e-commerce and supply chains – breaking down the boundaries

Andrew J. Berger

Internet technologies have already had a dramatic impact on the way that people around the world think and act. In the six or so years since the World Wide Web’s inception, its speed of acceptance has been unprecedented. The first two years of the 21st century have seen a boom and a bust in predictions of the impact of technology on supply chain management. For instance, a recent study conducted by the Momentum Research Group found that United States organizations currently deploying Internet business solutions had realized cumulative cost savings of $155 billion over a three-year period, starting on average in 1998. Furthermore, the study estimated that US organizations deploying Internet business solutions expect to realize $0.5 trillion in cost savings once all Internet business solutions have been fully implemented by 2010. I suspect that these estimates are probably realistic for the potential of 2010 but over generous in their assessment of benefits being delivered to current supply chain.

Supply chains have been affected by this new economy of e-commerce solutions, but I believe the major changes that are possible will take a lot longer to happen. To use a showbiz phrase: ‘you ain’t seen nothing yet!’ Organizations have experienced a period when many people involved with supply chain technology and software lost the plot when it came to the potential delivery of business benefits. People commonly confused the potential for very significant supply chain benefits, with the capacity of a technology solution to deliver those benefits. For a period, it seemed that causality between benefits and solutions had become unnecessary. Many companies learned the expensive way that supply chains are complex beasts to tame; there are rarely ‘magic bullets’ for success. However, we are now seeing more practical and effective approaches to delivering supply chain improvements through e-commerce. With
time, these new approaches have a big potential to address the clear performance gap that exists between what companies are achieving in their supply chains and what they could achieve.

This chapter will address the five major questions:

- Why will e-commerce have an impact on the supply chains of companies?
- Where will e-commerce affect the supply chain in the future?
- How is e-commerce affecting supply chains already?
- When will the major impact of e-commerce on supply chains emerge?
- What is the future impact of e-commerce that we should be preparing for?

**Why will e-commerce have an impact?**

e-commerce can be defined as the conduct of business communication and transactions over networks and through computers or as the buying and selling of goods and services, and the transfer of funds, through digital communications. It can include all inter-company and intra-company functions (such as marketing, finance, manufacturing, selling and negotiation) that enable commerce. e-commerce uses communications such as electronic mail, EDI, file transfer, facsimile, video conferencing, workflow, or interaction with a remote computer. e-commerce has also become associated with solutions and tools such as portals, e-marketplaces, e-auctions or virtual inventory. The last few years have seen a dramatic increase in the capabilities of e-commerce as hundreds of millions of dollars were invested in building new solutions and in fighting a marketing war for apparent first mover advantages.

So why should all this investment in technology and communication have an impact on the supply chains of companies? At a simplistic level, supply chains are typically made up of three major flows – physical, financial and information. e-commerce has the capacity to affect all three.

- **Physical flows** can be affected by using information to avoid physical movements and to make product information available through virtual ways. In essence, e-commerce can give companies access to more markets and customers without the physical need to move the levels of product and inventory that were required in the past.
- **Information flows** can be affected by the capacity of e-commerce solutions to provide ‘24 x 7 x 365’ access to information and to eliminate traditional paper-based approaches to working and company interactions. e-commerce is also particularly well suited to providing information such as product tracking and tracing.
- Financial flows can be affected by the capacity for e-commerce solutions to offer faster payment and settlement solutions at all stages of the supply chain.

At a more sophisticated level, e-commerce will have an impact on supply chains for five main reasons:

- The performance gap can no longer be hidden. An undoubted impact of the last few years has been the way that dot.com companies have helped to highlight the gap between the level at which companies’ supply chain could and are performing. It is now clear that major companies can no longer afford to be complacent about under-performance. Given that companies now know they need to change, e-commerce-related solutions are the logical enablers of new levels of performance.

- Companies have new capabilities that are not yet fully exploited. Most major companies have implemented new capabilities as a result of concerns over Y2K and the e-commerce revolution. For instance, many companies now have major ERP systems that integrate data between functions, locations and countries. They have the capacity to manage operations at a different level not only internally but also with customers and suppliers. In addition, many companies have bolted on best-of-breed software applications, such as e-procurement, demand and supply planning and e-logistics, to these ERP systems. Most companies are still at an early stage of exploiting these capabilities but will increasingly use e-commerce to deliver the benefits from these existing investments.

- Technology companies have invested heavily in new e-commerce solutions. The last few years have seen an unprecedented investment by technology companies and their financial backers into new supply chain technology. There has been an acceleration of the development of new software technology to support supply chain management. This has been particularly evident around procurement, marketplace, planning, and event management and fulfilment software. The casualty rate among software companies has been high. However, supply chain software now exists that software companies need to sell to get a return on their investments. We can expect them to remain aggressive in continuing to develop and sell new e-commerce solutions.

- The supply chain is one of the last major areas of business benefit. Supply chain change is hard work. Many companies have avoided addressing some areas of the supply chain because they have been too difficult physically or politically. e-commerce will help to break down this reluctance to address supply chain opportunities in two ways: by providing new solutions to old problems and by helping to reduce the political barriers to cross-functional, cross-company and cross-country changes.
The future competitiveness of companies will be fought out between value chains of partners on a global basis. The world is shrinking and the supply chains of companies are having to become more integrated between customers and suppliers and across geographies. E-commerce will be a key enabler of this integration and collaboration. The ability to use e-commerce to work with business partners quickly and effectively will also be a key differentiator between value chains of multiple companies. Business partners will become increasingly demanding of their supply chain partners and particularly their e-commerce capabilities.

Where will e-commerce have an impact?

E-commerce will not change what needs to happen in the supply chain, but how it is done. Business processes rarely disappear, they just get done differently. The impact of e-commerce on the supply chain will be felt in how work is done, including how areas of the supply chain interact, and in how supply chains operate between company and geographic boundaries.

e-commerce and how work is done

E-commerce will have an impact on all major areas of supply chain work in companies from design, through buying to fulfilment and service support. The major areas of work inside companies can be illustrated using a simple process map of a supply chain, as shown in Figure 4.1.1. The process map shows the high-level flows and interactions between suppliers’ suppliers and customers’ customers. It can also be used to show where e-commerce will have its greatest impact:

- **Indirect procurement.** E-commerce will have a direct impact on both indirect and direct procurement of goods and services. E-procurement applications, such as CommerceOne, Ariba and Rightworks, are being used to bring greater efficiency and effectiveness to the buying of indirect goods such as travel and stationery. The major benefits from such programs, which are typically in the 5–15 per cent range, will always come from effective strategic sourcing. E-procurement will have its greatest effect on change management and compliance. In some cases, indirect procurement will be shifted to e-marketplaces or outsourced procurement services using e-procurement solutions
- **Direct procurement.** Direct procurement represents a bigger prize for most companies than indirect spend simply because of the size of direct spends. In this area, the combination of e-commerce procurement solutions with existing ERP and MRP systems has the capacity to provide large efficiency savings. The level of these
Figure 4.1.1

e-commerce impact on supply chains

Source: Berger, A. J. and Gattorna, J. L. (2001)
savings will clearly depend on how well direct procurement is currently managed. In some cases, the major benefits will come from the integration of ERP, MRP and demand and supply planning systems. Procurement is, at the end of the day, a matter of visibility and business intelligence. e-commerce has the capacity to make buyers smarter and cost saving opportunities more visible.

- **Product and service design.** e-commerce has the capacity to improve the quality of product design, reduce design time-scales and fundamentally improve the interaction between designers, engineers, suppliers and manufacturing. Collaborative product commerce (CPC) is a term that is often used to describe the potential of e-commerce in this area. A great deal of the thinking and capabilities required for CPC have already been developed in the automotive, aerospace and electronics industries. We can expect these capabilities to be rolled out across many other industries as e-commerce solutions become more widely accepted.

- **Manufacturing.** e-commerce solutions will also have an impact on manufacturing as companies are required to be more flexible and responsive in what they make and in the levels of mass customization that manufacturing systems can deliver. e-commerce can, in some ways, be seen as a mechanism for customers to become more demanding of their suppliers. However, it can also be seen as a highly effective mechanism for ensuring that manufacturing is ultra responsive to the reality of actual customers rather than intermediary demand.

- **Demand and supply planning.** Most people find it difficult to cope with planning when it involves more than a few variables. This is an area where computers, statistics and e-commerce will always be more capable – if they are used in the right way. Demand and supply planning systems, such as Manugistics, Aspen Tech and i2 Technologies, are increasingly using e-commerce alongside their traditional software applications to improve the effectiveness of planning solutions. e-commerce is also expected to allow much greater interaction between the planning systems of multiple companies in areas such as collaborative forecasting and replenishment (CPFR) and e-marketplaces.

- **Fulfilment and e-fulfilment.** Fulfilment remains an area of great promise for e-commerce solutions, but one that has largely underperformed its potential. e-commerce has the capacity through information, such as tracking and tracing, to revolutionize the way that goods and services are delivered. It has the capacity to virtualize inventory and to change fundamentally the relationship between end customers, retailers, wholesalers and manufacturers. As yet, this has not happened for several reasons. First, it is not clear that customers are ready but it is only a matter of time before this changes. Second, most logistics suppliers are under intense margin pressure, making investments in fulfilment technology
difficult. Third, retailers and wholesalers are unclear about how their role will change if e-commerce allows greater interaction between customers and manufacturers. The potential for e-fulfilment is huge – it is just a matter of time before e-commerce revolutionizes this area.

- **Service and support.** Service and support is another area where e-commerce has made some impact but there is still potential for greater change. E-commerce has the capacity to transform the effectiveness of field service forces and to change the way that returns and repairs are managed. Like fulfilment, this is an area where the value proposition will drive radical change, but it will take time.

- **e-working.** E-working is an area that will have a more immediate impact on the supply chain. Most companies have already given thousands of their workers access to intranets and the Internet. They have given them e-working tools such as employee portals, knowledge management systems and computer-based training. Through e-mail they have revolutionized the way in which people work across boundaries of time and space. E-working capabilities are already having a significant impact on the working of supply chains and on the ability of employees to manage complex events and issues in the supply chain.

e-commerce and company boundaries

The impact of e-commerce is already being seen on the boundaries between companies, particularly in industries where great value is placed on inter-company collaboration. E-commerce will be a key enabler of this breakdown of boundaries, because it provides not only the solutions required for inter-company transactions but also the standards that will enable companies to connect and communicate. The breaking down of inter-company boundaries is likely to be a slow process. This is because it takes time to build trust in business partners and competence in new ways of working. By establishing common standards for data connectivity and content, e-commerce solutions have the capacity to eliminate a great deal of unnecessary duplication of effort in companies. The breaking down of inter-company boundaries can be seen in at least three areas:

- **Inter-company collaboration.** Collaboration is the logical next step in the process of breaking down barriers. Collaboration can happen without e-commerce, as already seen in famous case studies such as Procter & Gamble and Wal-Mart. However, a new phase of inter-company collaboration is now being enabled by e-commerce. Cisco and Flextronics provide a good example of how new levels of collaboration are being achieved between ‘best partners’ almost ‘one supply chain at a time’.

- **e-marketplaces.** A vast investment of money and time has been made in the building of e-marketplaces whether they are private,
independent or consortia. Despite the predictions of industry outsiders, these marketplaces generally have failed to make a significant impact on industries. However, following an inevitable consolidation of the number of marketplaces it is likely that a small number will play an active and effective role in promoting collaboration between companies across the supply chain. Some of these e-marketplaces will focus on areas such as indirect procurement or industry data standards and connectivity. Others will endeavor to balance industry discontinuities like excess demand and supply. In a more focused way, they will help to break down a number of inter-company boundaries.

- **Supply chain event management.** The number of software vendors offering event management solutions has also risen. These e-commerce solutions set out to improve overall inter-company transactions by highlighting and sorting out problems in the supply chain. This technology has great promise, although it is still early days. Event management technology also offers the possibility that true intelligent fourth-party logistics companies could emerge soon. These companies have the potential to become ‘magic clouds’ of data and transaction monitoring and decision-making. Much still needs to be done before this is ready for prime-time supply chain management, but there is significant potential.

**e-commerce and geographic boundaries**

e-commerce has the potential to breakdown many of the traditional barriers to supply chain management caused by geography. Greater integration is already occurring through NAFTA and the European Union and greater integration can be expected among some Asian nations in future. e-commerce is helping to establish the standards for cross border cooperation and collaboration. Such standards are needed to smooth supply chain operations across countries and enable companies to avoid managing inventory simply at a country or regional level.

---

Many examples indicate the e-commerce future is already here. However, the roll-out of e-commerce capabilities is patchy. A lot more needs to be done.

---

**How is e-commerce affecting supply chains?**

e-commerce solutions for the supply chain have been available for some years, so it is reasonable to assume that there are already good examples of its potential to deliver significant business benefits. Indeed, this is happening and there are some excellent case studies showing the impact of e-commerce on supply chain effectiveness. Leading these case studies are companies such as Dell Computer and Cisco that have the advantage of being relatively new, strongly versed in e-commerce technologies, growing rapidly (and hence attracting flexible new talent to solve new challenges) and unencumbered by traditional supply chain constraints.
More traditional companies have also embraced e-commerce rapidly and effectively in their supply chains. GE is a much quoted example. Its combination of ‘destroy your business’ thinking, Six Sigma and e-business execution have seen the successful introduction of new capabilities, including e-ordering, e-procurement, e-marketplaces, such as GE Polymerland, and new retail business models using virtual inventory, such as GE Appliances. Jack Welch, the former CEO of GE, has used the word ‘boundaryless’ to describe the corporate culture that emphasizes the removal of any boundaries within and external to a company to encourage idea sharing and team working.

Even industries traditionally slow to change such as chemicals and oil have seen the partial implementation of radical new uses of supply chain e-commerce solutions. Shell and BP have championed, until recently, indirect e-procurement marketplaces such as Trade Ranger. e-auctioning has become common using internal and external providers. Dow has been a leader in the chemicals industry in linking Six Sigma, a single ERP system and new supply chain solutions together into a coherent supply chain strategy. British retailer Tesco has been highly effective in combining traditional supermarket logistics with online ordering and local deliveries. In many ways the future is already here – just unevenly spread!

However, amid these examples the overriding impression is one of unfinished business. Few companies have completed the roll-out of these capabilities. Few software providers can honestly claim to have completed their products so that they can be effectively implemented. A great deal still has to be done before the causality between potential for supply chain benefits and e-commerce solutions can be proven on a significant scale.

Case study – Dell Computer
Dell is an excellent example for breaking the boundaries. Dell Computer Corporation is the world’s leading direct computer systems company, with more than 16,000 employees in 33 countries. Dell has completed a supply chain program called DSi2 to rapidly develop next-generation capabilities in supply chain management for the organization.

The new capabilities are focused on breaking the boundaries between departments through:

- redesigning materials requirements planning (MRP) processes and configuring i2’s Supply Chain Planner (SCP) tool
- enabling collaboration with suppliers regarding forecast and purchase information and configuring i2’s Rhythm Collaboration Planner (RCP) tool
- assimilating and summarizing global demand and supply data from each of Dell’s regions and providing the business community visibility to this much sought-after data

Dell Computer is breaking the boundaries between departments to develop next-generation capabilities in supply chain management.
- automating factory scheduling processes to create build schedules based on materials availability and configuring i2’s Factory Planner (FP)
- enabling collaboration with third-party distribution hubs for materials replenishment pulls every two hours into Dell manufacturing sites, including the configuration of i2’s RCP tool.

During the 12 months after project initiation, the project paid for itself with more than $32 million in measurable benefits and a 500 per cent plus return on investment. Factory utilization has increased by more than 5 per cent, with considerable factory headcount and space savings, reduced factory inventory and expedition costs, improved shipping to target and increased efficiency for materials planners and procurement.

The globally consistent processes for demand fulfilment and supply planning have improved inventory visibility across the supply chain (for Dell and its suppliers), providing a proven large-scale program methodology with a reusable framework. Automation of previously manual processes has led to a reduction in error introduction points, contributing to lower factory employee attrition rates.

**When will the major impact of e-commerce emerge?**

A central theme of this chapter is that organizations are generally underestimating the impact that e-commerce will have on supply chains and overestimating how quickly change will happen. These are common mistakes that are made when dealing with disruptive technologies. Many companies have certainly had a tendency to be better at starting supply chain initiatives than rolling out and completing their delivery. It was not uncommon to find senior executives losing interest in supply chain initiatives that they had sponsored after the first few implementations. e-procurement initiatives in some companies, for instance, are still to be delivered across all geographies and for all major commodities. The timing of the impact of e-commerce on the supply chain will vary by industry. It will also take companies much longer to deliver the full benefits of current e-commerce solutions and capabilities. The likely impact of e-commerce can be divided into three distinct phases over the next five to ten years.

**Early stage impacts (up to 2004)**

This period is likely to be characterized by two developments. First, companies will focus on getting the basics right and rolling out existing solutions, such as ERP, e-procurement, e-order management, and demand and supply planning, across organizations. Second, there will be a period of limited experimentation around new solutions,
such as e-fulfilment, tracking and tracing, collaborative design, and between supply chain partners. Some companies, for instance, could experiment with one-to-one collaboration between trusted partners. The early roll-out of new types of supply chain models could also occur. These would be aimed at new retail models and in connecting manufacturers (such as automotive) more closely to their customers.

We expect the early stage to be a critical time for the leading companies of the future to establish dominance around operational excellence and continuous innovation. While this might sound like simply getting the basics right, it is much more. This is a time when companies will succeed or fail in establishing whether they are the most attractive supply chain partners for others to collaborate with. The key differentiators will be whether companies are very good at their part of the supply chain, whether they are easy to partner with, and whether they understand what the key priorities in e-commerce and the supply chain will be in the future.

Medium stage impacts (2004–07)

In the medium term, we can expect to see the rollout of a much broader range of robust and sophisticated e-commerce solutions in the supply chain. e-marketplaces are likely to take a limited but important role in industry-level connectivity and in logistics solutions. The ‘one supply chain at a time’ solutions are likely to broaden as best supply chain partners gradually start to include a wider range of partners in their value chains. There will also be a much more robust range of e-fulfilment and service and support solutions using e-commerce. Much greater experimentation will occur between leading supply chain partners around supply chain synchronization solutions. During this period a shake-out of poorer performing companies is inevitable as they will be forced by economics to either focus on niche areas of supply chain excellence or to rescale their businesses to reflect their diminishing supply chain power.

Later stage impacts (2008 and beyond)

By this late stage, we can start to expect to see the increasing impact of supply chain synchronization initiatives in major companies. Supply chain synchronization is in many ways the ‘Holy Grail’ of current supply chain thinking. It will require e-commerce to work. It represents a world in which machine-driven decision-making, combined with very, very smart human analysis will be able to synchronize and re-synchronize multi-regional (if not global) supply chains on a real-time basis. The potential for this technology is huge. However, it is not simple. The first live simulators of synchronization were being built five years ago – and the technology worked them. However, the sheer scale of the changes in boundaries that are required suggests that effective implementation by 2008 is still very ambitious!
What is the future impact of e-commerce?

e-commerce will not only have an impact on the supply chains of medium to large companies. It will also change the way we live and work in our cities and communities, it will change government at both a local and national level and it will affect the way that we build contingency into our lives.

Internet technologies have grown out of a range of standards that are based on the need to communicate and interact openly. As such, we can expect to see day-to-day activities such as shopping, ordering, booking tickets and personal services increasingly moving online. This will have a dramatic impact in cities. More than 90 per cent of all telephone calls are local. Most people spend most of their income within a small radius (less than 50 miles) from where they live. It seems logical to predict that the design and execution of local supply chains within cities will change significantly.

Local distribution will change, as will the role of the city centre. Local and national government will need to adapt to new realities such as taxation, voting patterns, education levels and payments as people question the need for fixed assets and locations such as buildings. Government and local supply chains will need to be more responsive or companies and people will be increasingly willing to circumvent their authority and control. While e-commerce will make us more efficient it is also likely to make our supply chains more vulnerable to shocks. After 11 September 2001, we are all more aware of the need to be prepared for catastrophic changes in business conditions. This does not mean a return to high levels of company-level safety stocks, but a more mature approach to contingency between companies and geographies based on greater cooperation around mutual interests.

New e-commerce technologies will also emerge and have an impact, including wireless data communications such as 2.5 and 3G and radio frequency identification (RFID). This will give us the very real prospect of being able to not only track products and to transfer data using mobile communications but also the possibility of managing products and deliveries to the individual product level in real time. The amounts of data involved could be huge and will require significant enhancements to current ERP systems. Companies will see the benefits and penalties involved in giving all their products an individual personality!
Conclusion

e-commerce is already having a significant impact on supply chain management in some companies. In this chapter, we have outlined how that impact will increase over time as companies adopt e-commerce solutions more broadly and increasingly collaborate between companies and across countries. The broadening of e-commerce will be a gradual process, phased in over time; it will involve a lot of hard work. The benefits of supply chain improvements will be considerable, however, representing 5–15 per cent of overall supply chain costs. Leading supply chain operators are likely to achieve collaboration with their key value chain partners far more speedily and effectively than their slower competitors. Overall, we can expect a ten-year period of fundamental restructuring of the way that companies collaborate and synchronize their supply chains. The benefits of cost savings and performance improvements will accrue to the companies that are the best at harnessing e-commerce solutions.

References

Porter, M. (1999), ‘Rethinking competition’ in Rethinking the Future, Nicholas Brealey Publishing.