetitious modeling is no longer needed, Band-aiding different models together is no longer necessary, updating with additional components such as new sites, new resources, additional constraints, changes in suppliers and suppliers' constraints are all inherently taken care of in a holistic environment.

Adexa's Unified Data Model is a holistic representation of the entire supply chain connecting front office to back office, financial decision to operational decisions, corporate to factory and every resource, supplier to customers, and customers' demand fluctuations to supply and availability of resources and inventory to meet the changes.

A unified data model has an obvious implication of *one touch integration*. In an ever changing and dynamic model, the entire system needs to be updated continuously. In traditional disparate systems, every update at one level needs to be replicated. There is little assurance that updating of the model at the factory level (say a change in equipment efficiency or routing) will be reflected at the corporate level appropriately. This may then lead to inconsistencies in the generated plan and execution thereof. Using a holistic approach, manifested by a unified data

model, any changes in the model will be consistently reflected in other parts of the model both horizontally and vertically.

Very often financial decisions are made and business plans are generated that are not translated to actual operational scenarios. Within a unified data model, any financial plan and business strategy can readily be translated into a feasible operational plan taking into account all the manufacturing as well as vendor constraints (see Adexa's Collaborative Demand Planning and Network Optimizer as part of S&OP solutions). The entire process of customer demand and forecast can be translated into business plans which are then refined into detailed operational plans. It is inevitable that plans are nothing and planning is everything. Within a holistic environment, one needs to have the ability to allow collaboration horizontally as well as vertically. An example might help. A vendor might be late in delivery. This should be translated into a workable plan taking into account the objectives of the company, namely on-time delivery, resource utilization and inventory reduction etc. A revised plan is therefore generated within a very short time frame. Users are not prepared to wait for a long time to know what should be done. The new plan is then translated into an execution plan for the operations. The financial implications of the new decision and potential latenesses are then defined by exception. Thus, a horizontal event and its ripple effect is absorbed vertically by a change in plan. Disparate systems cannot perform this translation effectively or in a timely manner leading to sub-optimal decisions that can cost businesses millions of dollars in inventory or lost opportunity.

Adexa's unified data model addresses the total order fulfillment and optimization including financial planning, sales and operational planning, demand planning,

order configuration, network optimization, inventory planning, supply chain planning, factory level planning and shop level sequencing. In addition, it addresses comparison of plans vs. actuals, incremental changes in plan, risk management & analysis, and what-if analysis. Any undesired deviation needs to be addressed with a revised plan. Two important issues to consider in this case are: stability of the plan and accuracy of the plan. Too many re-planning can make a nervous plan, too few can result in an inaccurate plan. Users can set their own tolerance of how tight or loose the "shock absorbers" should perform.

For more information on this topic and learn more about Adexa innovations contact info@adexa.com.
