WHITE PAPER

Business Intelligence

Driving Business Value through Supply Chain Intelligence

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Executive Overview

More than ever, organizations are today faced with such challenges as globalization, product portfolio complexity, competitive pressures to innovate, necessity to implement cost reduction measures, increased competition from rivals, market pressures as well as external pressures from stockholders. For manufacturing, distribution and third-party logistics companies, efficiency of their supply chain operations is really key, as it reflects how effectively their inventory, plant and warehouse capacity and capital resources are utilized. Some of the more obvious areas that companies have historically looked into for improvements include optimizing stock levels, improving inventory turnover ratios (or days-on-hand), and improving on-time deliveries.

59% of the companies have either implemented or are evaluating scorecards and dashboards.

Source: AMR Research

Globalization has created enormous opportunities and alternatives for organizations as well as customers and, whilst an increase and diversity in product offerings has been a welcome outcome, nonetheless, the global scale of sourcing and manufacturing has added to the complexity of these organizations' business processes and their supply chains. For these organizations to continue to compete successfully, it is becoming increasingly imperative to improve both the efficiency and effectiveness of the overall supply chain operations. Managers must ensure their supply chains are flexible, responsive, and reliable and they need to focus on improving quality, service, and yields as well as better leverage their customer supplier relationships and strategies. They need to think about some of the following:

- How do I increase fill rates and accelerate the flow of goods through the chain?
- How do I improve flexibility to meet changing demand and improve overall service levels?
- How do I strike just the right tradeoff balance between efficiency and flexibility – i.e. maximizing capacity and minimizing inventory, while still retaining the flexibility to respond quickly to unanticipated demand and producing/delivering products in varying quantities with flexible lead times?
- In addition to reducing the fulfillment and replenishment lead times, how do I focus on driving cash-to-cash time down to a

minimum (ideally, this metric should be down into the negative range by getting paid by customers prior to paying suppliers).

Although many companies have invested considerably in traditional transactional systems such as ERP, SCM and CRM which have helped them in their planning, scheduling and execution operations, however, most of these systems do not provide insights into performance-driving metrics and key performance indicators (KPIs) that can seamlessly link and provide demand, supply, operational and customer views. In order to integrate, access, analyze and share information across the enterprise, companies must rely on the information within their organizations and use it as a strategic asset to gain competitive advantage. In fact, according to industry analysts, one of the top business initiatives influencing IT investment decisions is better utilization and analysis of data.

Managers need to evaluate, monitor, and improve their supply chain performance and efficiency by looking into such metrics as time, cost, efficiency, and effectiveness. They need tools that can help them gain visibility and insight into their constantly changing supply chain operations related to sourcing, manufacturing, delivery and returns to make smarter decisions about their business. In order to make effective decisions, companies must have a consolidated 360 degree view of their business operations and the underlying data. Leveraging this centralized and consolidated view of their business, companies can manage business processes and customer and partner relationships as well as better understand customer and operational trends over time. By being able to turn data into "knowledge" and developing unique demand, supply, operational and customer insights, companies can improve the efficiency and effectiveness of the overall supply chain and maximize their profits at optimal levels of customer satisfaction, thus gaining a critical advantage.

What is Supply Chain Intelligence?

Supply Chain Intelligence provides a single view of your supply chain by leveraging key performance indicators (KPIs), prepackaged dashboards, analytics and alerts to help you zero in on the primary drivers behind supply chain processes - planning, procurement, manufacturing, logistics, and returns - so you can analyze and act to increase your supply chain efficiency. Supply chain analytics can be implemented in several ways, depending on the needs of the organization, ranging from executive information systems using dashboards with drill down analysis capability, OLAP analysis, standard pre-built reporting, ad-hoc reporting and even advanced analytics employing such techniques as statistical processing, regression analysis and correlation.

Business Intelligence

Business Intelligence (BI) enables companies to integrate, access, analyze, and share information across the enterprise, and the convergence of supply chain management and business intelligence is essentially what is known as supply chain intelligence. BI technology can encompass reports, ad-hoc query, dashboards, scorecards, online analytical processing (OLAP), event notification and predictive analytics. The underlying data can come from transaction systems and data marts at a departmental or business unit level and, when extended to the enterprise level, it can involve data warehouses and the related metadata, database schemas and extraction, transformation and loading (ETL) scripts/tools. A centralized data warehouse can integrate information from many disparate systems and sources to provide users a single source of accurate, consistent and up-to-date information. Data integration from ERP systems, cross-functional supply chain areas, legacy and back-office applications and other operational and e-business systems can provide a single version of truth to base important decisions on. With a small incremental investment over and above the transaction systems, BI enables companies to squeeze additional value out of those systems. Decision makers can manage by exception, stay informed with alerts, and drill into data to examine the root cause of business conditions.

Metrics and Dashboards

Dashboards provide visibility into business activities in an easy-to-use interface using key performance indicators (KPI) that can intuitively highlight areas for action. Many companies are looking for new ways to integrate their scorecards with dashboards and visual analysis techniques to aggregate, monitor, measure and manage performance to help them analyze current business conditions, trends, and anomalies at a glance.

Dashboards and cockpits help companies track their key business metrics and enterprise performance in real time. These are basically customized user interfaces using gauges, maps, charts, and other graphical elements that help you monitor business processes, business units, exceptions and people to measure your organization's performance using a single point of truth across the enterprise.

Metrics provide up-to-the-minute snapshots of a business' key performance indicators to enable fast, proactive decisions. A dashboard on business performance can deliver organizational agility and answer questions like: How is my organization performing today? Is everything running according to plan? If not, how do we get back on track? Problem areas are red-flagged for the user's immediate attention. Whilst metrics and key performance indicators are critical, they are essentially just that—indicators. A manager will often want to know more about the business dynamics behind those data elements - Why are products being delivered late? Why are inventory costs rising? Performance management dashboards can also let you drill through to underlying data for analysis, comparisons, and answers. You can explore details of who, what, when, where, why, and how for the insights you need to fine tune processes for maximum performance. Alerts can be triggered automatically when performance falls outside pre-defined parameters for service levels, inventory and the like.

Reporting

Reporting is also an integral part of the supply chain intelligence. Reports can be of a static nature with fixed formats, parameterized reports where users have control over which data to view, or interactive reports where the format, structure or content can be manipulated. Ad-hoc reports can be generated by an individual user

on the fly using a set of data objects or items for a specific requirement. Reports can be drilled-through to access other data sources as well as other reports for more detailed information, allowing users to understand the reasons why an out-of-line situation is happening.

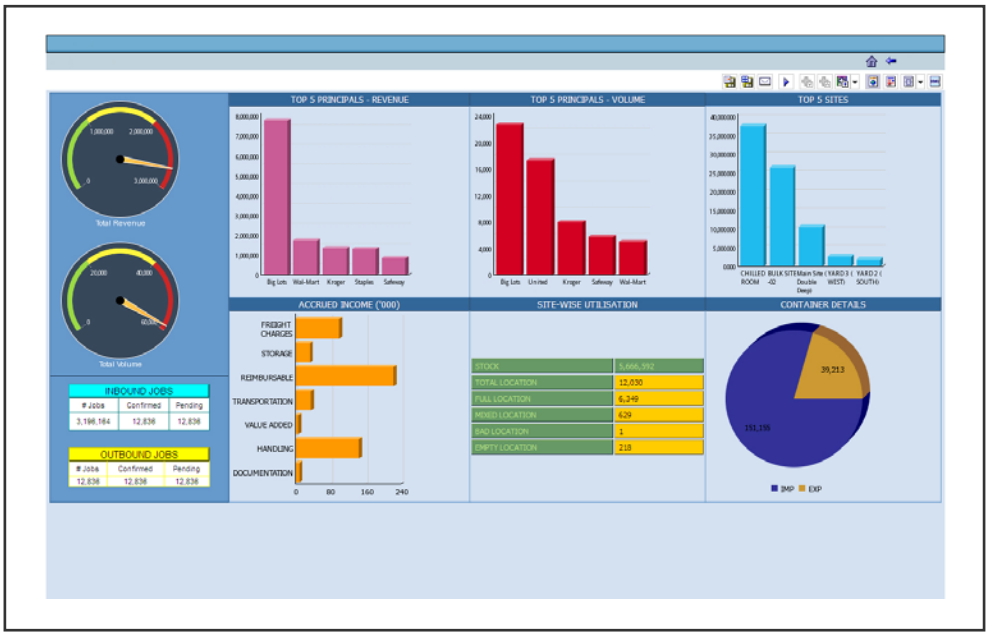

Figure 1. Typical Dashboard

Scorecarding

Scorecarding enables communication of strategy and provides instant focus on performance issues, while ensuring accountability and ownership. Scorecards can help you align your teams and tactics with strategy, communicate goals effectively and consistently across the enterprise and monitor the actual performance of the organization against targets. It is worth mentioning that balanced scorecards sit within the CPM (Corporate Performance Management) framework, sometimes also referred to as EPM (Enterprise Performance Management). CPM can be thought of as the application of business intelligence, metrics and methodologies to improve enterprise performance. The collaborative framework by which we can align planning and execution, strategy and tactics, and business unit as well as enterprise objectives is provided by methodology, with balanced scorecard being the most popular one. Balanced scorecard methodology was first introduced by Kaplan and

Norton in a Harvard Business Review article in 1992 and the idea was to put strategy at the heart of the management process by defining objectives and measures that are directly related to the vision and strategy of the organization. Others methodologies include six sigma, activity-based costing (ABC), total quality management (TQM) and Economic Value-Add (EVA). When scorecarding is linked with BI, in addition to answering the "How am I doing?" question through red/green/yellow status indicators, organizations can go deeper and get detailed answers to questions such as: Why is it happening? When did this happen before? What has to be done about it? Who all are included in the decisions and responsible for corrective action?

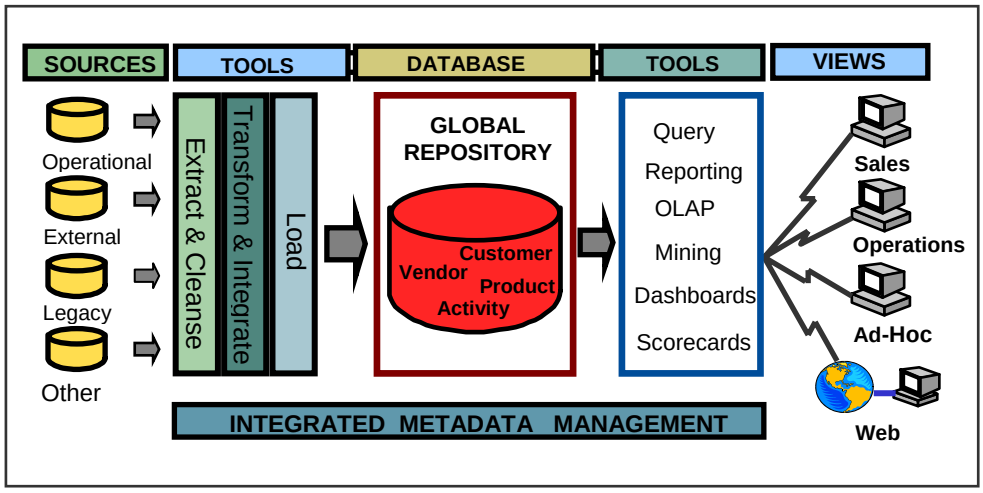

Figure 2. Typical Data Warehouse

Supply Chain Industry Perspective

More and more, customers want to measure where they are going, not where they been. Traditionally, the drivers of business performance have been typically viewed as financial. Financial metrics are historic in nature and measure the result of a business decision or a business process change after the fact. Companies are recognizing the need to increase visibility within the business to understand many other non-financial factors. For example, performance of their supply chains - who are my best suppliers, how are they performing, how is the delivery performance of my shippers, how is my inventory days of supply, what is the impact on stock levels and what is the impact over time to my business?

In many supply chain organizations, we see a patchwork of different applications and tools acquired over time by different departments. This results in different interfaces, inefficiencies and higher costs in maintaining a host of different tools in terms of money, time and people. Moreover, finding consistent answers to just one question becomes fragmented. And, the different time periods and gaps in the information means that customers have a lack of confidence in the numbers, there is a time delay in getting the information, with the process being open to risk. The result of this fragmented approach is a slow, disconnected decision-making process with low end user satisfaction and high costs of IT.

There are many factors that influence the performance of a company. One critical factor is the decisions that people make every day throughout the organization from the top to bottom and across functions and divisions. All those decisions are based on the information people have on hand, and the accuracy, timeliness and completeness of that information is crucial. With the volume and complexity of data growing by the minute, decision-makers need the ability to monitor and measure KPIs from the large volumes of information within the organization. Although we read about the Dells and Walmarts of the world who have almost perfected the build-to-order and just-in-time systems and maximized the performance of their supply chains to the point where they have

virtually eliminated inventories and the related carrying costs, however, there are many supply chain companies who still have a long way to go before they have the ability to analyze business information to really understand what is driving trends and spot anomalies to maximize efficiencies and profitability. They still lack the mechanism to track their business's key metrics and gauge the health of the organization. Often, they may be guessing at such things as delivery lead time trends, logistics costs (including equipment, fuel, labor, etc.), capacity utilization of transport vehicles, inbound/outbound delivery efficiency, stock turns and latency.

There are a lot of BI tools available in the market that can be easily adapted to existing ERP, CRM and SCM applications that may be running within an organization. Pre-packaged analytics applications are also available from several vendors that cover functional domains such as customer, product, service, operations and finance. Many BI vendors provide the framework for building and deploying analytic applications and include such analytic services as rules & alerts, metrics, predictive analysis and statistical process control. Some of the notable BI vendors include Business Objects, Cognos, Information Builders, Microstrategy, Oracle/Hyperion and SAS.

Suggested Deployment Ideas

A large majority of companies would consider cost control as one of the most critical elements linked to their profitability, however, on close examination of their various elements of the supply chain, they might find that there are other factors just as critical that can significantly impact their business. For example, a company may decide to embark on cost cutting measures with regard to streamlining their procurement processes or improving operational efficiencies related to materials management processes since they contribute to a product's cost structure. However, if the customer experience related to shipments and deliveries is where the problem lies, then a lower cost product still does not address the core issue. Perhaps managing the suppliers or transportation providers is what should take priority. It could even be a compliance issue that needs to be addressed first, without which a product may not go very far, regardless of the improvements in cost structure or shipment accuracies and efficiencies.

89% of senior executives at leading companies view efficient supply chains as critical or very important to their business.

Source: Accenture, Stanford and INSEAD study

Identify Critical Areas and Set Strategy

The first order of business is for companies to identify the high impact areas and critical elements of their supply chain using a top-down approach, whether that has to do with improving production processes, materials management, supplier performance or customer responsiveness. Once the high-priority business objectives in each process of the supply chain are identified, a strategy should be set at the strategic level and then clearly articulated into goals. The strategic plan should then be translated into an operational plan by establishing a set of organizational goals and objectives, a set of measures and targets to monitor the objectives, and a program plan and budget to support the initiatives.

A systematic and sustainable means of tracking, measuring, and improving business performance must be applied top-down throughout the enterprise in a structured environment that is common across all business units. The key is to link the goals with the people accountable for execution at the point of impact.

Review Technology Issues

Infrastructure and technology issues should also be looked into early on. Integrated applications such as ERP, CRM and SCM may be doing a great job in capturing transactional data, but they are also good at generating large volumes of data which is often not available in a common format and is not interoperable. Data from these multiple disparate sources needs to be extracted and transformed to a common format before it can be used for any analysis. Scrubbing the data from multiple sources and consolidating it into a common format has its own challenges. Providing shared intelligence through information consolidation, convergence and accessibility may require a centralized, cross-organizational enterprise data warehouse, which will have its own set of challenges. This data warehouse is likely to consist of multiple subjects from across different business units such as marketing, sales, finance, procurement, inventory, service and delivery. Ensure that the data model reflects the form and function of business processes and the areas of interest both for individual groups as well as managers who need to view data across business functions are well represented.

Think About Metrics and KPIs

The next step would be to give consideration to a set of metrics that need to be displayed through dashboards and scorecards. Metrics must have an assigned owner and relevant thresholds must be articulated clearly. Since metrics are the lynch pin between the people and the goals, it is key to link the metrics to the supporting intelligence so that we are not just measuring performance, but managing it as well. As the saying goes, you don't change what you don't measure. And you don't measure what you're not going to change. Since what gets measured is what will get changed, we must ensure that we are changing the right things. We also need to make sure that we evaluate progress in each arena and provide the necessary feedback to ensure we can make necessary improvements.

The difficult part is to decide which metrics to use. Consider the "less is more" approach. It is probably a good idea to start with a few high-level metrics which can then be expanded into a number of additional metrics which specifically relate to measurements that support elements like financial measures, productivity figures, delivery times and the like. Examples include number of picks per hour, days inventory on hand, pick accuracy, lines per hour, hour of

delivery, inventory turns, transportation cost as a percentage of revenue, distribution cost per line/order, etc.

Each identified KPI not only needs to be clearly defined, designed and developed into the BI environment to minimize complexity, but also needs to be monitored, managed, supported and maintained over time. It is also important to clearly identify the source data elements required to support the lower-level metrics.

In order to make sure everyone knows who the lead person is for ensuring that performance stays on track, every metric and scorecard should have a primary owner assigned to it. Each KPI that is populated in a dashboard or report should have a pre-defined target linked with it as well as a clearly defined process to follow when it is outside a target threshold range. Think about what must happen when the status of a performance indicator changes. Perhaps alerts need to be immediately sent to a user's desktop or PDA. Make sure every KPI is actionable. When presented with any KPI, the user should clearly understand what action to take. Keep in mind also that the targets will most likely be variables based on data from one of the other stages of the integrated supply chain process.

Follow a Reference Model

A good reference model that integrates widely held concepts of benchmarking and process measurement for managing supply chain performance is the Supply Chain Operations Reference model (SCOR), created by the Supply Chain Council. The SCOR methodology offers standard terminology, common metrics, associated benchmarks, and best practices for supply chain management. There are five standard supply chain management processes defined by the SCOR – Plan, Source, Make, Deliver and Return. Not all will be related to 3PL operations, nonetheless, the inbound, outbound and return processes will have relevance. The Plan processes relate to sourcing, production and delivery and help providing a balance between demand and supply. Source processes are related to procurement of goods or services to meet demand. Make processes are related to transforming a product to its intended finished state to meet demand. Deliver involves processes such as order management, warehouse management, transportation management, and distribution management. Return involves

processes associated with returning or receiving returned products for any reason.

SCOR Defined

The purpose of the Supply Chain Operations Reference-model (SCOR) process reference model is to provide supply chain organizations with a standard language and approach to describing, measuring and evaluating integrated supply chain processes. The SCOR model contains standard descriptions of the supply chain management processes, a framework of the relationships between the standard processes and many cross-industry standard metrics that can be used to measure and improve process performance throughout the supply chain.

The SCOR model is comprised of three hierarchical levels of process granularity, starting with the big picture and progressively moving into lower levels of detail. Level 1 includes a set of high-level metrics associated with one of five performance attributes related to the supply chain – reliability, responsiveness, flexibility, costs and asset management. Delivery performance, fulfillment lead times and fill rates are some examples of Level 1 metrics. Level 2, the configuration level, is where the major supply chain processes are polished and aligned to the organization's physical and technology infrastructure as well as supply chain strategies. Examples of Level 2 metrics include cash-to-cash cycle time, make/source cycle time, and supplier on-time delivery performance. Level 3 is the process-element level and it incorporates detailed business processes and operational objectives into the Level 2 design of the supply chain model. Examples of Level 3 metrics include percent orders/lines received complete, inventory obsolescence and packaging cost.

Think Beyond the Traditional

In addition to the typical areas for improvement such as inventory visibility, buyer/supplier performance, demand management and customer service, companies should also consider people, process and information management issues for realizing additional benefits. Additionally, they need to make sure that there is a clear understanding of the technology being adopted as well as its associated requirements and the BI providers' ability so that it can be used effectively by the people and processes. Often, it can also be helpful to consider other complementary technologies such as

visualization, predictive and guided analytics, geospatial technology and event processing for deeper insight and improved decision making. Applied in the right way, these technologies can help to significantly improve decision-making by automating the time-consuming task of analysis.

It is also important to extend the scope of supply chain intelligence deployment beyond the unit or departmental level to cross-functional areas across the enterprise, with executive management, middle management and front-line staff from various departments such as finance, sales, operations and marketing on board. Executive sponsorship for the project is imperative for it to be successful.

Areas of Improvement and Expected Benefits

The emergence of business intelligence solutions for the supply chain industry has presented many opportunities for improvement of supply chain processes and realizing significant benefits such as service improvement, cost control, improved delivery and fulfillment, inventory control, better forecasting, reduction in working capital, improved asset utilization, improvements in product quality and the list goes on. Supply chain intelligence technologies can provide strategic information to key decision makers and help them identify inefficient business processes and maximize productivity by identifying variances in such things as material usage, downtime, labor and overhead by shift. You can determine: Which suppliers, customers and services are the most valuable? How are the material forecasts in relation to the actual results? How many days of inventory exists in each warehouse? Are we meeting demand? How long is it taking to fulfill an order? Do we carry excess inventory to compensate for variability of performance or lack of visibility?

75% of CFOs see reducing logistics and distribution costs as important, while 74% of CFOs identify as their priority increasing the number of "perfect orders" – those delivered to the right customers in the right quantity at the right time.

Source: Accenture, Stanford and INSEAD study

Business Intelligence can provide significant benefits across a range of supply chain processes, from optimizing order quantities, pooling suppliers and reducing inventory levels to better forecasting of demand, measuring and managing vendor performance and improving order to cash cycle times. The application of Supply chain intelligence to various processes and the potential benefits that can be expected will depend on a number of factors and will vary from business to business. We will look at some general areas and the potential improvements that can be realized using business intelligence by considering the supply chain processes as defined by the SCOR model (Plan, Source, Make, Deliver and Return).

Plan

In the plan process, BI can help enhance supply chain efficiency by enabling you to monitor your cycle time, which can then point you to opportunities to shorten lead times. You can analyze your flexibility, reliability, and responsiveness for improvements by benchmarking your efficiency by location, cost, productivity, and error incidence.

BI can also help you analyze the movement of goods through your organization as well as monitoring days of sale so that you can plan for the right levels of inventory at the right place. Alerts can be generated when capacity levels are off target. By analyzing the speed and flexibility of your supply chain and identifying areas with spare capacity, you can improve asset utilization and maximize profitability.

Inventory deterioration, shrinkage and damage costs can be tracked with BI and their impact on overall supply chain costs and margins can be analyzed to guide you in planning to meet future demand.

Source

Supply chain intelligence can help you track key metrics to optimize supplier network and overall procurement processes. By analyzing cycle time, monitoring sourcing costs, and tracking receipt variance, you can track and measure your supplier's performance. You can analyze contract compliance, vendor performance, opportunities to consolidate suppliers, goods received, fill rates, inventory deterioration, and late orders. You can also set up instant alerts to avoid potential disruptions and take corrective action or alternative measures to meet material, production, and customer requirements. You can focus on reducing inventory costs and manage your inventory levels better by tracking stock turns and monitoring inventory deterioration on an ongoing basis. By carrying out consolidation analysis, monitoring contract compliance and benchmarking suppliers, you can improve supplier management and ensure that you are dealing with the most reliable, responsive, and flexible suppliers. Furthermore, key indicators such as average lead times, on-time deliveries, reliability and quality performance can help you identify your best suppliers and help you negotiate better terms.

With BI, optimization of inventory turns and reduction of stock levels can be achieved to improve the yield on assets. Reducing lead times and improving order accuracy, cycle times and on-time deliveries can enhance consistency and responsiveness. BI can also help you perform historical and forecast analysis, cost-value analysis and statistical analysis of your inventory data for guidance on optimal inventory levels as well as identifying the range of inventory

levels above which the inventory carrying costs are higher than inventory value, or bands below which lost sales could result from product unavailability. You can see trends in inventory value compared with inventory turns and days of coverage to identify opportunities and issues related to materials management. Visibility into usage and coverage trends can help in reducing excessive or unnecessary carrying costs and inventory write-downs.

Make

BI can help in managing manufacturing costs and efficiency related to the make processes, including throughput, work in progress inventory levels, unscheduled downtime and use of resources. With BI, you can identify trends that require immediate attention by analyzing cost variance, yields, work-in-progress inventory levels, scheduling efficiency and defects attributable to machinery/equipment, products or operating shifts. Actual and expected manufacturing costs can be analyzed easily using BI and the highest inventory value items can also be identified and monitored for deterioration rate to eliminate excessive WIP inventory and reduce costs. By measuring and tracking performance of your processes and analyzing cycle time, schedule compliance, and efficiency over time against targets you can look at opportunities to maximize throughput. Resource management can be improved by monitoring and analyzing utilization levels, production variance, quality levels and defect rates.

Deliver

This process can present opportunities to optimize fulfillment and delivery performance in the outbound supply chain, whilst reducing inventory costs and improving customer satisfaction.

Order, shipment and inventory movement data are generally available in operational systems. By consolidating information from ERP, forecasting and order management systems to get a unified view of supply, demand and forecast values for product lines, business intelligence can help streamline the supply and distribution management. You can determine material requirements and the right balance to ensure your supply chain is equipped to maintain uninterrupted supply of products and manage distribution of goods at the lowest cost possible.

BI can also help in analyzing various issues that impact customer satisfaction and costs including delivery cycle time and fill rate monitoring, late deliveries, inventory movement, deterioration and delivery costs. Analytics related to stock turn and stock deterioration can help identify opportunities to reduce inventory costs. Moreover, you can also set up alerts for late deliveries, fill rates and inventory unavailability to optimize delivery performance and meet product availability, fill rate and delivery targets.

BI can provide real-time visibility into such areas as backlog, order entry, shipments, customer credit history and inventory positions. By analyzing delivery, payment and order size, you can improve customer satisfaction as well as monitor trends and patterns to identify customers who are likely to switch to another supplier or service provider.

Consolidation of orders by customer, source, traffic lane and carrier as well as dynamic carrier and route optimization are some other areas that BI can be helpful in.

Return

By being able to get insight into reasons for product returns, disposal costs as well as the value of the returned goods, you can analyze which of the returned products are contributing the most to the overall cost of returns. With the ability to drill down into lower levels of granularity in the analysis process, you can discover additional information pointing to improvements needed in warehouse picking operations in the event of excessive errors or problems at the supplier end which could prompt elimination of suppliers or renegotiation of supplier contracts.

Summary

Organizations must identify and define the requirements for the actionable information that is needed to manage and improve each process of the integrated supply chain. To maximize the success of a supply chain business intelligence initiative, it should be approached at an enterprise level across major processes, business functions and geographies. Business intelligence project teams should collaborate very closely with the supply chain management process design and operations teams to ensure that their informational requirements are clearly understood and designed into the solution. The KPIs and metrics that are defined, implemented, reported and analyzed should support the identification of those supply chain processes which require attention or corrective action to achieve top performance. Besides identifying the right KPIs and metrics, ensure that the different user roles have also been taken into consideration. A supply chain operations senior executive would be more interested in a view of indicators that broadly cover the supply chain with such measures as manufacturing capacity usage, returns to/from suppliers and customers, costs by channel, stock turns and inventory levels. Whereas a logistics manager would be more keen to measure inbound/outbound delivery efficiency, transport vehicle capacity utilization, delivery rejection anomalies and logistics costs.

A well thought through supply chain intelligence system can provide tangible data and actionable information in a single shared view to help organizations make better informed decisions about their business and more effectively manage their production processes, materials, suppliers and transportation assets. It can provide improved visibility to help monitor performance across processes, products and suppliers, and can allow drill through to the transaction details. It can provide insight into cause-and-effect relationships to understand the impact of decisions up and down the line. It can also provide better predictability through regular reporting and analysis, proactively identifying events, operational trends, or other conditions so that pre-emptive action can be taken to prevent that can performance problems such as inventory shortfalls and delays.