



White Paper

LogicTools Suite Complements SAP Solutions

By

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Introduction

In recent years SAP has become the largest vendor of supply chain management (SCM) software. According to AMR Research, SAP took the lead in 2002 from i2 Technologies and has the largest revenue from SCM software in the market. The SAP product, called mySAP™ Supply Chain Management (mySAP SCM), provides planning and execution capabilities for managing enterprise operations, as well as coordination and collaboration technology to extend those operations beyond corporate boundaries. Some of this technology includes:

- Supply chain collaboration such as Collaborative Planning, Forecasting and Replenishment (CPFR), Supplier Managed Inventory (SMI) and Vendor Managed Inventory (VMI);
- Supply chain coordination such as event management including visibility and alert management;
- Supply chain execution including order management, procurement, manufacturing, warehousing and transportation; and,
- Supply chain planning including demand planning, supply planning, Available-to-Promise (ATP) and Configure-to-Promise (CTP) capabilities etc. These are all part of the Advanced Planner & Optimization (APO) component.

These extended capabilities combined with the ability to seamlessly integrate with SAP ERP create a formidable SCM platform. However, there are some important areas where additional capabilities are required that are not provided by SAP. One of these areas is strategic supply chain planning, where the ability to easily model the supply chain and quickly run many what-if scenarios requires a different type of interface and optimization capabilities than those required for operational systems.

LogicTools provides this complementary capability through its integrated suite of planning solutions that includes LogicNet Plus® XE for network design and planning and the Supply Chain Analyst modules: Inventory Analyst™ for strategic inventory positioning and optimization, Supply Planner for production sourcing and Product Flow Optimization for hub and spoke distribution decisions. LogicTools' integrated planning suite provides solutions that optimize the supply chain by considering the entire network, taking into account production, warehousing, transportation and inventory costs, as well as service level requirements.

In January 2004, LogicTools became an SAP software partner for supply chain network design. LogicTools network design solution, LogicNet Plus XE, is offered as an extension to the mySAP SCM solution and has a certified integration with SAP APO. LogicTools' technology, leadership and proven track record in the supply chain planning industry are the reasons SAP chose LogicTools to be their partner. In April 2005, LogicTools completed the Powered By NetWeaver (PBNW) certification of Inventory Analyst.

While working on many SAP accounts, we have found that LogicTools' entire suite is a good fit for SAP users whether they deploy the mySAP SCM suite or not. In particular, users of the entire SAP planning suite, including SAP APO, find that the LogicTools Suite is an excellent complement. This is true since LogicTools suite of products addresses strategic questions around supply chain design and planning. These include

- **Network design and planning**, addressing questions such as how many facilities to have; where to locate those facilities; what should be the size of each facility; how product should flow through the facilities and what should be the territory served by each facility, that is, which customer should be served from what facility.
- **Multi-echelon inventory optimization**, addressing issues such as where to place inventory; how much safety stock to keep; what is the right inventory mix at different locations; what are the key inventory drivers and how can the firm increase service level and decrease order fulfillment lead-time; can the firm take advantage of postponement strategies; and which portion of the supply chain should be managed based on push and which should be managed based on pull; and finally,

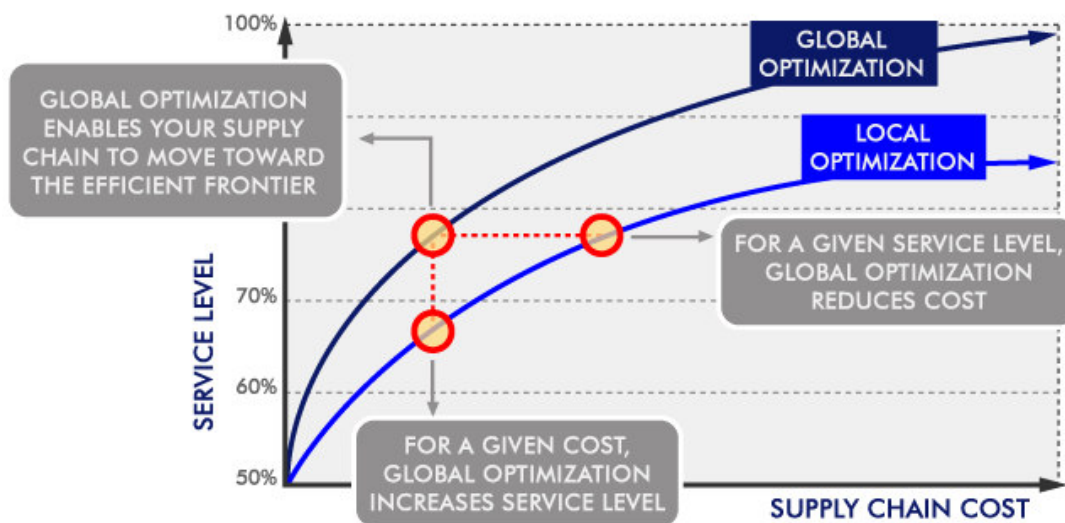
- **Production sourcing and asset planning**, focusing on where to produce; deciding between flexibility and specialization, that is between a flexible strategy in which each product is produced at multiple locations, versus a strategy in which each facility specializes in manufacturing a specific product; selecting among suppliers to provide raw material; determining the trade-off between inventory pre-builds and excess capacity; and how to utilize supply chain assets effectively to cope with seasonal supply, seasonal demand, and promotional activity.

All these questions and issues require decision makers to:

- **Perform end-to-end supply chain optimization**, referred to as **Global Optimization**. Indeed, many supply chain problems are driven by the tendency of managers and executives to optimize decisions in the supply chain looking at one facility and one product at a time, the so-called **Local Optimization** approach. Figure 1 below illustrates the impact of replacing local optimization by global optimization.
- **Consider many scenarios and run what-ifs at high frequency**. Indeed, since the frequency of making strategic decisions such as facility locations, inventory positioning or production sourcing, is relatively low, i.e., quarterly or annually, it is important to analyze many different scenarios in order to develop robust strategies and understand the tradeoffs between different decisions.
- **Take uncertainties and risk into account**. Uncertainties are inherent in planning on many levels. This includes not only uncertainty in demand but also uncertainties in supply, as well as processing and transportation time. The ability to incorporate uncertainty into the supply chain model allows decision makers to determine the appropriate inventory levels at different locations for different products, thus satisfying service level targets while minimizing system-wide cost.

The LogicTools suite is a powerful, easy to use and integrated set of planning solutions allowing decision makers to easily build scenarios and troubleshoot models, efficiently optimize large-scale supply chains, and effectively identify and explain key supply chain cost drivers.

Figure 1: Local vs. Global Optimization



Importance and returns of strategic and tactical supply chain planning

The majority of a supply chain's lifecycle cost is locked in the phase when strategic decisions determine the nature and design of the network. The decisions made at this stage include:

- The structure of the distribution network – decisions on where to produce, where to locate facilities etc.
- The push/pull boundaries – decisions on make-to-stock versus make-to-order
- Postponement strategies – where to finalize the product
- Positioning of inventory across the supply chain – where to keep and where not to keep inventory
- Parts and components suppliers – price, quality and service considerations
- Service levels to customers – requirements and commitments

The design of the supply chain structure is complex due to different conflicting objectives such as cost and service tradeoffs, inherent uncertainties in both supply and demand and various supply chain dynamics such as the “bullwhip effect”. Strategic supply chain planning solutions help companies:

- Find the right balance between inventory, manufacturing and transportation costs and service requirements.
- Match supply and demand under uncertainty by positioning inventory across the supply chain
- Use resources effectively in a dynamic environment.

Several recent developments have made this process even more complex and critical to a company's success, these include:

- Increase in global manufacturing capacity
- Dependency on outsourced manufacturing
- Focus on service to customers and large retailers, such as Walmart
- Pushing of inventory to suppliers

Implementation of strategic supply chain planning systems is relatively simple and fast with data easily imported from the user's current systems. Once the initial model is validated, additional scenarios can be ran quite easily and quickly, with results achieved in a matter of weeks.

Therefore the resulting ROI from these projects can be very high. Savings in network design studies are typically 5% to 15% of total supply chain costs. AMR Research in *Redefining the Role of Inventory for Demand-Driven Supply Networks*, January 25, 2005 mentions: “Quick Return on Investment (ROI)—Irrespective of the technology deployed, the companies we interviewed reported an ROI in weeks or one to two months, with many mentioning they had never had such a fast return from a supply chain planning project.”

In addition to cost savings, companies can at the same time achieve “Dramatic improvement in service—The companies' inventory optimization implementations also increased order fill rates by 2% to 13%, dramatically improving customer service levels.” (see AMR Report above)



LogicTools Suite

LogicTools' mission is to positively impact our customers' performance by providing the most effective strategic and tactical supply chain optimization solutions that complement existing IT investments

We achieve this goal through easy to use, state of the art supply chain optimization technology that helps companies make intelligent decisions in their supply chain. The suite, see Figure 2, includes three components, **Network Design & Planning (LogicNet Plus XE)**, **Multi-echelon Inventory Optimization (Inventory Analyst)**, and **Production Sourcing & Asset Planning (Supply Planner)**. It incorporates a variety of features required to effectively capture the realities of a complex supply chain. In addition, LogicTools' proprietary optimization solvers enable optimizing large and complex supply chains in a short amount of time. These off-the-shelf advanced optimization solutions have been used in many industries from retail and consumer goods through 3PL and manufacturing to high tech.

Consider for example the Timken Company, an SAP and LogicTools joint customer. According to Timken, they selected the LogicTools suite *"because of the ease of use, performance of their software as well as reputation and experience in supply chain optimization."* Indeed, LogicTools has always stressed the ease of use of the software through research and development as well as learning from our customers. Our solutions feature edit in Excel, fast import and export functionality, superior error messaging and fast solvers. This allows users to focus on the problem at hand and run through many what-if options to find the best solutions for their business.

The LogicTools suite provides an integrated software solution that includes:

LogicNet Plus XE for Network Design & Planning

LogicNet Plus XE® is a network design and planning solution that combines advanced optimization technology with an easy to use graphical user interface to manage the world's most complex supply chains. This powerful solution enables the quick analysis of the tradeoffs between production, warehousing, transportation costs and service requirements as well as the calculation of the optimal network configuration for different cost and service objectives. Solutions from the model can be viewed, compared and easily exported to tables and graphs for presentations and further analysis. It combines a state-of-the-art Mixed Integer Programming (MIP) based proprietary optimization solver that quickly analyzes various tradeoffs between costs and service requirements to arrive at the best solution. This product handles some of the most complex networks and is capable of designing multi-tier global supply chains.

SAP used to include a network design component called ND in all versions of SAP APO up to 3.0. Starting with SAP APO version 3.1 and forward the ND component is no longer included and since January 2004, SAP recommends LogicNet Plus which has a certified integration to SAP APO.

Examples of applications for Network Design & Planning:

- **Post Merger Integration:** A Fortune 500 food manufacturer was looking to rationalize the supply chain following an acquisition to realize operations synergies promised to Wall Street.
- **Global supply chain design and contingency planning:** A global Fortune 50 CPG client needed to identify the best number of manufacturing locations throughout the world to minimize supply chain costs. Additionally, the client wanted to explore network expansion for growth and contingency planning due to political or economic upheavals.
- **Long term distribution planning:** A Fortune 500 retailer needed to create 5-year distribution strategy to meet high growth rates. Client leveraged the multi period functionality of LogicNet Plus XE to identify a 5-year expansion plan.



Inventory Analyst for Multi-Echelon Inventory Optimization

Inventory Analyst is a multi-echelon inventory planning solution that helps companies improve their profitability by strategically positioning and optimizing inventory across the supply chain. Based on recent research in inventory management and proprietary LogicTools' stochastic and nonlinear optimization technology, Inventory Analyst is a revolutionary solution to optimize inventory and service levels.

Conventional inventory optimization software solutions look at inventory planning within a single facility. Unfortunately, by considering each site independently, a firm finds itself with excess inventory and poor customer service levels. Inventory Analyst™ can help find how to improve service level while placing the right amount of inventory in the right locations.

Since SAP does not have a module that can perform this type of inventory analysis, supply chain managers and executives need to complement their SAP investment with the appropriate technology that can feed safety stock information to their systems. **Inventory Analyst from LogicTools has Powered By NetWeaver integration.**

Examples of applications of inventory planning:

- **Inventory positioning and safety stock analysis:** The R&D Group of a Big 3 car manufacturer needed to identify the optimal positioning and identify key inventory drivers for their service parts division.
- **Make-to-Stock vs. Make-to-Order:** A contract manufacturer in the high tech industry needed to decide which facility should produce to order and which facility should produce to stock. The manufacturer has five echelons in their supply chain and Inventory Analyst determined the supply chain configuration and the level of inventory at the Make-to-Stock facilities.
- **Centralized vs. regional storage:** A Fortune 100 retailer needed to identify which SKU's (total = 50,000) needed to be centralized vs. stored regionally to minimize total landed costs which include inventory, transportation and warehousing costs.
- **Strategic sourcing:** A Fortune 500 heavy equipment manufacturer needed to evaluate alternate suppliers and structure appropriate service contracts to help reduce system-wide inventory.

Supply Planner for Production Sourcing & Asset Planning

The Supply Planner production sourcing and asset planning solution determines various tradeoffs between production costs, capacities and lot sizes, tooling requirements, warehousing costs, transportation costs and service requirements. The objective is to suggest production and replenishment plans for future time periods.

Specifically, Supply Planner helps users address issues such as:

- **Production:** When you have multiple facilities with similar capabilities, where should you produce each product to balance manufacturing costs, raw material costs, and transportation costs while considering limited capacity?
- **Sourcing:** When you have multiple sources for raw material, which supplier should be used for each plant optimizing over the price of the material and transportation costs while considering supplier contracts, capacities and availability at different times of they year?
- **Seasonality:** Determine appropriate trade-offs between pre-built inventory and excess capacity as well as determine effective asset utilization strategies throughout the year.
- **Equipment:** Where should the firm install certain tooling or packaging equipment? What will be the overall impact of moving or adding equipment and assets within the supply chain?

To some extent, Supply Planner functionality resembles the SNP component of SAP APO; however there are important differences that make Supply Planner and SNP complementary tools. SNP products are meant to be run on a daily or



weekly basis and, at their core, need to run down to the detailed level and provide, at minimum, good feasible results. As such, SNP employs sophisticated algorithms that weigh different factors to come up with a good feasible plan. Supply Planner is deployed as a strategic or tactical application to analyze tradeoffs by running many what-if scenarios. It employs sophisticated optimization algorithms that perform total cost optimization. It is relatively easy to set up a model in Supply Planner and it has fast run times measured in minutes that allow frequent and efficient what-if analysis. Often, Supply Planner models aggregate the data in some way and then disaggregate before feeding back to SNP as we show in Case Study 2 below.

These important differences motivated many SAP APO clients to deploy Supply Planner for strategic and tactical planning. Examples include:

- **Strategic production sourcing:** A Fortune 100 industrial components manufacturer needed to determine the optimal production sourcing strategies accounting for capacities and line speeds of the manufacturing process. Additionally, the model is used for centralized decision making and evaluating capital investments needed to support forecasted growth.

- **Ongoing production planning:** A global plastic accessories manufacturer needed a tool that would assist in strategic and tactical production planning. The strategic model helps evaluate the impact of the location of existing production lines as well as evaluates the need for additional investments. The tactical model is used for creating a monthly production plan that is fed to their scheduling system.

- **Warehouse sizing:** A Fortune 500 CPG company needed to determine warehouse size requirements (including those that are attached to plants as well as distribution centers) to account for significant seasonality in production and demand. Additionally, the client wanted to understand the trade-offs between adding space at plant warehouse vs. the use of overflow facilities.

- **Strategic Time-Phased Capacity Planning:** Determining how to optimally use or configure assets in a dynamic business environment where volumes fluctuate significantly throughout the year because of seasonality, commodity availability, or promotions. Without careful planning, a firm can find itself stuck with both poor asset utilization and excess use of overflow, outsourced, and overtime resources.

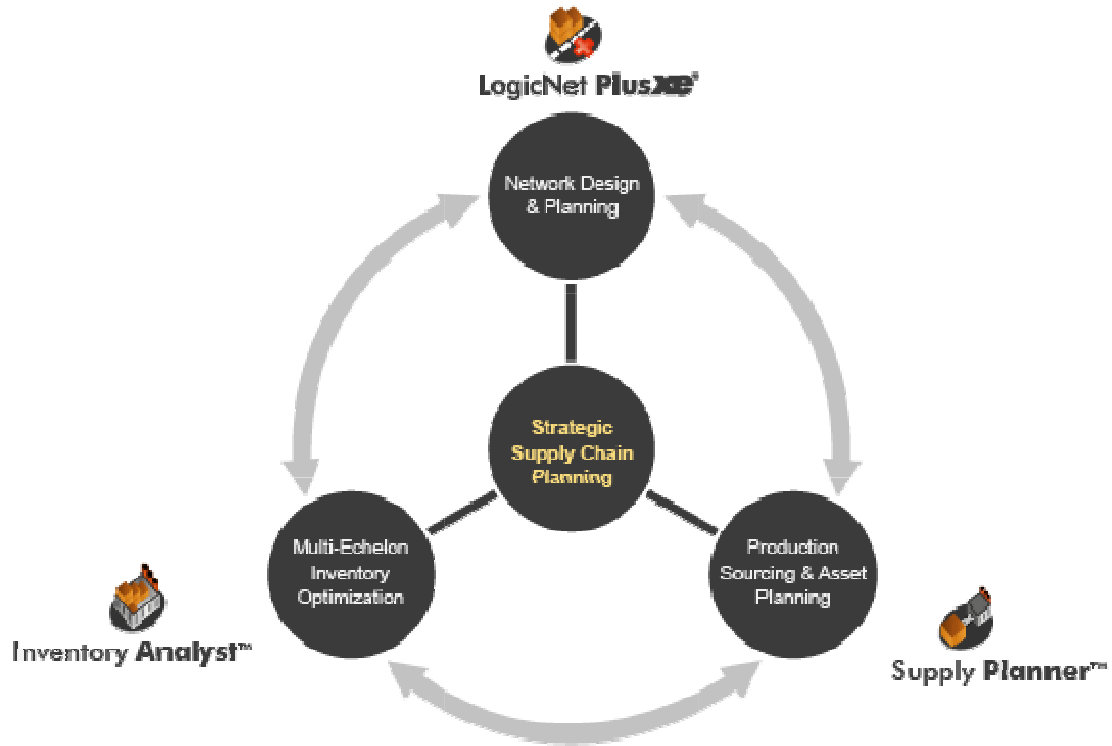


Figure 2: LogicTools' suite of solutions and sample business applications:

Combined applications

Although each of the suite components is designed to answer specific questions and works in a stand alone fashion, there are many applications where a combination of the suite is used to solve complex supply chain issues. LogicTools' integration capability between the three components allows for easy transfer of data from one component to another.

Some examples of applications where a combination of components is used include:

Network Design and Inventory Optimization: In the last few years many companies have used network design tools to identify an efficient supply chain. Unfortunately, in the past it was difficult to estimate the impact of changing the number and locations of facilities on inventory levels. Now, firms are adding Inventory Analyst capabilities to their network studies to understand how inventory should be positioned in the new network and how much inventory is needed for different scenarios.

Product Flow Optimization: Determining appropriate hub and spoke strategies requires network design and inventory optimization. Product Flow Optimization determines the number, location, and relationship between hubs and spokes as well as which products should be stored in the hubs and which in the spokes.

Network Design and Planning: Complex supply chains require both an understanding of the optimal number and location of facilities, as well as a need to determine which manufacturing facility is going to produce which product. In these cases, LogicNet Plus XE is typically used with annual demand forecasts to determine optimal locations using detailed monthly data to determine how to best use the assets within the network configuration.

Integration with SAP

LogicTools has many SAP customers who have worked with our suite for the last several years. They typically extract data required for modeling from the business warehouse or directly from R/3 and other systems. Results from the LogicTools applications are fed back into SAP either manually or through data files to the required systems. LogicTools is able to provide integrated solutions either through its integration of network design and inventory planning to SAP APO or through integration with SAP BW or other SAP components.

In January 2004, LogicTools became a software partner of SAP for supply chain network design. LogicTools network design solution, LogicNet Plus, is offered as an extension to the mySAP SCM solution and has a certified integration with SAP APO, see Figure 3. LogicTools' technology, leadership and proven track record in the supply chain planning industry are some of the reasons SAP chose LogicTools to be their partner.

In April 2005, we completed the Powered By NetWeaver (PBNW) integration for Inventory Analyst, our Inventory optimization product. The PBNW integration allows SAP users to access Inventory Analyst™ through the SAP® Enterprise Portal, access, transfer and search data from the Knowledge Manager and analyze reports in the Business Warehouse. Figure 4 depicts the Inventory Analyst interface through SAP Enterprise Portal 6.0



Figure 3: LogicNet Plus Certified Integration to SAP APO

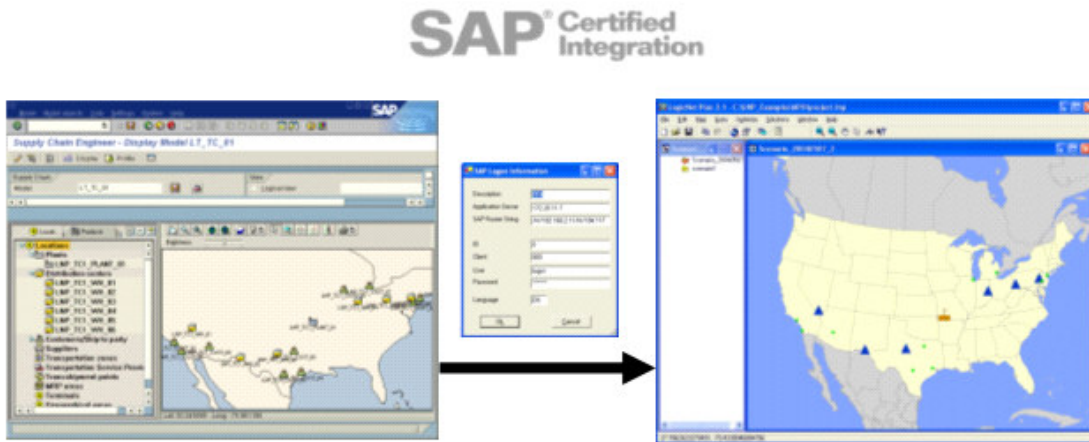
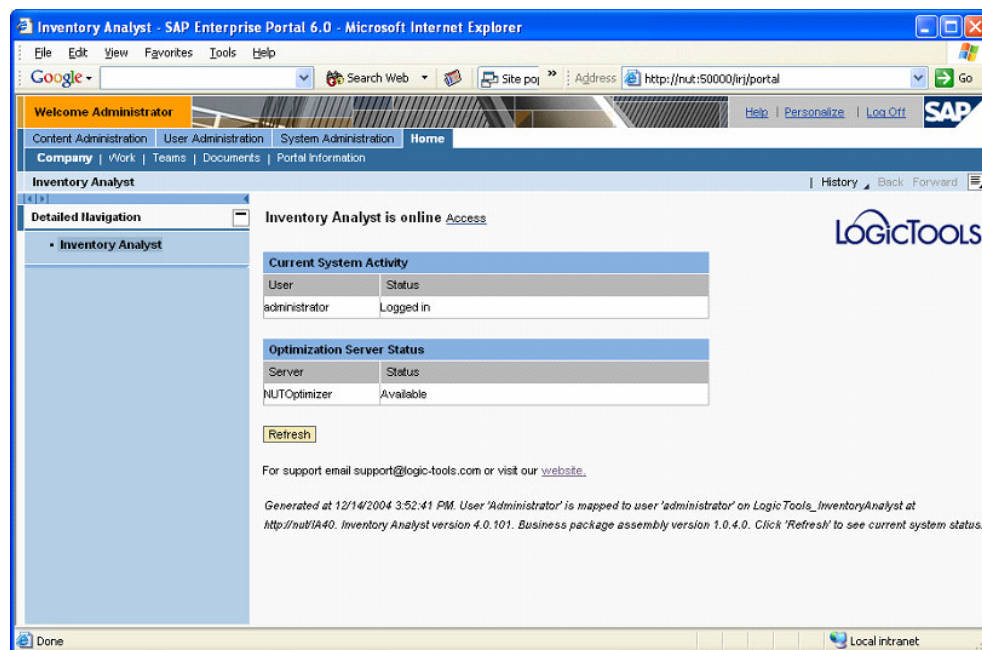


Figure 4: Inventory Analyst Powered By NetWeaver interface through SAP Enterprise Portal 6.0



Integration with on going supply planning processes

LogicTools customers who also use SAP are interested in integrating inventory optimization capabilities into their operations on an on-going basis. For instance they may view the supply planning process as consisting of

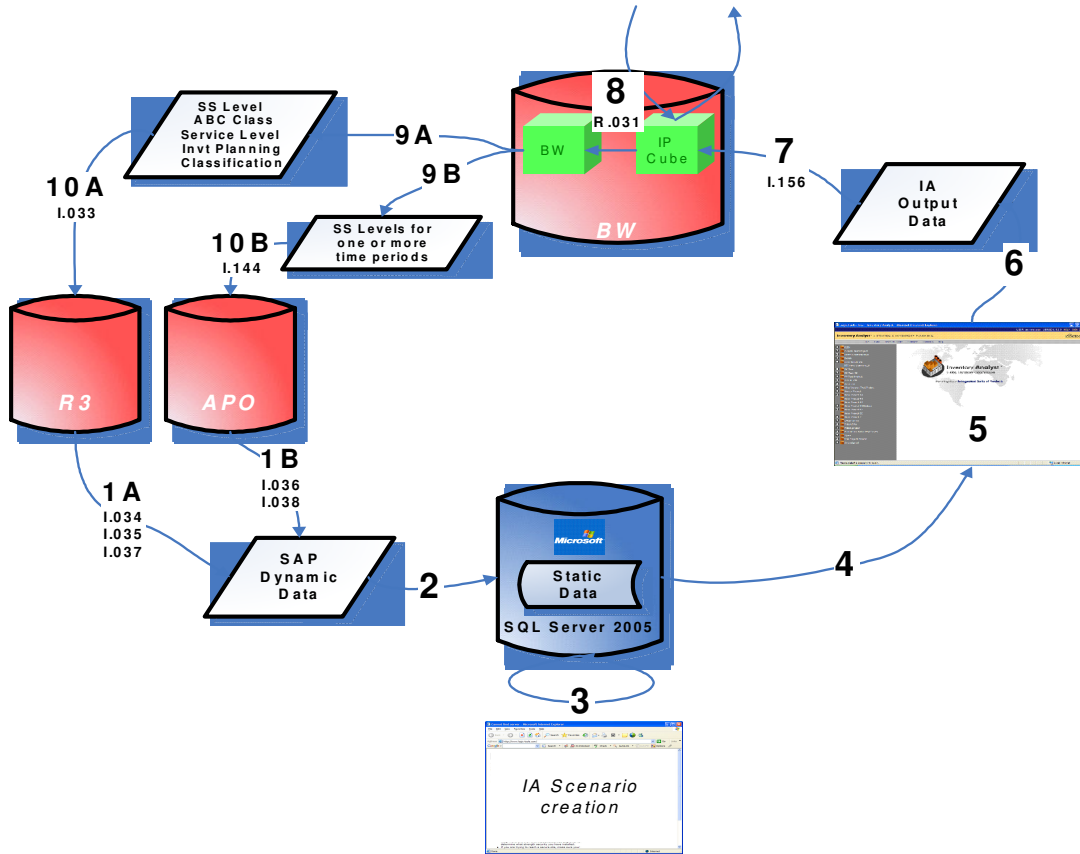
- Demand Planning** - make to forecast/ make to order definition and forecasting
- Supply Network Planning** - internal / external capacity checking
- Inventory Planning** – setting overall inventory targets, service level targets and safety stock targets
- Sales, Inventory & Operation Planning** - alignment of supply & demand, direction setting, and business decision process (mid-term / long-term).

Customers are looking for inventory planning solutions that provide standardized & repeatable processes that are executable across all business units, where parameters may change but the overall process remains the same. Examples:

- Optimize inventory levels while maximizing service levels across supply chain nodes with a process that defines service levels by SKU and calculates an expected aggregate service level across business units.
- Process to be executed monthly and integrated within the SI&OP planning processes.
- Implementation process will allow level loading of safety stock quantities to operate within business plan targets and have a formal approval process for modifications to targets.
- Annual process for setting target inventory and service levels.

Figure 5 below shows a typical integration scenario with SAP. Dynamic data from R/3 and APO, such as forecasts, forecast error and production information is pulled into an intermediate database and from there processed with static data such as network structure into Inventory Analyst. The scenarios are run in inventory analyst and the selected runs are loaded into an SAP BW for further analysis and from there the safety stock , service levels and other data is updated back into the SAP systems.

Figure 5: Inventory Analyst typical integration with SAP



LogicTools Case Studies

The following case studies are based on LogicTools customers who also use SAP and in two cases they also use SAP APO for supply chain planning. The names of the companies and details have been changed to protect confidentiality. The type of problems and issues addressed using LogicTools' suite tend to have a high impact on business strategies and therefore companies are often reluctant to share this type of information. The case studies cover examples of implementations of the LogicTools suite in several industries and the significant returns achieved through the modeling of the company's supply chains.

Case Study 1: Global Manufacturing Network Rationalization

Project Background

As part of an analysis of its global supply chain, ABC Inc., a large CPG manufacturer and an SAP APO user, undertook several projects to rationalize the global manufacturing network for each of its divisions. Since the products were relatively inexpensive with low cost manufacturing facilities, freight costs and duties became the focus of the study. The main objective was to design a global manufacturing network while minimizing total supply chain costs. Varied market requirements made it difficult for a few plants to satisfy all customer product needs. ABC leveraged LogicTools' expertise in network modeling to capture the current network configuration and then determine the best network of manufacturing facilities that minimized system wide costs.

Using LogicNet Plus XE, the manufacturer was able to identify savings of \$15 million. This was achieved primarily by rationalizing expensive assets and shifting production volumes to more cost effective locations. They also utilized lower cost and lower duty shipping lanes to further reduce their overall costs.

Company Background

ABC Inc. is one of the leading CPG manufacturers in the world with annual revenues of around \$14 billion selling household consumer goods for everyday use. The current project was focused on the manufacturing network for one of the main product lines.

Products are sourced from the company's own plants as well as from contract manufacturers throughout the world and shipped to end customers through local and regional distribution networks. The production process consists of two main steps: molding and finishing. The finishing operation is common to most products and is typically the bottleneck at any given facility. The manufacturing and related differences between various brands are quite complex.

Business Objectives and Challenges

The main objective of the project was to identify the best number of manufacturing locations throughout the world in order to minimize supply chain costs. The project team was also tasked to identify production volumes for each product at each manufacturing location and the markets served by each plant. Finally, ABC wanted to explore network expansion for growth as well as to address risks such as natural disasters, port delays and strikes etc.

All plants could not make all the products and local government regulations, local marketing considerations, etc., added to the SKU complexity. Different plants had different allocations of fixed and variable costs of manufacturing; some of the plants also served as 'technology testing' centers and therefore incurred higher allocation of fixed costs. Machinery was not of the same age or technological advancement at every plant and recommended shifts in production volumes, machinery write-offs and capital investments had to be considered.

Implementation

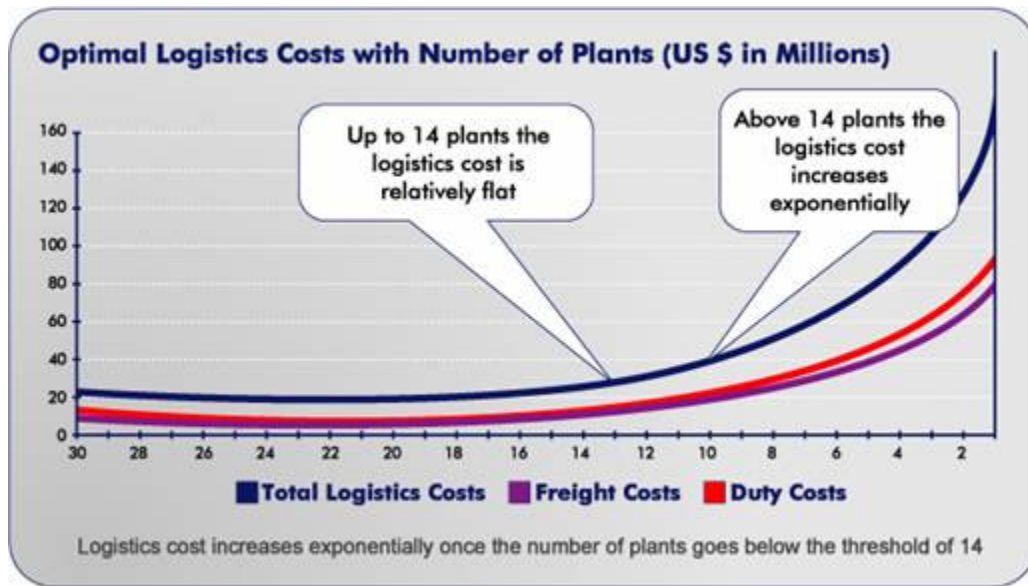
ABC’s global sourcing team worked closely with LogicTools on data requirements, assumptions, aggregation strategies, model building and analysis of results. Production costs, capacities, freight and duties formed some of the key inputs to the models. Current network configuration was first modeled and then various scenarios for optimal manufacturing network were analyzed. Key scenarios were then tested for their sensitivity to variables such as production costs and freight. Selected scenarios were further analyzed for capital investments and write-offs, savings, ROI and intangibles such as change management issues.

Results / Benefits

Using the results from LogicNet Plus XE, ABC was able to determine the optimal manufacturing network and identify a cost reduction of \$15 million. Cost reduction was in part due to closing expensive plants in high labor markets and reallocating some of the assets to cost effective locations. Optimally reallocating production volumes and utilizing cheaper freight lanes helped ABC reduce costs further.

The graph in figure 6 below illustrates the trade off between number of manufacturing facilities and logistics cost for ABC’s network. The interesting result was that reduction of the number of plants down to 14 plants does not significantly increase logistics costs. However, beyond that point, further reduction in plants causes significant rise in logistics costs. This entails that the company can take other factors into consideration, such as risk, when reducing the plants down from 30 to 14.

Figure 6: Optimal Logistics costs and number of plants



Case Study 2: Production sourcing

Project Background

DrinkUp Inc., one of the largest beverage manufacturers in the US and an SAP APO user, was reviewing its manufacturing locations for better utilization and replenishment strategies.

Using the network design and planning (LogicNet Plus XE) and production sourcing and asset planning (Supply Planner) solutions from LogicTools, the beverage manufacturer was able to increase utilization of current plants and plan for growth.

Company Background

DrinkUp Inc. is one of the largest beverage manufacturers in the US and is one of the largest in the world in capacity. Purity of water source is a key criterion for location of manufacturing plants and their main plant is one of the largest in the world. The manufacturing process and marketing differentiation drive refrigerated storage and transport throughout the entire finished good supply chain. The company has other types of facilities such as packaging locations and several hundred distributors in US with relatively minor volume of exports outside the US.

Business Objectives and Challenges

The key questions that needed to be answered were:

- 1 How should each product be replenished to each customer? From what finished goods warehouse? Via what Mode?
- 2 At what plant should it be produced? What production line should it be made on?
- 3 Through which warehouse should product move between packaging and customer shipment?
- 4 Which vendor should supply the components?

The main constraints were:

- 1 Line throughput capacities
- 2 Supplier minimums and volume-price incentives
- 3 Warehouse storage capacities
- 4 Mode throughput capacities: Rail/TL dock limitations, bulk Rail loading limitations and carrier availability
- 5 Manufacturing capability limitations by site

Implementation

DrinkUp's sourcing team worked on data requirements, assumptions, aggregation strategies, model building and analysis of results. Production costs, capacities and the various freight options formed some of the key inputs to the models. What they came up with was somewhere between a highly simplified strategic model and a true execution system. For example, the company has about 600 products but only needed to model 175 product families to accurately capture their business needs in the model. This type of modeling complements the more detailed analysis performed with SAP APO. The team modeled the plant and warehouse location questions in LogicNet Plus XE and then proceeded to modeling in Supply Planner for the detailed production sourcing decisions.

Results / Benefits

Using the results from LogicNet Plus XE and Supply Planner, DrinkUp was able to plan its expansion and make decisions on plant production with buy-in from the plant managers and all others involved in the process. Significant savings were found through better utilization of plants and transportation options to customer but these also produced a more efficient process with better service levels to customers.

Case Study 3: Inventory Optimization

Competition and the opportunity to lower manufacturing costs have led AllumaCorp, a leading metal component manufacturer and SAP user, to move manufacturing of a set of products from the US to China. Although the decision had already been made, executives at the company wanted to understand its inventory implications. Suppliers had unique contractual terms, and certain types of customers required different service requirements. Further, customs clearance had a direct impact on order to receipt time of the raw material. In light of its supply chain complexity, AllumaCorp realized that they needed a sophisticated way of managing their inventories. The company worked with LogicTools to estimate the level of inventory required in the new configuration and determine where it should be positioned.

Using Inventory Analyst™, the multi-echelon inventory optimization solution from LogicTools, AllumaCorp was able to determine the inventory levels for the new network configuration and identify opportunities for reducing inventory levels overall. The study also helped identify key inventory drivers which were very different from what executives had focused on at the beginning of the project.

Company Background:

AllumaCorp is a global manufacturer of metal components and engineered alloys with annual sales of \$3B in 2002. Products are sold world wide and shipped to customers either through the regional or country DCs.

For products manufactured in China, components were supplied from China, Japan and India. AllumaCorp had different terms of service with each supplier; some suppliers made-to-order while others made-to-stock. Transit times and customs clearance were different for different suppliers. Plants had fixed storage capacity for finished goods. AllumaCorp had two types of customers: OEM and after-market customers. OEM customers placed orders well in advance while after-market customers required the product to be available immediately.

Business Challenges:

The key business challenge for AllumaCorp was to accurately estimate the level of inventory in light of the new manufacturing network and determine where it should be positioned in the supply chain. Management had zeroed in on two key drivers of inventory and wanted to understand the impact of both. Consequently, they wanted to understand the benefit of more accurate forecasting methods and the impact of higher service levels to a certain type of customer base. Finally, they wanted to consider the entire the entire supply chain in making the inventory decisions.

Implementation:

AllumaCorp leveraged LogicTools' global inventory optimization solution to first determine where inventory should be positioned and the inventory levels required for the new supply chain. They built a model in Inventory Analyst to mirror AllumaCorp's current business and supply chain processes. Current supply chain configuration, demand forecasts and forecast error, service level requirements, service time requirements, transit times and their variability, processing times and their variability and inventory carrying costs for different SKUs formed the key inputs to the analysis.

Once it was clear to AllumaCorp that the inventory drivers they originally focused on had very little impact on inventory, they leveraged LogicTools' expertise to identify the actual inventory drivers of their supply chain. Although the new network had less safety stock due to repositioning of inventory it had higher in-transit inventory and higher cycle stock levels. This indicated that the factors affecting in-transit inventory and cycle stock would have a larger impact on overall inventory levels in the new network configuration.

Results:

Using the results from Inventory Analyst, AllumaCorp was able to optimally reposition its inventory across the network resulting in an overall inventory reduction of 30%. The analysis suggested that most of the inventory be held at two tiers of the supply chain to support stringent committed service times.

Contrary to their expectations that accurate forecasting methods and improve customer service times would reduce inventory, the study indicated that the key inventory drivers included the transit time from the China plant, committed service times for OEM customers and frequency of shipments to regional and country DCs. See figure 7 for more detail. The study helped AllumaCorp identify the factors that have a large impact on inventory and therefore, need to be managed closely.

Figure 7: Optimal Logistics costs and number of plants

Driver	Impact	Driver Suggested by
Reduced forecast error	< 1 %	Management
Longer lead times to customer	< 1 %	Management
Inventory positioning	30%	Global Optimization
Synchronization	0-19%	Global Optimization
Changing transit time	9%	Global Optimization
Changing shipment frequency	11%	Global Optimization



About LogicTools Solutions:

LogicNet Plus® XE is a network design and planning solution for facility location studies, distribution planning, and multi-site production sourcing. This product has a certified integration with SAP APO which is offered as an extension to the mySAP™ Supply Chain Management (mySAP SCM) solution.

Supply Chain Analyst™ is an integrated solution for supply chain and inventory optimization that enables both strategic and tactical planning. SCA includes different optimization modules, allowing users to address specific supply chain problems. Modules use a common database that enables users to quickly move from one module to another. Built in integration capabilities provide the ability to easily connect to other systems. Modules include:

Inventory Analyst™: A multi-echelon inventory optimization solution that enables companies to improve profitability by focusing on both strategic and tactical inventory objectives. Inventory Analyst is Powered by SAP NetWeaver.

Supply Planner™: A production sourcing & asset planning solution that supports production and inventory replenishment plans for future time periods.

Product Flow Optimization™: A network and inventory optimization solution that targets product flow decisions and joint network design and inventory distribution strategy optimization.

Demand Profiler™ is an add-on product that enables analysis of historical data to create forecast and forecast error.

About LogicTools

Founded in 1995 by David Simchi-Levi, Professor of Engineering Systems at MIT, LogicTools provides strategic and tactical supply chain optimization applications designed to complement existing IT investments. LogicTools' product suite allows companies to make a wide range of supply chain decisions, from choosing the best strategic network design, deciding on the most efficient sourcing strategy to optimizing inventory placement throughout the different levels of the supply chain.

LogicTools is headquartered in Chicago, IL and supports a global customer base across a wide range of industries. As a longtime SAP partner, LogicTools has helped many SAP customers complement their ERP and planning applications with optimization solutions. LogicTools' network design solution is offered as a certified extension to mySAP™ Supply Chain Management and its inventory optimization solution is Powered by SAP NetWeaver.

Contact LogicTools

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