WHITE PAPER

IMPROVING SUPPLY CHAIN VISIBILITY

Transentric™
Supply Chain Vision

EXECUTIVE SUMMARY

Maximizing the effectiveness of commerce supply chains requires a greater emphasis on transportation visibility. By improving their supply chain visibility, shippers, consignees and others can derive real economic value for their organizations. When the quality of information improves, efficiency improves which translates into bottom line savings – along with improvement in customer service. There is already a huge market addressing these needs through discrete pieces of the puzzle – $19 billion market in shipper logistics software and services; $3.7 billion in message exchange services; $8 billion in carrier software and services. The exploding growth of e-commerce will continue to be the catalyst for improvement in supply chain management practices; connecting discrete business processes and information systems to form the virtual supply chain.

In a 2000 speech to the New York Association for Business Economics, Federal Reserve Chairman Alan Greenspan outlined the correlation between gains in economic productivity and advances in information technology. Greenspan said that trends tracked over the past decade and a half for specific industry markets are now being evidenced in macro numbers. Now, he said, there is more to be gained:

> "The remarkable surge in the availability of more timely information in recent years has enabled business management to remove large swaths of inventory safety stocks and worker redundancies. The expanding opportunities for e-commerce are already changing the relationship between businesses and consumers. The networking forces unleashed by the Internet are almost surely to be even more potent within and among businesses, where uncertainties are being reduced by improving the quantity, the reliability, and the timeliness of information. This is the case in many recent initiatives, especially among our more seasoned companies, to consolidate and rationalize their supply chains using the Internet." [1]

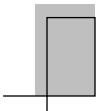
Supply chains are complicated — they include many participants with varying abilities to exchange information efficiently.

From the 60's to the early 90's, virtually all IT advancements focused on automating business processes internal to the enterprise (e.g. accounting, manufacturing, human resources).

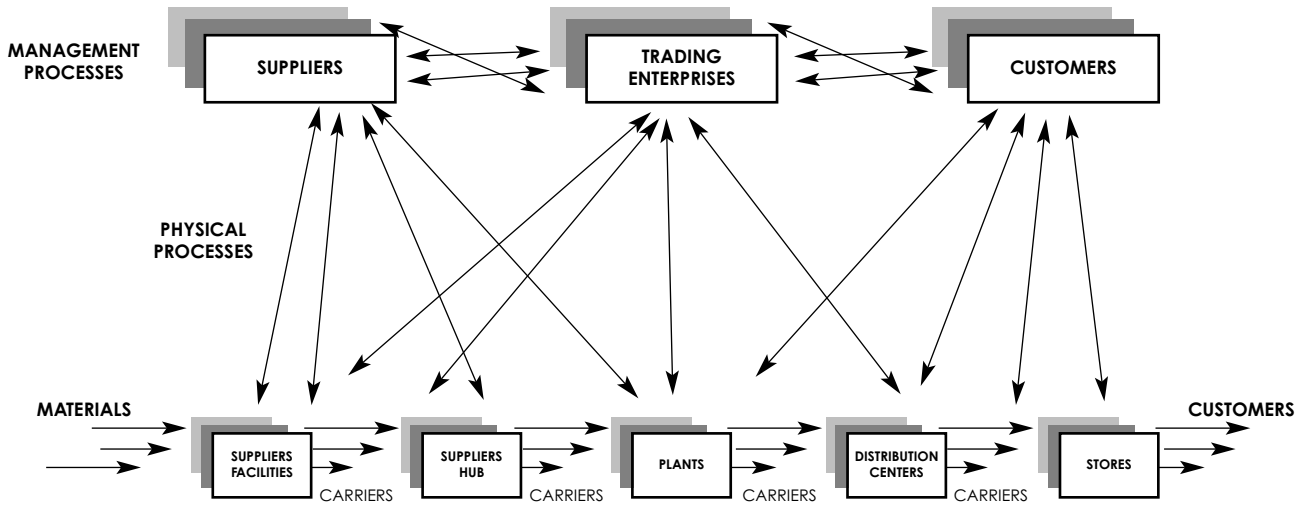
With this IT infrastructure in place, businesses have started looking at automating outside their four walls to tightly couple internal business processes with those of customers and suppliers — thus enhancing the overall efficiency of supply chains.

This same time period has seen considerable process innovation, from physical distribution management through logistics management to supply chain management. It has also seen a willingness to outsource collaborative processes among trading partners and joint process improvement and cost reduction initiatives — further enhancing the overall efficiency of supply chains. What is needed now is a corresponding integration of information technology across all enterprises in complex trading networks

A supply chain can be defined simply as the trading partners and intermediaries involved in the exchange of physical goods. This relatively simple concept can become complex quite rapidly. Consider all the participants involved in the chain — raw material supply, pre-processing, manufacturing, packaging, transportation, warehousing and consumer process — all of whom may be required to exchange purchases orders, invoices, return authorizations, delivery notifications and status reports. Further consider the organizational and physical separation between people running the management processes and those running the physical supply chain and the large, diverse and fragmented industry of third parties — 3PL's, 4PL's IMC's, forwarders, brokers, consolidators, warehouse operators, reloaders, and depots — and the concept can get even more complicated.



SUPPLY CHAIN COMPLEXITY



A major emphasis in the past decade has been how to interconnect with these trading partners, prompting "electronic file transfer" initiatives such as point-to-point electronic data interchange (EDI). One of the major obstacles the industry has faced, however, is that the supply chain is composed of companies of different sizes with different systems and different technical capabilities to adopt these procedures. Though many Fortune 1000 companies have highly sophisticated EDI procedures in place with their trading partners, many smaller firms are still tracking shipments using paper, white boards or at best spreadsheets, and communicating via fax, phone or at best Internet e-mail. Even the simpler supply chains may include hundreds of suppliers of components, subassemblies and MRO (maintenance, repair and operations) products. Customer rosters can number in the hundreds or thousands. Most manufacturers have multiple plants and distribution facilities. All of this can place a tremendous burden on supply chain participants in terms of compatibility and network integration.

As a result, software tools and techniques have been developed and optimized to manage each particular segment of the supply chain. Little has been done, however, to integrate these tools, and even less has been done to provide a shared view of events within integrated, interdependent supply chains.

Clients with global distribution challenges and who have manufacturing and marketing alliances with dispersed trading partners demand the level of assurance that only real-time visibility of supply chain events can provide.

One of the keys to supply chain efficiency is inventory visibility. Inventory can be defined as any item of property held in stock by a firm, including finished goods held for sale, goods in the process of production, raw materials and goods that will be consumed in the process of producing goods to be sold. Inventories appear on a company's balance sheet as an asset, and in the manufacturing industry, inventory can constitute a significant portion of the company's overall asset base. Beyond the actual cost of items in inventory is the carrying cost to finance these inventories, the capital cost of storage facilities, and the operating expense associated with storage, retrieval and transportation.

Most companies don't have the ability to see all the pieces of inventory in the supply chain. As mentioned earlier, systems do exist to track inventory in warehouses, and tracking and tracing systems enable transportation departments to determine what they have in transit. But typically the information doesn't all come together easily and certainly not in real time. Physical audits may occur on a periodic basis, but businesses cannot make day-to-day operating decisions based on outdated or incomplete data.

Thus, the existence of large on-hand inventories in past years was precisely due to the unknown status and service characteristics of supply chains. Because of this lack of real-time information, companies have had to maintain "buffered" stock reserves in plants, warehouses and distribution centers for emergencies or to cover them in the event of some unexpected change in demand. Excess inventory not only wastes the opportunity cost of the money tied up in it, but it also wastes manpower and floor space and increases the chance of loss through obsolescence.

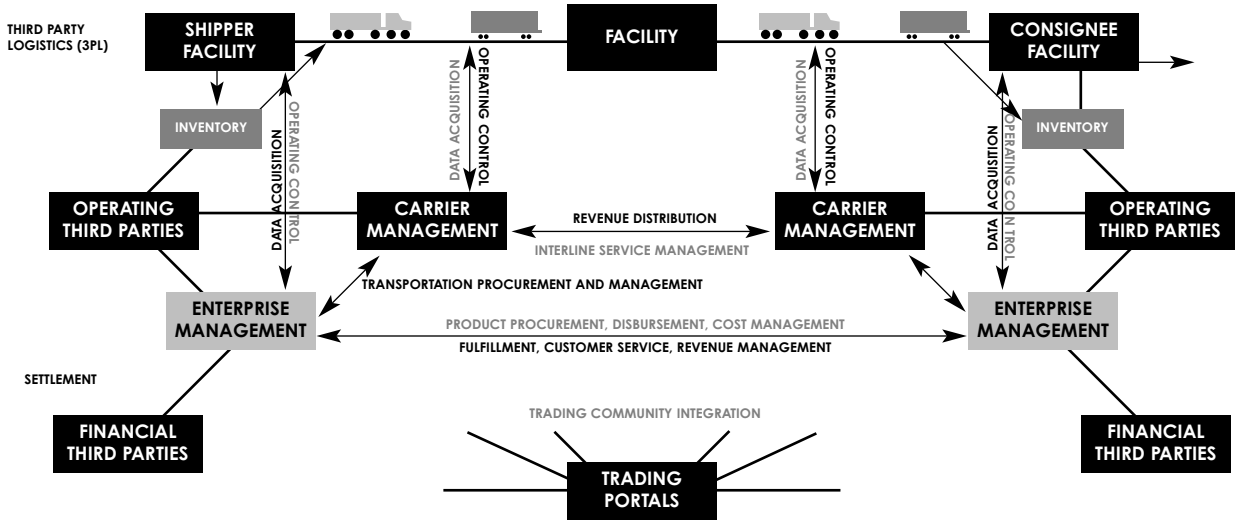
Immense savings are possible from reducing the amount of inventory investment. But it requires better information and visibility of in-transit and stored inventory, as well as expected demand.

In order to meet consumer demand for lower prices, producers have looked to radically reduce on-hand inventories to reduce cost. Of course there is risk associated with this, and producers are vulnerable to such impacts as plant shutdowns because of a single critical component that is not available or otherwise lost in the supply chain.

In simple terms, improved supply chain visibility substitutes information for inventory to buffer against these occurrences. With real-time information at their fingertips, managers have more time to anticipate and react to potential problem scenarios. Thus, visibility into the supply chain is vital for all participants, producers and consumers who depend on timely arrival of very specific goods, as well as logistics service providers who need visibility in order to provide basic customer service and to manage their own operational activities.

How does this work? In a complex supply chain, products move from origin, through transportation links and in and out of facilities before they get to the point of ultimate consumption. An important requirement of inventory management is to be able to see the products through various modes of transportation and within facilities along the way. Inventory visibility requires connectivity and information flow between vendors, suppliers and customers. Historically the shippers position has been, *"I shipped it. Is it on schedule?"* The carrier standard has always been, *"It is going from point A to point B and should take four days. Are we on-schedule or off-schedule?"* This type of thinking misses some of the realities of the market today. The information needs to answer the question — *what does the customer really need and when do they need it?* The answer may change on a daily basis. For example, a shipment could be on its original schedule, but the customer needs it faster because it is going to run out of a product — so this order needs to be expedited. Conversely, a shipment could be four days behind schedule. This too would prompt a call to expedite. Yet the customer may actually have more than it needs in reserve, and being four days behind schedule is not going to cause an out of stock situation or shut down the plant — thus no expediting needs to occur.

SUPPLY CHAIN INFORMATION FLOW



How is value created through inventory visibility?

A key element of supply chain economics is being able to know where all the inventory is at any particular point in the supply chain, while minimizing the amount of overall product in the supply chain. Reducing inventory in the supply chain reduces the cost of storage transportation, the direct handling costs and overall cost of obsolescence (minimizing materials in stock that become out of date and unsellable). With visibility into the inventory in the supply chain, a supply chain manager can make better tactical and operational decisions about redirecting it to fulfill real-time requirements at the destination.

The levels to which these practices have been realized varies widely by industry. With so many participants in the supply chain, each with their own operational perspective, it is often difficult to actually obtain relevant visibility. In general for high-value products like auto parts, fashion, computers and other premium consumer products, inventory visibility has been optimized because there was more value to be realized by doing so. However, it is within other manufacturing groups and bulk commodities where the significant opportunities lie for improving supply chain efficiencies.

What are the general requirements for an optimized inventory visibility solution? Data acquisition and connectivity must link many points in the chain.

The facility: A warehouse, transload facility or some other kind of storage facility. Warehouses were early targets to automate the process and traditional warehouse management software (WMS) packages have existed for quite some time. For a supply chain visibility solution to function, it must integrate with whatever WMS system is running the warehouse. The interface needs some capability of messaging to notify of the particular business event that takes place, such as product being shipped.

Shipment tracking: Occurs when the product is in the hands of the carrier. Here the interface is with whatever computer system is managing the carriers operation, often times a proprietary solution developed in-house. The carriers' unit of business is the shipment — an activity that starts with origin and finishes with destination. Somewhere along the way, tracking and tracing systems will periodically send messages regarding shipment status. Typically, it is not required to know exactly where the shipment is, as long as the ETA can be constructed and the destination verified.

Identifying contents of shipment at origin:
At any origin of a transportation link, when product is being loaded into the transportation equipment, there needs to be a transportation event that captures what makes up that shipment. It's not the shipment that needs to be visible, but the product. The industry has begun to refer to this event as the Advanced Shipment Notification (ASN). Unfortunately this business event lacks a clear definition across the industry (it has many formats and other uses), which is one reason why inventory visibility is so elusive.

Regardless of the complexity, the connecting thread for these systems is a good intelligent message capability. Messaging systems must collect all this diverse data from these different places in the supply chain (acquiring information about product in the warehouse, product in the custody of the carrier, product at the point of origin) and bring it together into one integrated view. From the warehouse, the events that receive product in, take product out, and adjust inventory based on physical counts are required. From the carrier, shipment status messages are needed. The most critical event occurs at the point of origin, when product is loaded into carrier's equipment, and product information is connected with shipment information.

A critical success factor in the data acquisition process is positive identification of the product. The key is that at the origin of link the content identities need to get grouped together and associated with that shipment. Relevant visibility into the supply chain will depend upon retaining those unique attributes of the goods that are meaningful to each participant part numbers, and then having the means to use those attributes to inquire about the location and status regardless of where the goods are in the chain.

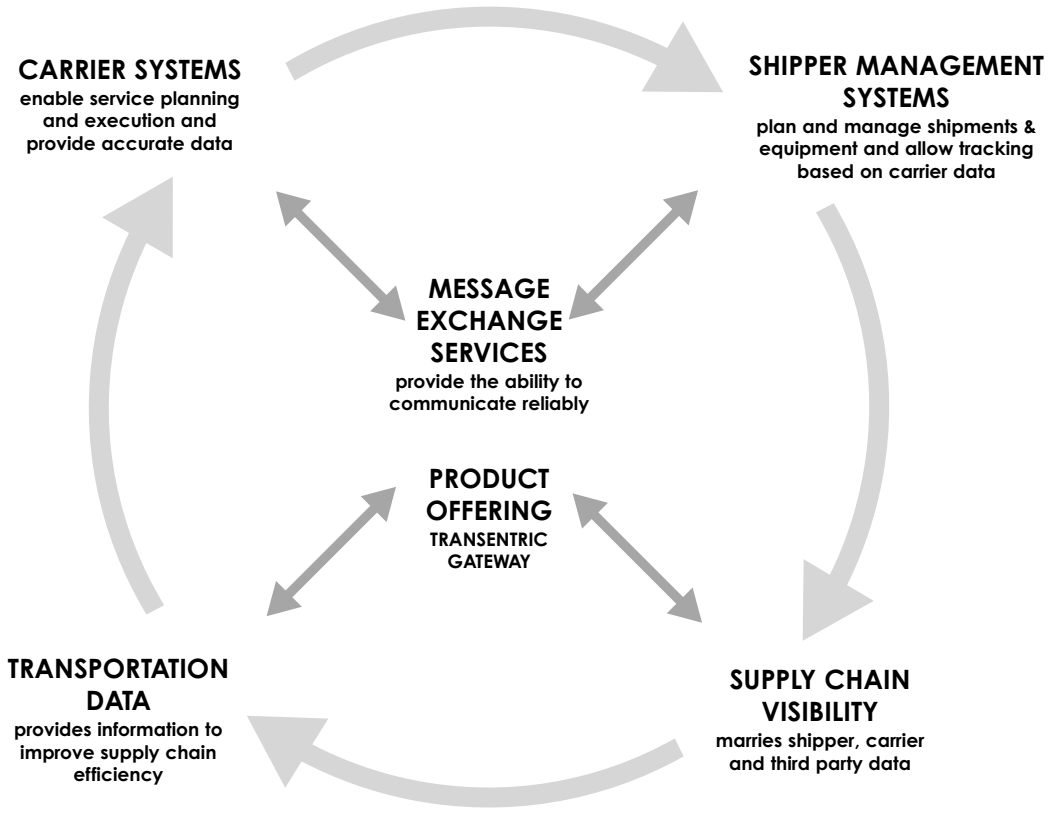
Defining that shipment consistently has proven to be extremely difficult. Product identification schemes vary depending upon whether the product is bulk (soda ash), unitized (lumber) or serialized (automobiles), and whether it occurs in batches or lots which require integrity during transportation. Sometimes product identification is hierarchical where individual items have one product identifier, but groups of them packaged for store display have another. Throughout the supply chain, product must be identified at the level of detail that is required by the visibility system. Finally, the system must process within a structure that fosters rapid information exchange between members of the supply chain and transmit information along a predefined communication path.

How well is this being implemented today? In industries with sophisticated supply chains, the business processes that create an ASN are pretty well automated, and the value propositions are well recognized. Programs have been written into the WMS, so that upon shipment, the ASN automatically picks up the carrier identifier, connects it with the content and sends a message. However, currently with the slightly lower value products that exist in railroad, barge or bulk, the processes to create an ASN do not exist. In many cases, messages are still being sent from clerks who manually collect data and then send faxes or make phone calls.

Whenever data is captured from this many sources, it is inevitable errors will occur. Events will be missed, shipment data mis-keyed or omitted. For example, a company could have a product associated with a shipment that doesn't exist. If the carrier then reports this status, it doesn't match any shipment that was identified.

Two things are required to address these issues, message delivery integrity and business process integrity. Message delivery integrity is relatively complicated, but most value-added networks and trading enterprises have mastered it. It is the environment of processing controls that ensures that every message that was originated is ultimately delivered to all intended destinations or that the failed delivery is positively communicated back to the originator. Business process integrity is the set of business rules, processing controls and trained people that identify, investigate and correct message content to ensure that the business event is completed properly. This requires knowledge of the business relationship between the two parties and the semantics within which the individual message occurs. The latter is usually executed by back office personnel who clean up the data, connect the information together and display it to the supply chain manager who is trying to manage the inventory and make decisions about replenishment.

TOMORROW'S VIRTUAL SUPPLY CHAIN



"Carriers, third parties, enterprises and trading communities will create sustainable competitive advantages by delivering information technology and technology-based services that provide effective management of transportation, logistics and commercial information in complex, global, mixed-mode supply chains. Internet–enabled products that focus on improving transportation and e-commerce processes and connecting these processes and players, will be essential for tomorrow's virtual supply chain."

This data should be made accessible to the user by any appropriate mechanism, whether client/server or Web browser. The underlying technology, however, is not as important as the underlying business process because the person who is trying to manage the product flows needs current and complete visibility of the system in order to identify impending stock outs, analyze suggested changes in production schedules; basically to see in advance where problems are likely to arise.

This information can be valuable across many disciplines within an organization including purchasing, manufacturing, transportation and distribution — and serves as a collaboration tool to further improve enterprise objectives. As a data repository, the system captures a huge amount of data that would permit historical reporting and data analysis to further optimize the supply chain practices long term.

Conclusion

Information visibility takes on an increasingly important role in operational control as supply chains evolve into complex trading networks and the value proposition of rapid response becomes realized. This promise includes both process and knowledge elements to provide electronic connectivity and software systems to seamlessly extract, translate and aggregate real-time information and present it in a shared-view fashion to appropriate parties along the chain. Only then can shippers, consignees and others derive real economic value for their organizations by better anticipating customer demand and seamlessly linking to product fulfillment strategies.

Sources

1 Remarks by Federal Reserve Chairman Alan Greenspan before the New York Association for Business Economics, New York, New York. June 13, 2000.

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