Supply Chain Management - A Practical Solution Approach

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Abstract
This paper starts by describing the SCM and then walks through the different domains that comprise SCM value chain. The document lists the drivers and benefits of SCM enterprise applications. This paper touches upon the SCOR methodology which is a best practice process reference model endorsed as the cross-industry de facto standard diagnostic tool for SCM. This paper goes on to describe a Reference architecture for SCM on which more specific solutions can be built. This paper provides a table consisting of SCM functional area and product/vendor solutions for that area/domain. The approach is to transform SCM enterprise so that the solution is based on the Reference architecture and product vendor catalog that the white paper emphasizes.

Supply Chain Management – SCM Introduction:

SCM is the management of the entire value-add chain, from the supplier to manufacturer to the retailer and finally to the customer. SCM is a systematic approach to manage the entire flow of information, materials, and services. Supply Chain is a huge network of retailers, distributors, transporters, warehouses and suppliers that participate in the sale, delivery and production of a particular product. SCM involves the flows of material, information and finance in a network chain consisting of customers, suppliers, manufacturers, and distributors.

SCM Drivers: The following list describes the drivers for the current SCM industry at large

- Reduce the cost of carrying excessive Inventory
- Reduce the cost of goods sold to Customer
- Increase the transaction processing speed by exchanging data in real-time
- Increase sales by implementing customer requirements more efficiently
- Reduce lead time from raw material to the finished goods to the customer

Figure 1: SCM Value Chain
SCM Domains: The above figure represents the SCM value chain. The following paragraphs describe in detail each of these areas.

1) **Planning:** Planning is a critical part of SCM in which the company develops a strategy for managing all the resources that are necessary to fulfill the customer demand for the organization’s products and services. Sales and Operations Planning enables key decision makers to monitor corporate S&OP performance metrics and trends. This will help company to achieve real-time sales and operations planning that will expand S&OP process beyond the traditional boundaries. The company will be able to balance supply, demand, and budgets and address promotion, allocation, cost, and customer service level issues profitably. The process helps company to achieve a holistic view of key performance metrics and trends across performance and across a wide variety of metrics, dimensions at various levels of aggregation.

2) **Material Resourcing or Sourcing:** This process deals with ordering, delivery, receipt and transfer of raw materials, products or services to meet planned or actual customer demand. This pertains to managing the inventory of goods and services the company receives from their suppliers, including receiving, verifying, transferring the goods and services to the appropriate facilities and authorizing supplier payment. This requires developing a set of pricing, delivery and payment processes with suppliers. The resourcing process mitigates the company's risk of engaging in business with suppliers who fail to comply with corporate or government-set standards with centralized information. This process also enables an online registration facility for suppliers to register and edit information, thereby streamlining the process and removing the barrier for entry. The process also consolidates the supplier data and enables procurement tracking in different regions from different suppliers with varying degrees of cost, risk and performance.

3) **Production:** This part of the value chain consists of order fulfillment for anticipated or actual customer demand for finished goods. The process facilitates scheduling activities necessary for production, testing, packaging and delivery preparation. The user should be able to schedule production and visibly track available stock of raw materials and finished goods in the inventory at all locations including suppliers and warehouses.

4) **Warehouse:** Warehouse Management provides for the planning and execution capabilities that allow warehouse managers to better plan and manage distribution center workflow. It provides upfront visibility into inventories to help manage and process orders at a faster rate. It provides better visibility into order process time and labor availability. WMS offers push and pull based replenishments to select the warehouses best able to efficiently pick high volume orders. Warehouse management facilitates integrated transportation planning and execution by leveraging dock door delivery models.

5) **Distribution:** This can also be referred to as Logistic Process. These processes will consist of providing finished goods and services to meet anticipated or actual demand, typically including order management, transportation management, and distribution management. This includes the distribution to the company’s distribution Partner, other distributors such as direct distribution to the channel partners including, IT key accounts, IT retailers and wholesalers.

6) **After Sales:** The final segment of the value chain defines processes associated with returning or receiving returned products from a customer or other channel partners. It also manages handling defective material received from the suppliers. It enables tracking all the information related to products or services. The process is integrated with the finance function to track and initiate cost settlement with customer / vendor. This enables users to seamlessly manage reverse logistics operations in the same distribution centers that handle vendor receipts and customer order fulfillment. The process supports component picks for discrete jobs and schedules, ingredient picks for process manufacturing batches, parts picks for maintenance work and repair orders.
Supply-Chain Operations Reference - SCOR Methodology: SCOR is a process reference model endorsed by the Supply-Chain Council (SCC) as the cross-industry de facto standard diagnostic tool for SCM organizations. SCOR enables users to address, improve, and communicate SCM practices within an enterprise.

The model is based on 3 major pillars which are described below.

1) **Process Modeling Pillar:** Describes supply chains using process modeling building blocks. The process pillar is focused on:
   - **Plan:** Processes that balance aggregate supply and demand to develop a course of action which best meets sourcing, production and delivery requirement
   - **Source:** Processes that procure goods and services to meet planned or actual demand
   - **Make:** Processes that transform product to a finished state to meet planned or actual demand
   - **Deliver:** Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management
   - **Return:** Processes associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support
2) **Performance Measurements Pillar:** This pillar deals with measuring the performance of the supply chain and comparing it against internal and external industry goals. These performance metrics derive from the experience and contribution of the Council members. Supply chain performance is focused on:

- **Reliability** - achievement of customer demand fulfillment on-time, complete, and without damage etc.
- **Responsiveness** - the time it takes to react to and fulfill customer demand
- **Agility** - the ability of supply chain to increase/decrease demand within a given planned period
- **Cost** - objective assessment of all components of supply chain cost
- **Assets** - the assessment of all resources used to fulfill customer demand

3) **Best Practices Pillar:** After the performance of the supply chain operations has been measured and performance gaps identified, it becomes important to identify what activities are melded to close those gaps. Re-alignment is achieved through a combination of the following:

- **Classic Process Re-engineering** from "As-Is" to "To-Be"
- **Lean Manufacturing** analysis and process change
- **Six-Sigma** analysis of defective processes
- **Theory-of-Constraints** analysis of systems of processes to elucidate root-cause issues
- **Balanced SCOR cards** and **benchmarking**

**SCM Reference Architecture**

SCM software solutions provide real-time systems that manage the flow of product and information throughout the supply chain network. They are designed to enhance SCM operations by reducing manual tasks through automations.

This below diagram depicts SCM application landscape consisting of interfacing applications/systems. Diagram depicts an SCM Reference architecture on which more specific architectures can be build. The Reference architecture is based on the SCM value chain domain and SCOR process methodology. The diagram segregates the applications based on infrastructure applications (Integration, Security, MDM) and business applications (Production Management, Procurement Management). The blocks depicted forms the essential components of the SCM eco system. There are close to 10 different vendors providing SCM application catering to different functions hence there is a lot of choice when it comes to the final list of application that will make the cut for an organization but the Reference architecture should still hold good. The final solution will be a matter of mixing and matching the COTS products and/or Customer Development applications based on different parameters like functionality, integration, processes, budget and vendor support to essentially to meet the organization requirements.
The Major Building Blocks of the reference architecture for SCM are

1) **ERP**: ERP accommodates a variety of business activities, including sales, marketing, delivery, billing, production, inventory management, quality management, and human resource management. It is often referred to as a back office system suggesting that customers and the general public are not directly involved with its functions. The major components of ERP includes
   a. Financial Accounting
   b. Procurement
   c. Inventory
   d. Order Manager
   e. Point of Sale

2) **Planning**: Planning deals with all planning related activities in the SCM ecosystem. This block includes supply, demand, production and distribution planning functions.

3) **Warehouse Management**: Warehouse management provides the planning and execution capabilities that allow warehouse managers to better plan and manage distribution center workflow. WM provides upfront visibility into inventories to help manage and process orders at a faster rate. Warehouse management facilitates integrated transportation planning and execution by leveraging dock door delivery models.

4) **Claims and Warranty**: CWS deals with the returns management process including warranty. This system manages returning or receiving returned products from a customer or other channel partners. It also deals with handling defective material received from suppliers.

5) **Transportation Management**: Transportation Management provides transportation planning and execution capabilities to shippers and third party logistics providers. It integrates and streamlines transportation planning, execution, freight payment, and business process automation across all modes of transportation.
6) **Supplier Portal:** Supplier Portal deals with communication and coordination with suppliers.

7) **Production Management:** Production Management deals with activities related to Production Management including MPS/MRP and production order.

8) **Procurement Management:** Procurement Management enables the complete procurement process from order to payment and allows complete visibility of the entire process. It also facilitates online negotiation and collaboration.

9) **Order Management:** Order Management handles the order fulfillment process from SCM business. OM facilitates end to end order to cash solution.

10) **Inventory Management:** Inventory Management provides advanced, real-time inventory transactions and visibility functionality for SCM. IM supports inbound, outbound, and reverse logistics, transactional support and finished goods, raw materials, and work in process components tracking.

11) **Master Data Management:** Master Data Management acts like the Central Repository of the Master data. It standardizes matches and removes duplicates from the incoming data. MDM cleanses and enriches the data centrally. MDM is a workflow-driven process in which various business units collaborate to harmonize, cleanse, publish and protect common information assets that must be shared enterprise-wide. MDM ensures the consistency, accuracy, stewardship and accountability of the enterprise’s core information.

12) **Integration Infrastructure:** This component deals with the integration of disparate systems and application through the EAI component. Allows simplified systems integration (Plug and Play) through clearly defined contract interfaces between applications. It also reduces software development costs by building on industry best practices and standards.

13) **PLM – Product Life Cycle Management:** PLM manages the information, processes, and decisions about products throughout their. The product record includes all the information required by an SCM enterprise and its extended design and supply chain to conceptualize, design, source, build, sell, service and dispose of products.

**Benefits of SCM IT Solutions:**

1) **Improved staff and task productivity:** Automating various SCM tasks from plan-to-produce, demand-to-build and order-to-cash processes thereby improving business processes and leading to increased productivity.

2) **Improved Supply Chain Network:** Supply chain software provides complete, all-round visibility throughout the entire supply chain network, a feature that cannot be achieved with manual processes. The organization can detect and respond quickly to market changes and quickly capitalize on new opportunities.

3) **Enhanced Collaboration:** This feature provides the organization with the ability to track the status of all interactions with its suppliers and distributors. It also enables suppliers and distributors access to the same information in the organization.

4) **Minimized Delays:** All processes can be seamlessly coordinated and executed from start to finish, ensuring collaboration and much higher levels of on-time delivery across the board.

5) **Reduced Costs:** Supply chain software can help reduce overhead expenses in a variety of ways.

6) **Increased Customer Satisfaction:** SCM enables the organization to better adapt to and meet customer demands thereby increasing customer satisfaction.

7) **Compliance with Regulatory Requirements** – Organizations can monitor compliance with the regulatory requirements.
SCM Application Functionality and Product Catalog:

SCM applications provide real-time analytical systems that manage the flow of product and information throughout the enterprise supply chain network. They are designed to enhance SCM operations – supplier sourcing, production planning, inventory planning, transportation planning, and demand planning, and so on. The SCM solutions are fragmented along these functional applications into specific spaces – for example, advanced planning and scheduling for the manufacturing plant, demand planning for the sales group, and transportation planning for the distribution center. The below table list the vendors against each of the functional areas in supply chain network.

<table>
<thead>
<tr>
<th>Function</th>
<th>Application Area/Sub Function</th>
<th>Vendor/Product Catalog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Demand Planning</td>
<td>SAP, Oracle Apps, JD Edward and Baan</td>
</tr>
<tr>
<td></td>
<td>Supply Resource Aggregation for Supply Planning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final Demand &amp; Supply Plan</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Material Resource Planning</td>
<td>SAP, Oracle Apps, Baan</td>
</tr>
<tr>
<td>Resourcing</td>
<td>Purchasing and Inventory Raw Materials</td>
<td></td>
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<tr>
<td></td>
<td>Supplier Portal</td>
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<tr>
<td></td>
<td>Procurement</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>Production Management</td>
<td>SAP, Baan, Oracle Apps, Interbiz</td>
</tr>
<tr>
<td></td>
<td>Inventory Finish Goods</td>
<td></td>
</tr>
<tr>
<td>Warehouse</td>
<td>Warehouse Management</td>
<td>JD Edward, JBA (System 21), Oracle Apps</td>
</tr>
<tr>
<td></td>
<td>Transportation Management</td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td>Order Management</td>
<td>Interbiz, Oracle Apps</td>
</tr>
<tr>
<td></td>
<td>Inventory Management</td>
<td></td>
</tr>
<tr>
<td>After Sales</td>
<td>Claim and Warranty Mgmt (Order Return &amp; Return Logistics)</td>
<td>Oracle Apps</td>
</tr>
<tr>
<td>Others</td>
<td>Product Life Cycle Management</td>
<td>Oracle, Sun, IBM</td>
</tr>
<tr>
<td></td>
<td>Master Data Management</td>
<td></td>
</tr>
</tbody>
</table>
Supply Chain Management Vs Enterprise Resource Planning

ERP equips the company to gain competitive edge by integrating all business processes and optimizing the resources available. It facilitates integration and synchronization of the isolated functions into streamlined business processes. ERP is being implemented in almost all types of organizations irrespective of its mode and spread of operation.

Difference Between ERP and SCM.

1) **Real Time Information:** Traditional ERP systems generally do not gather real-time information from everywhere in the supply chain. On the contrary, they often contain static, dated information only related to subsections of the supply chain. Getting answers from an overloaded ERP system may take hours, whereas getting them from a separate, memory resident, always running SCM system may take minutes or seconds.

2) **One Vs Many:** An ERP system accommodates a single company that is attempting to integrate its business activities, SCM almost always spans across multiple companies and involves only a relatively few people and resources within each company. One company may be involved in many supply chains for different product lines or different markets for the same product line.

3) **Decision Making:** Real-time information throughout the entire supply chain is needed to make correct decisions, and SCM products are designed to gather that real-time information. ERP systems broadly cover sales and distribution, business planning, production planning, shop floor control, and logistics. This would seem to cover the same areas as SCM. However, effective SCM enables the organization to make informed decisions throughout the entire supply chain network. SCM goes beyond traditional planning solutions by simultaneously considering demand, capacity and material constraints.

**SCM User Case Scenarios:** The following scenarios are addressed by SCM end to end workflow solutions and involve several of the components highlighted in the SCM reference architecture.

- Procure to Pay
- Order to Cash
- Lead to Service
- Forecast to Plan
- Demand to Build
Conclusion:

SCM software is the most fragmented group of software applications on the planet. Each of the six major supply chain domains outlined earlier consists of dozens of specific tasks, many of which have their own software. Organizations need to track supply, demand, manufacturing status, logistics and distribution on a real-time basis. They also need to share data with supply chain partners at an ever-increasing rate. Vendors assemble these different chunks of software under a single roof, but no single vendor will have a complete package that is right for every company. The trend is to consolidate these disparate functions into a comprehensive SCM solution, and this is where the Reference Architecture explained earlier provides a foundation on which more specific solutions can be built based on enterprise requirements.

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