

Optimizing the Supply Chain Ecosystem

Achieving Supply Chain Predictability
– and the Ability to Predict



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Managers working inside enterprises today face a curious conflict: while business systems provide more data than ever – a virtual flood of information – managers still lack actionable data about critical business processes and events. Managers of supply chains, in particular, struggle with the lack of useful timely data from their customers, suppliers, logistics providers, offshore operations, nearshore finishing centers, and distribution networks. As a result, they are stuck in a reactive mode without the option of proactive corrective intervention. This problem prevents them from exploiting the data and turning the supply chain into a competitive advantage.

This paper looks at the obstacles to obtaining timely access to actionable data and costs associated with the problem. It then details a solution that is gaining widespread adoption.

1. What's at Stake?

Organizations that can't tell in real time what is happening in their supply chains are at a significant disadvantage:

- They can't recognize disruptions and anomalies fast enough to mitigate the bullwhip effect.
- They can't recognize the full extent of adverse events, and so they are forced into complex reactive positions.

In a competitive marketplace, these two effects can have a significant impact on company performance by increasing manufacturing and delivery expenses, increasing inventory in the distribution channels, and extending time to market. Moreover, the lack of timely information prevents companies from exploiting opportunities in the supply chain and in the wider market.

When organizations synchronize supply chains and have real-time access to data, they enjoy several competitive advantages:

- Anomalies and exceptions are identified early and the data for intelligent response is immediately available. This greatly minimizes the bullwhip effect and saves downstream partners and customers from needless activity.

- Back-end processing of change orders, modified invoices, and updates to inventory systems can happen as decisions are being made.
- Visibility into partner systems makes planning easier and enables managers to see opportunities that were not apparent before. This visibility also enables supply chain partners to collaborate more effectively. This cooperation is essential when problem resolution requires the coordination of several supply chain partners.
- Easier integration and expansion. Because the synchronization and data passing mechanisms are not based on packages from supply chain software vendors or ERP firms, the software is optimized for all players. Packages can be changed without disrupting the infrastructure and new partners can be added easily.

OBSTACLES TO OBTAINING ACTIONABLE DATA

No one questions the benefits of supply chain synchronization, but the obstacles are daunting and varied, ranging from supply chain partners who cannot provide accurate data quickly to those who provide a surfeit of unimportant data that masks important signals. Typically, the limitations appear to managers in one of the following forms:

Data is not available at all. Limitations in partner systems and diverse levels of technological expertise can make it very difficult to ascertain the status and location of products in the pipeline. For example, semiconductor vendors face the recurring problem of obtaining data from overseas foundries and assembly and test facilities. Some overseas partners have not made sufficient investment in software to adequately monitor status, while others use packages with limited data export capabilities. To address this problem, some overseas partner firms are turning to web services to transmit data. However, this approach is often batch-driven, and so it does not provide the crucial timeliness of constantly streamed real-time data.

Data is available, but in an incompatible format. This problem is characteristic of more advanced supply chains, in which parties have invested in software to monitor processes, but there is no common industry format for sharing the generated data. Other kinds of incompatibilities can enter in:

- Different unit types (metric vs. imperial units, Celsius vs. Fahrenheit, etc.).
- Currencies with conversions performed at different times, resulting in cost figures that do not match exactly.
- Different ways of recording the same information. For example, some transport companies record product location in longitude and latitude. However, managers need more than geographic location. They need to know whether a product is in a warehouse or in transit and, if in transit, what the ETA is.
- Different software specifications. Supply chain suites rarely standardize interfaces to external products. For example, SAP, i2, Manugistics, and warehousing packages all rely on different internal data formats.

In sum, data sources that do not work well together result in poor or insufficient data.

Data is at the wrong level of detail. Foundries and many manufacturing plants generate reams of data for every shift. Pallets with RFID-tagged items create thousands of data points for minor events. GPS systems that track location of moving items generate hundreds of updates for even small changes of location, potentially creating tens of thousands of entries for a single long-haul truck run. ERP, supply chain management (SCM), transportation management systems (TMS), and warehouse management systems (WMS) business applications are transactional systems. These systems are easily overwhelmed by the mountains of raw data that is being generated by individual events throughout the value chain. For data to be actionable, it must be quickly evaluated then rolled up to a high enough level so that systems and managers can quickly recognize problems and identify opportunities. At the same time, it cannot be rolled up so high that important details are missed.

Data gaps between supply chain partners. Data gaps are created whenever product moves from one supply chain partner to another or when goods utilize intermodal transportation (ship to truck, truck to train, etc.). Responsibilities for tracking data rarely overlap between partners, so vendors are forced to wait until after a transfer to find out whether problems have occurred. There are trillions of dollars of global inventory sitting in this "black hole" every day.

The upshot is that managers often have the sense of flying blind. Rather than anticipating problems, they can only recognize and respond to them after the fact.

As their response time shrinks, costs rise commensurately. Managers also lose key opportunities to find alternative solutions, to be agile, and to use the supply chain as a true competitive advantage.

SOLUTION: OPTIMIZING THE ENTIRE SUPPLY CHAIN ECOSYSTEM

To solve the problem of getting actionable data on time, the entire supply chain needs to be synchronized at the level of data. Today's supply chains are extremely complex and global, which makes end-to-end synchronization a goal that eludes many enterprises. What is truly important is synchronization of strategic components of your supply chain, using existing data to identify actionable changes in the state of that supply chain component. As an example, it might not be as important to know where a ship carrying your product is on the ocean as it is to know that the ship's captain just communicated a diversion to a different port due to a massive weather system in his path. Knowing that piece of information would allow you to look at historical transit times to the new port of entry and project product availability at distribution sites. This actionable data would permit preemptive re-synchronization of supply and demand.

Specifically, there must exist a tight coordination of current data, historical data, transaction, physical processes, and activity schedules of all participants¹. Notice that this synchronization does not require a single, integrated supply chain with many data points, only coordination of processes and synchronization of available data.

The supply chain needs synchronization of data at various organizational levels among all members: from the suppliers, contract manufacturers, OEMs, logistics partners, and distributors to the inventory systems of the vendor and even of the vendor's customers. Most enterprises are capable of exchanging data, but the exchange is through a complex, rigid, and fragile integration infrastructure. Exchange of mission critical data is often batched or communicated in less than timely increments. The technology of the 21st century is enabling a dramatic shift to a more flexible and agile integration of trading partners and various components of the enterprise's supply chain ecosystem. This shift allows for an improved response to changing market conditions through access to real-time data. Such data provides forward leading indicators of possible supply interruption and significant demand fluctuations that directly impact operating margins versus a "rear view mirror" approach that merely recaps the damage.

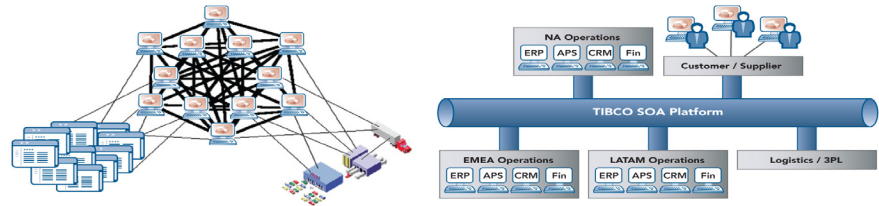


Figure 1. Rigid integration infrastructure vs. flexible infrastructure.

To do this, new technologies and integration methodologies will need to be adopted and deployed over time. This is strategic for many companies and considered necessary to move higher on the Supply Chain Maturity scale. Mission critical data must be generated in real time and certain agreements need to be in place beforehand to facilitate partner access to confidential information. These agreements specify the data to be shared including the level of detail, data formats, security policies, and the coordination between who pushes data and who pulls it.

2. Requirements for Successful Supply Chain Optimization

A supply chain that seamlessly synchronizes all partner interactions requires several different technologies that must integrate well. These are:

Technologies that can utilize existing enterprise assets. The capital investment a company has made in their employees, business systems, and technology needs to be leveraged. The deployment of a single global instance of a business solution on a homogeneous technology platform might be possible, but in today's rapidly changing markets not many companies can wait for such a multi-year project to yield a fully integrated supply chain where data is seamlessly exchanged. Being able to synchronize data among the various enterprise operating units and trading partners in the supply chain ecosystem will extend your current investments and deliver greater value without added risk.

¹This definition of supply-chain synchronization is adapted from one first enunciated by Jeff Ashcroft, now VP of Logistics/Supply Chain at PricewaterhouseCoopers LLP

A high-speed, reliable data transport. This is the bedrock infrastructure on which all other technologies are built. While there are many messaging products available today, supply chain synchronization requires very high performance, excellent scalability, and guaranteed message delivery. Because the transport will integrate various groups within the company and then extend outside the company, it must have sophisticated management tools, especially diagnostic capabilities that can pinpoint difficulties. Working with tech support departments of trading partners to isolate a problem on your own messaging transport can be a frustrating experience. The transport needs to have advanced tools to correctly diagnose and fix problems.

Enforced security and governance policy. With so many partners potentially writing data to the supply chain and taking sensitive data from it, security considerations are paramount. The synchronization tools must have strong security, including state-of-the-art encryption that is fast enough not to interfere with real-time data delivery. Ongoing governance of the relationships and operating policies must be strictly enforced and constantly monitored for conformance.

Quick connection of major business application provider solutions. Clearly, for the coordination to occur, the solution must be able to plug into all major supply chain management solutions (SCM), ERP manufacturing packages, supplier relationship management (SRM) solutions, customer relationship management solutions (CRM), logistics pipelines, carrier data systems, and transportation planning systems (TPS). In addition, it must be capable of integrating any legacy or custom planning, manufacturing, distribution, and accounting systems into the supply chain ecosystem. To do this, the solution must make available a large set of connectors or a service-oriented architecture (SOA) capability so data can flow seamlessly between dissimilar business application provider technologies. It is critical for this to enable and include integration with smaller partners whose partner-facing software might have been written in-house or whose technology expertise and capability may be limited.

Business process management. Business process automation, standardization, exception monitoring, and reporting are necessary to properly disposition actionable data. Process automation for timely exception management of actionable data will reduce required human intervention to resolve routine operational events. Ongoing monitoring of process performance and efficiency will guide continuous improvement projects to reduce bottlenecks that impede data movement among supply chain components. Dynamic process adjustment, for successful optimization of rapidly changing variables, will permit process control

What is CEP?

Complex event processing is the ability to use data from multiple data streams to recognize and respond to an unexpected event intelligently. For example, auto assembly plants require the delivery of parts to occur in a specific sequence. By tracking GPS (inventory location) and RFID (inventory contents) of trucks delivering the parts, an assembly plant can be alerted to a potentially late delivery and take corrective action with the supplier to avoid an assembly line shutdown. They can also determine which stations on the line will be impacted so the correct parts can be expedited by the supplier to keep the line up until the delayed parts arrive at the line. This ability to compute complex relations that span multiple input sources (GPS, RFID, inventory, and personnel) is a hallmark of CEP.

parameters to “flex” as global operational demands change. For example, if demand for a product in a particular distribution channel is increasing as planned, the demand deviation limits for the product will need to be increased as well to avoid false alert notifications to the Product Line Manager.

Complex event processing. Individual events, when evaluated on their own merit, might not indicate a potentially serious situation. However, if these individual events or anomalies are systematically correlated with other trading partner data, logistic provider data, or business transaction anomalies – and measured against historical norms or metrics – cause and effect patterns will begin to emerge. Pattern recognition promotes early detection and allows for prediction of larger pending failures. Real-time correlation of thousands of events on a global basis across the entire supply chain is a complex issue that is made possible by a technology known as complex event processing (CEP). This capability provides for proactive decision making without waiting on the next advanced planning solution cycle by sensing changes and correlation of seemingly unrelated events that could dramatically impact supply and demand management decisions. The synchronization of events requires a solution that can perform complex event processing and, having identified such an event, respond to it correctly.

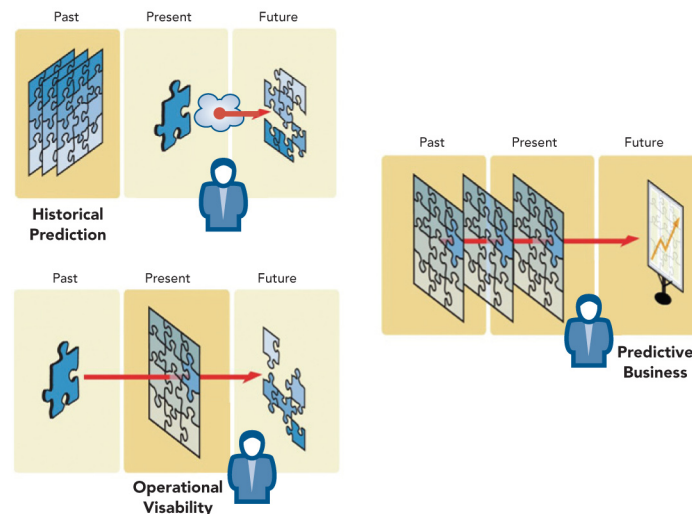


Figure 2. With CEP, the supply chain can become proactive and even predictive

Intelligent data presentation and visualization capabilities: Supply chain events requiring intervention must be presented to the appropriate level of management in a concise and actionable form. It is equally important to assure action notifications are exception driven and in direct response to defined operations metrics. The use of key performance indicators (KPIs) and scorecards can greatly assist executive management with risk mitigation by monitoring the health of the strategic components of their supply chain. A good solution presents the data in a dashboard or in a portal. These displays should enable a manager to tell in one glance the health of the supply chain. Alarms and alerts are designed to appear as high-visibility items that immediately attract attention. Depending on the nature of the problem, reports and data screens are prepared on the fly to permit managers to drill down to the necessary levels of data. These displays should integrate with analytics packages so that if further analysis of the data is needed, it can be done on the spot.

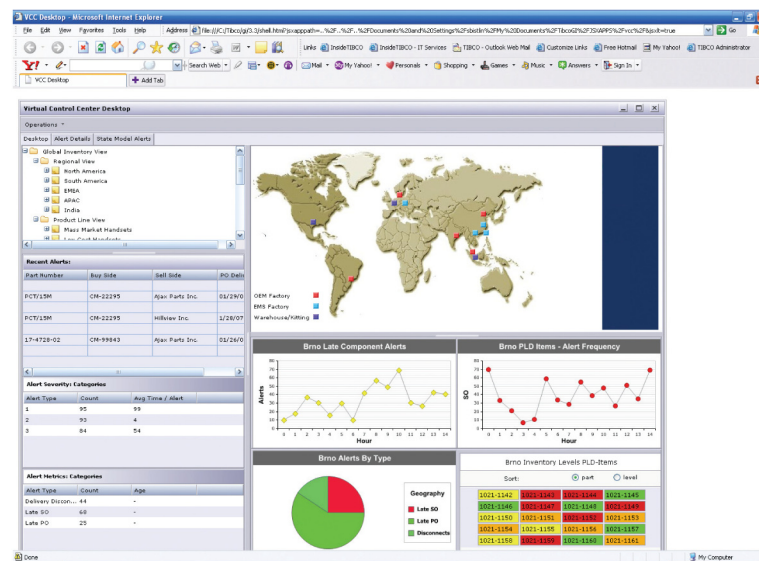


Figure 3. Business activity monitoring dashboards show KPIs and supporting contextual information.

Non-disruptive integration. Most enterprises today have some level of synchronization with a few key trading partners in their supply chain. A new synchronization solution should not require tear-out and replace strategies, but rather should integrate with existing software and infrastructure. While connectors provide part of the answer, more is needed: including web services and SOA support, direct connect capabilities, and data normalization facilities between

systems. By this means, the solution can be rolled out incrementally. It can also run in parallel with existing standalone solutions and either replace them over time or integrate them – whatever approach works best.

3. Why TIBCO for Supply Chain optimization

TIBCO's approach to supply chain optimization is vendor agnostic, with a focus on providing the integration between packages and advanced event-handling tools. Vendors of large supply chain packages will often coordinate with a few other packages, but rarely are they capable of efficiently and cost effectively synchronizing all the disparate elements of the entire supply chain. The primary objective of business application provider integration technology is to allow communication and connectivity among their own application suites. Consolidation of the business application provider space has forced the need for integration tools so they can continue to cross sell and up sell into their customer base. The required end-to-end communication, outside of their application suites, is not their forte or their goal. Most often, they focus on one segment of the value chain – procurement, logistics, etc. – and only provide connectors to the major players in the next link of the supply chain.

TIBCO is unique in offering a complete solution that can integrate packages from SAP, i2, Manugistics, and other vendors without difficulty. And this integration can be done via direct connections or web services as best suits a customer's needs. Because of TIBCO's vendor neutrality, it is capable of filling the gaps between links in the supply chain.

In addition, TIBCO has several offerings that deliver business process optimization based on complex-event planning, real-time analytics, and high-performance rules execution. These tools can be meshed with TIBCO's business process management (BPM) tools to provide a highly integrated solutions stack that enables companies to respond with agility to unexpected events.

An Agile Response To Katrina

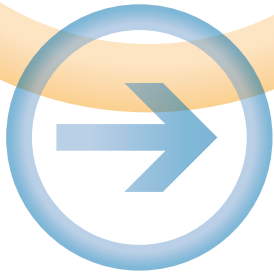
When hurricane Katrina struck the U.S. Gulf Coast in August 2005, it represented one of the worst natural disasters in the country's history. It generated losses of more than \$85 billion and caused enormous disruption to business.

However, companies with business optimization tools were able to keep costs of the storm to a minimum. They were able to identify truck location in real time and redirect the trucks out of harm's way. By using analytics and BPM tools, they could contact customers who needed the same inventory and provide it to them at a discount in exchange for accepting it ahead of schedule. Moreover, commitments to downstream partners and vendors could be modified to reflect the change. These companies could reroute the trucks and close the discounted sales in real time and issue signed change orders and documents almost immediately thereafter.

By this means, agile companies were able to save inventory and avoid costly losses and storage fees. The critical tool was the synchronized supply chain and the analytics engine underlying the business process optimization tools.

TIBCO provides an industry-leading set of visualization products including dashboards, business activity monitoring (BAM) tools, and a portal server that can display data, transactions, alerts, warnings, and full status information in an intuitive, easily navigable interface. These displays, which can be enhanced via TIBCO's Ajax-based rich internet application tools, customize data presentation on a per-user or per-application basis. They include built-in capabilities for data roll up and drill-down and they integrate easily with other in-house systems – both pulling and pushing data. That is, the tools can be used both to monitor and manage supply chain activities.

To find out more about how TIBCO products can deliver these benefits to your supply chain, go to <http://www.tibco.com/solutions/biztech/supplychain.jsp>



4. About TIBCO

TIBCO Software Inc. (NASDAQ: TIBX) is a provider of infrastructure software for companies to use on-premise or as part of cloud computing environments. Whether it's optimizing claims, processing trades, cross-selling products based on real-time customer behavior, or averting a crisis before it happens, TIBCO provides companies the two-second advantage™ – the ability to capture the right information at the right time and act on it preemptively for a competitive advantage. More than 4,000 customers worldwide rely on TIBCO to manage information, decisions, processes and applications in real time. Learn more at www.tibco.com



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