

## Chapter 1

# **E-Business Management: A Primer**

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**Abstract:** Building a successful e-business requires such enterprise capabilities as global networking, integrated business processes, sharing information with supply-chain partners, agility in responding to the market, and intelligent decision-making. At the same time enterprise systems have extended beyond the traditional business functions and include features to support supply-chain management, customer relationship management and electronic commerce. The new focus on e-business is, in part, driven by the adoption of the Web as a new channel for product distribution, marketing, and interaction with customers. The integration of the traditional as well as the Web-oriented functions is the cornerstone of a successful e-business. This paper presents an e-business framework that, on one hand, builds on the enterprise system but, on the other, encompasses the new e-business dimensions.

**Key words:** E-Business Management; Information Systems Research.

## **1. INTRODUCTION**

Building their companies into successful e-businesses has become an important objective for today's enterprises. To do so requires such business capabilities as global networking, process integration, information sharing, supply-chain agility, and intelligent decision-making. This paper addresses the strategic and research issues concerning (1) how to implement these concepts in real enterprises, (2) the most desirable strategy for developing and managing business systems, and (3) the research framework for

understanding the essential characteristics of e-business systems, how they evolve, and the direction in which they are moving.

Increasingly, enterprise systems have extended beyond the traditional business functions and include such new features as supply-chain management, customer relationship management (CRM), and electronic commerce. This shifting focus is driven by the adoption of the Web as a new channel for product distribution, marketing, and interaction with customers. The integration of traditional as well as Web-oriented functions is the cornerstone of a successful e-business. At the same time, information systems have become the nerve center of most enterprise systems. As enterprise operations increasingly go global, proper coordination between business, manufacturing, and the global value-adding chain needs special attention. Information systems can help provide that coordination. What makes information systems the backbone of business operations is the emerging global information infrastructure. Through this infrastructure, enterprise systems can achieve business integration and coordination. That becomes the foundation of any e-business.

## **2. THE WEB AS THE ENABLER FOR ENTERPRISE INTEGRATION**

An effective infrastructure is essential in order to coordinate various business units and processes into an e-business. The enterprise information system supports supply-chain processes and process coordination within and between enterprises. In addition, the infrastructure also includes (1) a global information network for supporting various electronic services such as brokerage and contracting, payment and banking, transaction processing, (2) electronic access to external data, and (3) electronic connections to customers that support such activities as filling orders and customer service. Increasingly, the way to integrate these infrastructure components is to use the Web infrastructure supported by the Internet. Using the Web infrastructure intranets support intra-organizational business processes; extranets connect enterprises to their channel partners; and the Internet links the enterprises to their customers, other institutions and agencies.

Using the Web as the infrastructure not only gives an enterprise a better means to coordinate with its supply-chain partners, but as important, it provides a new channel to reach out to customers. With the Web channel serving as the virtual storefront, there are opportunities for product marketing, customer relationship management, and product branding. In

addition, a new kind of consumer process is emerging combining information aggregation, navigation, and interactive exchanges. On the one hand, it enables mass customization; on the other, the infrastructure supports quick response to market demands. Such a new channel requires new capabilities from the enterprise systems.

The Web provides a new paradigm for supporting enterprise and supply-chain processes. The paradigm is basically that of a highly flexible network with interoperable and sharable modules. A Web technology that stands out as particularly useful for supporting the implementation of such a paradigm is component technology. The component approach can potentially better enable companies to integrate the supply chains and their processes among the supply-chain partners. They not only share product, manufacturing, and customer information with their partners; increasingly, they are letting the suppliers adopt parts of their business processes and systems to enhance coordination. Traditional enterprise systems put the emphasis on process integration. With this component-based approach, we will likely see more highly modularized companies, with each unit specialized in its core competency but always prepared to link up with business partners and their enterprise system (Baldwin and Clark, 1997). The component concept can be applied at several different levels: (1) *The software and system level*, where software objects and components have been used as the building blocks to make the functional components portable and inter-operable; (2) *The process and application level*, where business processes and applications, such as order fulfillment, customer services, etc., have been managed as separate modules, sometimes run at remote sites by applications service providers (ASPs); (3) *The enterprise level*, where business units can be quickly assembled to form virtual enterprises to explore a window of market opportunities.

The general trend these developments collectively point to is that in an e-business, there will be increasing use of modularity and the component model to increase portability, inter-operability, and plug-and-play functionalities. The paradox is that the enterprise systems will be more integrated because of the greater use of modularized components.

### **3. ORGANIZATION DESIGNS, INFORMATION SHARING, AND COORDINATION**

A distinct feature of an e-business system is its capability to adapt and react, making the organization more agile. The trend for e-business

organizations to shift gradually from hierarchical to networked organizations is in line with the general trend of the economy. With the increasing use of information systems in most organizations, organizations are moving toward flatter and more adaptive structures, sometimes referred to as the market oriented networked organizations (MNOs). Instead of the command and control innate to traditional, hierarchical organizations, MNOs require more coordination; and the coordination is done in a way similar to the way goods are allocated in the marketplace, through decentralized pricing and exchanges. A supply-chain network is a type of MNO when the business units are assembled through market forces. On the other hand, a supply-chain network may be a type of hierarchical organization if it is totally vertically integrated. Electronic commerce is moving e-businesses toward the MNO model. Successfully implementing e-business technology reduces transaction costs, and, therefore, the boundaries between markets and internal organizations are shrinking (Williamson, 1986) in favor of more market orientation.

Web technology overcomes problems of system incompatibility by encapsulating enterprise systems as object components made accessible by standardized interfaces, and by defining a protocol for transmitting documents between these components. This improves e-business management by (1) reducing production costs through lower procurement and distribution costs, (2) better utilization of resources through enterprise specialization, and (3) greater integration of supply-chain activities.

The lack of information sharing is a common cause for supply-chain related problems. One example is the so-called *bullwhip effect*, in which a slight variation in demand at the consumer end gets increasingly amplified and results in wild swings at the supplier end. The bullwhip effect has four possible causes: demand-signal processing, batch ordering, price fluctuation and shortage gaming (Lee et al., 1997). In demand-signal processing, for example, since data on the quantities sold to consumers is not passed on to the upstream levels, each tier is forced to predict demand based on its *adjacent* downstream order. This results in multiple forecasts, with predicted errors escalating as the distorted demand information travels upstream. Meanwhile, supplier's production information (e.g. capacity and lead-time) is not shared downstream. This leads to a vicious cycle of shortage gaming and large demand swings. Countermeasures that can overcome this undesirable phenomenon include consumer direct ordering, sharing point-of-sale capacity and inventory data, vendor-managed inventory, and continuous replenishment programs. These solutions boil down to the need for information sharing and an information infrastructure to support it.

Information sharing has been used not only for reducing the uncertainties and smoothing out supply chains, but also for eliminating wasteful activities, efforts, and resources along the supply chains. Larger corporations have started to make information sharing across their supply chains a common practice. In order to sell to Wal-Mart, for example, suppliers must study the giant's weekly sales figures, forecast demands for their products, and place them on the shelf. In other words, information-sharing has gone beyond simply providing some type of data. It may involve a plan of action based on the data. This kind of partnership has proven to be mutually beneficial. Increasingly, the Web has become the conduit for further enhancing this kind of supply-chain collaboration.

The Web can enhance various types of coordination. It has a special impact on the coordination mechanisms that require stronger partnerships. The major risk associated with Web-based EDI is still the lack of security. Web technology can help move inter-organizational information systems to a more advanced phase, where technology such as XML will become standard, so that the information being exchanged can incorporate semantic structures. The major impact of the Web on coordinating e-businesses, in terms of forcing change in business models, will be the sharing not only of information, but also knowledge and decision processes. Eventually, they can lead to the sharing of business processes between partners, or e-processes.

The capability of the Web for executing computational models and algorithms from remote sites makes this type of collaboration much more possible than before. The component approach just discussed can help facilitate development. For example, we may see more and more third-party contract manufacturers emerge as key partners in the supply chains. To coordinate better through the Web, these contract manufacturers can put their factory scheduling routines, simulation models, etc. on the Web. Their customers can run these models from remote sites to determine orders to be placed in view of the capacity available and the production plans already in place.

#### **4. MULTI-CHANNEL MANAGEMENT**

For most e-businesses, the emerging Web channel for purchasing, distributing, and marketing has created enormous opportunities for reaching out to new markets and customers. While there are companies specializing in

e-commerce and using the Web as the only channel, most companies still maintain traditional channels. How to manage the Web channel along side the other channels has increasingly become an issue for any e-business. The prominent channel management strategies used in running e-business are summarized as follows:

1. *Web enhances traditional channels.* This is a commonly used cross-marketing model. Major TV networks, for instance, often use the Web to provide more detailed coverage than their traditional channels, thus enhancing their brand and their traditional channels.
2. *Traditional channels promote the Web channel.* All e-commerce companies use traditional media to promote their brands. Some traditional retailers put kiosks in their stores to provide Web access to assist any need for additional product search, or allow customers to return goods purchased online to local stores.
3. *Web channel used to explore new markets.* Because of the specific demographics of Web users, some companies use the Web to reach out to segments of the market they do not normally reach. Furthermore, the Web enables an e-business to reach out to consumers around the world. Proctor and Gamble, for instance, uses Reflect.com to explore the market for customized cosmetics, which they do not sell through the traditional channels.
4. *Add new product lines only for the Web.* For the same reason, some companies use the Web to sell new products. This is especially effective when the business traditionally depends on powerful dealers/distributors and, therefore, selling the same products direct is not an immediate option. Also, major consumer goods companies have found the Web an effective channel to test market new product lines.
5. *Integrate the Web and traditional channels.* This is the “click and mortar” model, which is aiming at combining the best of traditional and Web channels. Pure dot-com companies need more traditional distribution channels to provide more efficient logistics and better customer services. Traditional channels need to add the Web channel to gain new capabilities for searching, navigation, and interactive, hyper-linked information retrievals.
6. *Cannibalize traditional channels.* Sometimes the new Web channel takes over the major share of the business. When this is inevitable in a given industry, a company might as well cannibalize the resources and focus its effort on the Web channel-- rather than been eaten up by competitors' aggressive Web channels. This happens in the industry where the Web will inevitably become the main channel.

7. *Building alliances between traditional and Internet companies.* The alliances recently built between car-makers and pure e-commerce companies, for example, belong to this model, which stems from the desire to build synergy between the Web and traditional channels. The alliance between Borders' bookstore and Amazon.com, in which consumers can order books online and then pick them up at a Border's local store is also a good example of this model.

What these channel-management issues imply is that the enterprise information systems for an e-business can no longer be just for integrating traditional enterprise functions in accounting, production, marketing, etc. There have to be additional components to provide capabilities for e-commerce trading, channel coordination, and dynamic market making with other e-businesses.

As with any of the other channels used by enterprises to reach their customers, the Internet has its strengths and weaknesses. It is, therefore, a risky proposition when a business relies on the Internet as its sole channel. Increasingly, it has become important for any enterprise to master how to integrate multiple channels (bricks-and-mortar stores, mail catalogues, call centers, the Internet site, portal site, etc.) and to build as much synergy among them as possible. These channels can be complementary in providing customer service, returns of goods, cross-marketing, merchandising, and other activities involved in shopping and purchasing. The use of multiple channels presents two challenges for enterprise information systems. The first is to integrate fully the channel activities. The second is to support the logistics and back-end infrastructure so that the transactions coming through the various channels can be processed seamlessly.

## **5. E-BUSINESS FULFILLMENT: FROM SUPPLY CHAINS TO SUPPLY WEBS**

The Web infrastructure provides opportunities to redefine the fulfillment process. Increasingly, e-businesses will adopt network organizations of specialized units coordinated through electronic networks to replace the traditional hierarchical organization. Because of their agility, these network organizations can be configured and reconfigured rapidly. The Web also provides new ways to coordinate workflow, manage documents, and enhance group work.

General e-business fulfillment processes may be executed differently according to the particular business model adopted. For example, ComUSA, a computer retailer, has expanded its role in the supply chain. It started to re-label computers made by third-party manufacturers under its own name. It also oversees parts procurement, assembly at the factory, and shipping. A customer can specify his own PC configuration at a kiosk in the store or via the Web, and the PC will be built to order (Shaw, 2000). Dell Computers, on the other hand, has perfected its direct-sell, build-to-order business model by integrating the role of the retailer, the distributor, and the product brand-name company. It has achieved the fastest inventory turn-around time in the PC industry by adopting this business model. It has actually achieved a negative “cash-to-cash cycle time,” i.e., the time from when it receives payment from its customers to the time it pays its suppliers! That has fundamentally changed the valuation model used to benchmark an e-business.

In running an e-business the Web-based supply chain model provides opportunities for several companies to work together and form a virtual enterprise. An example is the plan of Ingram Micro Inc., the largest distributor in the PC industry, to team up with Solectron Co, a giant contract manufacturer. Their goal is to help brand-name PC makers, such as Compaq Computers or Hewlett-Packard, to build PCs to customer orders. Instead of the PC companies handling orders and manufacturing, Ingram serves as the supply-chain coordinator to facilitate order fulfillment and shorten response time. PC “makers” such as HP and Compaq still have their brand-name labels, but they no longer actually make computers. Instead, they focus their efforts in marketing, quality assurance, product development, customer service, and building the whole “supply web” (Shaw, 2000).

There are many examples following this trend of “supply webs.” Companies such as Flextronics International Ltd., Solectron Corp., Jabil Circuit Inc., and SCI systems, have emerged as highly efficient manufacturers and supply-chain managers that operate factories around the world. The electronic giants whose names their products carry – Compaq, Ericsson, and Cisco Systems – are just as quickly getting out of making things, concentrating instead on developing new products and persuading consumers to buy them. IBM also has dropped out of the business of making personal computers in 2002, and has similarly adopted the business model of outsourcing the manufacturing of its personal computers. But the story of forming a supply web is more than outsourcing the manufacturing operations. It is about the ability to form a global supply-chain quickly while being able to link with the supply-chain partners electronically. Through the

e-business infrastructure, companies in the whole supply-chain (or, more accurately, the whole supply-web) act as one virtual company. The customers cannot tell that many companies are involved in the supply web. To them, the products are made by one company bearing the brand name.

This is happening because, with the Web providing the links for sharing information among channel partners and the component technology providing the interoperability to integrate business processes, companies will use more outsourcing in their business models. As a result, companies will concentrate on their specialized products while working closely with the suppliers. The ability to manage supply-chain networks will, thus, determine the competitive advantage of a company. Supply-chain networks represent the collaboration among a group of business units working together to exploit the underlying adaptability, collective capabilities, and market opportunities. The Web helps facilitate coordination among the units, reducing inventories and cycle-times. The networked nature of the Web forms a natural infrastructure to support and transform e-businesses. Because of the potential to manage e-business organizations in these dynamic, innovative ways, the fulfillment process has become an important core competency in running any e-business.

## 6. BUSINESS-TO-BUSINESS E-COMMERCE

The Web provides an e-business with greater opportunities to interact with the market place in managing its supply chain. As a result, there is an increasing need to shift supply-chain activities to interact more with B2B intermediaries, markets, and exchanges. This emerging focus of supply-chain management on B2B e-commerce provides an important link for an e-business to link with other e-businesses. Moreover, conducting B2B e-commerce over the Web has made e-business better connected in the global network that matches sellers and buyers.

What do enterprise systems need to incorporate to fulfill these functions? For B2B supply chains, there will be more and more *market-making* and *aggregation* activities even for the supply chains of main products and their components. As a result, the supply-chain management function for an e-business needs to coordinate and integrate the transaction flows among channel partners on a more dynamic basis. There are five B2B e-business models across a supply chain, starting from the upstream of the supply chain, they are:

- *Manufacturer direct*, such as Dell or Cisco;
- *e-distributors*, such as W. W. Grainger;
- *Neutral exchange and auction sites*, such as Freemarkets.com;
- *Buyer-side catalog aggregators*, such Ariba or Commerce One; and
- *Industry-wide (vertical) marketplaces*, such as Transora and Covisint.

In supporting business-to-business procurement, for instance, the B2B model can be based on Web-based catalogs, supply/demand aggregation, markets, or exchanges. For web-based catalog systems, there are two key considerations. First, the suppliers' product information will have to be interoperable, so that the customers can navigate between the product catalogs of different suppliers. Second, the catalog search and related activities must be integrated with the enterprise legacy systems, so that the front-end information search processes and the back-end support processes can be seamlessly integrated. For supply/demand aggregation, market, and exchange models, the key to successful e-business development is to integrate transactions across multiple sites.

A complete e-business framework must enforce integration with B2B transactions, channel partners, supply-chain processes, and customer relationship management needs are equally important for managing an e-business. The framework also includes the ability to coordinate and integrate with other e-businesses. As opposed to the emphasis on hierarchical information organization to ensure process coordination and data consistency, as is the case in traditional enterprise systems, the new generation of enterprise systems will be open, flexible, modular, and interoperable. As important, it will fully integrate with the Web channel for supporting business-to-consumer and business-to-business transactions.

The three major areas where B2B e-Commerce has made the most impact are: (a) the productivity gains made possible by transformations in processes and organizational structures; (b) the increasing opportunities to participate in electronic market-places to further improve the efficiency of both the supply- and buyer- sides; and (c) the resulting B2B infrastructure to help streamline the activities and transactions across whole supply chains. It is clear that B2B e-Commerce will continue its path of transforming supply-chain relations, industrial organizations, and inter-organizational structures.

What is less clear is how to evaluate a given B2B e-Commerce system for a specific enterprise environment. Unlike traditional engineering projects or investments in new equipment, B2B e-Commerce usually involves not only infrastructure investments, but also transformed processes and varying

enterprise organizational structures. How to assess the precise valuation of B2B e-Commerce is still an unsolved problem. And a solution is much needed to make technology investment and implementation decisions. In my preliminary investigation, for the effective implementation of B2B e-Commerce, an enterprise must consider a number of process, organization and supply-chain attributes that determine the value of a B2B e-Commerce project. Therefore, it is important to identify and understand these attributes and their relationships to the implementation strategies adopted.

## **7. E-BUSINESS VALUATION**

The contribution of IT to productivity gains has now been generally recognized, after a considerable period in which the IT productivity paradox was at the center of debate. With e-business systems now under the spot light of major capital investments, there are similar issues raised regarding the value of e-business systems. Some of the questions asked are practical ones. When millions of dollars of investments are being poured into e-business system projects in most larger companies, it is natural for IT managers to face the challenges of quantifying the value of e-business investments.

Depending on the nature of the e-business systems, the valuation can be systematically assessed on several levels, including (1) B2B Supply Chain, (2) Enterprise, (3) Operational Processes, (4), Strategic, and (5) B2C Customer Relations levels.

With respect to supply chains, the impact of Inter-organizational systems (IOS) has been positive in improving the efficiency of business processes and the overall performance of manufacturing organizations. Electronic processing and communication of inter-organizational data improves timeliness and accuracy of information, allowing firms to plan and manage such assets as inventory better. This type of impact is first and foremost on the operational level and results in faster transactions, cost reduction, higher productivity and improved quality.

Within the firm itself, value is not uniform across processes and business units; therefore, a variety of strategies are needed. The type of business units, products, suppliers and the characteristics of the enterprise have been shown to be important predictors of the level of improvement. Understanding the value of technologies and how they benefit different users, as well as business units, is critical in increasing the adoption of such systems.

The very nature of e-business technologies gives enterprises unprecedented capabilities to focus on the customers, enhancing all activities concerning customer acquisition, retention, and services. The value of these benefits is readily quantifiable. The more difficult measurements are such intangibles as brand image, reputation, and goodwill. Moreover, the key to customer facing is also about better integration of IS on the customer end and those managing supply chains and other business processes. While e-business technologies greatly enhance relations with customers, the back-end support is critical. That is the hidden side of valuation of e-business initiatives on the business-to-consumer front.

On the B2B side, e-business systems such as IOS provides competitive advantages by increasing the bargaining power of the buying organization, better coordination among supply-chain partners and greater information available about the business processes and demands across the whole supply chain. Technologies, such as EDI, have resulted in the greater integration of firms with their suppliers. Inter-organizational technologies also lead to shifts between different forms of coordination. Choosing a specific IT-based coordination structure creates risks in the form of relationship-specific investments, shifts in bargaining power and the need for trust and commitment to an ongoing relationship. Web-based B2B e-commerce systems are radically different from other IT-based systems, and, therefore, it is questionable if the valuation methods and criteria developed previously are still valid. For example, search costs, negotiation costs, and coordination costs are significantly lower in a Web-based system, requiring researchers to include them in the valuation model. Moreover, the impact of the Web is increasingly difficult to isolate because of the transformation of processes and organizational structures. As traditional hierarchical organizations are replaced by Web-enabled, agile and networked organizations, it is critical to understand the value of the transformations and how the various systems should be integrated to derive maximum value.

On the B2C side, e-business systems generally are aimed at helping improve the whole cycle of customer relations, i.e., the acquisition, enhancement, and retention of customers. Activities involved in these different phases include direct marketing, sales force management, customer services, call-center coordination, and personalization. The value of acquiring new customers can be quantified by balancing acquisition costs and the life-time value of customers. Enhancing customer service and the retention of existing customers are strategic factors that can be measured by

the additional revenues generated by the services and the opportunity costs of losing customers due to poor service.

Lastly, many e-business systems are implemented as experiments for potential future competitive and strategic positions. In a similar vein, e-business initiatives can help enhance organizational learning because of its focus on enterprise integration, customer facing, and supply-chain coordination. Managers view them as the initial steps toward greater future investments, depending on how future strategic positions and the technology should evolve. The underlying value of this type of e-business system is analogous to that of investing in financial *options*. This concept becomes especially important when considering the vast uncertainties involved in the future developments of e-business technologies.

There are several challenges involved in assessing the value of e-business technology to an enterprise:

(1) e-business technology is transformational. The adoption of e-business technology often requires changing business processes, organizational structure, and even supply-chain relationships. Because it is not an isolated component, e-business technology must be evaluated in the enterprise context.

(2) e-business technology is dynamically evolving. New versions of enterprise e-business systems arrive constantly. Sometimes they only require incremental changes, but at other times they bring about destructive innovation.

(3) e-business technology is implemented for strategic as well as for operational objectives. The intangible yet strategic benefits of e-business systems are usually the hardest to estimate precisely.

Estimating the use of wireless technologies in B2B e-procurement is a good example of the complexity of e-business valuation (Subramaniam and Shaw, 2002). While intuition pointed to improving operational benefits such as reduced process times, the preliminary results from our study, in collaboration with Motorola, show that there are some unique attributes of the wireless infrastructure, such as providing timely messages, instant authorization, the ability to handle emergencies, and greater mobility, that outweigh the operational benefits. But that may change since wireless technologies are evolving rapidly, and soon the limitations of the devices in screen size, key boards, and bandwidth may all improve to the extent that benefits can be greater for regular operational processing. There are also applications yet to be created that may leverage the major characteristics of the wireless infrastructure. The three major features of wireless are mobility,

the location-specific information, and orientation toward peer-to-peer communications.

## **8. UBIQUITOUS COMMERCE**

A significant development is taking shape in the effort to push the boundaries of electronic commerce further. With the advent of wireless, mobile technology and devices that can be taken almost anywhere and to most business environments, we will see a new paradigm for business information management. That is, the information processing power will become more person- and location-oriented, as opposed to the current paradigm that is machine-oriented based on desk-top computing architecture. Because of the ubiquitous nature of the “points of execution”; when this paradigm is implemented in electronic commerce, we call it Ubiquitous Commerce, or U-commerce. The devices used to execute U-commerce include handheld mobile devices (personal digital assistants (PDA), two-way pagers, cellular phones, net phones and in-vehicle devices), laptops, desktops, workstations, and audio/video appliances. These devices are networked together to form a strong and integrated backend and a highly mobile front-end infrastructure.

U-commerce builds on the Web information infrastructure to add three important capabilities to make the Internet access ubiquitous – mobility, an interface to address access needs of general population, and powerful distributed computing. Further, the architecture is envisioned to consist of a device-independent ubiquitous commerce platform that is integrated with the enterprise information, supply-chain network and electronic market infrastructures. U-commerce infrastructure consists of a core device-independent middleware platform, that is integrated with three major categories of information infrastructure – organization, supply-chain and market. This middleware is built on the Web infrastructure with the added capability of being accessed by consumers through a variety of wired and wireless devices. As these various devices have very different display, processing and communication capabilities, the commerce platform should be flexible enough to add new devices, but also be secure and reliable. It is critical for their electronic commerce applications to be integrated with these enterprise systems.

There are several major technological developments that have the potential to make next generation electronic commerce ubiquitous. The increasing use of small, hand-held mobile devices, wireless networks and

satellites has enabled a wireless extension of the Web infrastructure. With the increasing use of small portable computers, wireless networks, and satellites, mobile commerce (m-commerce) has emerged to provide a wireless extension of existing e-commerce solutions. Built upon a ubiquitous computing environment, users do not need to maintain a fixed position in the network, which increases the mobility and decreases the cost of wiring and reconfiguring wires to support an expanding staff. It allows businesses to maintain a mobile workforce inside its daily business process. For example, GE Global Exchange Services, which recently made a deal with a wireless service provider to create a service that lets wireless devices communicate with enterprise back-end systems, such as customer relationship management. On the other hand, from the viewpoint of end customers, mobile commerce creates a new form of business interaction. Using location information, companies are able to offer the applications that merge physical presence with the virtual services. For example, by knowing that the customer is at a particular location, an organization can promote a product or service available in that location. Those services can also extend to configure the physical shopping environment to customer's own preferences.

## **9. OPEN ENTERPRISES, INTEROPERABLE INFRASTRUCTURE, AND SHARABLE E-PROCESSES**

As opposed to vertically integrated corporations, modern enterprises form and use supply-chain networks to work with other companies to meet market demand. Because of the current rapid pace of new product introduction and product updates, an enterprise needs to be able to form a global supply chain quickly with its selected partners to explore emerging market opportunities. Ideally, there should be an interoperable "supply-chain platform," where the enterprises can plug in to be connected with its suppliers or distributors. This interoperability not only needs the support of a global information infrastructure, which is greatly assisted by the Internet, but also the availability of sharable business processes for such supply-chain activities as procurement and order-fulfillment.

The benefits of interoperable supply chains with standardized business processes have become so attractive that companies who are competitors may nevertheless adopt the same supply-chains platform and processes. Such supply chains make it attractive to collaborate to explore the increased bargaining power with the suppliers of their industry. Recent examples of such industry-wide efforts are abundant, especially in the auto and the

computer industries. In the former the major manufacturers form an industry-wide e-marketplace called Covisint. In the latter a consortium call the RosettaNet, which establishes supply-chain collaboration and develops process standards. An interesting research question is how to enforce collaboration from fierce rivals in an industry. Obviously, there are enough incentives for the Big Three auto makers to collaborate in forming Covisint. A primary source of the incentives is the reduced procurement costs—which makes suppliers reluctant to join, unless there is sufficient increased volume overall. Another source of incentives for all participants comes from the fact that the supply chain will be more efficient and less wasteful (e.g., by reducing unnecessary inventories and improving the efficiency of logistics). This combination of collaborative and competitive behavior among the participants may be better understood by game-theoretical analysis. For instance, two competitors may find themselves both better off if they can form a consortium, through which they can develop common procurement to gain cost advantages.

The use of plug-and-play e-processes greatly increases a company's ability to work with its business partners even if they use different enterprise systems. It means:

- More flexible business relationships with more partners linked by sharable e-processes;
- Lower set-up costs when working with new supply-chain partners, and thus easier-to-explore, new business opportunities with greater bargaining power;
- Greater visibility and information-sharing across the supply chain, making the supply chain more efficient with less inventory;
- Greater integration in executing main supply-chain processes, such as order fulfillment, thus reducing cycle times; and
- Improved operational efficiency enjoyed by all supply-chain participants.

The idea of developing interoperable supply chains has the potential to fundamentally transform the structure of many industries. This trend will continue, and it will force companies to adjust their practices accordingly. As a result, several trends are emerging:

*The Open Enterprise Model.* Companies are unbundling their enterprises into modular business processes so that they can focus on their core competencies while outsourcing the non-core businesses. Furthermore, the standardized global information infrastructure enables the same companies to open up the borders of the enterprise in order to share processes and

information with their partners in the global supply chains (Moore, et al., 2000). Process sharing is the key to the seamless plug-and-play infrastructure provided by the underlying supply chains. The open systems paradigm helps provide component interoperability and commonly recognized standards, which are important to establish connectivity and full integration. (Companies that used traditional enterprise resource-planning systems have painfully found that hierarchical systems, while they also achieve connectivity and integration, are too rigid, restricting, and closed).

*Connectivity, Mobility, and Interoperability.* Connectivity has been extended beyond simple networking, to include mobile infrastructure. The new business infrastructure will have two components: one a powerful backbone system with an interoperable platform running the major applications and business processes; the other a highly portable, networked, and mobile front-end that acts as a collection of nerve cells for data collection, information sensing, and front-end processing. At the same time it provides connectivity, the information infrastructure also provides interoperability on the enterprise and supply-chain levels.

*Integration and Customer Facing.* E-business systems integrate enterprise applications from customer relationship management to supply-chain management. They also help integrate business processes across the supply chain to facilitate such supply-chain processes as order fulfillment and product development. The common infrastructure is interoperable and the processes sharable. This integration of processes and enterprise systems enables companies to interact with their customer on the one hand, while remaining fully aware of the current status of supply-chain information on the other.

*More Collaboration and Market Orientation.* By the very nature of the Web, e-business systems are based on the principle of open systems with a market orientation. Any e-business system must be ready to be connected with a partner's system and share the common processes. The market orientation of e-business systems provides additional business-to-business and business-to-consumer opportunities and choices. Moving toward more collaboration and more market orientation seem to be two opposite goals, but e-business infrastructure helps achieve the two simultaneously. The standardized information infrastructure and sharable processes help promote collaboration; network connectivity and B2B choices enhance market orientation. We have also seen the combination of the two in e-marketplaces and other industry-wide consortia.

## 10. CONCLUSIONS

The e-business framework described in this paper, therefore, can be viewed as the next generation of enterprise systems, where the integration with B2B transactions, channel partners, supply-chain processes, and the needs of customer relationship management are equally important for managing an e-business. The framework also includes the capability to coordinate and integrate with other e-businesses. The new generation of enterprise systems will be open, flexible, modular, and inter-operable. As important, it will fully integrate with the Web channel for supporting business-to-consumer and business-to-business transactions.

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