Supply Chain Process Management
Collaborative Applications

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Vitria’s Supply Chain Process Management Collaborative Applications

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Introduction

The global economy has changed dramatically during the last few years in response to new technological, financial, and political conditions. Today’s companies are struggling to cope with the new economy’s more stringent business and operational conditions including mercurial markets, ever-slimmer margins, highly discerning customers, and heavy dependence on trading partners as a result of outsourcing over the years. Business executives have recognized that operational excellence is critical to achieving long term, sustainable competitive differentiation. Smart companies in manufacturing industries are pursuing various strategies to increase productivity, efficiency, effectiveness, customer loyalty and quality.

The rise of the Internet as a business medium has been the most significant technological development in the last 20 years. Companies continue to learn how to leverage the Internet into a competitive advantage and avoid its potentially deadly pitfalls. For many, the Internet’s ‘first-mover’ advantage has been a painful lesson. The Internet has enabled buyers to easily and rapidly find suppliers around the world increasing their buying options. Increased margin pressure is a direct consequence of globalization. Therefore, to remain attractive to buyers, companies are reducing their margin—and costs—to the bare minimum.

Global markets have created unprecedented demand volatility. Sudden changes in demand can happen by the hour. Companies must become more agile in their business processes in order to successfully respond to market volatility. To maximize customer satisfaction in such conditions, companies must respond quickly and flexibly when fulfilling customer orders. Despite demand volatility, orders must be delivered correctly and exactly when they are needed. To remain competitive, companies must minimize their cycle-times and maximize flexibility.

Customer loyalty is paramount to the success of a company in two ways. First, loyal customers provide an on-going revenue stream. Secondly, satisfied customers can be used as references to encourage others to become customers too, thus nurturing business growth. Nevertheless, customers are becoming more knowledgeable and demanding; thus, more discerning. The more discerning a customer, the more inclined he is to break up relationships with unsatisfactory suppliers. Therefore, companies are striving to differentiate based on the best possible customer service to increase their customer retention indexes.

The trend of outsourcing over the last 10 years has dramatically altered corporate structure. The transformation from vertically integrated operations to virtually integrated operations means that fundamental operational data is no longer immediately accessible. Data critical to operational efficiency is now originated by customers (e.g., demand forecasts), suppliers (e.g., parts and raw material availability), and outsourcing partners such as 3PLs and 4PLs (e.g., delivery dates) Operational efficiency also requires that managerial decisions be precise and based not only on specific details of a particular issue, but also on a global view of tendencies and performance indicators across the extended enterprise. In this new extended enterprise structure, supply chain collaboration is all about sharing such data with one’s trading partners. This new structure compels companies to collaborate to improve their own efficiency.
All the objectives listed above—market agility, reducing margin pressure, cost cutting, increasing customer loyalty, cycle-time reduction, and trading partner collaboration—are directly related to the efficiency with which a company’s supply chain is managed. Vitria’s Supply Chain Process Management (SCPM) Collaborative Applications Architecture was conceived to help companies achieve these objectives by providing the means to integrate, automate, analyze, monitor, and control their supply chain business processes.

Current Problems in Supply Chain Management

The scope of today’s supply chains can include distant geographic areas, complex communication networks, many disparate systems, and distinct trading protocols. Throughout the supply chain, forecasts are created, orders placed, packages picked up, trucks dispatched, and products delivered by the minute. Extracting relevant pieces of data from these business events, consolidating, and promptly presenting them in an appropriate format to be used in decision-making is a challenge for most companies. The lack of visibility into critical operational information across the supply chain is a problem that inhibits cooperation and, thus, increases operating costs and holds down customer satisfaction.

Even assuming that a company is able to capture, record, and track all these transactions, and extract useful information from them, it is still necessary to propagate it between decision-makers and trading partners in a timely manner for distinct interactions so that quick decisions can be made and resulting action plans can be executed. Typically, performing this sequence of tasks and interactions is prohibitively long. The latency between the time the information trigger is received and the time by which the appropriate actions can result is a critical problem that affects the core rationale of business processes. Companies that live with a high level of latency in their supply chain have to accept the consequences of excess of inventory, long cycle-times, and extensive recovery-times caused by sudden changes in supply or demand. Companies try to compensate for this latency by increasing inventory, buffer stock, and the size of replenishment orders. Latency is one of the primary causes of the unwelcome “Bullwhip Effect”.

As suggested above, decision-makers today typically receive delayed, incomplete and inaccurate information about the ever-changing status of their supply chain execution capabilities. This current scenario fosters late decisions, made on the basis of old, outdated information. As a result, inappropriate, ineffective and delayed actions will be performed in hopes of adapting the supply chain to new conditions. Lethargy degrades the overall performance of a supply chain.

Vitria’s Supply Chain Process Management Collaborative Applications Architecture addresses the problems just described. Our new configure-to-fit and fast-start collaborative applications are built on this architecture. In the next sections, we describe the capabilities of the architecture and present the benefits that can be achieved.

Vitria Integration Platform

Vitria’s Supply Chain Process Management Collaborative Applications architecture is built on top of Vitria’s Integration Platform, which was conceived to provide the infrastructure services to enable application integration, trading partner communication, data transformation, and process automation. The Integration Platform provides a secure, reliable, and fully integrated environment in which a company and its partners conduct the time-sensitive, mission-critical transactions that drive business revenue and profitability. Furthermore, it allows a company to integrate non-electronic value chain members while addressing the security, non-repudiation, and reliability requirements of the application. The Integration Platform also facilitates the use of common business semantics and incorporates existing business processes into the solution. It consists of four well-established components:

EAI: The Enterprise Application Integration component securely and reliably moves process information and transactions on internal networks in and out of internal business applications using protocol translation and data transformation services.
**B2Bi:** B2Bi enables rapid build-out of trading partner network and associated business processes, transactions, and data exchange protocols. It makes use of protocol translation and data transformation to map this information to the various trading protocols and formats for receipt and recognition by different trading partners. It enables end-to-end management of business processes across the extended enterprise regardless of which transport protocol is used, such as XML, EDI, or ftp.

**BPM:** The Business Process Management component maps, controls, and automates the exchange of information and transactions among a company’s trading partners, its internal business applications, and employee activities. It provides the process modeling environment and the process execution engine for handling high volumes of business transactions.

**BIM:** The Business Intelligence Management component allows business managers to analyze and optimize the on-going business processes in real-time. Business users are provided with unparalleled real-time visualization and drilldown of information for those business processes. Both the global picture and supporting details of business activities are instantly available.

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**Vitria’s Supply Chain Process Management Collaborative Applications Architecture**

In order to leverage all its components functionality for distinct business domains, Vitria is offering solutions for Telecommunications, Energy, Healthcare, Financial Services, Insurance, and Manufacturing industries. Target manufacturing vertical industries (in priority order) are: Automotive, Aerospace, Logistics and Distribution, High-Tech, Pharmaceuticals, and Consumer Packaged Goods. Each solution provides specific functionality that best fits its target industry. The Supply Chain Process Management Collaborative Applications architecture was conceived to enable a business user in charge of the operations of a supply chain to specify and collect user-appropriate information, monitor critical analytics, and launch effective commands, without requiring significant technical skills.

The components of the Supply Chain Process Management Collaborative Applications Architecture are:

- **Analysis.** Not only will users be able to visualize data that has been captured throughout the supply chain, they will also be able to create their own Key Performance Indicators (KPIs) based upon historical and real-time data. Historical data can be extract from applications, databases, and data warehouses and mixed with real-time data coming from on-going transactions handled by BusinessWare components. Thus, complex, multi-dimensional KPIs can be periodically evaluated, consolidated, and aggregated before being presented to the users. For example, a user may want to observe patterns of orders being processed right now as a percentage of the total forecast for this month. Another example could be analysis of how much a given order contributes to the percentage of orders that have been assigned to a given carrier in the last seven days. Supply chain visibility is achieved to its full extent when analytical capability is combined with integration and real-time connectivity. Users will have graphical displays of meaningful information being conveniently refreshed on their screen, creating the basis for making quick and informed decisions about all aspects of supply chain operations. In addition, comprehensive reports can be issued at different levels of aggregation and sent to other executive levels.

- **Control.** Once a user obtains an accurate picture of the current status of a supply chain, he may decide to dispatch a command to improve the conditions in which a supply chain is operating. Usually, a command would involve a sequence of actions to be performed by different applications, and results to be communicated to remote destinations or even other trading partners. The entire business process underneath the dispatched command can be automated by the Integration Platform, so that the user has to deal only with high level commands, and not with the details of coordinating the execution of partial tasks. For example, upon identifying that there is a surplus of orders of a given product P, and that its parts inventory will drop below minimal levels next week, the user decides to send new replenishment orders to the part suppliers. The user’s
command could simply be: Send Replenishment Order of 10% for all parts of product P. The SCPM Collaborative Applications would then execute all the tasks such as get the bill of materials, identify the current inventory for parts, update procurement systems, create replenishment orders, and send orders to partners either by a standard protocol (i.e., EDI), or e-mail, or even fax. (Notice that all the intermediate tasks would be performed by internal applications. SCPM Collaborative Application would just coordinate them.) By providing the user the means of easily launching commands and efficiently having them executed, Vitria’s SCPM framework transforms a sluggish and rigid supply chain into an brisk and agile one.

• **Monitoring.** Visibility and control is not sufficient for effective supply chain process management. The large amount of data and the high frequency of unexpected events make the supervision of a supply chain an overwhelming task. After identifying the important metrics and KPIs, users can pre-define thresholds and logical conditions based on those KPIs that indicate a problem, a potential problem, or even an opportunity (for example, redirect orders to other supplier to take advantage of a discount that has been recently offered). This type of logic is known as an Alert. Alerts can be used to simply notify a user that a given condition was met, or they can launch one ore more complex commands involving multiple actions, as described above. Alerts are particularly suitable for periodically checking conditions that are not explicitly part of a business process. Such conditions may be important for giving the users indications of other factors in the supply chain that may affect a decision. Alerts are flexible tools that enable the users to keep track of meaningful business conditions in the supply chain, and automatically dispatch commands to correct or prevent problems. For example, if by the 10th of a month, total orders placed for a given product reached 60% of the forecast for that month, then a command might be dispatched to re-run the planning system, and notify the planning supervisor and the procurement department. Latency is dramatically reduced by the use of Alerts.

• **Administration.** Users will have role-based access to functions and data. Depending on their role, users are enabled to execute specific functions or to access restricted data. This level of security is particularly important if trading partners are expected to access the system.

**Solution Architecture**

Figure 1 shows the Supply Chain Process Management Collaborative Applications Architecture. External communication, with customers and suppliers, is provided by the B2Bi component, which provides three main services: transport protocol, vocabulary, and trading processes. The transport protocol provides the B2B transaction definitions, enveloping and routing of the transactions, and the wire specific transport of the information. Vocabulary provides a library of terms specific for different industries and business contexts. Trading Processes service offers a library of publicly established trading processes to automatically conduct business with trading partners that are also using shared trading protocols, such as Rosettanet, ebXML, and BizTalk. All the internal application integration and connectivity are provided by the EAI component, which is based on a reliable and secure message-based system. Internal business processes are modeled and automated using BusinessWare Business Process Management component. It coordinates the execution of the core processes for the enterprise, and the sporadic commands dispatched by the Control module. Examples of the processes that can be automated are: Demand Fulfillment, Inventory Management, Product Lifecycle Management, Collaborative Planning, and Direct Material Procurement. Tightly related to all business processes to be executed are the Analysis, Control and Monitoring components, as already described in the previous section. This is a web-based application with role-based configurable interfaces.
Benefits

The SCPM Collaborative Applications provides full visibility of information in a supply chain, reduces its latency, and makes it agile. Its features deliver the following benefits:

- **Increase Customer Satisfaction**: By supporting standard trading protocols and performing automated trading processes, a company can rapidly respond to customer needs, thereby increasing customer satisfaction.
- **Improve Supplier Relationship**: Common protocols, automated processes, and reliable data increase trust, cooperation, and efficiency of one’s relationship with suppliers.
- **Reduce Inventory Levels**: Visibility and quick reactions to sudden changes in the supply chain enables a company to reduce its inventory to the bare minimum, and sustain a high level of customer satisfaction.
- **Reduce Operating Costs**: Meaningful analytical information and real-time decision-making processes minimize waste of material and increases asset utilization in all aspects of a supply chain, such as fleet size, work shifts, depot area, and energy consumption.
- **Increase Capacity Utilization**: Frequent status updates on supply chain conditions enable planning and scheduling systems to provide high quality solutions; increasing capacity utilization.
- **Prevent Problems and Disasters**: Visibility and monitoring are instrumental in preventing problems and disasters, thus avoiding outrageous recovery costs.

The companies that would benefit most from Vitria’s collaborative applications are likely to have at least one of the following features:

- **Complex products**: automation and exception handling to manage complex products are paramount. Examples of problems are: managing the inventory of parts, provide visibility of the states of a product, and implementing an Engineering Change Order. Examples of industries with such features are Aerospace, Automotive, and High-Tech.
• **High volume of products**: visibility and partner communication are critical to operate with high volumes of products. Examples of problems are: product stock-out and complex distribution logistics management. Examples of industries: Retail, Consumer Packaged Goods, and Pharmaceutics.

**Vitria’s Supply Chain Collaborative Applications**

**Demand Fulfillment: Vendor Managed Inventory Structure**

As an example of a typical VMI scenario, assume that a company \( S \) manufactures a product \( P \) in two sites: west and south regions. \( S \) supplies an OEM company at five production plants across the US. All five sites have their own local inventories, which are managed by \( S \). The \( S \) manufacturing sites send material to two distribution centers, which replenish the local inventories at the OEM customer (Fig. 2). Regardless of the preferred routes are the ones from the \( S \) manufacturing sites to the Distribution Centers and then to the customer sites, it is also possible to send material from one Distribution Center to another.

![Fig. 2: Supplier/Customer VMI Replenishment Routes](image)

A VMI process that would apply to the scenario just described is presented in Figure 3. The process starts with the buyer placing a purchase order (PO) to the supplier. In this case it is a blanket PO, which works as a contract with conditions that must be abided by both parts, such as price, minimum stock level, and minimum quantity that will be bought by the buyer; this step happens only once. Then, the buyer sends a Demand Forecast notification to the supplier, who will direct the data to the VMI Decision-Support Application (VMI-DSA). Each inventory site also sends the current amount of material available and inventory consumption to VMI-DSA. On the supplier side, the manufacturing sites send in information about in-hand stock and production forecast. The contract management application provides transportation lead times, and preferred routes to the VMI-DSA. Finally, a third-party transportation logistics company (3PL) sends in an update of the pick-up and delivery schedules for in-transit material. Once the VMI-DSA executes and comes up with a new material movement plan that satisfies the needs of all buyers, the plan is published to all parties in the process. The 3PL, then, executes the plan, notifies the buyers sites about future deliveries by sending Advanced Shipment Notices, and notifies the seller about material that have been delivered with the Proof of Delivery documents, upon which the supplier will be sending invoices to the buyer. By the time that the supplier has firmly decided on how much material he will be sending to the buyer, he may send a PO acknowledge to the buyer as an advanced notification. The numbers next to the transactions in the figure are possible EDI transactions that maybe used to send the messages.
The benefits of using the SCPM Demand Fulfillment application for VMI are:

- Accurate inventory availability
- Real-time material tracking
- High inventory turns
- Electronic collaboration with customer and 3PL
- Quick reaction to sudden demand/supply changes
- Low transportation cost
- High customer satisfaction

**Demand Fulfillment for Discrete Orders**

Consider the scenario before and the one after deploying Vitria’s Demand Fulfillment Collaborative Application to a certain company:

- **Before deploying Vitria.** A distribution company has several distribution centers (DCs) worldwide. Each has its own order management system (i.e. SAP, JDE, BAAN), and only accepts an order if the delivery address belongs to the delivery region of the DC handling the order. Upon manually receiving an order, if the product is on the shelf, the order is acknowledged and the product is shipped the next day. Otherwise, it is a stock-out product, and the order acknowledgement is sent to the customer with an arbitrary delivery day, a buyer is informed about the need for replenishing the product, and a purchase order is sent to a supplier one or two days later. The supplier eventually commits to the order, but no updated delivery date is sent to the original customer. DCs are poorly integrated: inventory inquiries take a few days to be processed by other DCs.

- **After deploying Vitria Demand Fulfillment application.** Once Vitria’s Demand Fulfillment application is deployed, orders can be electronically received (EDI, for example), and automatically loaded to the order management systems. Acknowledgements can be similarly created and sent back to customers. DCs can now communicate in real-time to each other. Therefore, an order can be fulfilled and shipped from any DC, thus enabling a significant reduction in inventory without any effect on customer satisfaction. For those orders that cannot be
fulfilled by any DC, purchase orders are automatically created and dispatched to suppliers by electronic means as well. Once a supplier commits to a delivery date, an updated acknowledge is automatically resent to the original customer. Furthermore, supplier’s committed dates can be actively monitored, and corrective actions can be taken as soon as a delivery becomes late.

- **Benefits.**
  - Inventory reduction
  - Lower Operational Cost
  - Full real-time visibility
  - Order cycle-time reduction
  - Improvement of partner relationship management
  - Better delivery performance
  - Customer satisfaction increase
  - Emergency actions reduction

**Conclusion**

Vitria’s Supply Chain Process Management Collaborative Applications Architecture can profoundly enhance the performance of a company’s supply chain operations by providing reliable integration and connectivity among the internal applications of a company (EAI) and those of its trading partners (B2Bi) and by automating critical collaborative business processes (BPM). In addition, Vitria’s SCPM Collaborative Applications Architecture provides an analytical platform that delivers a meaningful blend of historical and real-time information to improve operational decision-making. Furthermore, by automatically monitoring key performance indicators, users can make more informed decisions to quickly and effectively adapt operations to unexpected changes in the supply chain. This complete set of capabilities is required for management to gain greater control over operational performance. As a result, a company can reduce costs, improve margin, reduce cycle-times, increase customer loyalty, and improve collaboration with trading partners. All are vital characteristics to survive in the current highly competitive and volatile global market.