Supply chain management

CONTROLLING THE UNCERTAINTY

E-supply chain, Web-centric supplier, business-to-business e-commerce, Internet fulfillment, e-transport, collaborative commerce networks, event-driven supply chain. Tired of buzz words? Well, just keep on reading, and let's go back to some of the true, basic questions companies have about supply chain management projects.

A recent survey of German managers on supply chain management issues showed that nearly 40% of the surveyed companies are currently preparing to implement supply chain management (SCM) tools and technology. But fewer than 10% of them have actually implemented SCM and have productive solutions in place. The survey results also indicate that one of the basic success factors for SCM is to concentrate on specific key business processes and to develop an appropriate set of key performance indicators (KPIs) for the specific business application to control and manage internal and external activities. For example, it has become clear that the intention to control and manage distribution processes for key customers and to receive actual demand data from the markets is very strong in the whole automotive industry.

Besides these specific aspects, the survey highlighted the main business goals for future SCM projects:

- Increase transparency in the supply chain
- Reduce bound capital (stock)
- Reduce overall delivery lead times
- Increase the flexibility to react to market forces
- Increase productivity
- Make better use of production capacity

Is it realistic to think that we can meet these goals and the resulting challenges by just applying some of the e-technologies mentioned at the beginning of this article? Not necessarily.

An early experiment

When cyberneticists Mark Gardner and Ross Ashby simulated the dynamic behavior, stability, and reliability of complex systems in 1970, they presumably did not focus on supply chain control, or on supply chain uncertainty or complexity. Then, years later, the late Jack Burbidge and Denis Towill from the Logistics Systems Dynamics Group at Cardiff University in Wales, rediscovered Gardner and Ashby's work. But why are these early experiments so fundamentally relevant for the design, control, and management of today's supply chains?

Gardner and Ashby's simulation experiments revealed that a complex system basically performs unreliably – that means explicitly unstable and unpredictable – if:

- The number of nodes that might be interconnected within the network is increased above a switching line that specifically determines the beginning of chaotic behavior
- The system connections between the nodes measured by random traffic is leveled above a certain tolerance border

When you apply uncertainty to supply chain management, the importance of their work becomes clear. The Gardner and Ashby effect – unreliability – affects real-world supply chains. There is much evidence that uncertainty resulting from supply chain complexity is the major distortion factor that makes it difficult or even impossible to control and manage supply chains from the demand or the supply side. Designing and keeping the supply chains simple, lean, and manageable to avoid too many interconnected nodes and traffic is the important message of Gardner and Ashby's experiments.

Reliability in logistics processes greatly depends on delivery precision with regard to time, quantity, and quality. The aspect of time must allow for potential differences between promised and actual deliveries. The more actors or nodes included in a supply chain, the greater the risk to accurate planning and execution – and particularly process synchronization. Likewise, there is always a risk of discrepancies between the quantities of goods delivered and goods received. The quality of deliveries also plays an important role: that is, the proportion of flawless deliveries. Experience shows that any supplier with decreasing quality performance will cause increased information flow on returns and safety stocks – or traffic – in the supply chain in order to fulfill the customer's delivery goal.

The price of uncertainty

Achieving world-class delivery precision is one of the most demanding and challenging goals of customer-oriented end producers and their suppliers. Designing and operating efficient supply chains is a major requirement for delivery precision. Common wisdom holds that the markets will force companies to build and operate highly efficient supply chains, but the entire supply chain is important – not just an individual company. A massive U.S. $1.1 trillion is required in inventory to support U.S. $3.2 trillion in retail sales, according to an evaluation by the U.S. Department of Commerce based on the economic resources and the price of inventories and stocks within U.S. supply chains and supply networks. Is this the price to be paid to ensure precise and timely deliveries from different industries to a broad range of end customer markets, simply because there is so much uncertainty at all levels of the supply chain? There is much evidence that the economic values stocked between the supply chains as a result of uncertainty are very high – too high.

In the industrial application, typical key performance indicators are the proportion of deliveries on time, early, delayed, incorrect, damaged, or with incorrect quantities. The basic factors affecting delivery precision and the complexity of supply chains are the stock quantities, the reliability or uncertainty of the supply chain (internal and external processes depending on industry-specific requirements), the organizational flexibility to react on demand to changes and unforeseen events, and the quality of delivery demand data.

If SCM is a vision to overcome functional division and to achieve seamless process integration across several levels, we should concentrate on specific supply chain business processes and their relevant key performance indicators.

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