EXECUTIVE BRIEFING SERIES

WHITE PAPER

Volume 3

Taking Control of the B2B Exchange:
What's Next in the Supply Chain Evolution

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Contents:

INTRODUCTION

Business is, at its root, about buying and selling. While each business needs to provide a good or service that other people value, and each business adds value in a variety of ways, every business needs to buy things to survive. Whether it's a manufacturing business that transforms steel into finished goods or a service business that provides consulting advice, every business needs to sell things to survive.

This rather elementary point has driven the creation of many of the current business-to-business (B2B) exchanges. The majority of B2B electronic commerce players today are concerned with procurement. And the majority of those are concerned with procurement of indirect goods – those goods that support the core purpose of businesses but which are not part of the business' finished products. Indirect goods are commodities like paper clips, computers and floor cleaning solutions.

There's a good reason why most B2B e-commerce has focused on commodities: It is much easier to electronically enable the procurement of commodities than it is to deal with the complexity of the direct goods supply chain. Take just one aspect of procurement, logistics, as an example. If you order a PC for your office and it doesn't show up until several days after it was promised, chances are you can live with that. If you order parts for your assembly line and they are delayed, your line could be idled, and employees could be laid off.

This is not meant to minimize the problems presented by eProcurement of indirect goods. There is a formidable challenge in transforming paper- and fax-based business processes into streamlined electronic document flows. However, this white paper focuses on the additional challenges involved in electronically enabling the supply chain for direct goods. Companies wishing to become eBusinesses will need to transform not only their indirect and direct procurement processes, but also their new product introduction, demand forecasting, supply chain visibility, logistics, and financial settlement processes. It's a tall order, and it's the next wave of the e-commerce revolution. We feel that the predominant form of e-commerce will evolve from the current emphasis on commodity exchanges to intelligent supply chains enabled by Private Exchanges.

BACKGROUND

Before turning to the specific challenges involved in evolving an intelligent supply chain, first let's understand what an exchange is. The term is used quite loosely in the marketplace to refer to everything from online catalogs and stores, to true bid and ask exchanges, to electronically-enabled private supply chains.

A Public Exchange (also known as an Independent Trading Exchange) is an independent marketplace that is not majority-owned or influenced by a single industry participant. It may have agreements with industry players that a certain percentage or volume of their procurement will be routed through the exchange. In general, such exchanges need to attract 20 to 30 percent of the purchasing volume in an industry to survive. An example of a successful Public Exchange is Altra Energy, an independent, real-time, anonymous electronic trading exchange for natural gas, crude oil, natural gas liquids and power that was chosen the best Public Exchange by AMR Research. More than 7,000 users buy and sell energy using Altra, and it recently saw a record 18.9 million megawatt hours trade in August 2000. In general, barriers to entry are low in a Public Exchange.

A Captive Exchange, or COBAM, is a marketplace that is majority-owned by one or more industry participants. The industry players typically contract to have the marketplace built by third parties. Covisint, the auto exchange originally formed by General Motors, Ford, and DaimlerChrysler, is an example of a Captive Exchange. Announced in February, 2000, Covisint was established as an independent Limited Liability Corporation with DaimlerChrysler, Ford, General Motors, Nissan, Renault, Commerce One and Oracle as members. Recently, auto parts vendor BorgWarner joined the exchange. In a Captive Exchange, vendors often have no alternative but to join or lose business. There may be high barriers to entry in an invitation-only exchange.

A Private Exchange can be thought of either as a grown up extranet or as an extension of a company's supply chain. The marketplace is controlled by a single company, usually a buyer, and the company attempts to run a substantial amount of its procurement through the exchange. The number of Private Exchanges already in place or under construction dwarfs the number of public marketplaces, according to GartnerGroup, which estimates there may be as many as 30,000 Private Exchanges in various stages of development. In contrast, the number of Public or Captive Exchanges now in existence is estimated to be around 1,000. Membership in a Private Exchange is by invitation only, and generally only a company's existing trading partners are invited. Vendors such as Webridge offer software to establish Private Exchanges, while vendors such as i2, Manugistics, and Vitria offer supply chain management software that can be enabled within a Private Exchange.

We view the Private Exchange, or evolved extranet, as the first step in the development of an intelligent supply chain.

For our purposes, there are three types of exchanges in existence today:
- Public Exchange
- Captive Exchange (also called COBAMs – Collaborative Online Brick And Mortar exchanges)
- Private Exchange

Align with Exchange Goals

The goal of the Independent and Captive exchanges is to create liquidity and thus ensure lower prices. Liquidity is a term meaning potential for marketplace activity. A marketplace that is not liquid does not have a lot of trading activity. There may be too many vendors, too many buyers, or not enough of either. A liquid marketplace tends to put pressure on prices. It's hard to maintain a high price if there are many competing vendors who may cut prices to get the deal.

The goal of a Private Exchange is typically not liquidity, although a critical mass of transactions is necessary to justify its existence. Rather, a Private Exchange's goals may be to improve communications and increase collaboration with supply chain partners. The buyer and the suppliers can design new products or logistical flows, and all can benefit from greater visibility into what's happening in the supply chain. The Private Exchange is more about creating lower costs through decreasing supply chain friction rather than through increasing competition.

Remove Friction

Exchanges use several methods to take the friction out of procurement:

- Hosted Catalogs
- Auctions (including reverse auctions)
- RFP/RFQ
- Bid/Ask Exchanges

Hosted Catalogs, like Grainger.com, feature fixed price procurement. A purchasing agent visits the site, searches the catalog, and selects items, usually using a market basket methodology. Payment is frequently via credit card, but may involve PO's or trade credit relationships. A sophisticated catalog site will have the ability to display different prices to different users, based on negotiated contracts. Catalog aggregators make it easier on purchasing agents by bringing together several vendors' catalogs into one site. Purchasers may even set up their own catalogs on their own web sites for the ultimate in customization. The leading eProcurement vendors, Ariba and Commerce One, both offer catalog capabilities.

Auctions, such as IT equipment marketplace TekSell.com, typically feature at least the so-called English auction. In an English auction, the price rises as multiple buyers top each others' bids. Other auction types include Dutch, which can have multiple winners, and reverse, where a purchaser asks vendors to bid on providing a particular item. In Dutch auctions, prices typically rise much like an English auction. In reverse auctions, the price typically falls as vendors compete with one another to win the right to supply the item. Ariba and Commerce One offer auctions in their solutions, and there are a variety of other vendors such as FreeMarkets that offer specialized auction software.

RFP/RFQ (Request For Proposal or Request for Quotation) methodologies, such as those offered by SupplierMarket.com (now part of Ariba), allow purchasers to publish a request for goods or services and receive bids. This method is similar to a reverse auction, and prices to tend to fall as a result of competition. But RFP/RFQ services are typically used for non-commodity items with some kind of customized component. These tools are used more for sourcing decisions than spot procurement, and are often an integral part of direct materials solutions.

Bid/Ask Exchanges, such as the National Transportation Exchange, are what we generally think of when we think of exchanges. Like the stock markets, there are multiple buyers and multiple sellers. Typically what is bought and sold is a commodity, such as stocks, grains, energy, or excess truck capacity. Prices rise and fall with supply and demand using a bid/ask methodology. Vendors such as Living Systems provide software to set up this type of exchange.

Many of these techniques are used in current Private Exchanges, and some will continue to be used in intelligent supply chains. For example, catalogs and RFP/RFQ applications are valuable tools for supply chain use. Auctions and bid/ask tools are less likely to play a significant role in the intelligent supply chain.

FUTURE FOR EXCHANGES

The various industry analysts mostly paint a rosy future for Internet exchanges:

- Analysts predict 2,000 to 10,000 online marketplaces by the end of 2003

- GartnerGroup estimates $7.3 trillion in global corporate spending via exchanges in 2004, up from $145 billion last year

- Forrester predicts trade via real-time models will reach $746 billion in 2004

- Yankee Group says marketplace transactions will total $850 billion by 2004

- Morgan Stanley Dean Witter estimates 5 percent of corporate goods will be obtained through auction by 2003

Despite this optimism, there are some false expectations. For example, AMR Research predicts that the more than 600 exchanges today will be reduced to 50 to 100 in 2001. Other analysts also predict a future consolidation of the burgeoning exchange market, with some, like Morgan Stanley Dean Witter's Mary Meeker, asserting that only one or two exchanges per industry will survive.

But GartnerGroup makes an even more chilling prediction: By 2005, "the entire supply chain between suppliers and buyers will be automated." To understand the effect of this prediction, we must first examine why Public Exchanges are proliferating today.

WHY AN EXCHANGE?

Why are exchanges popping up all over the B2B landscape? And why are so many of them public or independent exchanges?

One reason has been the slowness of bricks and mortar (BAM) businesses to embrace the Internet. This is a classic scenario that was played out in the Amazon/Barnes & Noble drama in the business-to-consumer (B2C) arena. When Amazon launched back in July 1995, very few BAMs were thinking about the potential of the Internet to challenge their business models. Amazon provided a compelling shopping proposition for book lovers: They launched with a million titles, took credit cards securely, and shipped the product quickly, while you didn't need to stray from the comfort of your keyboard. It was years before B&N took notice, and longer before they countered. By that time, Amazon had seized the technological high ground and established a brand and a loyal franchise.

This same scenario is playing out in countless B2B industries today. One main difference is, the timeframe is very much compressed. Another difference is, many of the B2B BAMs have learned the lesson and refuse to be Amazon'd.

It can be argued that the current exchange marketplace is the result of a lot of wired companies who "got it" and raced to beat the BAMs into the marketplace with exchanges. These innovators had the advantage of time, technical savvy, and nimbleness. The BAMs, like Sears and Carrefour with their GlobalNet Exchange and Kroger, Target, and Kmart with their Worldwide Retail Exchange, are roaring back, however. And it remains to be seen if a Public Exchange can survive a challenge from one or more industry BAMs.

Nonetheless, many of these combatants may be missing the point. Yes, exchanges are about procurement, but there's more to B2B than procurement. Many current exchange purveyors don't "get" the truth about the real e-commerce opportunity: intelligent supply chains.

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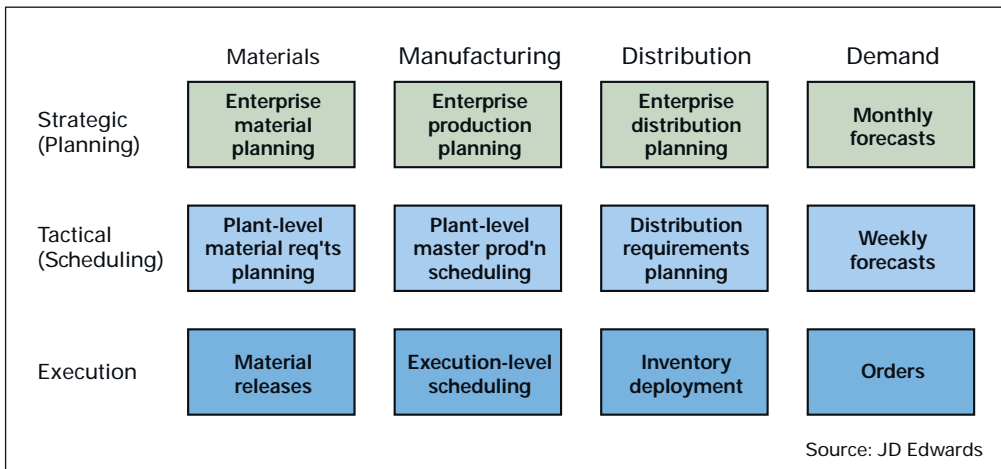
IT'S ALL ABOUT SUPPLY CHAINS!

Essentially, exchanges are really about the supply chain, either the indirect goods supply chain or the direct materials supply chain. Typically, a business' supply chain makes up the single largest cost component, anywhere from 55 percent to 85 percent of revenue. But industry analysts estimate that as much as 80 percent of today's businesses are still doing their core transactions via paper, whether it's fax or mail. Thus the concept of electronically-enabled Supply Chain Management (SCM) has received increasing attention by software vendors and supply chain participants alike. SCM is widely seen to have two components:

- **Supply Chain Planning** – involving determining (specify, design, plan) what materials or services are required, finding (sourcing) a vendor that can provide them under proper terms, initiating a business relationship for procurement, and creating inventory and logistical plans. Areas involved in planning include: network design, supply planning, demand planning and forecasting, distribution planning and plant floor scheduling.

- **Supply Chain Execution** – involving putting the plans into practice and modifying them as events dictate. An especially important aspect of execution is logistics, ensuring the delivery of inbound and outbound goods or services. This can include: everything from order processing, financing, credentialing (for regulated or hazardous materials), transporting, receiving, warehousing, inventorying, customer service and tracking.

Industry analysts estimate that as much as 80 percent of today's businesses are still doing their core transactions via paper, whether it's fax or mail.

The following figure represents what ERP vendor JD Edwards views as the categories of management necessary to implement SCM successfully.

	Materials	Manufacturing	Distribution	Demand
Strategic (Planning)	Enterprise material planning	Enterprise production planning	Enterprise distribution planning	Monthly forecasts
Tactical (Scheduling)	Plant-level material req'ts planning	Plant-level master prod'n scheduling	Distribution requirements planning	Weekly forecasts
Execution	Material releases	Execution-level scheduling	Inventory deployment	Orders

Source: JD Edwards

Some of these supply chain interactions will pertain to commodity goods such as oil or personal computers. In this type of indirect goods scenario, the value proposition of an exchange is straightforward: Increase the efficiency of the marketplace by getting the best price for the purchaser. Relationships and a high level of communication are

less important in this type of transaction, and there tend to be low switching costs for finding replacement vendors. Also, there are low barriers to entry for either vendors or exchanges. Yet even by 2005, Public or Captive Exchanges are only forecast to account for a small fraction of worldwide B2B commerce.

But what about the supply chain for direct materials — the goods and services that form an enterprise's main business? Direct materials may be highly customized, made to order, or engineered. In the old business world, relationships, as expressed in product design collaboration and supply chain visibility (where's my shipment?), were paramount in this arena.

Participation in a supply chain was generally based on long-term relationships. You have lunch, play golf, and then build up trust through a series of successful transactions. The switching costs in the old world were generally enormous. You need to build an entirely new relationship. You need to establish trust in a new partner. It all takes time.

Relationships and the Goal of Exchanges

Today, it is safe to assume that, on the whole, most businesses are more or less satisfied with their vendors. In the BAM world, most businesses have probably been working with their vendors for years. And most are usually satisfied with the way they acquire new vendors. On the other hand, it is also safe to assume that most vendors would love to form relationships with more customers.

Thus, buyers and vendors have fundamentally different goals: The buyer seeks efficient, low-risk relationships; the seller/vendor seeks efficient prospecting for opportunities. These goals will inevitably align with the goals of the various types of exchanges:

- **Public Exchange** – many-to-many – liquidity and transparency (ability to see the marketplace)

- **Captive Exchange** – few-to-many – price efficiency

- **Private Exchange** – one-to-many – supply chain efficiency, including optimum price and high reliability, but perhaps more importantly, involving partner collaboration and supply chain visibility

Today, then, vendors would seem to have more interest in participating in a Public Exchange that could help them connect with more customers, although the downside is pressure on prices. Buyers of commodities may like Public Exchanges due to the liquidity (the availability of product on immediate terms), but worry about vetting the reliability of new partners.

When dealing with direct materials, however, buyers are more interested in stream-lining their interactions with vendors, increasing collaboration with their partners, and gaining better information about conditions throughout their supply chain. Buyers naturally want to drive costs out of their supply chain, but may not be as concerned with beating up their vendors over price as they are in making the interactions with those vendors more efficient. They are not generally as interested in making the market as a whole more efficient. While buyers may participate in captive exchanges for competitive reasons or to exert price pressure, a buyer's supply chain is inherently a one-to-many marketplace, and the information that flows along it is very sensitive and must remain private.

So vendors' goals are aligned with public and, to a lesser degree, Captive Exchanges, while buyers' goals are aligned with Private Exchanges.

For this reason, we predict that by the end of the decade, most enterprises will have developed Private Exchanges to automate and facilitate their private supply chains. The number of Public Exchanges will stabilize around the middle of the decade and will decrease from there through attrition and consolidation until there are relatively few Public Exchanges, primarily based around commodities.

Just a few predominant standards will emerge, upon which these Private Exchanges will operate, thereby allowing vendors to easily participate as members of many different buyers' Private Exchanges. These standards will be to Private Exchanges as national currency is to a country's national economy – a uniform system of commerce accounting.

The Supply Chain Evolution

The Internet compresses business time. This is evident in the way our attitudes have changed about basic things such as obtaining business news. In the old world, news came daily in the newspaper, TV, or radio, for the most part hours after the fact; weekly via industry newsletters, generally days after the fact; monthly or quarterly via magazines, generally months after the fact; or through word of mouth. Today news comes by the minute, live, online. When you read about it the next day in the newspaper, it seems old. In the future, news will find you wherever you are via wireless technology. This change has occurred extremely rapidly; did you even have a cell phone a decade ago?

The Internet is similarly compressing business decision time, and this includes the decision process regarding trading partners. And the major reason for this is the availability of information. Most of the effects of the Internet can be boiled down to the fact that it has sped up the transmission, dissemination, and thus availability of information. These attributes are revolutionizing trading partner relationships and are accelerating, we believe, the transformation of supply chains into Private Exchanges and from there into intelligent supply chains.

The following figures illustrate the evolution of the supply chain from the traditional, pre-Internet supply chain, through the existing disintermediated supply chains to the future Web-enabled intelligent supply chain.
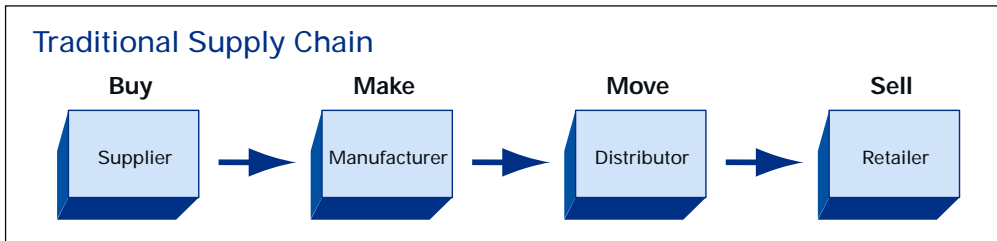
Traditional Supply Chain

The Internet is similarly compressing business decision time, and this includes the decision process regarding trading partners.

In the traditional model, each component of the supply chain is an island of processes, connected via phone, fax and mail. Information moves slowly across the gaps, and the chain responses lag problem indicators. Because of long lead times, inventory is often used as a buffer for unpredictable demand, and this leads to waste. Problems are generally worked out through collaboration between adjacent supply chain components only. The lack of robust information connections makes demand forecasting very difficult.

Current Supply Chain
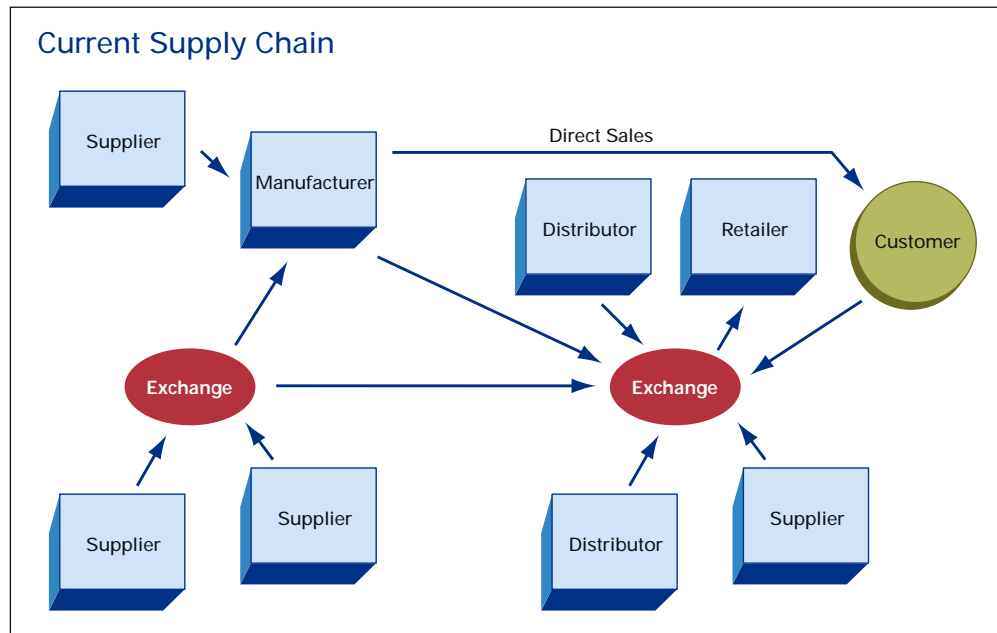
Today, traditional supply chain members find themselves in different configurations due to the rise of the exchange, or Net Market, and the ability of the manufacturer to disintermediate chain members and sell direct to the customer via the Internet. Some parts of a company's supply chain have aggregated around exchanges, both on the manufacturing side and the on the distribution side. Indeed, some businesses' customers have also begun to participate in exchanges themselves, and may replace some of the business' functions in this way. The positive aspects of being able to quickly and easily find new trading partners are offset by the lack of sufficient processes to maximize new relationships.

Future Supply Network
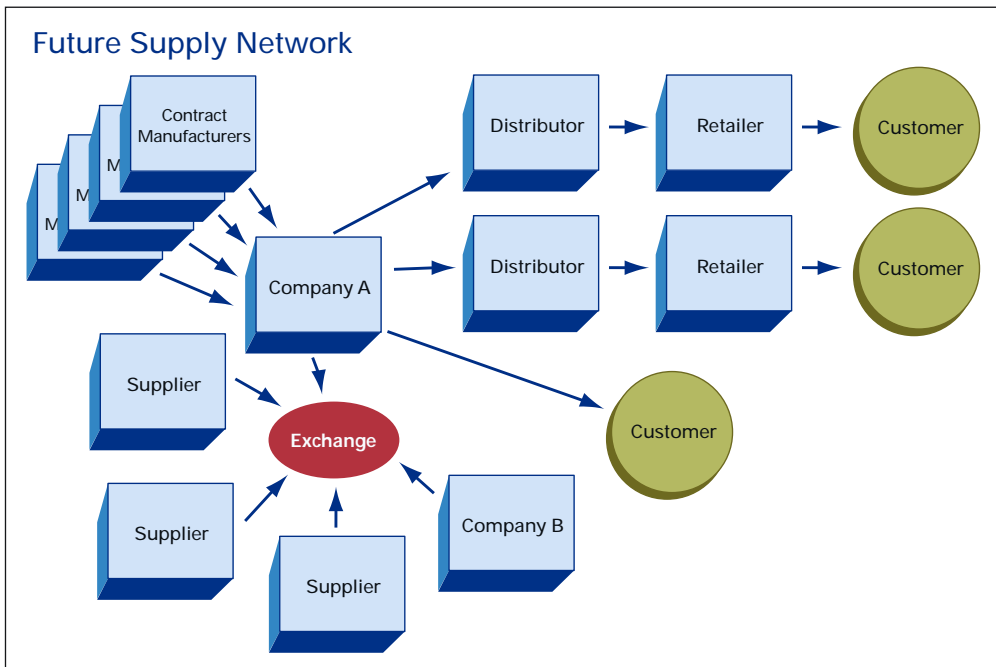
In the future, the virtualization of the corporation will continue, with many companies consisting of little more than the intellectual property that makes their products distinctive. Surrounding this core will be a flexible supply network with many inter-changeable parts. Manufacturing processes will routinely be outsourced, as will many other aspects of the supply chain. Companies will have more distribution options because the costs of finding, binding, and optimizing new network partners will be reduced through use of collaboration and improved forecasting and planning applica-tions. Enterprises will find themselves increasingly in "co-opetition" with traditional competitors (see the Covisint COBAM). Although many functions will be outsourced, enterprises must retain control over new product design and supply chain planning and forecasting with the dual goals of being more responsive to the demand chain and reducing the costs of transacting business.

In 1937, economist Ronald Coase observed that the purpose of geographically dispersed enterprises was to counter market inefficiency by reducing the transaction costs of the repetitive, complicated activities of creating, selling, and distributing goods and services. In their book, *Unleashing the Killer App*, Larry Downes and Chunka Mui extended Coase's observation into the Law of Diminishing Firms. This law takes note of both Metcalfe's Law (the value of a network equals the square of the number of users) and Moore's Law (computer processors will double in power and capacity every 18 months, keeping physical size and costs fixed.) The result of these twin productivity drivers is extreme pressure on the value of large organizations due to increasing market efficiency. "As the market becomes more efficient, the size and organizational complexity of the modern industrial firm becomes uneconomic, since firms exist only to the extent that they reduce transaction costs more effectively."[1]

In other words, firms increase in size to the point where the next transaction would be just as cheap if done outside the firm. Downes and Mui don't predict the disappearance of the corporation, however. "Firms will not disappear, but they will become smaller, comprised of complicated webs of well-managed relationships with business partners that include customers, suppliers, regulators, and even shareholders, employees, and competitors."

The current extranets, where companies invite their partners to interact in a private secure environment, are evolving into full-fledged private marketplaces, and will evolve from there into intelligent supply chains. For example, Owens Corning's Internet-based order processing tool enables its customers to define their own orders, determining whether they want to build a full truckload for their own order or split a load through a less-than-truckload (LTL) shipment. The system allows online pricing, truckload sizing, order entry, acknowledgment, invoicing and status checking. The company not only benefits from more-satisfied customers, but it also has a new source of data about it's demand chain.

Cemex, a global cement and concrete company that operates in Mexico, uses Web-enabled GPS (Global Positioning Satellite) systems to direct legions of roving cement trucks to job sites in real time. Because of the traffic situation in Mexico City, trucks often couldn't make it to job sites on time unless deliveries were scheduled well in advance. As a result, customers cancelled, changed or rescheduled up to half their orders. The Web solution has significantly improved delivery time accuracy, allows customers to track their deliveries online and has improved productivity by 35 percent. Using the older phone-, fax- and mail-based supply chain, such improvements were impossible. The information just moved too slowly.

Much attention has been devoted to how faster, wider, and more available information is beginning to create tremendous efficiency within supply chains. Many analysts focus on the removal of friction in the procurement process, and this is undoubtedly an important potential savings for business. According to Zona Research, "Reengineering procurement processes to generate benefits often has an almost 1-to-1 impact on the bottom line." Small wonder that procurement, especially of commodities, has received such attention.

However, there are aspects to B2B e-commerce and to the supply chain beyond straight procurement. When you think of all the interactions that go on between two trading partners, the actual placement and fulfillment of standard orders with existing vendors may be the least important.

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HOW TO BUILD AN INTELLIGENT SUPPLY CHAIN

In the intelligent supply chain (also known as a dynamic supply network, a supply net, or a value net), all participants have supply-chain-wide visibility and responsiveness, engage in planning and execution based on real-time event triggers, and focus on "customer pull" (demand chain visibility) versus "supply chain push" (traditional demand forecasting).

The intelligent supply chain has the following characteristics:

- **Customer Focused** – Ideally the supply chain is completely responsive to, and driven by, the demand chain. Information about demand is granular and available to all participants.

- **Efficient** – Activities that don't add value, such as excessive inventories (and associated costs) or redundant processes and procedures are minimized or eliminated.

- **Flexible** – The supply chain is able to respond to demand in close to real time, and is able to replace old or plug in new participants with a minimum of effort or disruption.

- **Fosters shared roles and responsibilities** – The supply chain is focused on the goal of making and delivering the good or service, but responsibility and authority is delegated among the trading partners. Rather than responding to the dictates of a manufacturer, trading partners collaborate to manage key business processes.

- **Organized around business processes, not functions** – For example, transportation planning involves key stakeholders from manufacturer, distributor, and retailer and is not controlled by a single job function.

As defined by the Meta Group[2], the ingredients of an intelligent supply chain are:

- **True visibility to actual demand:** Understanding true customer demand is essential for a pull-driven approach to supply chain management. In the old supply chain, this kind of information can be extremely difficult to obtain, primarily because other supply chain members own the ultimate customer. Understanding demand can mean obtaining store-level point-of-sale data from retailers as well as Web-based data sharing and collaborative planning applications. Businesses must remember that the information not only needs to flow freely from the business to its partners, but within the company's own internal processes and technologies. This may require some internal process re-engineering to accomplish.

- **Web-enabled global visibility**: Near-real-time track and trace of inventory at the SKU level must be established to optimize logistics and responsiveness. Traditional EDI (Electronic Data Interchange) will continue to be important. However, Internet-based applications are more flexible in collecting relevant carrier information and enabling real time response. Software providers such as Blinco Systems, Descartes Systems, i2, Rockport Trade, and Syncra as well as new service-oriented providers such as Global Logistics Village and Global Technology Services are taking the lead in this area.

- **Componentized application architectures**: If an enterprise is to remain flexible in choosing trading partners and modes of communication, the IT infrastructure supporting the supply chain must also be flexible. Using a component approach in creating supply chain systems enables rapid deployment of new capabilities, faster customization of functionality, and event-driven architectures that trigger intelligent reaction. Although a warehouse management system (WMS) approach currently predominates, vendors such as EXE, Logility, Manhattan Associates, and HK Systems are moving down the componentry path. McHugh Software has taken an aggressive approach toward componentry with its DCS WMS application.

- **Real-time planning/execution linkage**: Supply chain planning and execution data flows and process flows must be linked. For example, data integration enables a transportation plan to be available to the WMS for order pick sequencing. Process integration enables transportation planning and the WMS to collaborate and optimize the cost trade-offs between the size of a pick wave and the transportation loading plan. The logistics execution suite of McHugh Software and the developing relationship between planning vendor i2 and execution vendor EXE envision this type of process integration, while Manugistics achieves integration with WMS vendor Catalyst.

- **Reporting and analytics**: You need to measure it to manage it, and the availability of reporting and analytical applications can be critical to the improvement of supply chain efficiency. Performance Measurement Group found that four indicators are especially effective for measuring resource utilization and supply-chain efficiency:

  1. Total supply-chain management cost

  2. Upside production flexibility, or the number of days required to achieve an unplanned, sustainable 20-percent increase in production

  3. Cash-to-cash cycle time, the gap between payments made for materials and payments received for products

  4. Delivery performance to request, the percentage of on-time or better order fulfillment.

Although these measurements are relatively easy to calculate, reporting and analytics often involve a custom effort to extract operational data, load it into a data warehouse, and write custom reports. This is an area in which many supply chain software vendors need to improve. InfoRay, through eMetrix[3], its joint effort with GartnerGroup, offers applications that provide real-time reporting on supply chain efficiency. SeeCommerce, in its SeeChain application, provides alerts and reports that help you assess the health of your supply chain in real time. Meta Group feels that efforts like these will give rise to the new concept of "logistics statistical process control," using concepts widely deployed in manufacturing environments to inform supply chain operations around predefined tolerance bands and reduced performance and service variability.

- **Common messaging-alert system backbone**: Since most supply chain application vendors are in early stages of messaging and alert capabilities, the difficulty of cascading and escalating alerts across multiple systems presents a real possibility of "alert systems chaos." In addition to SeeCommerce's integrated package, alert systems solutions are available from Enterprise Integration Application-oriented vendors (like Viewlocity's Shipment Visibility and Inventory Visibility), supply chain vendors (like Numetrix, acquired by JD Edwards and now integrated into OneWorld), and vendors that specialize in providing alert software (like Categoric Software's Xalerts, which enables wireless alerts). Meta Group estimates that cross-enterprise supply chain messaging and alerting will not be in general implementation until 2003 and tags Categoric, Descartes Systems, Viewlocity, and JD Edwards as leaders in this area.

The Aberdeen Group[4] adds two additional points to these intelligent supply chain attributes:

- **Enable universal self-service access** – All supply chain participants need immediate access to supply chain data 24/7 as well as a degree of autonomy in rooting out and solving problems.

- **Support demand-driven business procedures** – In many respects, the evolution of the supply chain is all about integrating with the demand chain. In a perfect system, demand would drive supply (and, implicitly, manufacturing) thus eliminating inventory and logistical waste. The business processes must support the software processes or demand-driven supply chain planning and execution will not succeed.

At this stage in SCM's evolution, unfortunately, the components of the intelligent supply chain must be assembled from multiple providers. This means transforming your supply chain will likely involve partnering with a development partner, such as Geneer, to integrate the various pieces with your legacy systems with best of breed software from supply chain vendors.

Increased Collaboration is Key

One omission in the Meta Group's definition of the intelligent supply chain is collaboration. The future supply chain must be collaborative in nature. There is no benefit to having increased data and analytics if only the supply chain owner can act on it. In fact, the concept of a single owner of the supply chain is evolving into a joint ownership model. Flexibility is an important attribute of the intelligent supply chain, and involving all supply chain partners in receiving information and collaborating on solutions is key to achieving flexibility.

In the current business environment, it is people talking to people that drives innovation in the form of new products and new supply chain processes. There is no reason to believe this will not be the case in the future. However, the efficiency of this collaboration will be greatly enhanced by the tools available and under development today.

In his white paper, *The Seven Immutable Laws of Collaborative Logistics*[5] , Dr. C. John Langley, Jr. identifies several activities participants in successful collaboration networks must do:

- **Investigate** – Understand the value proposition prior to joining the network
- **Integrate** – Synchronize individual firm business process with those of the network
- **Acclimate** – Find potential partners on the network that may add value
- **Negotiate** – Establish the rules of engagement with a collection of partners
- **Cooperate** – Share resources according to the rules of engagement, transact on the network creating gains via shared resources
- **Evaluate** – Measure the benefit/cost of collaboration for each member firm
- **Regenerate** – Extend or regenerate the collaboration assuming it has benefited each of the member firms

Langley further identifies four stages of collaboration:

- Stage 1: **Messaging** – Able to synchronize individual business processes through messaging transactions such as EDI and XML
- Stage 2: **Shared Data** – Able to share historical data for reporting and process validation
- Stage 3: **Shared Process** – Able to create and share a single business process to be used by all members, across multiple enterprises
- Stage 4: **Shared Results** – Able to establish and automate cost- and gain-sharing agreements

The future supply chain must be collaborative in nature. There is no benefit to having increased data and analytics if only the supply chain owner can act on it

An important area for collaboration is the understanding of demand. In a traditional supply chain, the manufacturer is insulated from information about demand by other supply chain members and by order aggregation practices. For example, when a manufacturer gets an order from a distributor for 100 widgets, planners have no idea whether the order represents demand by one or 100 customers. Thus the nature of the demand chain is disguised. In a collaborative supply chain, manufacturer and distributor could collaborate to interpret the nature of the demand and feed this information back into the planning process. The transition to the collaborative supply chain is not going to be without challenges. The information being shared is valuable, and it will take time for participants to be able to trust each other to use the information for everyone's benefit. Such collaboration cannot flourish where one participant reaps a disproportionate benefit. If, for example, a large partner uses information collected from smaller retailers to drive its own marketing, but does not assist the retailer in optimizing its efforts, the retailer could resent being used merely as a data collector for the larger partner. There are likely to be many bumps on the evolutionary road to the collaborative supply chain.

While software can support such collaboration, closing the loop requires changing companies' business processes. "E-business is all about reengineering the business process," says David Altschuler, an analyst with the Aberdeen Group[6]. "The real thing that's going on here is that a process that has been historically defined in terms of relationships has been redefined with different technologies and infrastructures – all enabled by the massive infrastructure called the Internet." Changing the way people interact in fundamental business processes will not happen overnight. It will require tremendous effort and commitment. But the accelerating pace of business will make such change not only inevitable, but critical to survival.

Take the creation of a complex new product – a rocket engine for example. To facilitate the creation of a new propulsion system to compete with fire sale prices on Russian engines, Boeing's Rocketdyne division set up a Private Exchange. The exchange was designed to enable collaborative product development with vendors and customers and has become the poster child of the electronic collaboration movement. Using the exchange, project members:[7]

- Designed a product that cost 30% of its predecessor
- Reduced manufacturing cycle time by 63%, from two years to 10 months
- Cut development cycle time by 50%, from two years to one
- Improved product quality, reducing number of parts from 1200 to only 6
- Created a knowledge repository for re-use on subsequent projects

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This type of Private Exchange enabled unprecedented collaboration between the manufacturer, its vendors, and its customers. Such a process could not have been accomplished on a Public Exchange; there's too much proprietary information involved. The intense level of collaboration would have been very difficult to accomplish using traditional, site-based teams. The Rocketdyne team, however, was completely dispersed geographically. The secure collaborative facilities of a Private Exchange enabled this type of efficiency.

Unfortunately, the Rocketdyne effort was too far ahead of its time. The company has yet to repeat this type of process with other projects. And to make matters worse, the Russians came to their senses and raised their prices, reducing the need for the new engine.

The benefits of collaboration are not limited to small project teams. They are apparent throughout the intelligent supply chain. Electronic collaboration can be a key contributor to success in Inventory Management, for example. The widely used Aggregate Forecasting method has evolved into two inventory management techniques that require enhanced levels of interaction and collaboration: Vendor Managed Inventory (VMI) and Jointly Managed Inventory (JMI). In VMI, the vendor has great visibility into the buyer's inventory and is able to act upon information to ensure inventory efficiency. In JMI, the vendor and the buyer collaborate in managing inventory, to the point that they enter into joint business planning and forecasting. Building on the success of VMI and JMI, VICS, the Voluntary Interindustry Commerce Standards Association, developed CPFR® (Collaborative Planning, Forecasting, and Replenishment), a standard that fosters Collaborative Planning, Collaborative Forecasting, and Collaborative Replenishment.

The CPFR Process
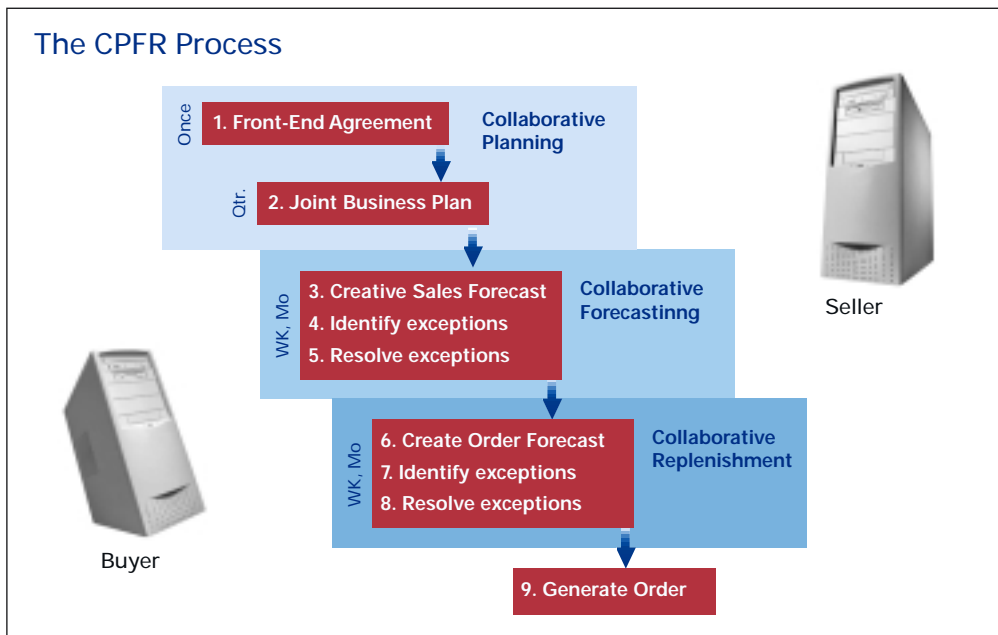
CPFR cannot hope to succeed without collaboration and information available in real time, electronically. The methodology is based on vendors and buyers sharing their objectives and business plans, and adapting them as events dictate.

Omni Consulting Group[8] defines the following requirements for successful collaboration in a supply network:

- The network must foster synergy value among traditionally single-facing party relationships (e.g. buyer-to-buyer or supplier-to-supplier)

- All agents must affirm economic productivity and output measurements from the network

- Trust and policy must maintain assurance of the network's goals (to produce economically-viable goods or services for which there is a demand)

- Risk must be balanced between the agents

- Rewards must be fairly distributed across the member participants

According to Meta Group, collaboration practices will evolve beyond planning activities into supply chain execution. "True collaboration will continue to focus on planning-related activities. But significant integration between supply chain participants also will be necessary to enable the high-velocity, event-driven supply chain execution models that will be necessary to compete by 2002-2003."[9]

Vendors promoting supply chain collaboration include those targeting CPFR (Syncra, Manugistics); those developing their own industry-specific process models (i2, Logility); vendors focused primarily on supplier collaboration and new product development (Agile Software, Parametric, WebPlan); and inter-company integration technology providers (Extricity, Vitria, Harbinger).

Rapid Re-Sourcing

Finding new sources for key direct goods may be necessary for many reasons: A supplier is late or can't handle the capacity; a vendor is not performing adequately; or competitive pressures require vendor replacement due to cost. Situations where there is only a single source for a part can make efficiency in finding a new vendor a critical business need. For example, a project manager for an aerospace company told us that a key part for an important system was supplied by a man who literally worked out of his garage. He was getting on in years, and was making noises about retiring. The project manager was worried about replacing this trading partner because, as far as he knew, there was no one else in the world who knew how to make this complicated part.

Finding a viable replacement vendor via a Public Exchange in situations like this might not be possible due to the confidential nature of the specifications or other intellectual property. How can you find a new vendor without yielding competitive advantage? You must first develop fairly extensive intelligence on the capabilities of candidate vendors. In the old world, this could be a very lengthy process, involving search firms, finder's fees, and credential evaluation.

In the future, online, exchange-enabled versions of third party business information sources such as Dun & Bradstreet, supplier ratings vendor OpenRatings, and especially Société Générale de Surveillance (SGS) will be critical. Founded in 1878, SGS is the largest verification, testing and certification organization in the world. They have a global network of personnel that can make on-site visits to remote trading partners' facilities and assess their ability to deliver as promised. SGS, seeing the increased need for their services in the online exchange world, has created a San Francisco-based operating unit called SGS OnSite. This brings SGS's capabilities for rating vendors, verifying product specifications, drawing and preparing samples, and carrying out pre-shipment inspections into the online world. They assign confidence scores to vendors based on historical and ongoing performance.

Why is this sort of development so significant? Because finding the right vendor for direct materials is tremendously important. The Aberdeen Group[10] estimates that sourcing takes 3.3 to 4.2 months on average. Further, 80 percent of the cost and structure of a product is built in during the design and sourcing cycles. Therefore, sourcing can determine the cost effectiveness and competitiveness of the organization. In the traditional supply chain, there are high switching costs for changing vendors as well as a lengthy timeline for due diligence. Availability of vendor verification and credentialing services to online exchanges will dramatically lower switching costs, allowing the quicker establishment of new vendor relationships.

In order to benefit from the growing flexibility of supply chain sourcing, you need to find and be found by trading partners. An effort initiated by Ariba, IBM, and Microsoft, called the Universal Description, Discovery and Integration (UDDI) Project, has recently established a central database of trading partner characteristics. Businesses will use this registry to find out about the capabilities of existing or prospective trading partners. The registry allows your business to:

- list a definition of itself and its services

- define how a partner can conduct e-commerce with your business

- describe the business services your Web sites offer

Once you register, your business is accessible through searches by potential buyers and marketplaces. You can register for free at http://www.uddi.org/register.html.

Strategic sourcing is a business process that demands a software solution. Supply chain information and applications enable enterprises to define optimal sourcing strategies based on spend history, demand, past performance, business objectives, market and commodity trends, and e-Market opportunities. Current practice, in which sourcing data is manipulated in spreadsheets, can't have the comprehensive scope or the responsiveness of an integrated software solution.

Vendor support for strategic sourcing among the dominant procurement and supply chain vendors, however, is spotty. While many have an RFP/RFQ function, few have more sophisticated tools. One of the market leaders is i2, whose TradeMatrix Buy Solution application supports commodity analysis, vendor analysis, contract analysis, design for supply, and spend aggregation. Other vendors applications offering strategic sourcing decision support include MindFlow's ProcureMind, Agile Software's Agile Buyer, NexPrise's ipTeam (tapped by Covisint for its marketplace), PTC's Windchill Sourcing FACTOR!, B2eMarkets' Buyer Insight (collaborating with D&B and OpenRatings), Webango's Source Select and Source Evolve, iCG Commerce's RealPurchase and Healy Hudson's eSW.

Strategic sourcing may well be the killer app for the intelligent supply chain. While increasing efficiency and saving money on processing purchase orders and other procurement documents is all well and good, the real return on investment is likely to be in reducing sourcing costs. According to a Forrester Research survey, while only a third of companies employ any outward-facing applications such as strategic sourcing today, 88 percent say they'll be running them by 2003.[11] Supply chain application vendor i2 estimates that companies can save between 3 and 5 percent by improving sourcing decisions using their software, and that one customer reduced their supply base by 50 to 80 percent while reducing time to market by 70 percent.

As the decade progresses, we will see much less resistance to vendor switching. In fact, according to the Meta Group, future supply chains will not only be extremely flexible, but also competitive. "A firm's success, however, is intimately tied to the chains that it participates in, and conversely the chain is only as strong as its weakest link. This extensive 'co-opetition' between chains and individual links will create a dynamic, flexible, and (usually) competitive marketplace. It will also prove difficult to manage from planning and organizational perspectives and will place great demands on an organization's technical architecture and infrastructure."[12]

Using intelligent supply chains in a Private Exchange context, companies will be able to attract, locate, partner with, and collaborate with new trading partners to a degree we cannot presently imagine. This is not a particularly far-fetched prediction. A real world company has already been built around these concepts: Dell Computer. By focusing on commodity parts, scrupulously bargaining for the lowest cost, and building machines just in time, Dell developed a ruthlessly efficient supply chain that ensured their price leadership and resiliency.

Retailer Balance of Power

A final trend that will drive the ascendance of the intelligent supply chain can be found in the consumer retail industry, particularly the grocery retail business.

For years, grocery stores have strived to manage their inventory and replenishment utilizing the data derived from their laser scanning checkout counters. A movement called Efficient Consumer Response (ECR) aimed for the nirvana where the entire supply chain was optimized. In the ideal, when a consumer purchase caused shelf inventory to drop, the whole supply chain responded to ensure no out-of-stocks (you're losing sales!) and no excess inventory (you're adding costs!). If a store sold a case of canned corn, a case was ordered from the warehouse, which ordered it from the manufacturer, all automatically.

Reliant on batch-oriented EDI, ECR is difficult to implement, and grocery chains have had varying degrees of success with the concept. Now there is a trend building that promises to transform the relationship between the manufacturer and the retailer forever. It's called Scan-Based Trading (SBT).

In Scan-Based Trading, retailers pay for inventory only after it has been purchased by a customer and scanned at the cash register. When combined with price synchronization software like that available from viaLink, SBT represents a potent cost cutting force. In a recent pilot program sponsored by the Grocery Manufacturers Association (GMA), supply, receiving, and overall distribution costs dropped an average of 59 percent. The pilot involved two retailers and 12 vendors of Direct Store Delivered (DSD) goods like snacks and bread. Invoice deductions, which the GMA estimates amount to approximately 8 percent of annual invoiced sales dollars, were reduced by a minimum of 70 percent. The GMA further states that SBT results in a 5 to 12 percent sales increase with a one to two point increase in margins. Bread maker Earthgrains, ice cream maker Dreyers and mega-retailer Wal-Mart have been implementing SBT for years.

SBT is a fundamental change in the way grocery retail works, and there is little doubt it will affect other industries as well. Brokerage firm Donaldson, Lufkin, and Jenrette said, "We believe that the next wave in supply chain management or B2B is about to be rolled out. We expect the next wave to reduce retailers net investment in inventory to near zero, pull inventory out of the channel reducing markdown pressures and transaction costs, and substantially reduce out of stocks." When SBT is fully implemented, inventory in the channel can decline by up to 75 percent implying reduced handling costs and reduced markdowns.

DLJ predicts that more than 5 percent of costs will be pulled out of the supply chain channel over the next five years, and retailers, vendors and consumers will share the savings. The impact of this efficiency? Retailers will finance their inventory with payables. Vendors will benefit from better information flow from the retail store, which will help them better plan inventory and perform demand forecasting. Vendors and retailers will establish joint business plans and find even more efficiencies from supply chain collaboration.

The SBT trend, combined with a new product tracking initiative out of MIT, will utterly transform not only the retail environment, but also the entire supply chain.

MIT's Auto-ID project[13] has attracted as members Sun, Procter & Gamble, Kraft, Gillette, International Paper and the Uniform Code Council among others. The first goal of the project is to place unique electromagnetic identification called an ePC (electronic Product Code) on each individual manufactured product. This, together with short-range wireless scanning technology, could replace the current UPC or bar codes. The technology can enable a machine to identify a product and access crucial information about it such as when and where a product was made, from where it was shipped, and how it should be handled, prepared and safely used.

The result will be products that can talk to the devices in your home – like a frozen dinner that tells the microwave how to cook it, or medicine that tells the medicine cabinet to reorder. That's great for consumers, but the implications of this added intelligence to the supply chain are even larger. Products can be tracked and managed throughout their life cycle. Inventory counting will take significantly less time to complete. There will never again be any question of where a product is in the supply chain. And all this additional data will be managed by trading partners within intelligent supply chains.

Other potential AutoID applications include:

- Better replenishment
- Soft sensing of product freshness
- Easier stock rotation
- Faster recalls
- Compliance checking
- Interaction warnings
- Counterfeit protection
- Identification of diversion
- Easier logistics for custom products
- Inventory management
- Production to demand ("pull")
- Direct order from home
- Theft prediction
- Identification of items by robots
- Faster checkouts
- Personalized marketing and advertising
- Consumer information in-store and at home
- Recycling

The project hopes to have the first AutoID goods in the supply chain by 2002.

CONCLUSION

The adoption of CPFR, SBT and intelligent product tracking virtually requires the establishment of an intelligent supply chain. These are just some of the components of the ultimate supply chain, and they're in development today. To get ready for tomorrow, you'll need a development partner like Geneer to help you adapt and use today's emerging best practices. Even more important is developing your organization's commitment to also evolve. This can mean getting involved in efforts where the ROI is not at all clear. It may also mean missteps and failures along the way, but the potential rewards and the competitive edge you'll develop can be substantial.

So, how can you get started? First, develop an intelligent supply chain strategy. Giga Group[14] recommends:

- Focus on business goals and core business processes, look for ways to use the Internet for improvements

  - Tactical improvements for quick wins

  - Strategic improvements for large benefits

  - Use back-end systems to improve the customer experience and understand what drives the customer buy decision

- E-business strategies should address key challenges

- E-business strategies are dynamic — revise every quarter

- E-business strategies are inclusive — a partnership of business and IT

The business planning process should include:

- Strategic Business Plan – Goals and Objectives

- Organizational, Functional, and Process Models

- Conceptual Data and Application Models

- Conceptual Distribution Model

- Conceptual Technology Model

- Implementation/Migration Plan

Private Exchanges comprised of extranets, catalogs, collaboration spaces, and automated supply chains, will evolve into intelligent supply chains and become the force that transforms unwired businesses into eBusinesses.
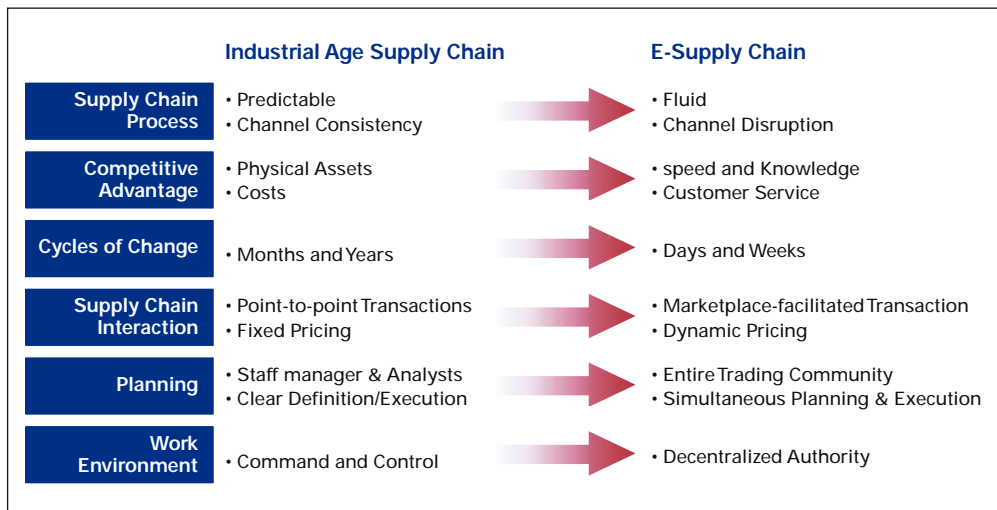
In many organizations, it is very important to seek the quick wins to maintain momentum for the effort. While implementing many of the new technologies and methodologies mentioned here can be a significant effort, introducing some form of supply chain collaboration can be a quicker win. And one fertile area of the supply chain for this type of improvement is outbound logistics. Transportation and ware-housing comprises 10 percent of the supply chain and supports a $3 trillion global logistics market according to Cass Information Systems.[15] Yet nearly 20 percent of capacity moves empty, which has prompted the creation of a number of exchanges, such as the National Transportation Exchange. Companies like General Mills are turning to vendors such as Nistevo to begin to achieve some of the benefits of eLogistics. By implementing collaborative logistics on just one truck route, General Mills saved 19 percent, decreased driver turnover to 10 percent, and achieved 99 percent service reliability.[16]

Quick wins notwithstanding, there are still a number of formidable challenges you'll face[17]:

- Getting management, end-user, customer and vendor buy-in
- Dealing with multiple and international sites and partners
- Changing culture and mindsets
- Moving to new business processes and a new IT platform
- Integrating SCM and ERP modules and products
- Integrating legacy systems and data; data analysis and conversion
- IT training; getting and keeping IT staff
- Finding the right development partner
- Costs

But the rewards will be worth it. Who wouldn't want the e-supply chain on the right of the next figure?[18]

	Industrial Age Supply Chain	E-Supply Chain
Supply Chain Process	• Predictable • Channel Consistency	• Fluid • Channel Disruption
Competitive Advantage	• Physical Assets • Costs	• speed and Knowledge • Customer Service
Cycles of Change	• Months and Years	• Days and Weeks
Supply Chain Interaction	• Point-to-point Transactions • Fixed Pricing	• Marketplace-facilitated Transaction • Dynamic Pricing
Planning	• Staff manager & Analysts • Clear Definition/Execution	• Entire Trading Community • Simultaneous Planning & Execution
Work Environment	• Command and Control	• Decentralized Authority

So get ready or get run over. We predict that the handful of Public Exchange failures will become a flood and will result in an exchange crunch within the next two years. Concurrent with that, Private Exchanges comprised of extranets, catalogs, collaboration spaces, and automated supply chains, will evolve into intelligent supply chains and become the force that transforms unwired businesses into eBusinesses. Those standing on the sidelines wringing their hands over the risk inherent in change are likely to get out-maneuvered by competitors who seize this opportunity to reap real savings today and enjoy a competitive advantage tomorrow.

FOOTNOTES

[1] Downes, Larry and Chunka Mui, *Unleashing the killer app: digital strategies for market dominance*, Harvard Business School Press, Boston, MA, USA.

[2] http://www.metagroup.com/communities/ccm/ads768.htm

[3] http://www.gartner.com/emetrix

[4] http://www.aberdeen.com/ab%5Fabstracts/2000/01/01001705.htm

[5] http://207.87.183.164/cgi-bin/main_reg_record.pl#

[6] http://www.informationweek.com/790/ssnext.htm

[7] Presentation at Delphi eBusiness Summit, November 30, 2000, "Streamlining Product Design with Collaborative Commerce," R. L. Carman, http://www.oneclickb2b.com/presentation_archive/pdf_archive/2000_b2b_summit/carman_r_l.pdf

[8] http://www.omniconsultinggroup.com

[9] http://www.metagroup.com/communities/ccm/ads832.htm

[10] http://www.mindflow.com/mf-aberdeen_report.asp

[11] http://www.forrester.com/ER/Research/Report/Interviews/0,1338,10071,FF.html

[12] http://www.metagroup.com/communities/ccm/ebs929.htm

[13] http://auto-id.mit.edu/index2.html

[14] http://www.gigaweb.com/marketing/search/loadContent.asp?intResourceID=28&urlContent=http://www.gigaweb.com/Content/GigaTels/eag-082000-00002.html&intKSalonID=&intGContextID=6

[15] http://www.cassinfo.com/freight_payment_products.html

[16] "*Foresight in the Collaborative Supply Chain*," presentation at Delphi Group's B2B Summit, November 30, 2000. Online version not yet available at http://www.oneclickB2B.com

[17] http://www.delphiweb.com/delphiweb/virt_conferences/virtual-ibps/vibps/ibps99-ed_lewis.pdf

[18] http://www.broadview.com/info/info_ereport_form.html

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