



RFID in Integrated Order Management Systems

RFID, VMI and CPFR in Integrated Order Management Systems for Retail Supply Chains

This paper will highlight the key features of an integrated order management system in a retail supply chain in light of Auto ID (RFID) technologies and processes like Vendor Management Integration (VMI) and Collaborative Planning, Forecasting and Replenishment (CPFR).

An integrated order management system in a large retailer environment includes multi-level collaboration among trading partners in the areas of standards-compliant product coding, data synchronization, automated replenishment, efficient logistics, data exchange and overall supply chain visibility across enterprises.

Real-time visibility into the storage and movement of products enabled by Radio Frequency Identification (RFID) and Electronic Product Code (ePC) will help locate bottlenecks and areas of inefficiency in the supply chain. This paper explores how such real-time information from RFID will enable retailers and suppliers to place the right merchandize at the right place in the right quantity, and will reduce inventory and stock-outs.

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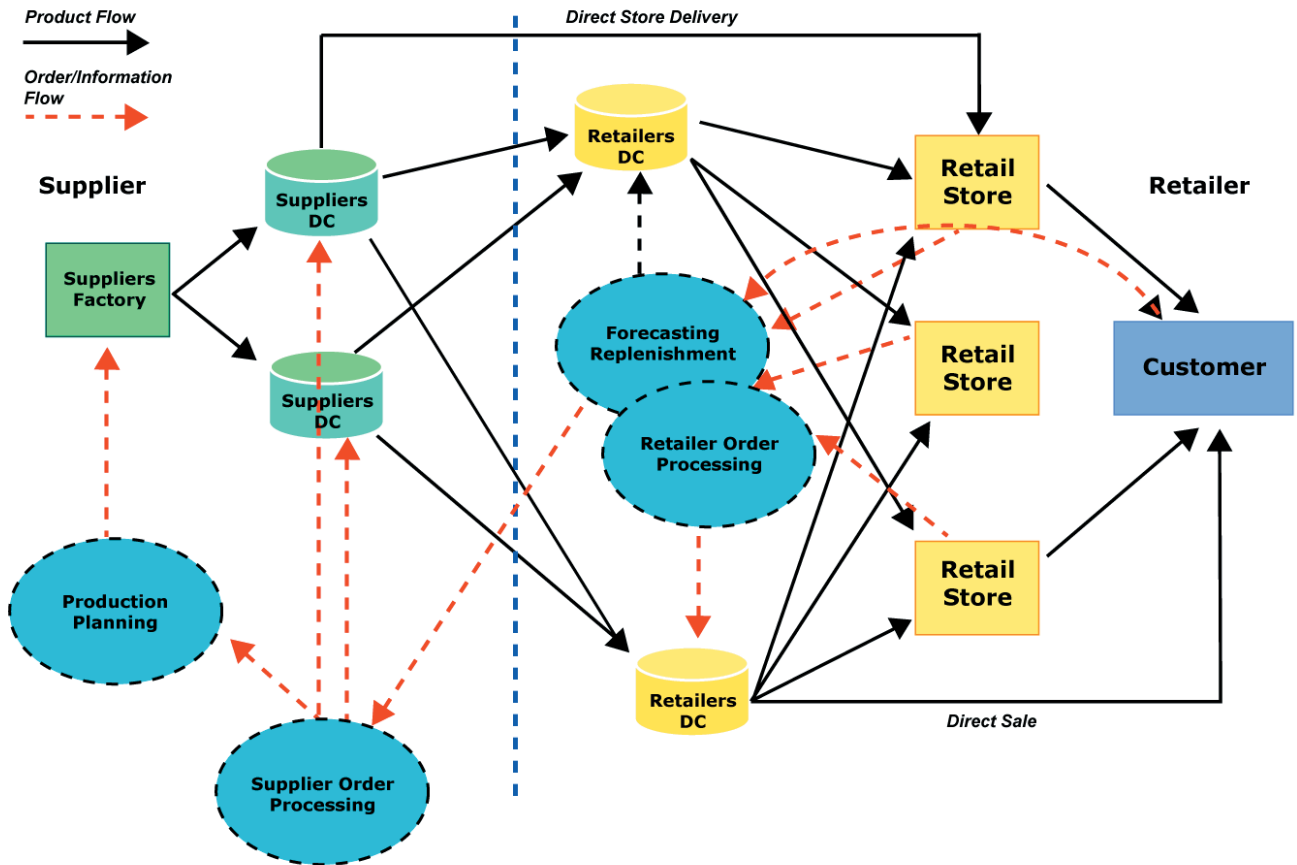
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Overview of Retailing Trends

Retailers have seen unprecedented changes in their business. In the last 16 years, there has been a flood of new retail space, with the top 50 retailers increasing their square footage by more than 55%. Not only are there more stores, but many offer similar products. The same brand of shaving razors can be bought at convenience stores, grocery stores, drug stores, super-centers, discounters and warehouse clubs. Denim wear can be found at the discounters and warehouse clubs, as well as at department stores, mass merchandisers, specialty stores and other outlets. Even the latest DVD of a blockbuster movie can be found in a large range of stores spanning from discount stores, specialized electronic stores to even mass merchandisers and drug stores. This explosion of consumer choice puts tremendous pressure on retailers, and has seen many historical leaders struggling in today's increasingly competitive environment. Of the 15 most profitable retailers in 1985, only six remained on the list by 1996. To survive in such a competitive market, it is no longer enough to just buy the right goods at the right cost – retailers must also get them to the right place at the right time, and at the right operational costs. Doing this well requires the best possible combinations and coordination between merchandising, supply chain functions and logistics. This requires combining the information that determines buying decisions with the product flows that deliver goods to customers most cost effectively. The retail industry has benefited immensely from growths in the scale of business, but only those retailers with efficient operations and enabling (physical and technology) infrastructure built around customer responsiveness and focus can compete effectively in today's marketplace. A key area in optimizing the retail supply chain is the need for optimal and cost-effective coordination among the various components of the supply chain. Improvements in order management, inventory management and purchasing functions using processes like Vendor Managed Inventory (VMI) and Collaborative Planning, Forecasting and Replenishment (CPFR) are practices that successful retailers have adopted. These industry-leading processes have the potential to be fully complemented by technology enablers like Auto-ID (RFID), ePC-oriented Data Synchronization, and Electronic Data Interchange (EDI).

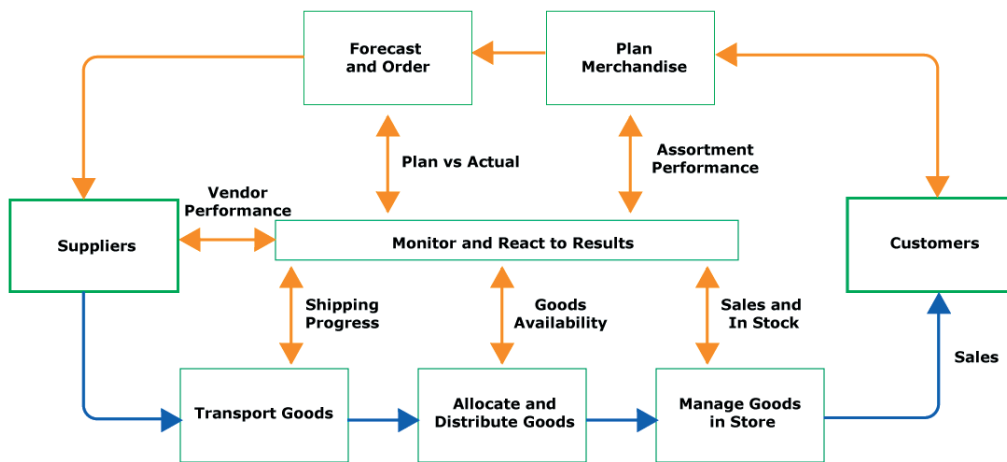
The Retail Supply Chain and Integrated Order Management

The retail supply chain is the connecting link between the demand and supply of retail goods and is therefore at the heart of retail operations. On the demand side of the retail value chain, the merchandise mix is dynamic, as it is driven by changing customer preferences. To effectively manage costs, retailers are sourcing goods from providers based on comparative advantages well beyond geography which leads to a culture of global sourcing. Using effective information exchange practices to integrate the retail purchasing function with both merchandising and supplier management is the key to achieving operational excellence. Implementing the proper technology infrastructure can create quantifiable advances in the time, cost and scale of purchasing and replenishment processes and creates competitive advantages by aligning these purchasing processes to business objectives. Supply chain management can be defined as managing a set of entities which are involved in the design of products, procurement of raw material, transforming them into semi-finished and finished products and delivering them to the end-customer as illustrated in the following diagram.



The Retail Supply Chain

For the purposes of this paper, we will concentrate on the purchasing and distribution functions between the retailer and the manufacturer/supplier which form the order management system of the retail supply chain as illustrated below.



The Purchasing and Distribution Functions in a Retail Supply Chain
(Source: Retail Logistics McKinsey Quarterly)

Retail Purchasing and Distribution Functions

What does a retailer need to know to manage the supply side of the retail supply chain? In simple terms, four questions *what, how, how much and when to buy* need to be answered. For a small single store retailer carrying small quantities of merchandise and sourcing locally, this would not be difficult. However, increased customer expectations and competition have made the single store retailer non-existent. The future belongs to organized retailers with an understanding of customer needs and an ability to improve retail operations.

The purchasing function in large retailers is managed by the collective effort of merchants and buyers. The basic questions need to be looked at from the point of strategic activities, required processes and technology requirements. This will enable us to derive the key considerations for the retail purchasing function right from strategy through implementation.

Retail purchasing process is driven by the business planning phase for managing the portfolio of product categories which ultimately leads to decisions on category roles, sales targets and budgets. This is typically done using a mix of top down and bottom up approach (i.e. the retail chain tries to see how the corporate level targets for revenue and profit can be achieved by revenue and profit of categories, assortments and finally, SKU's at the store level). The store managers and merchandising personnel share their insights about various categories and give their estimates at the store level, and finally arrive at the assortment plan. The assortment plan is detailed further to arrive at the purchasing budgets for SKUs at the store level.

At this point, the following questions should be considered by the retailer:

- How much visibility of sales and gross margins exist across product categories at all stores?
- How do you analyze performance metrics of each category in the merchandise mix?
- Do you have systems to reduce the need to manually enter the same information multiple times?

The purchasing budgets need to be utilized over a period of time and need to be monitored on the basis of differences between planned sales and real sales. Retail buyers utilize Open to Buy (OTB) to purchase merchandise on the basis of available budget. The planned and actual/extrapolated figures for sales, markdowns, and opening and closing stock levels are factored into the OTB calculation. This acts as the guideline for carrying out purchasing at the operational level. The sourcing process drives the supply side of the retail value chain. Retail buyers scan the supply market to identify potential suppliers for different product categories. They evaluate suppliers and utilize their buying power to negotiate deals. They collaborate with their suppliers to achieve business objectives in the best possible manner. The retailer enters into contracts and maintains relationships with vendors supplying various product categories, meeting their requirements.

OTB, which is calculated at item level at stores, translates to requirement for replenishment at stores. At an operational level, this is achieved with Distribution Centers (DC) servicing a group of stores with the purchase orders generated at the DC level and with DC's effecting transfers to stores based on these store requirements. Purchase orders are raised by buyers on the basis of desired item level inventory levels, quantity on order and planned sales. Typically, PO's are raised on the basis of the aggregated requirements of multiple stores and contain details for multiple items with requirements for partial shipments over a given timeframe.

Once a purchase order is raised for a particular quantity of a particular item, the supplier is expected to deliver the items in those quantities within a pre-negotiated lead time to the retailer. Reacting to demands, shelf and store inventory levels, and buying trends, the retailer's DC is asked to replenish the item quantities requested. The DC, where the pooled inventory for all stores (usually in geographical proximity) is stored, delivers the requested quantities to the store. The DC in turn requests additional quantities of the item from the supplier to replenish its own stock to fulfill future demand of the item. The delivery mechanism of doing the above is determined depending on the parameters like presentation minimum, store capacity,

DC capacity, delivery truck capacity, number of trucks available, distance between supplier's DC and the retailer's DC, the rate of product demand, demand variability, inventory holding costs for both supplier and retailer, transportation costs, lead time of the supplier and the retailer's DC, and many other factors. The retailer will want shorter supplier lead times, high order fill rates, lower inventory holding costs and lower transportation costs. The supplier on his part will want lower inventory and transportation costs but will also want full truck loads amongst other things. These 'wants' of the supplier and the retailer may often conflict, and it is often to their mutual advantage to coordinate and negotiate their supply chain relationship on an objective basis.

The following questions should be considered by the retailer:

- Do you have the tools to share and use purchasing budgets and support joint planning of merchandising with the purchase order management team?
- How much visibility of purchase volumes across product categories by the supplier exists?
- Have you defined metrics for supplier evaluation by factoring characteristics of categories supplied and do you have tools to track performance of existing suppliers on those metrics?
- Do you use analytical tools to carry out inventory analysis at store and DC level to arrive at the min-max levels for all items?
- Do you have visibility of item wise inventory levels at the store and DC?
- Do you have tools for effective information exchange of inventory information within the company and with suppliers?
- Do your suppliers benefit from advance notice of requirements and do they respond with lesser lead time for order fulfillment?
- How do you decide when to order more stock of a particular item from your DC so as to prevent stock-out as well as to keep store inventory minimal?
- How and when do you order for an assortment of different items of different quantities from different suppliers each offering different prices?
- How do you decide when to order more stock of a particular items for your DC keeping its inventory minimal taking into account uncertainty in supplier lead time and store demand?

On reflecting on these questions, one realizes that the underlying requirement of order management is the need for timely and accurate information and data at various parts of the value chain. Moreover, the above questions can be consolidated into the challenges that the order management system of a retail supply chain faces as mentioned below.

Typical Challenges in Order Management

The purchasing and distribution value chain encompasses a series of activities in planning and execution. The key issues could be within each of these areas, or it could be in the connecting links between these areas.

Visibility of Purchase Volume

Visible, accurate, current information on purchase volumes across categories across suppliers is the key to effective negotiations for a retailer. Lack of visibility on spend information can arise from issues in data quality and inadequate functionality of systems to capture purchase information. To create and sustain a competitive advantage, enterprises should invest in systems for recording data at the optimal level of granularity. With superior quality and currency of recorded data, and the utilizing tools to derive and share key information from this data, retailers will be in a position to negotiate on the basis of hard facts. By linking this with supplier evaluation, they can rationalize the supplier base and benefit further.

Assessing Total Cost

The pricing policy of suppliers need not be in line with the real cost structure of the item in question. Apart from the basic product cost involved, this would include transportation costs, inventory carrying costs and would depend on terms for delivery.

Information sharing on how the cost structure for suppliers vary with assured purchase volumes can help consumer goods companies to have a basis for negotiation and provide options on price terms to the retailer based on the party taking responsibility for shipping and warehouse management.

For the retailer, information about how the cost per unit would vary with change in volume of sale would enable the retailer to redefine category plans and objectives, and be in a position to benchmark suppliers and negotiate effectively on the basis of real data connecting cost, quality and volumes. Retailers need to establish processes and systems to gather data and carry out analysis to support their negotiation.

Vendor Management

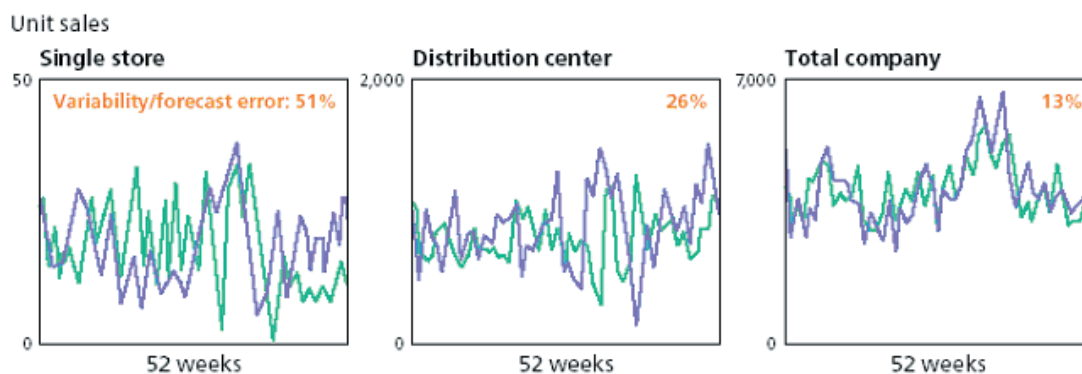
The purchase planning process in retail rests on expectations on order fulfillment by the supplier. Noncompliance by vendor in product quality and delivery lead time has a cascading effect on every element of the supply chain leading to higher costs and lost sales. Retailers need to define key metrics for vendor performance and need to formulate contracts with those. Continuous monitoring of vendor performance on the basis of defined metrics and factoring limitations of vendors on lead times in the planning process would enable retailers to mitigate risks in vendor management.

Internal and External Collaboration

With the increase in number of specialized roles involved in the chain of purchasing activities and with clear definition of roles and responsibilities, opportunities to collaborate and plan collectively tend to get ignored. This involves internal collaboration between assortment planning and purchase order management, as well as external collaboration between the purchasing function and suppliers by sharing information on sales and inventory levels at the store and DC level and by sharing the basis of reordering. Organizations should structure incentives as well as processes and systems to support collaboration and joint planning. They should foster a culture of sharing information, data and benefits.

Demand Aggregation at the DC

Translating customer demand at stores to replenishment plans from the DC to the store to achieve high customer service levels and a low inventory level is a desired objective. Modeling and building a reliable demand chain forecast is the key to matching demand with supply. Many retailers extrapolate past shipment data and are not in a position to factor in specific drivers of sales in the forecasting process. They are not in a position to have a unified view based on sales, inventory requirements and lead times. They lack the tools to effectively carry out forecast at the DC level based on forecasted requirements at the store levels. This leads to excessive use of thumb rules without any real analytical basis. Apart from a few top-selling items or big promotional sales, buying patterns are random and hard to predict. But they become more predictable if you look at a group of stores served by a distribution center, overall company sales and even to item sale across all retailers. This is illustrated in the graphs below. The challenge here is then to have a unified view of the supply chain by identifying that part of the retail supply chain where aggregation of data can best predict demand which requires a close relationship with all the components of the retail supply chain, especially the supplier. Suppliers benefit from this by having access to more accurate demand forecasts that can help them plan their production more optimally.



Forecast Accuracy Using Inventory Pooling (Source: Retail Logistics McKinsey Quarterly)

Inventory Management and Order Replenishment

Effective inventory management is the central challenge for any retailer. Too much of one particular item ties up capacity and working capital, and creates inventory carrying costs and problems of obsolescence or perishability. Insufficient stock, out-of-stocks or late availability results in opportunity costs in terms of resource utilization, lost sales, and diminished customer goodwill.

Leading retailers using large economies of scale to become profitable, creating pressure on retail supply chains to become more complex yielding faster order lead times, lower stock-outs and leaner inventory. The retailer is also faced with the problems of accurately pinpointing where items are physically located, including high labor costs involved in searching, identifying and sorting items, variability in the throughput of items, product returns, and more.

The following questions should be considered:

- How often the inventory status (of an item) should be determined?
- When a replenishment order should be placed?
- How large should the replenishment order be?
- What should the service level of the replenishment be in terms of the order fill rate?
- How much safety stock should the retailer keep?

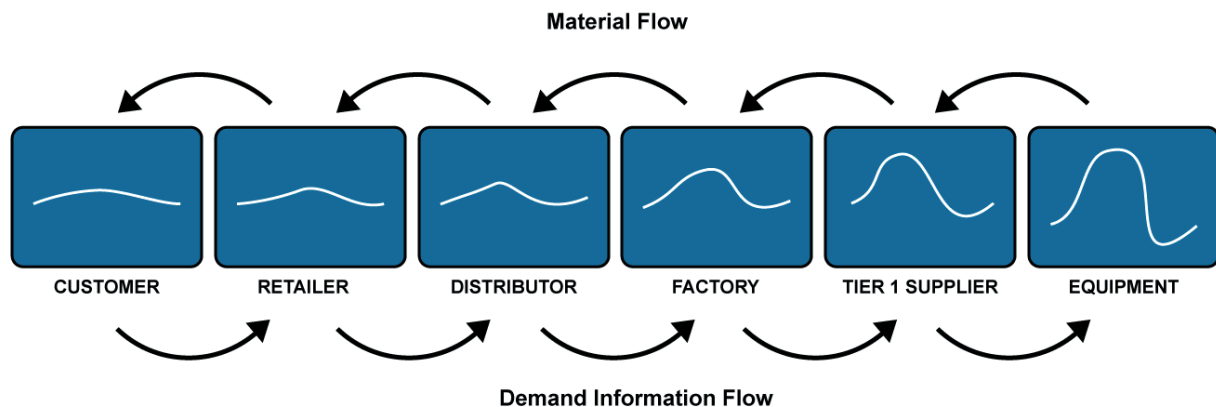
The initial answers to the above are typically in conflict with each other and as shown below may result in excess inventory leading to inefficiencies and wastage or stock-outs and loss of sale. A more automated and intelligent inventory management system is required to strike a balance. This involves more sophisticated forecasting as well as coordination of the retail supply chain.



DC Inventory versus Store Sales (Source: Retail Logistics McKinsey Quarterly)

The Bullwhip Effect

- This is a phenomenon which many supply chains face. This is characterized by how a small variance in customer demand gets amplified into a larger variance at the Distribution Center (DC) level and to an even larger variance in order size to the supplier. Retailers that experience large variations in demand of items are at risk. Firms that depend on suppliers upstream or distributors and retailers downstream may be at risk. Hence, all parts of the retail supply chain are vulnerable. This effect is amplified in a supply chain where many retailers are sourcing from many suppliers through multiple DC's. The bullwhip effect is the uncertainty caused from distorted information flowing up and down the supply chain.



The Bullwhip Effect in the Retail Supply Chain

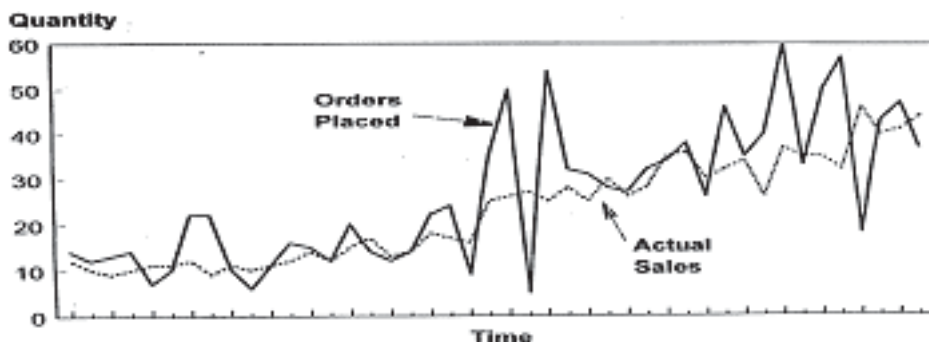
The cause of this effect is a combination of the following:

- Overreaction to backlogs by suppliers;
- Neglecting to order in an attempt to reduce inventory by the retailer;
- No communication up and down the supply chain;
- No coordination up and down the supply chain;

- Delay times between information flow and material flow;
- Order batching - larger orders result in more variance. Order batching occurs in an effort to reduce ordering costs, to take advantage of transportation economics such as full truck load economies, and to benefit from sales incentives. Promotions often result in forward buying to benefit more from the lower prices;
- Shortage gaming - customers order more than they need during a period of short supply, hoping that the partial shipments they receive will be sufficient;
- Demand forecast inaccuracies - everyone in the chain adds a certain percentage to the demand estimates. The result is no visibility of true customer demand; and,
- Free return policies.

Demand information distortion and delay, material supply delay, overreaction and the lack of visibility across the components of the supply chain create cycles of excess inventory and shortages for the retailer. Lack of coordination among the various components of the retail supply chain can cause inefficiencies that translate to lower operational performance.

Impact of the Bullwhip Effect



As seen from the above graph, there is a mismatch between orders placed and the actual sales. This can result in excess inventories, problems with quality, increased raw material costs, overtime expenses, increase in shipping costs, lost customer service, lengthened lead time and lost sales resulting. The above lead to stock-outs and backlogs affecting the total revenue of the retailer, as well as higher inventory costs and poor utilization which, in turn, affects the operating costs of the retailer. Hence the end result is lower profitability for all parties in the supply chain.

The following are measures to counter the bullwhip effect:

- Countermeasures to order batching: high order cost is countered with Electronic Data Interchange (EDI) and Computer Aided Ordering (CAO). Full truck load economies are countered with third-party logistics and assorted truckloads. Random or correlated ordering is countered with regular delivery appointments. More frequent ordering results in smaller orders and smaller variance. However, when an entity orders more often, it will not see a reduction in its own demand variance - the reduction is seen by the upstream entities.
- Countermeasures to shortage gaming: proportional rationing schemes can be countered by allocating units based on past sales. Ignorance of supply chain conditions can be addressed by sharing capacity and supply information. Unrestricted ordering capability can be addressed by reducing the order size flexibility and implementing capacity reservations. For example, one can reserve a fixed quantity for a given year and specify the quantity of each order shortly before it is needed, as long as the sum of the order quantities is equal to the reserved quantity.
- Countermeasures to fluctuating prices: high-low pricing can be replaced with Every Day Low Prices (EDLP). Special purchase contracts can be implemented in order to specify ordering at regular intervals to better synchronize delivery and purchase
- Countermeasures to demand forecast inaccuracies: Lack of demand visibility can be addressed

by providing access to Point of Sale (POS) data. Changes in pricing and trade promotions and channel initiatives, such as Vendor Managed Inventory (VMI), Collaborative Planning, Forecasting and Replenishment (CPFR) and continuous replenishment can significantly reduce demand variance. Free returns also upset the demand forecast accuracy. To counter this, returns should be tracked all the way from the store to the supplier using reverse-logistics data.

It can then be inferred that sharing of useful and undistorted information is essential at all levels. This requires better data handling and scaling capability of the supply chains IT system.

Systems Landscape

Retail IT systems have had an organic growth over the years to meet requirements of specific business functions. With little data sharing between systems, they tend to have poor data quality arising from inconsistency across systems. Though these systems meet business requirements of business functions in isolation, they tend to create roadblocks for seamless exchange of information between internal and external entities in the purchasing function. This calls for a disciplined approach to evaluate the portfolio of IT systems on the basis of business functionality and integration requirements. This analysis should enable companies to classify some legacy applications to be replaced and other legacy systems to be enhanced. Leaders in the retailing industry will have to develop a roadmap for implementing an integrated solution (packaged or custom-built) to enable those critical business processes that will deliver value and success in an increasingly competitive industry.

Collaboration in the Retail Supply Chain

Efficiency of purchasing and distribution functions in an order management system in the retail supply chain it comes from better collaboration between the retailer and the supplier. To optimize these functions, this collaboration has to be enabled by near real-time data and information sharing capability as well as processes and strategic initiatives between the stakeholders of the retail supply chain.

Vendor Manage Inventory

The Vendor Managed Inventory (VMI) process can be defined as a mechanism where the supplier creates the purchase orders based on the demand information exchanged by the retailer/customer. To say this in simple terms, VMI is a backward replenishment model where the supplier does the demand creation and demand fulfillment. In this model, instead of the customer managing his inventory and deciding how much to fulfill and when, the supplier does. The VMI concept provides improved visibility across the supply-chain pipeline that helps manufacturers, suppliers and retailers improve production planning, reduce inventory, improve inventory turnover and improve stock availability. With information available at a more detailed level, it allows the manufacturer to be more customer-specific in its planning. The VMI concept is being widely used in many packaged consumer goods processes where the end-user's demand for products is relatively stable with short-term fluctuations in supply chain. With the ability of supply-chain applications to manage inventories at retailer locations, VMI concepts are being applied at both the distribution center-level and the store-level.

In the fulfillment process using VMI, typically the activities of forecasting and creating the purchase orders are performed by the vendor/supplier and not by the retailer. Electronic Data Interchange (EDI) is an integral part of the VMI process and takes a vital role in the process of data communication. The retailer sends the sales and inventory data to the vendor via EDI or other business-to-business collaboration facilities and the supplier creates the purchase orders based on the established inventory levels and fill rates. In the VMI process, the retailer is free of forecasting and creating the orders as the vendor generates the orders. The vendor is responsible for creating and maintaining the stock plan for the retailer. The vendor sends the shipment notices before shipping the product to the retailer's store/warehouse. Soon after this, the vendor sends the invoice to the retailer. Upon receiving the product, the retailer does the invoice matching and handles payment through their account payable systems.

Benefits of the VMI Process

The VMI process brings benefits for both retailers and suppliers. Some of those benefits are listed below.

Retailer Benefits

- Reduced inventory: this is the most obvious benefit of VMI. Using the VMI process, the supplier is able to control the lead-time component of order point better than a customer with thousands of suppliers they have to deal with. Additionally, the supplier takes on a greater responsibility to have the product available when needed, thereby lowering the need for safety stock. Also, the supplier reviews the information on a more frequent basis, lowering the safety stock component. These factors contribute to significantly lower inventories.
- Reduced stock-outs: the supplier keeps track of inventory movement and takes over responsibility of product availability resulting in a reduction of stock outs, there-by increasing end-customer satisfaction.
- Reduced forecasting and purchasing activities: as the supplier forecasts and creates orders based on the demand information sent by the retailer, the retailer can reduce the costs on forecasting and purchasing activities.
- Increase in sales: due to less stock-out situations, customers will find the right product at right time. Customers will come to the store again and again, there-by reflecting an increase in sales.

Supplier Benefits

- Improved visibility results in better forecasting: without the VMI process, suppliers do not exactly know how their customers are going to place orders. To satisfy the demand, suppliers usually have to maintain large amounts of safety stocks. With the VMI process, the retailer sends the POS data directly to the vendor, which improves the visibility and results in better forecasting.
- Reduces purchase order errors and potential returns: as the supplier forecasts and creates the orders, mistakes, which could otherwise lead to a return, will decrease.
- Improvement in service level agreement: the vendor can see the potential need for the item before it is actually ordered and the right product is supplied to the retailer at the right time, improving service level agreements between the retailer and supplier.
- Encourages supply chain cooperation: partnerships and collaborations are formed that smooth the supply chain pipeline.

Challenges and Limitations of VMI

The VMI approach has its own set of challenges and limitations:

- Some companies continue to manufacture to stock without leveraging customer specific data effectively for production planning;
- In order to provide priority service to VMI partners, some vendors reserve inventory resulting in shortages to other customers;
- Insufficient level of system integration results in incomplete visibility;
- Higher expectations are continuously set from retailers;
- Resistance from sales forces due to concerns of losing control, effecting sales based incentive programs;
- Lack of trust and skepticism from employee; and,
- Means offloading risk, uncertainty and inventory cost onto the supplier

Overcoming the Limitations of VMI

Effective implementation of VMI depends on smoothly overcoming the limitations and addressing the concerns of various stakeholders. Some of the concerns can be addressed as explained below:

- Redefine incentive programs based on partnership building instead of sales volume;
- Build strong partnerships with management commitment to effective communication, active sharing

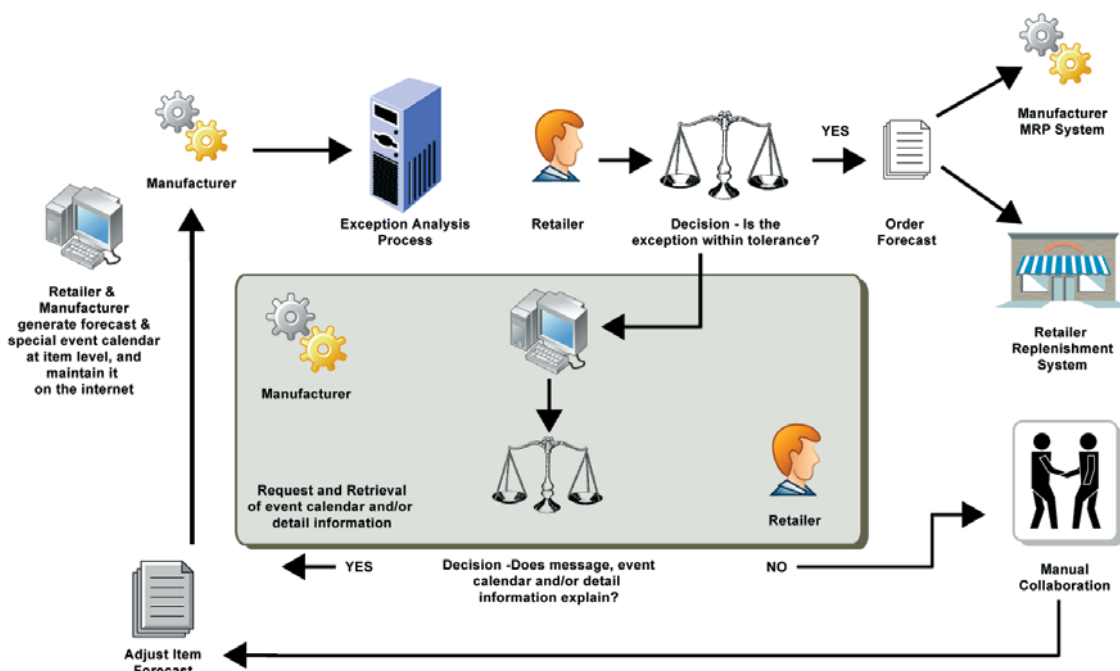
- of information, commitments to problem solving and continued support;
- Conduct simulations and pilots before actual implementation;
- Organize training sessions before launching VMI program;
- Set reasonable targets for benefits of VMI; and,
- Establish agreements on service levels and process to handle exceptions.

Collaborative Planning, Forecasting and Replenishment (CPFR)

CPFR is a set of guidelines supported and published by the Voluntary Inter-industry Commerce Standards (VICS) Association. Trading partners share their plans for future events, and then use an exception-based process to deal with changes or deviations from plans. By working on issues before they occur, both partners have time to react. A supplier can build inventory well in advance of receiving a promotional order and carry less safety stock at other times. A retailer can alter the product mix to reduce the impact of supply problems.

Synchronizing the supply chain from raw materials to the consumer offers the greatest opportunity to improve profitability and provide greater value to the consumer. CPFR provides the process to link business plans and ensure synchronization. One of the key drivers for CPFR is to include a better understanding of consumer purchases. Point-of-sale information provides the ability to track current purchases and develops more accurate sales forecasts for managing the retail supply chain. The following are the various levels of collaboration between the retailer and the supplier.

- Front-end agreement: participating companies identify executive sponsors, agree to confidentiality and a dispute resolution processes, develop a scorecard to track key supply chain metrics relative to success criteria, and establish any financial incentives or penalties.
- Joint business plan: the project teams develop plans for promotions, inventory policy changes, store openings/closings and product changes for each product category
- Sales forecast collaboration: trading partners share consumer demand forecasts and identify exceptions that occur when partners' plans do not match or change dramatically. They resolve exceptions by determining causal factors and adjusting plans where necessary.
- Order forecast collaboration and order generation/delivery execution: trading partners share replenishment plans, identifying and resolving exceptions. Results data (POS, orders, shipments, on-hand inventory) is shared and forecast accuracy problems, overstock/ stock-out conditions, and execution issues are identified and resolved.



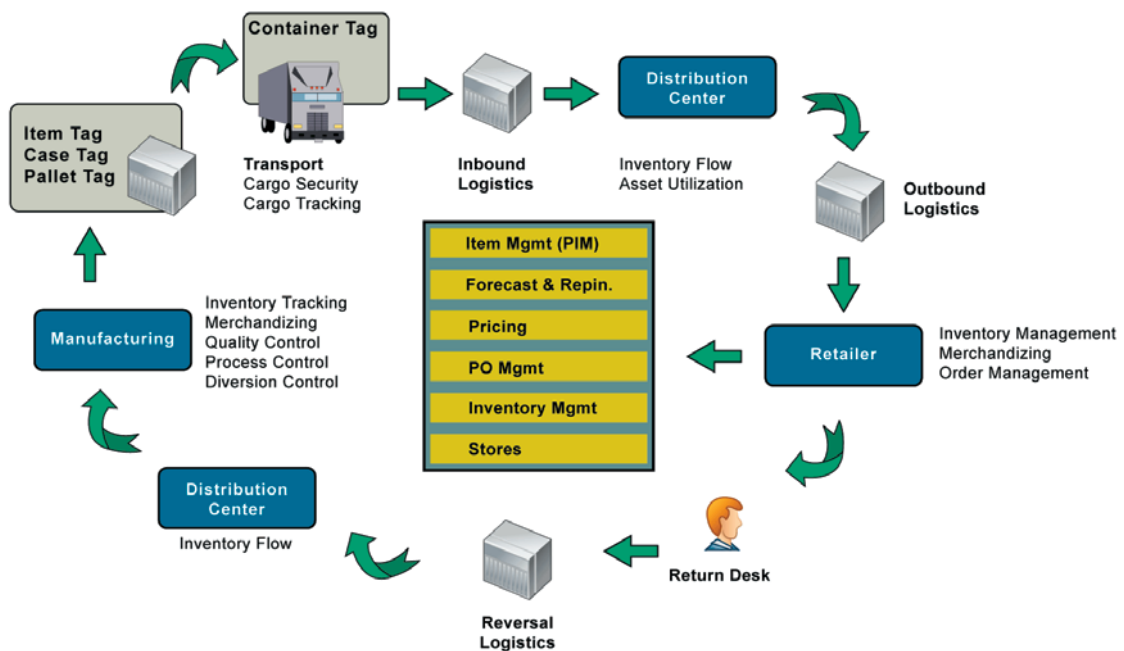
Collaborative Planning, Forecasting and Replenishment (Source: VICS)

Benefits of CPFR

- **Enhanced relationships:** implicitly, CPFR strengthens an existing relationship and substantially accelerates the growth of a new one. Buyer and seller work hand-in-hand from inception through fruition on business plan, base and promotional forecasts. Continual CPFR meetings strengthen this relationship.
- **Greater sales:** the close collaboration needed for CPFR implementation drives the planning for an improved business plan between buyer and seller. The strategic business advantage directly translates to increased category sales.
- **Category management:** before beginning CPFR, both parties inspect shelf positioning and exposure for targeted SKUs to ensure adequate days of supply, and proper exposure to the consumer. This scrutiny will result in improved shelf positioning and facings through sound category management.
- **Improved product offering:** before CPFR implementation, the buyer and seller collaborate on a mutual product scheme that includes SKU evaluation and additional product opportunities.
- **Improved order forecast accuracy:** CPFR enables a time-phased order forecast that provides additional information, greater lead time for production planning and improved forecast accuracy vs. either stand-alone VMI/CRP or other industry tools.
- **Inventory reductions:** CPFR helps reduce forecast uncertainty and process inefficiencies. How much inventory does your company hold to “cover up” for forecasting errors or a trading partner’s inability to have the product available in a timely manner? With CPFR, product can be produced to actual order instead of storing inventory based on forecast.
- **Improved technology ROI:** through the CPFR process, technology investments for internal integration can be enabled with higher quality forecast information. Both the retailer and supplier can benefit by driving internal processes with common, high-quality data. As other processes improve, the return on investment from CPFR can be substantial.
- **Increased customer satisfaction:** with fewer out-of-stocks resulting from better planning information, higher store service levels will prevail, offering greater consumer satisfaction.

RFID in Order Management System

RFID/ePC can be thought of as a non-contact, non-line of sight automating technology. This automating ability allows an item which is tagged by an RFID tag to be accurately and quickly tagged with minimal human interference. In order management this is the key driver for creating efficiencies in the retail supply chain. These efficiencies mitigate some of the problems that conventional order management systems face and which were mentioned earlier in the article. Moreover, these efficiencies can complement collaborative processes like VMI and CPFR due to the accuracy and depth of data that RFID is capable of realizing if used optimally.



RFID, in tandem with the 96 Character ePC, allows a product to get a unique identity and be automated at the same time. Being automated, and having the ability to read and ascertain the unique identity of multiple items accurately at very fast rates, reduces human labor and error. However, at the same time the identity of the product is constantly being tracked. This is very important in high velocity items which have high throughputs through the retail supply chain. In a conventional order management system the item/case/pallet information is entered either manually or using a line-of-sight bar code. This requires manual intervention and hence the item information can be read extremely slowly and there is a possibility of a reading error. Most successful retailers are increasingly deriving supply chain efficiencies and profitability through their large scale of purchasing, distribution and sales. Therefore, these conventional methods of raising high velocity purchase orders, which may have to be verified and validated multiple number of times throughout the supply chain, do not scale up to the necessary speed and quantities. Moreover human error in reading item information can cause an erroneous purchase order, which, considering the huge scale of shipments, can have large impact on the bottom line. Finally, this may require a large labor force to be maintained, which, depending on the cyclical nature of shipments may be underutilized under some conditions and overworked under others.

RFID scales up very easily to the large quantities and velocities at which items may move in the supply chain. RFID prevents errors and hence increases the order fill rate. RFID requires less labor, reducing direct costs and freeing up resources for other functions. Even if RFID tagged shipments are misread at some point in the supply chain since they are tracked over the entire supply chain, any identity error can be diagnosed early enough so that corrective action, like returning the shipment can be done early on hence reducing the cost of negating and subsequently re-processing the order. Considering the scale of retail operations, this may have significant impact on the bottom line. An Advanced Shipping Notice (ASN) can automatically and instantly be generated when the tagged consignment is dispatched out of the supplier's premises. Throughout the journey from the supplier to the retailer the shipment can be tagged continuously in the RFID enabled trucks and other entry and exit points. At each instance the retailer, the suppliers and the logistic company can track and compare the status, location and description of the order and compare it against the ASN. When the retailer receives it the item is tracked throughout his enterprise and an acknowledgement of receipt is raised automatically on the shipment being read in the retailer's premise.

The retailer can quickly inspect the shipment and then make the payment for the shipment. The supplier can then receive the payment more quickly. This is beneficial for him because of the large cost of goods involved and on receiving his payment faster and more efficiently, frees up more working capital for him, which gives the supplier more financial flexibility and profitability. By continuously tracking the shipment the supplier, retailer and other partners can quickly determine the reason and responsibility of an error in shipment. Hence a greater level of accountability can be ascertained and this can be used by the retailer for optimal vendor management.

Forecasting and Replenishment

An RFID enabled supply chain is able to get real-time information from all interfaces in the supply chain accurately and quickly. This facilitates aggregation of forecasts upstream into the supply chain and provides more accurate forecasts at the store, DC and supplier level. This enhances greater visibility in the supply chain, allowing reorder points for replenishment of the items to be estimated more accurately. The retailer can also optimize the amount of on-order and on-hand stock he wants. This reduces the average lead times of the various items, reducing safety stock and inventory costs, increasing service level in terms of the order fill rate and decreases the number of stock-outs. Overall response time of the supplier also decreases, and the more in-depth and accurate forecasting allows greater flexibility and reduces turnaround time in searching for and hiring transportation of the shipment. This allows the supplier to plan his shipment better negotiating in terms of the fraction of trucks that are filled, frequency of shipments, and number of shipments. Hence better logistics can be utilized. This further drives down both the lead time and the shipping and inventory costs, and reduces non-required inventory.

Inventory Management

Because of better visibility of all parts of the supply chain and because of better forecasting, more optimum use of shelf and floor space can be achieved in the warehouse and the store. This is because it is easier and faster to track and locate tagged items. Moreover, better visibility and inventory tracking leads to lower 'shrinkage' of inventory. This reduces write-offs due to misplacement or theft of assets. This lowers the cost of the retailer and also enables higher fill rates, better service levels and lower stock-outs. More efficient use of floor space allows the use of high throughput strategies like 'flow through'- where shipments are quickly transferred from the entry dock to the shipping dock spending very little time in the DC. This contributes in reducing the lead time, hence reducing costs and safety stock. This frees up more working capital for the retailer and gives him more financial flexibility. Hence lower costs, higher working capital and higher revenue due to fewer stock-outs increase the retailer's profitability. In conventional systems, many times the product is in the store – but not on the shelf. Existing in-store retail inventory systems lack the precision required to identify SKU-level inventory locations within the store. Accuracy and timeliness of product on-hand information in-store and through the supply chain becomes the critical failure point of the order management system.

Store Level and DC Level efficiencies:

Because of better visibility in the supply chain and more efficient inventory management and logistics, more store level and DC level efficiencies can be gained. At the DC level different last mile distribution strategies for different type and volumes of items can be achieved, decreasing lead time and safety stock and increasing the operating profits. At the store level, because of more optimal inventory management, distribution and logistics becomes more effective, customer centric and profitable merchandizing and marketing strategies can be achieved. Customer returns can be tracked all the way to the supplier and the cost of servicing returns can be reduced by identifying and reducing reverse flow in-transit inventory.

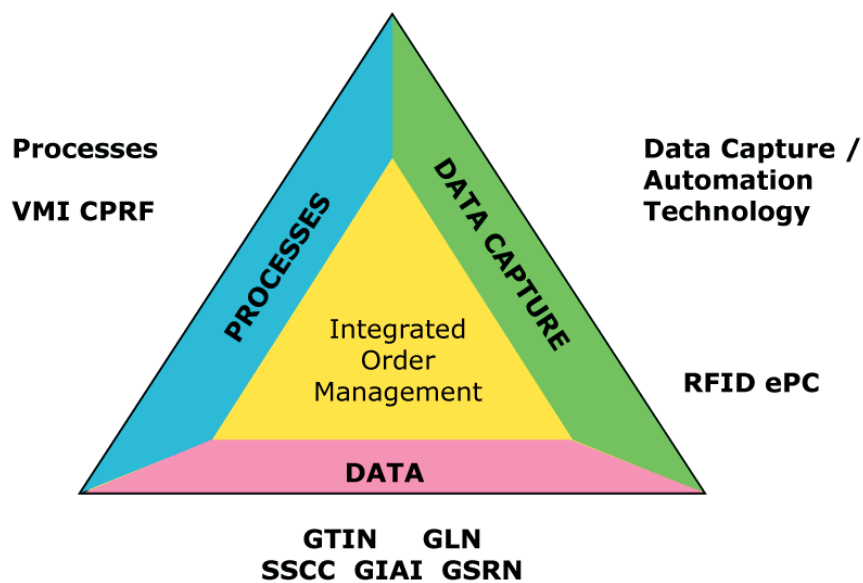
Complements Collaborative SCM, VMI and CPFR Processes

For processes like VMI and CPFR, a retailer's Point of Sale (POS) data and real time item information across all interfaces of the supply chain has to be readily available to coordinate the partnerships among the various components of the supply chain. RFID enables this with zero time delay. This reduces lead time as far as information flow is concerned and helps communication of information through the supply chain. The relationship between suppliers and retailers is, on the whole, still combative rather than collaborative, despite all the efforts of Collaborative Planning Forecasting and Replenishment (CPFR) initiatives. With conventional technology it has been too expensive historically to provide accurate inventory levels throughout the end-to-end supply chain. Many retailers provide Consumer Packaged Goods (CPG) suppliers with POS data, but few provide inventory data surrounding stock in transit, warehouse/distribution center stock and the status of that stock (free, reserved, in quality control, etc). Similarly, many CPG suppliers find it difficult to track inventory through their internal supply chain, especially when product is made in one division, but sold in another – as is often the case in Europe. Providing the ability to track in real time, actual accurate inventory movements "for free" throughout the end-to-end supply chain, provides an integrated data platform on which more effective demand planning can take place. Barcode-based solutions do have inherent inaccuracy built in due to human error. If anyone throughout the supply chain fails to physically scan data integrity is lost. Despite the best efforts of operations professionals and bar code system manufacturers, it still requires many different people to physically scan at the right time to maintain inventory accuracy – inevitably this does not happen – which leads to a hazy picture of the supply chain and uncertainty. Inevitably, demand planners build in buffers "just in case" the data is wrong, building in inefficiencies through the supply chain, increasing the risk of unsaleables and increasing paperwork discrepancies.

Best Practice for RFID for Order Management System (OMS)

- Keep data needs simple;
- Make sure that data is clean, relevant and updated;
- Establish short-term and long-term business context;
- Information sharing and collaboration with partners;
- Need for maximum adoption of RFID/ePC by all components of the supply chain for greater impact in success of RFID adoption;
- Establish pilots (RF environment, physical needs, network needs, software needs) prior to adopting in real business processes;
- Plan to evolve from “slap and ship;”
- Look out for RFID enabled solutions to fit your landscape; and,
- Factor in evolving technology and standards (firmware upgrades, network security).

Data Synchronization



As shown in the diagram above, RFID/ePC can be the data capture/technology side of a balanced and efficient OMS. The other two aspects being processes like VMI and CPFR which have been described earlier and the data/identifier part on which any successful OMS is based upon. With the use of ePC standard in RFID technology, a common platform for capturing data on a transactional basis is formed. However with the use of existing identifying standards like Global Location Number (GLN), Global Trade Item Number (GTIN), Serialized Shipping Container Code (SSCC), Global Individual Asset Identifier (GIAI) and (Global Service Relation Number (GSRN) as defined by the Uniform Code Council (UCC), RFID can be used to leverage more accuracy and standardization throughout all suppliers and retailers world wide. This will enable RFID/ePC to utilize larger scale of operation and facilitate co-operation between different partners to realize retail supply chain efficiencies. In this identification, the logistics and shipping part, is achieved by the Serialized Shipping Container Code (SSCC). Standardization in product and asset identification is taken care by Global Trade Item Number (GTIN) and the Global Individual Asset Identification (GIAI) respectively. Products/items can be identified by their place of origin or location by the Global Location Number (GLN) and on the basis of relationship by the Global Service Relation Number (GSRN).

RFID in collaborative SCM, VMI and CPFR are the keys to utilizing shared data and information but however good your processes and technology if these have to be successful then it is imperative to have data integrity and a common semantic interpretation of the data. Whether we are talking about brand-new technologies like RFID or rebirth initiatives like VMI and CPFR – having good, usable, uniform data is the foundation for

sharing and processing data to achieve a collaborative, tighter, supply chain. However consistent product information is not yet in place. Today's retail and CPG corporations have realized that the enabler for item synchronization is a single notation for item information. European Article Numbering (EAN) and Uniform Code Council (UCC) have jointly introduced a set of actionable supply chain standards an infrastructure and processes to support, maintain and evolve them. These standards will allow retailers to effectively pursue sophisticated collaboration and supply chain management strategies. Global Data Synchronization (GDS) is not a new concept, and much has been said about its strategic benefits and dollar ROI over the last two years. Even as the membership to UCCnet continues to expand exponentially, the total value of goods registered and synchronized through the GLOBALregistry amounts to less than 1% of the annual global sales. Most suppliers have taken tactical routes to GDS, using the lowest cost solution available, and often using even more manual work to put data on the GDS through ASP services or web-screens. This approach has been sufficient to meet the Wal-Mart mandate deadlines. However, as mandates for interdependent initiatives such as RFID, and later VMI and CPFR will begin to close in – suppliers are in danger of being like the person who ran out of breathing oxygen because he used it all to burn wood and keep warm. The message cannot be clearer that companies taking isolated tactical approaches to all collaborative commerce initiatives will face increasing retailer dissatisfaction, competitive pressures from those who are taking a well-defined strategic path to collaborative-commerce and huge technological challenges for future implementations.

Conclusions

RFID/ePC offers a major breakthrough in providing clarity around the current state of product supply – while dramatically reducing the transactional cost to capture real-time, detailed and accurate product supply status data. RFID/ePC technology can be used as an enabler of processes like CPFR and VMI for order management, enabling status tracking through the supply chain, from source to retail shelf. Adoption of RFID standards and sharing of information between trading partners can replace the proprietary, inconsistent and incomplete data used by demand planners with accurate, granular and timely data. Increased data accuracy can increase the accuracy of the demand forecast helping CPG companies to achieve the right product at the right place at the right time, for the right cost.



TCS RFID Solutions

TCS RFID solutions group focuses on conceptualizing, designing and delivering RFID based identification and tracking solutions. These solutions build upon TCS domain experience, enterprise applications expertise and systems integration capability with skills and assets in core RFID technology (hardware/sensing technology) and middleware. Taking a business and processes perspective, TCS focuses on using technology for process improvements and elimination of customer's pain areas.

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Tata Consultancy Services (TCS) is among the leading global information technology consulting, services and business process outsourcing organizations. Pioneer of the flexible global delivery model for IT services that enables organizations to operate more efficiently and produce more value, TCS focuses on delivering technology led business solutions to its international customers across varied industries.

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