IBM ILOG LogicTools Suite Complements SAP Solutions

David Simchi-Levi
ILOG Chief Scientist, Application and Integration Middleware Software,
IBM Software Group

Edith Simchi-Levi
VP Operations, ILOG Supply Chain Applications,
Application and Integration Middleware Software, IBM Software Group

Michael S. Watson
Software Sales Manager, ILOG Supply Chain Applications,
Application and Integration Middleware Software, IBM Software Group

Contents

Introduction

In recent years, SAP has become one of the largest vendors of supply chain management (SCM) software. According to AMR Research, SAP took the lead from i2 Technologies in 2002 and has the largest revenue from SCM software in the market. SAP's main product – SAP Supply Chain Management (SAP SCM)–delivers a complete set of features and functions for building adaptive supply chain networks.

SAP SCM enables:

- **Supply chain planning and collaboration**—model existing supply chains, set goals, and forecast, optimize and schedule time, materials and other resources. Supply chain planning functionality enables companies to maximize return on assets and help ensure a profitable match of supply to demand. In addition, the SAP Sales and Operations Planning (SAP SOP) application supports an integrated sales and operations planning process, enabling a single, unified plan to drive business operations.
- **Supply chain execution**—SAP SCM enables the carrying out of supply chain planning and the generation of high efficiency at the lowest possible cost. It provides the ability to sense demand and respond to it through an adaptive supply chain network in which distribution, transportation and logistics are integrated into realtime planning processes.
- **Supply chain visibility design and analytics**—provides network wide visibility across the extended supply chain to perform strategic and day-to-day planning. The application also enables collaboration and analytics to monitor and analyze the performance of the extended supply chain using predefined key performance indicators (KPIs).

Contents

Highlights

The LogicTools 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.

Planning capabilities such as demand planning and supply network planning are available with the SAP Advanced Planner and Optimization (SAP APO) component. These capabilities, combined with the ability to seamlessly integrate with the SAP ERP platform, create a formidable SCM platform. However, there are some important areas where additional capabilities are required but 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 different what-if scenarios requires optimization capabilities and a different type of interface than those required for operational systems. Other areas include setting safety stock across the supply chain and providing integrated production planning and scheduling to the process industry.

IBM® ILOG Supply Chain Applications provide this complementary capability through the IBM ILOG LogicTools Suite of planning solutions. The suite includes:

- **IBM ILOG LogicNet Plus** for network design and planning
- **IBM ILOG Inventory Analyst** for inventory positioning and optimization
- **IBM ILOG Product Flow Optimizer** for integrated stocking and distribution
- **IBM ILOG Plant PowerOps** for integrated production planning and detailed scheduling
- **IBM ILOG Transportation Analyst** for transportation planning

The LogicTools 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.

Highlights

In January 2004, LogicTools, now IBM, became an SAP software partner for supply chain network design. IBM ILOG LogicNet Plus complements SAP SCM and has a certified integration with SAP APO. The LogicTools suite has also received "Powered by SAP NetWeaver" certifications for IBM ILOG Inventory Analyst and IBM ILOG Plant PowerOps.

Through working on many SAP accounts, we have found that the entire LogicTools suite is a good fit for SAP users, whether they deploy the SAP 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.

The LogicTools suite of products addresses strategic questions concerning supply chain design and planning, and provides the appropriate tools to do the analysis.

This is true because the LogicTools suite of products addresses strategic questions concerning supply chain design and planning, and provides the appropriate tools to do the analysis.

These include:

- Supply chain design questions such as:
  - How many facilities to have?
  - Where to locate those facilities?
  - What should be the size of each facility?
  - How should product flow through the facilities?
  - What should be the territory served by each facility, that is, which customers should be served by which facility?

Highlights

In recent years, the impact of carbon emissions has been increasingly taken into account when designing the supply chain.

- Multisite production planning and sourcing 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-offs between inventory prebuilds and excess capacity
  - How to utilize supply chain assets effectively to cope with seasonal supply, seasonal demand and promotional activity

Commodity pricing changes, in particular oil prices and various other risks, can be quickly evaluated once a company has these models set up.

Commodity pricing changes, in particular oil prices and various other risks, can be quickly evaluated once a company has these models set up.

- Transportation planning is also important at the strategic level. Questions address:
  - Determining the best fleet size
  - Setting fixed routes for private fleet
  - Deciding between private fleet, commercial truckload, and less than truckload carriers
  - Analyzing opportunities for combining forward shipments and backhauls
- Inventory positioning and optimization issues such as:
  - Where to place inventory
  - How much safety stock to keep

Highlights

- What is the right inventory mix at different locations
- What are the key inventory drivers
- How can the firm increase service level and decrease order fulfillment lead time
- Can the firm take advantage of postponement strategies
- Which portion of the supply chain should be managed based on push and which on pull

- Safety stock setting enables calculating safety stocks in the system based on multi-echelon inventory optimization that takes into account service levels as well as variability in demand, production and transportation. This provides more accurate settings than those typically provided by single echelon calculation.

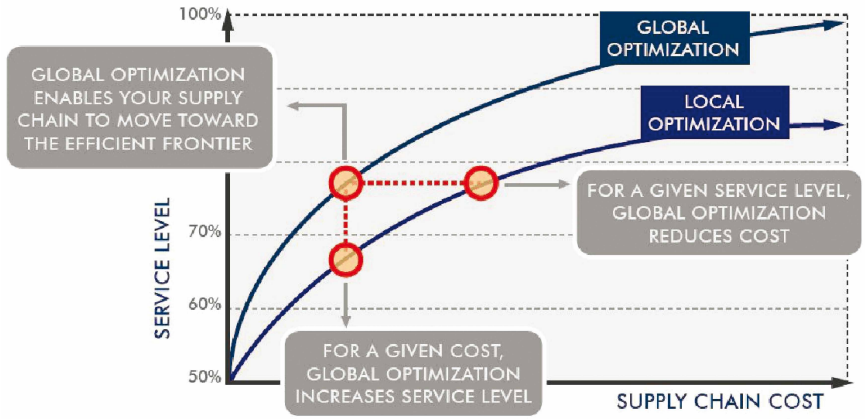
All these questions and issues require decision makers to:

- **Perform end-to-end supply chain optimization, referred to as global optimization.** 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 with global optimization.
- **Consider many scenarios and frequently run what-ifs.** Since the frequency of strategic decision making on matters such as facility locations, inventory positioning and production sourcing is relatively low (for example, quarterly or annually) it is important to analyze many different scenarios in order to develop robust strategies and understand the trade-offs between different decisions.
- **Take uncertainties and risk into account.** Uncertainties are inherent in planning on many levels. This not only includes 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 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.

Highlights

Figure 1: Local versus global optimization



Importance and Returns of Strategic Supply Chain Planning

The majority of a supply chain's life-cycle cost is locked in the phase when strategic decisions determine the nature and design of the network.

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.
- **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 conflicting objectives such as cost and service trade-offs, 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 commodity costs, in particular oil prices
- High risks associated with port closings and weather
- Carbon emission awareness and restrictions in some countries
- Increase in global manufacturing capacity
- Dependency on outsourced manufacturing
- Focus on service to customers and large retailers, such as Wal-Mart
- Pushing inventory to suppliers

Highlights

Implementation of strategic supply chain planning systems is relatively simple and fast, with data easily imported from the user's current systems.

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 run quite easily and quickly, with results achieved in a matter of weeks.

Therefore, the resulting return on investment (ROI) from these projects can be high. Savings in network design studies are typically 5 percent to 15 percent of total supply chain costs. AMR Research in "Redefining the Role of Inventory for Demand-Driven Supply Networks," Jan. 25, 2005, reports quick ROI, stating "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, AMR reported that companies can achieve "Dramatic improvement in service—the companies' inventory optimization implementations also increased order fill rates by 2 percent to 13 percent, dramatically improving customer service levels."

Highlights

The LogicTools suite is a powerful, easy-to-use integrated set of planning solutions that allows 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.

LogicTools Suite

The LogicTools suite is a powerful, easy-to-use integrated set of planning solutions that allows decision makers to easily build scenarios and troubleshoot models, efficiently optimize largescale supply chains, and effectively identify and explain key supply chain cost drivers. Optimization based decision support and operations solutions improve the overall decision-making process for an organization's supply chain.

IBM's mission is to provide easy-to-use, state-of-the-art supply chain optimization technology to help companies make intelligent decisions in their supply chain. The suite (Figure 2) includes the following components:

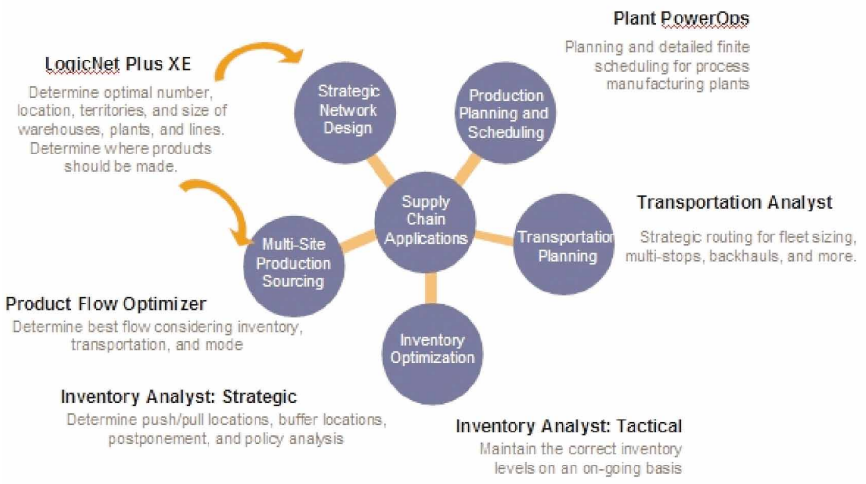
- **IBM ILOG LogicNet Plus** for network design and planning
- **IBM ILOG Inventory Analyst** for inventory optimization
- **IBM ILOG Product Flow Optimizer** for integrated stocking and distribution
- **IBM ILOG Transportation Analyst** for strategic transportation planning
- **IBM ILOG Plant PowerOps** for production planning and detailed scheduling

It incorporates a variety of features required to effectively capture the realities of a complex supply chain. In addition, IBM's optimization solvers enable large and complex supply chains to be optimized in a short amount of time. These off-the-shelf advanced optimization solutions have been used in many industries, including retail, transportation and manufacturing.

Highlights

A global manufacturer of highly engineered alloy steel and components, an SAP and LogicTools joint customer, "the LogicTools suite was selected because of the ease of use, performance of their software, as well as reputation and experience in supply chain optimization."

Figure 2: IBM ILOG LogicTools suite of supply chain applications



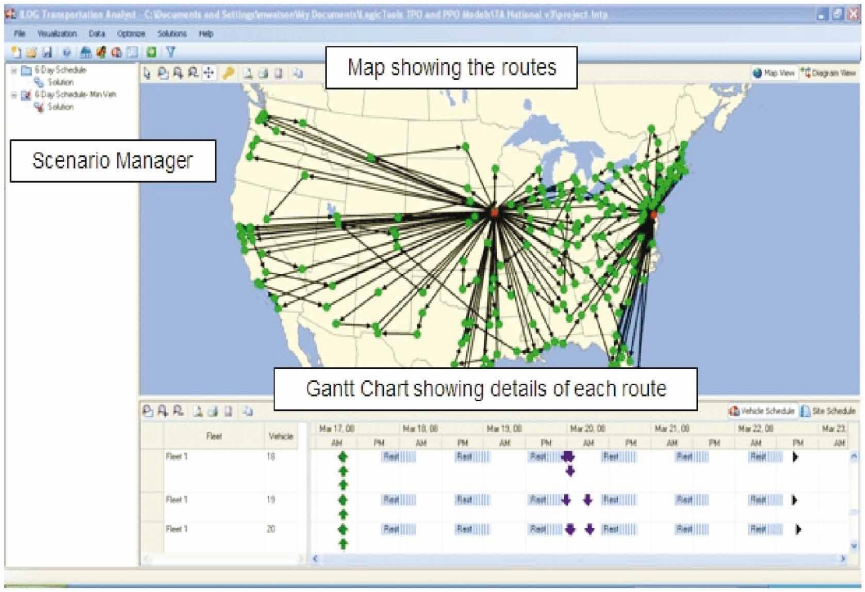
Consider, for example, a global manufacturer of highly engineered alloy steel and components, an SAP and LogicTools joint customer, "the LogicTools suite was selected because of the ease of use, performance of their software, as well as reputation and experience in supply chain optimization."

Indeed, the design of the LogicTools suite has always stressed the ease of use of the software through research and development, as well as feedback from our customers. Our solutions feature editing in Microsoft Excel, fast import and export functionality, superior error messaging, configurable reporting 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. For example, the IBM ILOG Transportation Analyst user interface (Figure 3) provides the user with all the functionality for performing the task in a simple interface that includes a scenario manager, map and Gantt chart.

Highlights

IBM ILOG LogicNet Plus handles some of the most complex networks and is capable of designing multitier global supply chains.

Figure 3: IBM ILOG Transportation Analyst user interface



IBM ILOG LogicNet Plus for Network Design and Planning

IBM ILOG LogicNet Plus is a strategic supply chain design tool that helps determine optimal supply chain configurations by considering variables such as manufacturing costs and capabilities, transportation modes and costs, warehousing costs and capacities, taxes, duties and service constraints. It uses a state-of-the-art optimization solver based on mixed integer programming (MIP) that quickly analyzes various trade-offs 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 multitier global supply chains.

Highlights

SAP recommendeds IBM ILOG LogicNet Plus, which has certified integration with SAP SCM.

SAP included a network design component called ND in SAP APO up to Version 3.0. Starting with SAP APO 3.1, the ND component was left out. However, since January 2004, SAP has recommended IBM ILOG LogicNet Plus, which has certified integration with SAP SCM.

Examples of applications for network design and planning:

- **Post-merger integration**—a Fortune 500 food manufacturer was looking to rationalize its supply chain following an acquisition to realize operational synergies promised to Wall Street.
- **Global supply chain design and contingency planning**—a global Fortune 50 consumer packaged goods (CPG) maker needed to identify the best number of manufacturing locations throughout the world to minimize supply chain costs. Additionally, the company 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 a five-year distribution strategy to meet high growth rates. The customer used the multiperiod functionality of IBM ILOG LogicNet Plus to identify a five-year expansion plan.
- **Strategic production sourcing**—a Fortune 100 industrial components manufacturer needed to determine optimal production sourcing strategies that accounted for the capacities and line speeds of the manufacturing process. Additionally, the resulting model is used in centralized decision making and evaluating capital investments needed to support forecasted growth.
- **Warehouse sizing**—a Fortune 500 CPG company needed to determine warehouse size requirements for plants and distribution centers to account for significant seasonality in production and demand.

Highlights

IBM ILOG Transportation Analyst provides the ability to quickly analyze many different strategies to determine the best way to deliver products and use transportation assets.

IBM ILOG Transportation Analyst for Strategic Transportation Planning

IBM ILOG Transportation Analyst provides the ability to quickly analyze many different strategies to determine the best way to deliver products and use transportation assets. Assignment of shipments to vehicles and sequencing of pickups and deliveries are determined to minimize costs while adhering to various constraints.

Examples of applications for IBM ILOG Transportation Analyst:

- **Company planners in CPG and retail**—supply chain planners analyze their transportation network strategy across many dimensions and compare multiple what-if scenarios. Planners quickly test different transportation strategies to highlight opportunities in their network. Determine trade–offs for private fleets versus commercial truckload (TL) and less than truckload (LTL) carriers.
- **3PL**—analyze different transportation strategies for customers.
- **Complement to network design**—after analyzing different network design scenarios, users can go into more detail on the transportation strategies and detailed routes. Some of this refined information can be input into the network design for additional planning.

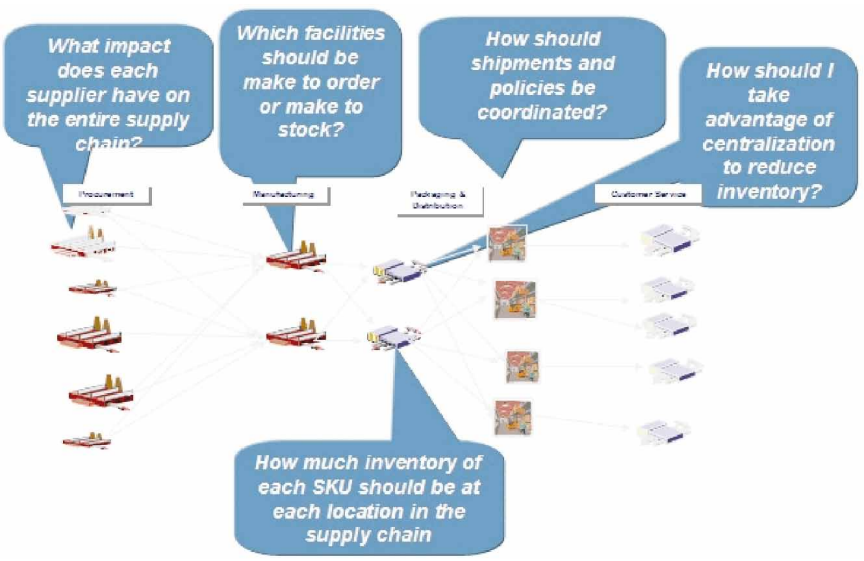
IBM ILOG Inventory Analyst for Inventory Optimization

IBM ILOG 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 stochastic and nonlinear optimization technology, IBM ILOG Inventory Analyst is a revolutionary solution for optimizing inventory and service levels (Figure 4).

Highlights

IBM ILOG Inventory Analyst can help determine how to improve service levels while placing the right amount of inventory in the right locations.

Figure 4: IBM ILOG Inventory Analyst provides multi-echelon optimization



Conventional inventory optimization software solutions look at inventory planning within a single facility. Unfortunately, by considering each site independently, a company finds itself with excess inventory and poor customer service levels. IBM ILOG Inventory Analyst can help determine how to improve service levels 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 technology that can feed safety stock information to their systems. IBM ILOG Inventory Analyst is certified for SAP Netweaver.

Highlights

Examples of applications of inventory planning include:

- **Make to stock versus 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 had five echelons in their supply chain, and IBM ILOG Inventory Analyst determined the supply chain configuration and the level of inventory at the make-to-stock facilities.
- **Centralized versus regional storage**—a Fortune 100 retailer needed to identify which stock keeping units (SKU) needed to be centralized versus stored regionally to minimize total landed costs, which included inventory, transportation and warehousing costs.
- **Strategic sourcing**—a Fortune 500 heavy equipment manufacturer needed to evaluate alternative suppliers and structure appropriate service contracts to help reduce systemwide inventory.
- **Safety stock setting**—a large SAP chemical customer uses IBM ILOG Inventory Analyst to set safety stock in SAP APO globally every quarter.

IBM ILOG Inventory Analyst has been integrated successfully in many SAP projects.

IBM ILOG Inventory Analyst has been integrated successfully in many SAP projects (see the white paper "How Inventory Analyst integrates with SAP Solutions" for more information).

There are three main types of users for IBM ILOG Inventory Analyst, as depicted in the two diagrams below:

Diagram 1: Three types of IBM ILOG Inventory Analyst users

Business Analyst

- Deep knowledge of IA modeling concepts, inputs, and analysis
- Evaluate changes to supply chain processes and structures
  - Push/Pull analysis
  - Evaluate strategic changes and what-ifs
  - Project-based work

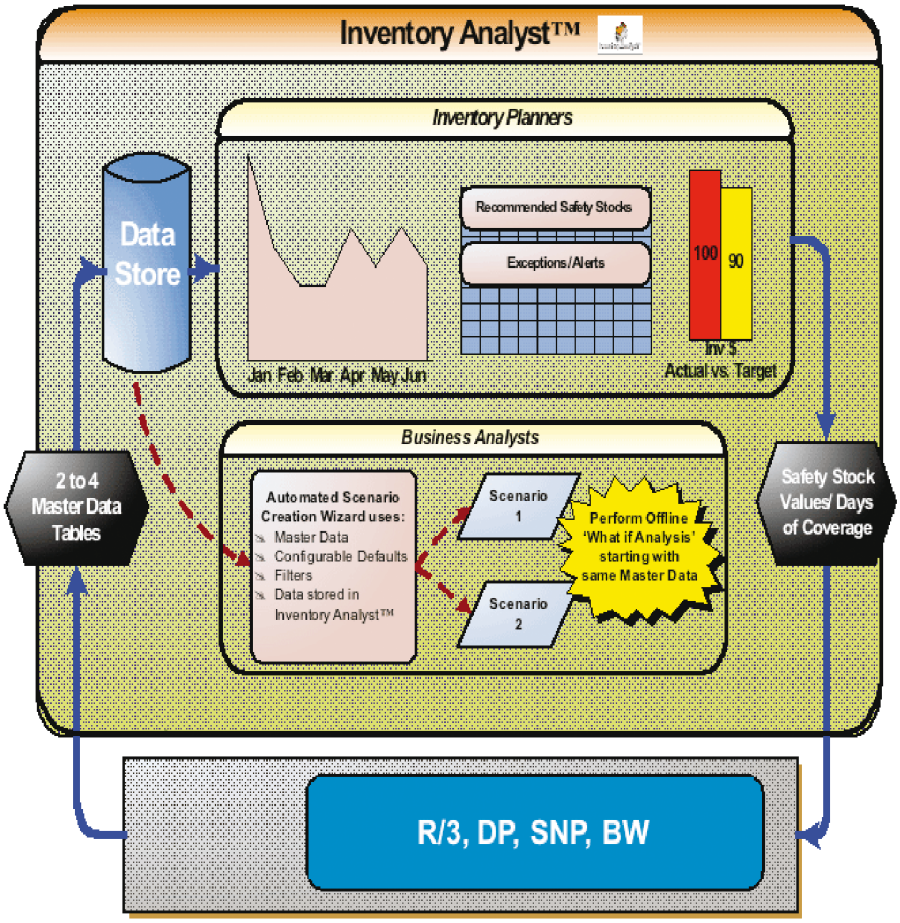
Inventory Planners

- Needs to know the recommended inventory levels on periodic basis
- Needs to be able to see exceptions and understand what drove exceptions
- Needs to be able to review, override, and publish results

System Administrator/IT

- Provide integration for on-going use
- Maintain data flows and adjustments to processes

Diagram 2: Users and architecture of IBM ILOG Inventory Analyst



Highlights

IBM ILOG Product Flow Optimizer is a unique product that combines the ability to make hub and spoke distribution decisions with inventory analysis.

IBM ILOG Product Flow Optimizer for Integrated Stocking and Distribution

IBM ILOG Product Flow Optimizer is a unique product that combines the ability to make hub and spoke distribution decisions with inventory analysis. It helps facilitate both strategic and tactical planning using built-in integration capabilities to easily connect plans to other systems.

Businesses can analyze trade-offs between transportation, warehousing, inventory carrying costs and service requirements to arrive at the optimal product delivery path for customers. Companies improve profitability and meet their customers' requirements. Solutions can be viewed, compared and easily exported to tables and graphs for presentations and further analysis.

IBM ILOG Product Flow Optimizer addresses key issues in the retail and distribution industries.

Examples of applications of ILOG Product Flow Optimizer:

- **Better customer service**—optimize the balance between shipping and warehousing costs and service level requirements to improve product delivery times. The ability to respond to customer demand and competitive threats is crucial to revenue growth.
- **Improve upon traditional make-to-stock processes**—determine stocking strategies for different SKU's that can represent significant cost savings for the supply chain by correctly identifying which SKU's should be held in central distribution centers (DCs), which in regional DCs, which in both, and which should not be stocked at all.
- **Optimize product distribution based on regional customer demand**—determine the correct distribution flow for each SKU and customer region, allowing companies to realize significant supply chain savings.

Highlights

- **Reduce distribution costs**—IBM ILOG Product Flow Optimizer determines the best distribution strategy for each SKU in customer regions to minimize total costs for sourcing, transportation, receiving and inventory.
- **Optimize inventory levels to meet customer requirement**—determine the levels of inventory needed to maintain customer service goals based on stocking and distribution strategies. What-if analysis capabilities allow companies to visualize how optimal stocking and distribution strategies change as customer service changes.

IBM ILOG Plant PowerOps for Production Planning and Scheduling

IBM ILOG Plant PowerOps takes production planning to a new level for managing demand variability and building executable schedules.

IBM ILOG Plant PowerOps (IBM ILOG PPO) takes production planning to a new level for managing demand variability and building executable schedules. It offers integrated planning and detailed scheduling for the difficult production challenges associated with the fast-moving consumer goods, pharmaceutical and chemical industries. Few applications can match IBM ILOG PPO's efficient management of tanks, cleaning in place, and changeover procedures.

IBM ILOG PPO is the perfect extension to SAP Production Planning and Detailed Scheduling (PP/DS) and Oracle Advanced Planning and Scheduling (APS). IBM ILOG PPO helps you address key issues in the food and beverage, chemical, pharmaceutical and other CPG industries.

Highlights

IBM ILOG PPO scenario creation and comparison interface lets supply chain and operations managers evaluate alternative plans and schedules, comparing them across key business and manufacturing metrics.

Examples of applications for IBM ILOG PPO:

- **Improve plant efficiency**—the combination of state-of-the-art optimization models with a decision support application designed for production planners is powerful. React quickly to changes and unexpected events while gaining a clear understanding of the consequences in terms of service levels, asset utilization, efficiency and profitability, Improve overall operational efficiency to more easily handle new product introductions, marketing promotions and unexpected orders.
- **Improve profitability and service levels**—more efficient planning and scheduling realizes higher throughput with lower per-unit costs, inventory reductions and less product waste. Greater agility and more compact, efficient schedules can significantly increase revenue in capacity constrained environments.
- **Defer capital expenses**—to increase production through a facility, most businesses will be able to defer some equipment purchases and plant expansions over time.
- **Make the best operational decisions possible**—use an interactive planning and scheduling environment built on top of the most fine-grained optimization models available for process manufacturing. IBM ILOG PPO scenario creation and comparison interface lets supply chain and operations managers evaluate alternative plans and schedules, comparing them across key business and manufacturing metrics. Managers can balance the trade-offs among service levels, inventory coverage, asset utilization and operational efficiency, and make the best operational decisions possible.
- **Enhance performance through improved plant design and process design**—IBM ILOG PPO enables industrial engineers to simulate the impact of different investment decisions in the plant using the same sophisticated planning and scheduling tool used by their colleagues in manufacturing. Industrial engineers and production planners can now collaborate in making decisions affecting plant profitability.

Highlights

LogicTools Suite Case Studies

The following case studies are based on IBM customers who also use SAP, and in two cases, SAP APO for supply chain planning. The names of the companies and other details have been removed to protect confidentiality. The type of problems and issues addressed using the LogicTools suite tends 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 companies' supply chains.

Case Study 1: Global Manufacturing Network Rationalization

Project Background

As part of an analysis of its global supply chain, 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. The company utilized LogicTools' expertise in network modeling to capture the current network configuration and then determine the best network of manufacturing facilities to minimize systemwide costs.

The company utilized LogicTools' expertise in network modeling to capture the current network configuration and then determine the best network of manufacturing facilities to minimize systemwide costs.

Highlights

Using IBM ILOG LogicNet Plus, the manufacturer was able to identify savings of U.S.$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.

The company is one of the leading CPG manufacturers in the world, with annual revenues of around U.S.$14 billion from selling household consumer goods for everyday use.

Company Background

The company is one of the leading CPG manufacturers in the world, with annual revenues of around U.S.$14 billion from 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 and 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 address risks such as natural disasters, port delays and strikes.

Highlights

All the plants could not make all the products, and local government regulations and local marketing considerations 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 a 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

The company'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 an optimal manufacturing network were analyzed. Key scenarios were then tested for their sensitivity to variables such as production and freight costs. Selected scenarios were further analyzed for capital investments and write-offs, savings and ROI, as well as intangibles such as change management issues.

Results and Benefits

Using the results from IBM ILOG LogicNet Plus, the company was able to determine the optimal manufacturing network and identify a cost reduction of U.S.$15 million.

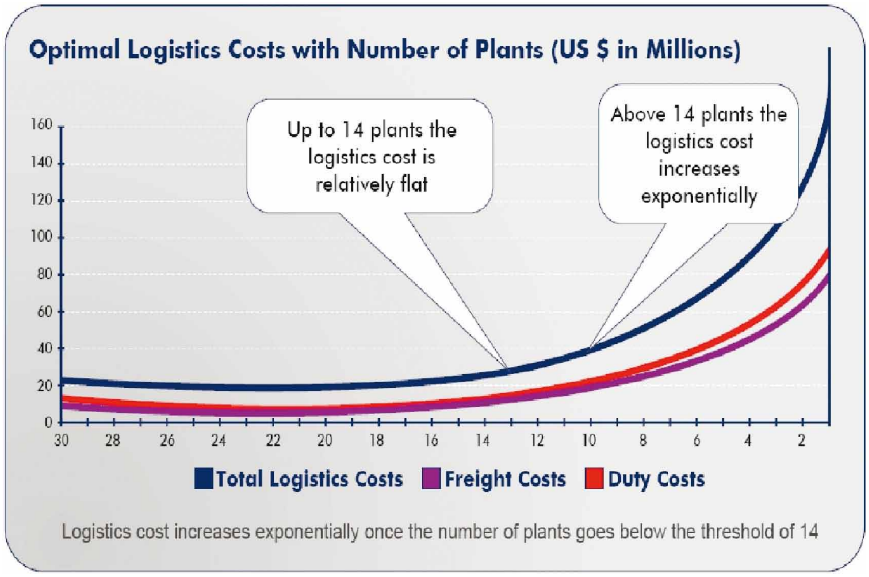
Using the results from IBM ILOG LogicNet Plus, the company was able to determine the optimal manufacturing network and identify a cost reduction of U.S.$15 million. Cost reduction was in part due to closing expensive plants in high labor markets and reallocating some of the assets to cost-effective locations.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

The graph in Figure 5 below illustrates the trade-offs between the number of manufacturing facilities and logistics costs for the company's network.

Highlights

Reducing the number of plants to 14 does not significantly increase logistics costs. However, beyond this point, further reduction causes a significant rise in logistics costs. This requires the company to take other factors, such as risk, into consideration when reducing the plants from 30 to 14.

Figure 5: Optimal Logistics costs with number of plants



Case Study 2: Production Sourcing

The beverage manufacturer was able to increase utilization of current plants and plan for growth, using the network design (IBM ILOG LogicNet Plus) and multi-site product sourcing (LogicChain) solutions from LogicTools.

Project Background

One of the largest beverage manufacturers in the United States and an SAP APO user was reviewing its manufacturing locations for better utilization and replenishment strategies. Using the network design (IBM ILOG LogicNet Plus) and multi-site product sourcing (LogicChain) solutions from LogicTools, the beverage manufacturer was able to increase utilization of current plants and plan for growth.

Highlights

The company is one of the largest beverage manufacturers in the United States and one of the largest in the world in capacity.

Company Background

The company is one of the largest beverage manufacturers in the United States and one of the largest in the world in capacity. Water purity is a key criterion for locating manufacturing plants, and the company's 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 U.S. distributors with a relatively minor volume of exports outside the United States.

Business Objectives and Challenges

The key questions that needed to be answered were:

1. How should each product be replenished to customers? From what finished goods warehouse and through what mode?
2. At what plant and production line should it be produced?
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, including rail and TL dock limitations, bulk rail loading limitations, and carrier availability
5. Manufacturing capability limitations by site

Highlights

The company was able to plan its expansion and make decisions on plant production with buy-in from the plant managers and others involved in the process, using the results from IBM ILOG LogicNet Plus and LogicChain.

Implementation

The company'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 IBM ILOG LogicNet Plus and then proceeded to modeling in LogicChain for the detailed production sourcing decisions.

Results and Benefits

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

Case Study 3: Inventory Optimization

Project Background

Competition and the opportunity to lower manufacturing costs have led a leading metal component manufacturer and SAP user to move manufacturing of a set of products from the United States 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

Highlights

The company was able determine the inventory levels for the new network configuration and identify opportunities for reducing overall inventory levels using IBM ILOG Inventory Analyst, the global inventory optimization solution from LogicTools.

requirements. Further, customs clearance had a direct impact on the order-to-receipt time of the raw materials. In light of its supply chain complexity, the company realized that they needed a sophisticated way to manage 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 IBM ILOG Inventory Analyst, the global inventory optimization solution from LogicTools, the company was able determine the inventory levels for the new network configuration and identify opportunities for reducing overall inventory levels. 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

The company is a global manufacturer of metal components and engineered alloys with sales of U.S.$3 billion in 2002. Products are sold worldwide and shipped to customers either through regional or country distribution centers.

For products manufactured in China, components were supplied from China, Japan and India. The company had different service terms with each supplier. Some suppliers made to order, while others made to stock. Transit times and customs clearance varied for different suppliers, and plants had fixed storage capacity for finished goods. The company had two types of customers: original equipment maker (OEM) and aftermarket customers. OEM customers placed orders well in advance, while aftermarket customers required products to be available immediately.

Highlights

The company utilized LogicTools' global inventory optimization solution to first determine where inventory should be positioned and the inventory levels required for the new supply chain.

Business Challenges

The key business challenge for the company 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 benefits of more accurate forecasting methods and the impact of higher service levels on a certain type of customer base. Finally, they wanted to consider the entire supply chain in making the inventory decisions.

Implementation

The company utilized 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 IBM ILOG Inventory Analyst to mirror the company'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 the company that the inventory drivers they originally focused on had very little impact on inventory, they utilized LogicTools' expertise to identify the actual inventory drivers. 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.

Highlights

The company was able to optimally reposition its inventory across the network, resulting in an overall inventory reduction of 30 percent using the results from IBM ILOG Inventory Analyst.

Results and Benefits

Using the results from IBM ILOG Inventory Analyst, the company was able to optimally reposition its inventory across the network, resulting in an overall inventory reduction of 30 percent. 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 improved 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 6 for more details. The study helped the company identify the factors that have a large impact on inventory and, therefore, need to be managed closely.

Figure 6: 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

Highlights

The main goal of this company was to implement a flexible solution capable of improving key operational performance metrics such as stock coverage, operational efficiency, equipment utilization, product waste, changeover and cleaning costs.

Case Study 4: Production Planning and Detailed Scheduling

Project Background

In revisiting their production planning and detailed scheduling system, the main goal of this company was to implement a flexible solution capable of improving key operational performance metrics such as stock coverage, operational efficiency, equipment utilization, product waste, changeover and cleaning costs. Important secondary goals included giving planners a better tool for performing what-if analysis and rescheduling, and implementing a solution that complemented the major investment that this company was making in SAP APO for supply chain management.

Company Background

Its fresh dairy product division has more than 40 plants and experience year-on-year growth rates exceeding 20 percent in many emerging markets, including Russia, Turkey, Argentina and Mexico. The fresh dairy division has multiple product lines, including solid yogurt, liquid yogurt, desserts and fresh cheese. The individual products are made through a complex, multistep process including milk preparation, pasteurization, fermentation, and finished products filling and packaging.

Business Challenges

In food production, extra care must be taken to ensure high standards of sanitation, control of allergens, batch traceability and maximum product freshness. The plant must closely coordinate the two primary production steps: the transformation of raw materials into intermediate products (white mass), and the filling and packaging of the final product.

The right amount of white mass has to be scheduled, and it has to be used as quickly as possible. Operational scheduling challenges include:

- Deciding which and how much white mass to produce in each tank given the available connections to the filling and packaging lines
- Finding the best time to clean the tanks and the filling lines given health and nutrition labeling requirements, and the availability of cleaning equipment
- Synchronizing material consumption with white mass availability and freshness
- Respecting batching policies for compliance with traceability regulations
- Maintaining a steady supply of finished goods within a min/max inventory corridor

To these production challenges must be added those for high demand variability. Fresh dairy products are consumer goods with significant promotional marketing and a steady introduction of new products. Demand is often uncertain. New products may steal sales from old products or simply contribute to market share, and marketing campaigns can result in sales that are higher or lower than forecasted. A quarterly S&OP process can only partially manage these challenges. Moreover, in the fresh dairy industry, the challenges associated with demand variability are compounded by the short shelf life of the finished products and relatively long production lead times. Poor production plans lead to both product waste and stock shortages, making agility and regular rescheduling critical.

Highlights

Implementation

A team composed of production planners, business and IT managers, and consultants from IBM analyzed the needs of four different fresh dairy plants. Since IBM ILOG PPO was designed to meet the very operational complexities of the fast moving consumer goods industry, discussion focused primarily on required metrics and integration with SAP APO. A pilot project was launched in Mexico, at one of the largest fresh dairy production facilities serving a market growing at 25 percent per year. The plant's capacity was constrained, so any improvement in scheduling efficiency would result in significant benefits. SAP is the single repository of both master data and transaction data. Changes in master data, such as resources to schedule or products to make, are done only in SAP. For the planners, IBM ILOG PPO is seen as an analytic extension to SAP APO PP/DS.

Results and Benefits

The pilot project fully met the expectations. The plant replaced a homegrown system, which took two days to generate an imperfectly optimized plan, with a system that generated a far better schedule in under 15 minutes. As a result, planners could move from planning once a week with mixed scheduling quality to high-quality planning and rescheduling whenever necessary. The planners appreciate the ease of use, plan feasibility, schedule quality, greater amount of information on production orders, activities and resources at their finger tips, and availability of new operational and financial metrics. IBM ILOG PPO's integrated planning and scheduling approach enables them to find the best balance between inventory levels and operational efficiency.

IBM ILOG PPO's integrated planning and scheduling approach enables them to find the best balance between inventory levels and operational efficiency.

Now, everyone involved can see the impact of unexpected changes in demand on the manufacturing process, as well as those of production scheduling decisions on inventory levels and order fulfillment rates. With the plant's constrained capacity and the rapid market growth in Mexico, the efficiency resulting from the IBM ILOG PPO solution has contributed greatly to the company's profitability. And while asset utilization gains have certainly translated into lower operating costs and higher margins, the biggest financial benefits have come from increased sales and market share. This solution has been deployed in three other plants, with the fourth one underway.

IBM Global Services
Route 100
Somers, NY 10589
U.S.A.

Produced in the United States of America
September 2009

WSW14056-USEN-01