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SETLabs Briefings

Knowledge Applications enabling Competitiveness for Consumer Electronics Manufacturers through Supply Chain Information Management

Santosh Iyer and Badri Devalla, PhD

Transforming supply chain data to information and further synthesizing information to knowledge for decision making is imperative for competitiveness and profitability

INTRODUCTION

Consumer Electronics Original Equipment Manufacturers (OEMs) outsource most of their manufacturing and assembly. In addition, retailers and consumers demand direct store and/or home delivery of goods. This makes the consumer electronics supply chain not only one of the most complex, but also the most critical differentiator for branded OEMs. The policies and distribution mechanisms used in these supply chains have to contend with both demand variability and supply disruptions, directly determining the profitability.

Consumer Electronics OEMs are therefore trying to gain a competitive advantage by harnessing the information around supply chain events for both better forecasting and better distribution. A direct objective is to save millions of dollars through hedged procurement (e.g. Apple iPod and Flash memory [1]) and/or reduced inventory without a reduction in customer service (e.g. Dell).

We propose a Supply Chain Information Management (SCIM) framework that defines Data, Information and Knowledge layers with transformations from one layer to another. At the Knowledge layer, we define business value applications, called `Knowledge Applications' (KApps) that use institutionalized knowledge for agile decision making and strategic control of supply chain assets.

INEFFECTIVENESS OF SUPPLY CHAIN DATA MANAGEMENT

A number of business problems have their source in the way supply chain data is handled and consumed. A sample list derived from customer interactions is as follows:

- "Visibility of finished goods at the different nodes in our supply chain is lost"
- "There are no lead indicators on effectiveness of promotions for our new product introductions"

- "Our Business Intelligence (BI) systems are unable to tap into the information that exists in our supply chain"
- "New reports are constantly made but we are unable to synthesize the end-to-end supply chain information"
- "Access and visibility to key operations information at our third party warehouses is required and OEMs need selected access to information from us."
- "Each time a new factory is purchased, integrating decisions, especially in procurement, across multiple geographies seems to take years. "

Analysis of the root causes of the problems indicates that data management and data consumption need to be managed better.

There has always been tremendous amount of data available in the supply chain. New AIDC technologies like RFID and standards like GS1 [2] allow for a more granular capture of such supply chain information. Thus, there is never a lack of data but problems with institutionalizing how data is handled across functions within an enterprise and across supply chain partners.

A cross-industry study by AMR Research [3] indicates that supply chains with the best visibility strongly outperform their peers in inventory investment, perfect order fulfillment, cash-to-cash cycle time, and stockouts.

Lack of visibility has to do with an inability to use inventory related data. Consumer Electronics OEMs constantly note the opacity and difficulty in working together with partners, directly impacting competitiveness and profitability. Complex and outsourced supply chains are also susceptible to disruptions [4].

Enterprises rarely use structured ways to consume supply chain data across business processes and decision making layers for targeted business benefit. Common hurdles include difficulty to define returns on investment and complexity of a data modeling and integration exercise.

Frameworks for transactional reports and ad hoc analytics exist and are in use. However, these have a `silo' focus in them – the buyers have their supplier performance reports, the planners have their reports on how they are performing to forecast, and the warehouse managers have their fulfillment reports. We rarely see organizations address these functions holistically, to say, improve customer satisfaction through a combination of better cost, better availability and better on-time delivery.

Clearly such a holistic response is far more vital when there is unplanned variability or disruptions. We believe better information management can alleviate some of these problems. The key, we believe, lies in tying information management to business value realization i.e. transforming the data into business value. Such management of information also demands an aggregate and cross-functional view, with the ability to filter out exceptions and focus on key metrics.

What is also worth noting is that having such an information management in place may actually reduce the cost of response for unplanned supply chain disruptions as enterprises can be proactive about potential problems.

SUPPLY CHAIN INFORMATION MANAGEMENT

Supply Chain Information Management (SCIM) is about defining a layered framework to funnel the right types of data, in the right context and

aggregation to decision making applications that can consume the data for business benefits. SCIM consists of a series of transformations to derive business value from supply chain events and data.

SCIM Layers and Transformations

The different layers and transformations of SCIM are shown in Figure 1.

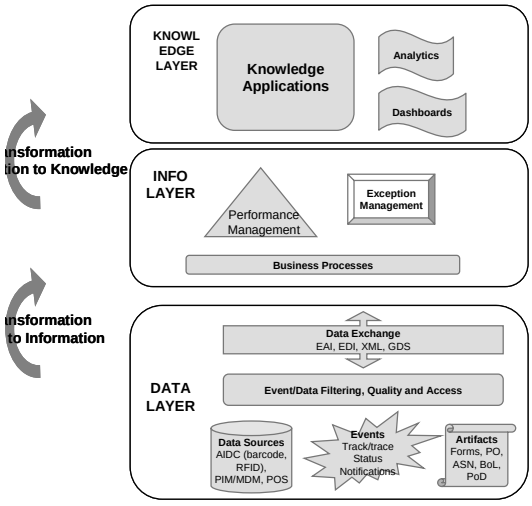

Figure 1: SCIM Layers and Transformations
Source: Infosys Research

The first transformation is that of supply chain data and events to supply chain information contextualized to business processes with performance and exception management. The next transformation is that of supply chain information to knowledge through the implementation of Knowledge Applications and Analytics. Business value is realized through a set of Knowledge Applications (KApps) implemented in the Knowledge layer.

In each layer, we perform specific functions to allow for transformation to be effective. Events, data and their capture form the lowest `Data' layer. While managing data and events is well known – be it bar-code or an RFID scan, our focus is on correcting and filtering the data. Thus, we try to contain the data access, quality and integrity to this layer.

The Information layer relies on "clean" data to derive information by contextualizing disparate data to specific business processes. For example, associating the different pallet scans pertaining to an order can provide information on when a pallet was delivered. This merely connects different data to complete all the attributes of say a pallet location, event and time. The contextualization extends beyond just business process mapping.

Specifically, the SCIM framework provides a Performance Management and Exception Management as two additional transformations to provide richer information. Performance Management is achieved through defining and applying a metrics hierarchy. Supply Chain Council's SCOR model and others provide a good starting point on how to measure Supply Chain Performance [5, 6, and 7]. The Exception Management layer sets threshold on key metrics and provides alerts. The Information layer thus presents highly contextualized information tied to business processes and aggregated to metrics with the ability to monitor exceptions.

The final transformation is to derive knowledge from the information. The knowledge is in terms of business value – Knowledge Applications (KApps) defined at this layer help business users with decision making. Knowledge Applications is further detailed in a separate section.

How is SCIM different from Enterprise Performance Management (EPM) and Business Intelligence (BI)?

SCIM combines information management techniques for specific business problems enterprises face in the supply chain. A generic EPM measurement framework cannot capture

the intricacies in real time events along with strategic decision making needed for supply chain efficiencies. SCIM can be an integral part of EPM that provides more knowledge about supply chain performance.

SCIM differs from a typical Business Intelligence (BI) platform by using an expanded set of supply chain data and event information. Typical BI platforms are not designed to integrate supply chain event and partner information with static and other transactional data in SCM systems. BI platforms do not include Supply chain specific performance models and cannot provide information needed for predictive analytics and intelligent decision making. SCIM Knowledge Application is designed to present information in terms of aggregate business metrics for decision making and `what if' scenario planning

KNOWLEDGE APPLICATIONS: BUSINESS VALUE REALIZATION

Knowledge Applications (KApps) focus on delivery of business value based on contextualized information through an aggregated set of metrics. KApps use predictive analysis to aid in decision making. KApps feature mechanisms for tactical and strategic control of supply chain assets. Since they consume supply chain information at an aggregate level, KApps are designed for consistent, coordinated and optimized response.

We illustrate a KApp on Inventory Visibility. The objective of this KApp is to provide visibility to inventory levels at different nodes in the supply chain and contextualize that information to the Accounts Payable (AP) and Accounts Receivables (AR) processes to reduce Days Sales Outstanding (DSOs).

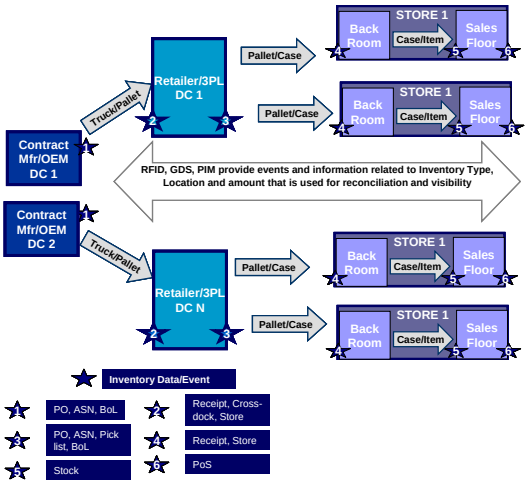

Figure 2: Illustrating KApp for Inventory Visibility
Source: Infosys Research

Consider the example shown in Figure 2. The figure shows finished goods inventory movement in a typical Consumer Electronics supply chain to a retailer. There is a large amount of supply chain data available at different nodes. The information layer contextualizes this data to order, shipping and receiving processes. In Figure 2, PO stands for Purchase Order, ASN Advanced Shipping Notice, BoL Bill of Lading, GDS Global Data Synchronization and PIM Product Information Management

The KApp therefore can then focus on inventory visibility – illuminating different inventory attributes at different parts of the supply chain. This visibility information can then be used for several purposes – some of the popular ones include invoice reconciliation, product promotion and inventory optimization.

Taxonomy of Knowledge Applications for the Consumer Electronics Industry is presented in Figure 3 to help understand the types of KApps.

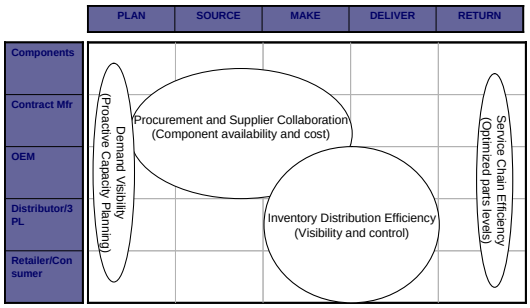

Figure 3: Taxonomy of KApps
Source: Infosys Research

The figure shows a table that has the Consumer Electronics Supply Chain partners as rows and the key processes as the columns (For illustration, we use a generic set of processes in the SCOR model). This representation shows the cross-functional and inter-enterprise nature of data and information that a Knowledge Application acts on.

KApps can be either around enhancing value of specific functions like demand visibility or service chain efficiency. These would rely on extensive metrics hierarchies, highlighting aggregated metrics that impact demand visibility for example. Other types of KApps include greater focus on processes – such as an OEM having a tight control over procurement of components by its contract manufacturer or real-time inventory visibility for outsourced logistics.

Based upon taxonomy, we can define several KApps that are relevant to Consumer Electronics Industry, such as

- Promotion execution & new product launch
- Inventory optimization in a multi-tier supply chain
- Customer service initiatives around order fulfillment
- Predictability in outsourced supply chains
- Cost efficient risk management

CASE STUDY:

INVENTORY RECONCILIATION AND PROMOTION EXECUTION FOR A CONSUMER ELECTRONICS MANUFACTURER

The customer is a multi billion-dollar consumer electronics manufacturer with the highly competitive U.S. retailer channel contributing to significant revenue. Being one of the top 100 suppliers for Wal-Mart the customer is an early adopter of EPC/RFID technology [8] in their outbound supply chain.

One of the customer's top priorities was to move beyond EPC/RFID mandate compliance, and extract business value by improving their working capital and finished goods distribution efficiencies by harnessing highly granular information on finished goods inventory movement.

Business Problems:

1. The shipment process to Wal-Mart was inefficient because of manual errors in counting during the receiving process, resulting in incorrect invoice verifications by the retailer. Also, process failures like shipment of wrong quantity or wrong product led to disputes and deductions. The cost of resolving these disputes also claimed productivity of critical resources reconciling how much was sent versus what was claimed as received. This led to increased Days Sales Outstanding directly resulting in working capital inefficiencies.

2. Every year, like most consumer electronics manufacturers, the customer spent 10% to 12% of revenue on promotions to support discounts, rebates, circulars, coupons, end-of-aisle displays, cash incentives, and subsidized financing. Revenues generated by these promotions were anywhere from 25% to 40%. Also, new product introductions accounted for

9% to 14% of their total annual earnings growth, and up to 50% of growth within specific categories. Despite the business importance of promotions and new product launches out-of-stock (OOS) was a common business problem with the customer, resulting in lost sales.

The customer contends a complex environment of numerous promotional campaigns and new product launches targeting a range of products and multiple segments and channels. The objective is to accurately predict and monitor the overall effectiveness of their promotional spending and successfully launch new products to ensure higher revenues, lower costs, higher market share and greater customer satisfaction through quality of product and service

The SCIM Solution:

The Infosys Supply Chain Information Management (SCIM) solution for the customer essentially consisted of three layers:

Data Layer

The customer's supply chain is fed by multiple data sources across disparate systems. For example, customer purchase order information was in their SAP ERP system while the delivery and shipment information resided in a homegrown WMS system. Also, the customer used the EDI 856 standard to communicate ASN information to Wal-Mart. The RFID implementation also resulted in supply chain event data from the EPC/RFID Middleware and the Wal-Mart Retail Link portal.

The data layer integrated the following data sources in an accurate data store:

- Product and product hierarchy (SAP and EPC/RFID Middleware)
- Shipments information (WMS)
- Orders (SAP Deliveries)
- Objects identified by unique EPC/RFID license plates such as cases, pallets etc
- Location and Location hierarchy
- Partner read information (Wal-Mart Retail Link and other EPCIS mechanisms)

Information Layer

This layer contextualized the customers supply chain data along process, performance and exception areas. The goal here was to convert data from the previous layer into contextualized information, which can be utilized by the next layer of KApps. The focus is on finished goods inventory. Thus, an inventory specific contextualization leads to information to understand inventory related attributes – what was received, how many, where and at what time.

Figure 4 shows the Data and Information Layers for the Case Study. These layers serve as the basis for KApps that are implemented on top of these layers.

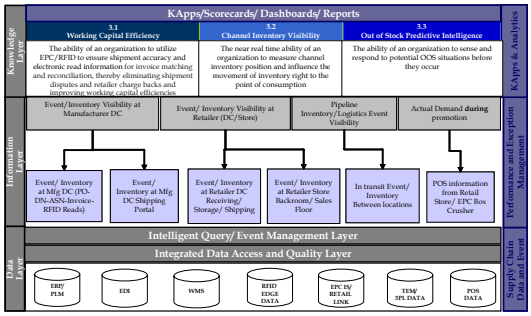

Figure 4: Data and Information Layers for the Case Study

Source: Infosys Research

Knowledge Layer

We illustrate the Knowledge Layer through two KApps

KAPP1: INVENTORY RECONCILIATION TO IMPROVE WORKING CAPITAL EFFICIENCY.

KApp for invoice reconciliation targets inventory exchanges throughout the supply chain. By ensuring the shipments that match the orders and tracing these, the KApp enables automatic invoice reconciliation reducing Days Sales Outstanding (DSO).

The KApp uses information contextualized to SAP Purchase Order, WMS Delivery Notification, ASN, Invoice and EPC/RFID read information at the Manufacturer's Distribution Centre (DC) for every shipment passing out of the shipping portal. The tight integration between the contents of the WMS shipment and the RFID/EPC pallet verification readers ensured that the right products in the right quantities were palletized for a particular shipment. Further, when the pallets passed through the dock doors before the being loaded onto the trucks, the shipment content information in the form of unique EPCs for every case on the shipment was recorded automatically in the ASN document which was sent by an EDI 856 transaction to Wal-Mart. The ASN – Invoice link in the SAP backend ensured that for a particular invoice, the case EPC information could be retrieved via the KApp.

When the shipments were received into the Wal-Mart Distribution Center (DC) the readers at the receiving door recorded the pallet- case information which was published onto the Wal-Mart's Retail Link™ portal. Wal-Mart uses Retail Link™ to exchange supply chain and store sales information to its suppliers. The KApp intelligently retrieved data from Retail Link™ and integrated it with the existing outbound shipment information via timed ETL agents to match manufacturer shipped versus retailer received information, thus reconciling invoices faster. Also, barring any technology related read errors, any difference between the shipped and received information also helped indicate pilferage.

This KApp dramatically improved the speed and accuracy in the invoice verification process between the customer and Wal-Mart and hence faster payment collections. It also helped reducing the costs associated with invoice reconciliation and avoiding incorrect charge backs - ultimately resulting in higher working capital efficiencies.

Figure 5 shows how the information is transformed to knowledge by KApp1 and KApp2.

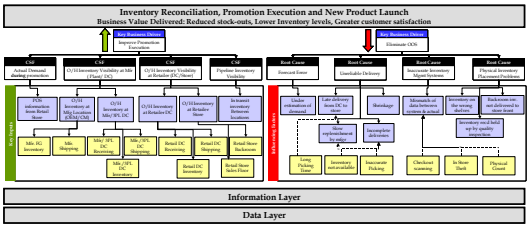

Figure 5: Knowledge Applications (KApps) for the case study

KApp2: Promotion Execution and New Product Launch Management

The KApp for promotion execution and new product launch management is based on supply chain visibility and predictive intelligence enablement by integrating event, POS and EPC/RFID data in the extended supply chain thereby enabling the customer with an ability to identify and correct supply chain execution problems before they occur.

By integrating near real time consumption, demand and product movement information across disparate systems of customer and the Wal-Mart Retail Link™ portal into one information store, with predictive intelligence and exception management capabilities, the solution helps the customer to better manage live replenishment of inventory from source to consumer consumption.

Some of the KApp2 features designed include:

- Proactive Promotion Inventory Control & Product Cut-In Compliance
- Rapid Forecast Initialization and In-Flight Forecast

- Near Real Time In-Flight Promotion Management
- Promotion/New Product Launch Collaboration & Execution Coordination
- End-of-Life Optimization

The implementation of KApp2 features is under consideration. KApp2 is designed for a higher forecast accuracy to prevent out of stocks and allow optimal inventory holding to service customer demand. KApp2 helps the management achieve strategic objectives of increased supply chain delivery reliability, responsiveness, flexibility and asset management efficiency and reducing supply chain costs.

CONCLUSION

Consumer Electronics manufacturers are looking to harness supply chain data for insights into demand, supply and distribution. We highlight this need through examples that show how Infosys delivered business value around invoice reconciliation to improve working capital efficiency and promotion execution for new product launch for a consumer electronics manufacturer.

Well designed Knowledge Applications can become effective tools in a competitive market that rewards differentiation in sensing demand variations and responding with appropriate supply. Additionally, KApps also present an immediate return on Supply Chain Information Management investment.

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AUTHOR PROFILES

Santosh Iyer is a Senior Associate in Supply Chain Consulting with Infosys High Tech & Discrete Manufacturing business unit. He has over 8 years of Business Consulting & Engagement Management experience. He has an MBA from IIM Kozhikode & a Post MBA specialization in International Business from IIM Calcutta and can be reached at Santosh_Iyer@Infosys.com

Badri Devalla is a Senior Principal in Supply Chain Consulting with Infosys High Tech and Discrete Manufacturing business unit. He has several years of experience as a Systems Architect, Product Manager and Business Consultant. He has a PhD in Computer Science from Texas A&M University and can be reached at B_Devalla@Infosys.com