IT Plays Important Roles in Dell'S Supply Chain Management

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Abstract
Information technology (IT) is an important aspect of the electronic supply chain management (SCM). Advances in information technology, particularly in the Internet, enables companies to share information within and inter-organizations. The Internet and its three important types of networks: Intranet, Extranet, and Web allow organization to transfer digital data instantly and with high fidelity at nearly zero marginal cost. Information sharing is a vital aspect of coordination amongst parties in a supply chain. Information sharing can increase supply chain efficiency by reducing inventories and smoothing production. In Addition, e-commerce can enhance selling online and help better understand customers. E-SCM efficiency is highly important as today's competition is no longer between companies, but between supply chains. This paper examined how IT - the Internet, Intranet, Extranet, Web technology affects, transforms and streamlines Dell's SCM. Research results showed IT played important roles in enhancing, transforming, and streamlining Dell's SCM for success.
Keywords: IT, Internet technology, Web technology, e-Commerce, SCM

1. INTRODUCTION

Information technology (IT) has increasingly become a necessary component of business strategy and a strong catalyst for economic development. The strategic integration of IT in business has revolutionized relationships within organizations and those between and among organizations and individuals. Specifically, the use of IT in business has enhanced productivity effectively; smoothly information sharing, encouraged greater customer participation, and enabled mass customization, besides reducing costs. Firms are effectively using new IT and wireless telecommunications to improve service and delivery processes. More than ever possible before, the Internet increases the quantity and expands the richness of information in real-time to a much wider set of participants and thereby raises dramatically the value of information in supply chain management. Using the intranet, extranet, internet, Web and associated information technologies (ITs), bits of information of strings of zeroes and one can be shipped anywhere in the world in seconds at virtually no cost, opening up a world of opportunity and rapid innovation.

Information technologies (ITs) used for planning, organizing, coordinating, and controlling supply chain activities including [1]:
a. Enterprise resource planning (ERP) software. ERP helps manage both the internal and the external relationships with the business partners.
b. Supply chain management software: SCM software helps in decision making related both to internal segments and to their relationships with external segments.
c. Radio frequency identification (RFID): RFID is a technology that uses electronic tags (chips) instead of bar codes to identify objects or items. This technology is similar to the 2D tags.

A company's competitive advantage—for example, low cost, reliability, quality, speed to market, and quick response—depends on how well the supply chain is aligned and managed. Three of the major IT-supported managerial activities are improving supply chain operations, integrating departmental systems with ERP, and introducing a variety of customer relationship management (CRM) activities. IT is a major enabler of all of these. But this IT enabler should be supported by a good IT Infrastructure.

IT infrastructure refers to the shared information resources, such as corporate networks and databases and their linkages, operation, maintenance, and management. IT supports individual business processes in all functional areas with management information system (MIS) applications [2]. It also supports activities along the supply chain such as procurement, relationship with suppliers, SCM, CRM, and order fulfillment. The design of the IT infrastructure allows and limits the ability to store, protect, and manage data so that it can be made accessible, searchable, shareable, and, actionable. Virtualization increases the flexibility of IT assets, allowing companies to consolidate IT infrastructure, reduce maintenance and administration costs, and prepare for strategic IT initiatives. So, the information systems that support supply chains create an extended enterprise.

1.1. Internet Technology: Intranet, Extranet, and Web Technology

ITs are things such as computers and internet, which allow the storage and transmission of data in digital formats. IT is the collection of the computing systems in an organization, or organization's collection of information systems, their users, and the management that oversees them. IT, in its narrow definition, refers to the technological side or the technology component of an information system. It includes the hardware, software,

data and database, networks, procedure, people, and other electronic devices [3]. Intranet is managed and controlled by an IT department as shown in table 1 and figure 2.

Table 1: Similarities and Differences between the Internet, Intranet, and Extranet

Descriptions	The Internet	Intranet	Extranet
Access	Open/Public	Private	By Agreement Only
Information	Fragmented	Proprietary	Selective - Shared by Business Partners
Users	Public/Everybody	Organization Members	Business Partners

One of the first applications of e-commerce that sell consumer goods and industrial products is to develop an electronic catalog on their Web sites. Rather leafing through thousands of pages, the user can define exact requirements and easily locate the appropriate item in the catalog, and the catalog should be continuously updated. The general Applications of Extranet by major factors are shown in Table 2, and the Internet versus Intranet.

Table 2: General Applications of the Extranets by Major Sectors

Sector	Application
Government	Electronic filing of SEC documents and fax documents
Manufacturing	Order status, and online order placement by customers
Pharmaceutical	Gathering test data from different sources for drug testing conducted by researchers throughout the world
Service Industry	Providing access to corporate databases, account information and for transfer of funds to their customers
Transportation	Allowing customers to check into the availability schedules for their truck, rail and air fleets
Utilities	Allowing customers to access account and utilization status

As an enabling technology, IT, particularly the internet technology, has become the major facilitator of a firm's business activities both in global and domestic economy in which every firm has to win over its competitors. Basically, the Internet consists of computers with data, users who send and receive the data files, and a technology infrastructure to move, create, and view or listen to the content. An Intranet is a network that funs internally in a corporation using Internet standards. An Extranet is an Intranet to which value chain partners are admitted for strategic reasons [4]. The Web-based system is the part of the Internet that supports a graphical user interface for hypertext navigation with a browser. The roles and positions of Internet, Intranet, and Extranet in a firm's activities are clearly delineated in table 1 and table 2. In practice, IT refers to the technology component of information system (IS) which emphasis on the "communication multimedia or equipment." An IS as one that collects, processes, stores, analyzes, and disseminates information for a specific purpose.

1. 2. How Does Internet Affect Supply Chain Management?

IT is also responsible for the integration between firms which brings about smooth flow of information and products between customers, suppliers and the transportation through 3PL (third party logistics) as delineated in Figure 1 and Figure 2. IT integrates the decision making process, business operating processes and information sharing for business performance management. Thus the relationship that exists between IT and the supply chain is one in which IT improves the supply chain through integration. IT has made it possible bring the notion of an integrated supply chain to life.

The most direct effect of the Internet is to create new opportunities to improve the efficiency and effectiveness of the operation of the supply chain and exchange processes through e-commerce. This is because of the cost-effective capacity to generate visibility across all aspects of the supply chain, including point-of-sale information, manufacturing schedules, vendor stocks, customer inventories, demand patterns, marketing & sales initiatives, and carrier schedules.

Table 3: Similarities and Differences between the Internet and Intranet

Key Feature	Internet	Intranet
User	General	Employees Only
Geographical Scope	Unlimited	Limited to unlimited
Speed	Lower than intranet	Higher than Internet
Security	Lower than intranet	Higher than internet
Technology Used	TCP/IP	TCP/IP
Document Format	HTML/XML	HTML/XML
Multimedia capability	Could be lower than intranet	Could be higher than internet

1.3. Impacts of the Internet in SCM

The Internet changes the way companies do business. The changes are permanent in the transition from the industrial economy to the network economy. SCM has been enabled by convergence, which refers to the integration of computer and communication technology. The Internet-strengthened power of convergence can be viewed in two aspects: ubiquitous and low-cost connectivity makes it possible for small and mid-sized companies to take advantage of SCM techniques; and speedy network transmission helps businesses realize seamless and real-time communications and transactions. The potential challenges and impacts made by the Internet can be categorized as follows [5]:

a. Shifting power to buyers: Many e-commerce experts have profound arguments on the impact of the Internet on the supply chain is that the Internet is shifting power from the seller to the buyer irreversibly. The search power for the buyer is now unbounded. Suppliers also provide products and services information through their Web sites.

b. Enabling global interconnectivity: The Internet not only provides businesses and individuals with the convenience and flexibility in transaction and communication, but also brings the competitions into the global arena. The Internet facilitates companies to conduct business in the global village.

c. Enabling the trading partners to better coordinate and collaborate: The Internet enables the trading partners within the supply chain (or the value chain) to better coordinate and collaborate for mutual benefits. Technologies that are based on the Internet make seamless integration possible among business partners.

d. Breaking the old paradigms of inter-organizational boundaries: The Internet changes the way supply chains are managed, planned and controlled. SCM-related information and decisions are integrated into the Web, breaking the old paradigms of inter-organizational boundaries. By implementing the Web-based SCM and CRM, companies can virtually eliminate the boundaries among business partners to form the extended enterprise.
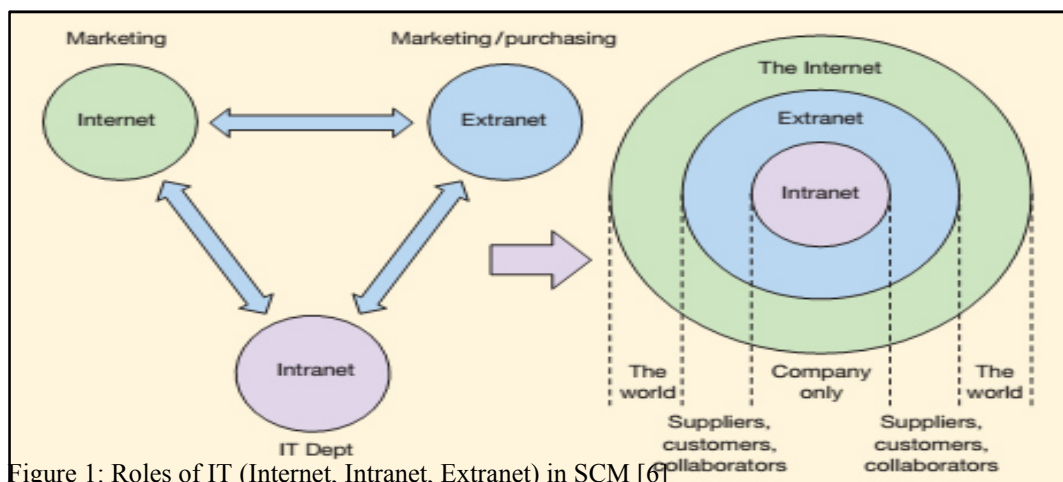

Figure 1: Roles of IT (Internet, Intranet, Extranet) in SCM [6]

1.4. The Internet and Web technology's contribution to SCM

The Internet and Web technologies can support the entire supply chain's operations. Internet-based supply chain operations are fast and inexpensive. Customers can instantly check the status of their orders by simply clicking their computer mouse. Corporate executives and managers can conduct real-time access to firm's inventory level, and so do their suppliers and distributors as depicted in Figure 1 and Figure 2. The Internet and Web technology made the following contributions to SCM [7]:

a. Developing e-commerce applications: E-commerce consists of buy-side e-commerce (e-commerce procurement) and sell-side e-commerce (e-commerce marketing) as shown in Figure 1 and 2. E-commerce plays an important role in SCM because it supplies the critical data of customers and sales information to the whole partners that engaged in SCM. Customers' data could be from individuals or organizations – such as B2C, B2B, B2G e-commerce that are needed by all supply chain partners in terms of meeting customer satisfaction. Web technology offers a variety of supports for online communications and transactions. A supply chain management serves as the back-end application by linking suppliers, manufacturers, assembling manufacturers, distributors, and retailers in a cohesive production and distribution network while e-commerce marketing serves as the front-end application by linking a firm with its customers.

b. XML-based information exchange and sharing: EDI plays an important role in the evolution of SCM. Trading partners used EDI for information exchange, such as sending requisitions and receiving purchasing orders. The XML (Extensible Markup Language) based Internet system allows organizations to exchange

data on a transaction-by-transaction basis. As XML documents and XML schema are text-based, they can be transmitted through HTTP protocol.

c. Applications integration: Applications integration is one of the most important IT strategies since it can create or modify the interactions among related applications and to encompass canned software, legacy applications and Web services.

d. Comprehensive integration of various technologies: IT in various forms and combinations ranging from Internet, Web-based Technology, HTML and XML to different applications and systems including ERP, CRM, SCM, and enterprise application integration (EAI), are enabling business processes and creating new business contexts for companies to operate effectively and efficiently in real-time.

e. Partners' collaboration: Collaboration among trading partners helps SCM participants gain great benefits from providing end customers with high quality, low cost products through flexible and efficient distribution. Web technology boosts the supply chain visibility by providing more real-time data from all links of the supply chain, resulting in greater collaborations among trading partners.

1.5. The Roles of IT in SCM and ERP:The Relationship Between SCM and ERP

The function of SCM is to plan, organize, and coordinate the activities along the supply chain. Today, the concept of SCM refers to a total systems approach to managing the entire supply chain. The supply chain concept is theorized from the formation of a value chain network consisting of individual functional entities committed to providing resource and information (information sharing) to achieve the objectives of efficient management of suppliers as well as the flow of parts. SCM is the concept getting the right things to the right places at the right times for profit. It is the science of better, faster, and cheaper in terms of getting the right things to the right places at the right time for profit.

While SCM is as old as trade itself, new ITs - particularly Internet and Web, have revolutionized today's supply chains, making them extraordinarily better, faster, and cheaper. Dell's suppliers play a key real-time role in keeping production, distribution, and information flowing smoothly. Better supply chain models do not just help manufacturers of physical goods, but also service businesses such 3PL or a third party-logistics, including those that require great creativity, imagination, and specialized knowledge as illustrated in figure 2. A supply chain is a concept describing the flow of materials, information, money, and services from raw material suppliers through factories and warehouses to the end customers. A supply chain also includes the organizations and processes that create and deliver these products, information, and services to the end customers [8]. The SCM concept is an integrating philosophy for coordinating the total flow of a supply channel from supplier to ultimate user. Initially, the concept of a supply chain refers to the flow of materials from their sources (suppliers) to the company, and then inside the company to places where they are needed [9].

When a supply chain is managed electronically, usually with Web-based software, it is referred to as an e-supply chain. It should be noted that as the Internet becomes more pervasive and ubiquitous, the distinction between IT-enabled supply chains and e-supply chains is rapidly diminishing. Most supply chains now involve a mix of Web-based, Internet, Extranet, Intranet, and other information systems to ensure efficiency and uninterrupted flows of goods and services in a timely manner. Thus, most supply chains are actually networks. So it may be more accurate to use the term Supply Network or Supply Web to describe the structure of most supply chains [10], as shown in figure 2.The improvements in supply chains frequently involve an attempt to convert them to e-supply chains, namely, to automate the information and financial flows in the chain. Information sharing can increase supply chain efficiency by reducing inventories and smoothing production. IT-enabled Supply chain efficiency is highly important as today's competition is no longer between companies, but between supply chains.

The firm applies effective SCM processes that include (1) integrated computer systems that provide production schedules and demand forecasts to all supply chain members, and (2) collaborative programs-management tools that allow manufacturers and suppliers to synchronize activities and respond to events in real time. The supply chain includes a variety of firms, ranging from those that process raw materials to make component parts to those engaged in distribution center and wholesaling. Included also are all types of organizations engaged in transportation such as FedEx and UPS, warehousing, information processing, and materials handling. The critical processes involved in SCM include (1) Customer Relationship Management – CRM (2) Suppliers Relationship Management – SRM (3) Customer Service Management – CSM (4) Demand Management (5) Order Fulfillment (6) Manufacturing Flow Management (7) Product Development and Commercialization (8) Return Management [11]. SCM software includes supply chain planning, supply chain execution, and supplier relationship management. Planning involves designing the supply chain network, demand planning, and collaborative supply planning. Execution involves fulfillment, manufacturing, and delivery. Relationship management handles all the interactions with suppliers from supplier certification to quality assurance, contracts, and agreements.

Supply chains could not function at high levels of efficiency and effectiveness without powerful

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information systems. The Internet – and Internet technology in particular is the major tool firms rely on to manage their lengthy and integrated systems. SCM software refers to software that supports specific segments of the supply chain, especially in manufacturing, inventory control, scheduling, warehousing, and transportation. This software is designed to improve decision making regarding supply chain issues, optimization, and analysis. Importantly, SCM software applications provide real-time analytical systems that manage the flow of products and information through the supply chain networks. In addition, it offers better control of the storage and flow of goods and services along a supply chain.

The result is that firms can work with a comprehensive "supply chain suit" of software that manages flow across the supply chain while including all of the key function areas. Several firms producing "ERP" software such as SAP and Oracle have developed applications that attempt to integrate functional areas and bridge gaps across the supply chain [12]. SCM software creates the ability to transmit data in real-time and helps firms transform supply chain processes into competitive advantages. Third party logistics (3PLs) such as FedEx and UPS, as Dell's partners are the best-practices leaders at seamlessly integrating a variety of technology to enhance all processes across an extended supply chain [13] as illustrated in figure 2.

ERP is software that helps integrate the components of a company, including most of the supply chain processes, by sharing and organizing information and data among supply chain members [14]. It transforms transactional data like sales into useful information that supports business decisions in other parts of the company. For example, when data such as a sale becomes available in one part of the business, it is transmitted through ERP software, which automatically determines the effects of the transaction on other areas, such as manufacturing, inventory, procurement, invoicing, distribution, and accounting, and on suppliers. Through these information flows ERP organizes and manages a company's supply chain. Most ERP vendors systems handle external, Web-based interactions, and have software specifically for SCM. ERP is software that organizes and manages a company's business processes by sharing information across functional areas. It transforms transactional data like sales into useful information that supports business decisions in other parts of the company, such as manufacturing, inventory, procurement, invoicing, distribution, and accounting. In addition to managing all sorts of back-office functions, ERP connects with supply chain and customer management applications, helping businesses share information both inside and outside the company. Thus, ERP serves as the backbone for an organization's information needs, as well as its e-business initiatives.
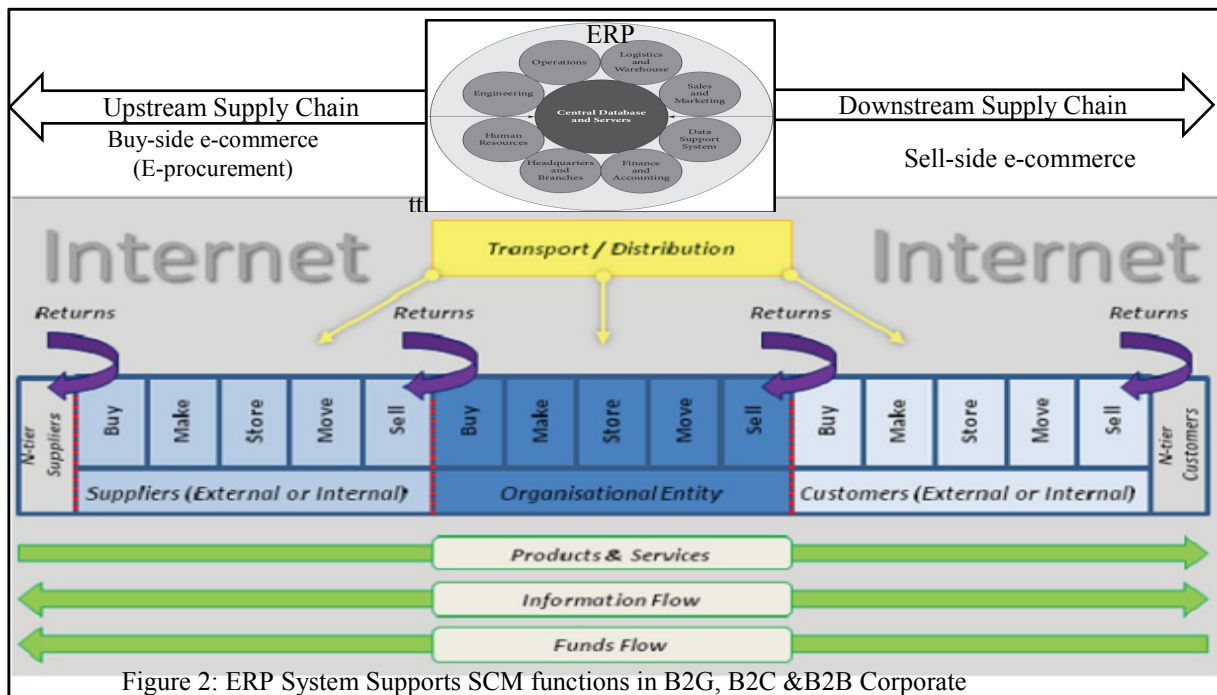

Figure 2: ERP System Supports SCM functions in B2G, B2C &B2B Corporate

With ERP, companies could integrate their accounting, sales, distribution, manufacturing, planning, purchasing, human resources, and other transactions into one application software. This enabled transactions to be synchronized throughout the entire system. For example, a customer order entered into an ERP system would ripple through the company, adjusting inventory, parts supplies, accounting entries, production schedules, shipping schedules, and balance sheets. ERP systems help companies manage their resources efficiently and, at the same time, better serve their customers.

From the above list it can be seen that the distinction between business software applications has become increasingly blurred as ERP vendors are adding more SCM functions, and SCM vendors are encroaching on ERP. SAP, whose ERP applications, R /3, runs most Fortune500 companies, is now concentrating on e-business with new offerings in supply chain management, customer relationship management, and product lifecycle management.

1.6. Supply Chain Management: A Tool for Competitive Advantage

These goals can be achieved successfully by demonstrating comprehensive and effective IT-enabled SCM as a tool for competitive advantage. The supply chain can be a powerful competitive weapon, as market leaders like Dell, Grainger, and Hewlett-Packard have demonstrated through the unparalleled success of their supply chain processes. Dell achieves competitive advantage through deploying successful IT-enabled SCM. Dell achieves rapid response by building personal computers with each customer's requested software in a manner of hours. Dell's dominant strategy is quick, reliable response. Competitive advantage is the creation of a unique advantage over competitors [15]. Competitive advantage consists of at least the aspect:

a. Low Cost Leadership: Low cost leadership strategy means becoming a low-cost producer of products and services in the industry or find ways to help suppliers and customers to reduce their costs or a firm should need to operate efficiently without sacrificing the quality of products and services. It means a firm would be able to sell its products and services inexpensive or cheaper than those of its competitors while quality remains unchanged.

b. Differentiation or Unique: Developing ways to differentiate a firm's products and services from those of its competitors or at least better products and better quality, and more innovative than those of its competitors.

c. Response or Faster: A firm should quickly response to customers' requests and the market changes, or at least better than those of its competitors,

1.7. IT Has Transformed and Streamlines SCM: The Way Dell Inc. Does Its Business

Globalization and the evolution of information technology have provided the catalysts for supply chain management to become the strategic means for companies to manage quality, satisfy customers, and remain competitive. A supply chain encompasses all activities associated with the flow and transformation of goods and services from the raw materials stage to customer, as well as the associated information flows. In essence, it is all the assets, information, and processes that provide "supply." It is made up of many interrelated members, starting with raw material suppliers, and including parts and components suppliers, subassembly suppliers, the product or service producer, and distributors, and ending with the end-use customer. The relationship between IT and the supply chain can be explained as: IT is responsible for integrating the supply to achieve greater capabilities and profits. The primary role when it comes to supply chain management is creating the integration of processes and information within a firm such as marketing, finance, sales, manufacturing and distribution.

The movement of goods along the supply chain is reflected by corresponding movements of information. However, without a good IT infrastructure, properly designed supply chains, and capable people, this will not succeed. SCM focuses on integrating and managing the flow of goods- services and information through the supply chain in order to make it responsive to customer needs while lowering total costs. However, to compete in today's global marketplace a company has to count on the combined and coordinated effort of all members of the supply chain. Supply chains require close collaboration, cooperation, and communication among members to be effective. Suppliers, and their customers must share information. It is the rapid flow of information among customers, suppliers, distributors, and producers that characterizes today's supply chain management. Suppliers and customers must also have the same goals. They need to be able to trust each other: Customers need to be able to count on the quality and timeliness of the products and services of their suppliers.

Electronic data interchange (EDI) is also one of ITs, has been heavily used in industries. Web technologies allow firms to collaborate with business partners to gain the benefits of reducing costs, enhancing customer satisfaction, and retaining competitive advantages. New information technologies and e-commerce solutions have transformed supply chain operations from mass production to mass customization as conducted by Dell where its practice of giving customers the ability to match supply and demand because its customers order computer configurations over the phone or online through Web site or Internet. These computer configurations are built up from components that are available.

Dell, Inc. is known throughout the world as a leader in supply chain management (SCM) and just-in-time (JIT) manufacturing. Relying heavily on a vendor managed inventory (VMI) model, Dell has nearly eliminated inventory cost while maintaining a JIT manufacturing strategy. The power of SCM and e-commerce are well exemplified by Dell, Inc. Dell Computers continues to enhance and broaden its competitive advantage by integrating the Internet into its entire business process, including online marketing & sales, procurement, customer support and CRM.

This case study focused on how IT plays important roles in SCM; how IT transforms and streamlines

SCM, and Dell's successful electronic SCM and e-commerce implementation are illustrated and discussed.

Research framework is based on theoretical framework and includes three dimensions consisting of how Dell Inc. harnesses IT power to enhance its SCM for success through competitive advantage; how IT, particularly the Internet and Web technology play critical roles in electronic SCM; and the Internet and Web technology's contribution to SCM. By linking a company with its suppliers, vendors, and customers, the supply chain creates an extended enterprise. That extended enterprise depends on IT and information systems to share data and collaborate, similar to the way various departments within the company do. Supply chains can be grossly inefficient unless the companies in the supply chain can share data, collaborate, and respond to changes in demand and do so efficiently and quickly.

2. RESEARCH METHOD

A case study approach was conducted to obtain data and information pertaining to the roles of IT in Dell's SCM. A literature review on textbooks related to IT, particularly Internet (including intranet and extranet) and Web technology, business software applications such as ERP, SCM software, CRM, e-commerce, and supply chain management concept, was conducted to complete data and information obtained in this case study. Additional data and information were gathered from Dell's annual reports, whitepapers, journals, and Dell's Web-based e-commerce through Web browsing and e-mail [16].

Case background

Michael Dell had the idea of selling computer systems directly to customers when he was a student at the University of Texas 1984. This business model inspired Michael Dell to set-up a new business called "Dell Inc. In 1985 his new company designed its first computer system and soon began offering next-day, on-site product service. By 1993, Dell, Inc. had become one of the top five computer makers worldwide, threatening Compaq, which started a price war. At that time, Dell Inc. was taking orders by fax and snail mail and losing money. Dell's Losses reached over $ 100 million by 1994 and caused the company was in trouble. (Source: www.dell.com and www.dell.com/delldirect)

By 1996 Dell was selling computers on the Internet/Web e-commerce as depicted in figure 3, and by 2000 the company's Web site was pulling in $50 million a day in direct sales. Dell's revolutionary supply chain is characterized by its minimum levels of inventory, a policy of paying suppliers only after the customers have paid Dell, and direct sales. Industry analysts say that these strategies have changed high-tech manufacturing the way Wal-Mart changed retail. Dell's business model which is based on IT power, efficiency, and speed, can work as well in parts of the world.

3. RESULTS AND ANALYSIS

3.1. Insights Dell's product lines Its Customers

The commercialization of the Internet in the early 1990s and the introduction of the World Wide Web in 1993 provided Dell with an opportunity to expand rapidly. Dell implemented aggressive online order-taking and opened subsidiaries in Europe and Asia. Dell also started to offer additional products on its Web site. This enabled Dell to batter Compaq, and in 2000 Dell became number one in worldwide PC shipments. At that time, Internet sales topped $50 million per day (about $18 billion per year). Dell sells about $62 billion a year in computer-related products online, from network switches to printers, employing over 88,000 people.

Dell survived from its losses of over US$ 100 million through a best-practice leader at seamlessly integrating IT (internet, web-ecommerce) and SCM to enhance all processes across and an extended supply chain and e-commerce. Dell sells its product lines to Individuals & Households such as homes and home offices; for Businesses/Institutions/Government/Health-care organizations/Partners; Small and Medium-sized Enterprises (SMEs); Large Corporations; Institutions/education, Government; health-care organizations; and Partners.

3.2. Internet and Web Technology Harness Dell's B2C, B2B, and B2G EC

Sales to the first group are classified as B2C e-commerce. Consumers shop at dell.com using an electronic catalog. The sales are completed using mechanisms of e-commerce platform. Business-to-customer (B2C) sales are facilitated by standard shopping aids (e.g., catalogs, shopping carts, credit card payments. Dell matches supply and demand because its customers order computer configurations over the phone or online (Internet). These computer configurations are built up from components that are available.
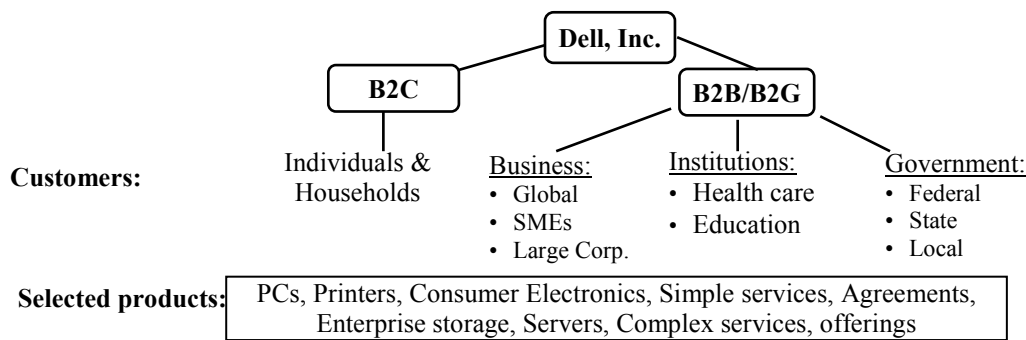
Figure 3: Dell's e-Commerce and Product Lines

For B2B EC (e-commerce), sales to the other four groups are classified as B2B e-commerce. Most of Dell's sales are to businesses that cover SMEs, Large enterprise Institution/educational, Government, and health-care organizations. B2B customers obtain additional help from Dell where Dell provides each of its nearly 100,000 business customers with Premier Dell service.

For B2G, British Airways as an example considers Dell to be a strategic supplier. Dell provides notebooks and desktops to 25,000 British Airways users. Dell offers two e-procurement services to British Airways purchasing agents. The more basic service, Premier Dell, allows British Airways and other businesses to browse, buy, and track orders on a Dell Web site customized for the user's requirements. The site enables authorized users to select preconfigured PCs for their business unit or department. A more advanced version, Premier B2B, supports e-procurement systems. This provides automatic requisition and order fulfillment once an authorized user has chosen to buy a PC from Dell. British Airways has placed the e-procurement tools on its E-Working intranet. This allows authorized staff to purchase PCs through a portal that connects directly into Dell's systems.

In addition to supporting its business customers with e-procurement tools, Dell also is using e-commerce in its own e-procurement. Dell developed an e-procurement model that it shares with its business partners. One aspect of this model is the use of electronic tendering to conduct bids. Dell uses electronic tendering when it buys the components for its products.

3.3. IT Plays an Important Role in Dell's SCM

Dell demonstrates effective IT-enabled SCM in conducting business. Dell adjusts to its changing environment by deploying a comprehensive integration of IT (e-commerce) and SCM. IT-enabled SCM enables to communicate and collaborate (e-collaborate) with its many business partners with whom it needs. Dell uses shippers, such as UPS and FedEx, to deliver its computers to individuals. It also uses third-party logistics companies to collect, maintain, and deliver components from its suppliers, and it has many other partners. Dell is using Web Services, an e-commerce technology, to facilitate communication and reduce inventories. Web services facilitate B2B integration. The B2B integration offer combines Dell PowerEdge servers based on Intel architecture and Web Methods B2B integration software to link customers' existing ERP or procurement systems directly with Dell and other trading partners. In addition, Dell can provide e-procurement applications and consulting services.

Dell demonstrates e-CRM effectively. Dell uses a number of different tools to provide superb customer service around the clock. To leverage CRM—a customer service or e-customer service approach that is customer centered for lasting relationships, Dell provides a virtual help desk for self-diagnosis and service as well as direct access to technical support data. Customers can also arrange for a live chat with a customer care agent. Product support includes troubleshooting, user guides, upgrades, downloads, news and press releases, FAQs, order status information, a "my account" page, a community forum (to exchange ideas, information, and experiences), bulletin boards and other customer-to-customer interaction features, training books (at a discount), and much more. Dell keeps a large customer database and using data mining tools. The database is used to improve marketing as well.

Dell demonstrates successful Intra-business e-commerce. IT-enabled SCM fully supports Dell for mass-customization. To support its build-to-order capabilities, significantly improve its demand-planning and factory execution accuracy, reduce order-to-delivery time, and enhance customer service, Dell partnered with Accenture to create a new, high-performance supply chain planning solution. Now in place in Dell's plants around the world, the program, which paid for itself five times over during the first 12 months of operation, enables Dell to adapt more quickly to rapidly changing technologies and the business environment, maintaining its position as a high-performance business. Dell also has automated its factory scheduling, demand-planning capabilities, and inventory management using information technology and e-supply chain models.

Dell adopts effective IT-enabled marketing strategy. Dell's promotional programs links to a variety of Websites by which Dell provides affiliate partners the opportunity to link from their Websites to dell.com. Dell pays 2 to 4 percent on any qualified sale made from clicking on Dell's link at the partners' Websites. In addition, Dell auctions refurbished Dell computers and other products at dellauction.com.

Dell succeeded in achieving competitive advantages through the deployment of IT-enabled SCM and effective e-commerce by which attributed to its direct-sales model in mass customization or build-to-order systems. This made Dell excel over its competitors through effective IT implementation to enhance SCM operations and survive from losses of over US$100 million in 1994. And Dell has been one of Fortune's top five "Most Admired" companies since 1999, and it continuously advances in the rankings of the Fortune 500 and the Fortune Global 500.

Despite the slow PCs market forced Dell's revenue to drop, its core competency in strong IT-enabled SCM helped Dell manage 15 percent increase in product shipments as industry volume dropped 5 percent in 2001. As a result, Dell surpassed Compaq to become the No. 1 PC maker in the world in 2001.

4. CONCLUSION

The results and discussion reveal that Dell Inc. is expert in ITs and better understand IT can play important roles in its supply chain management. Dell has succeeded in harnessing IT, particularly Internet, Web technology (e-commerce), ERP and SCM software, EDI, etc. to transform and streamline Its SCM. Yet, IT is an important aspect of the electronic supply chain management (SCM); IT is just one component of Dell overall strategy, it simply extends the firm's reach, and it must be integrated into the overarching strategy the firm uses to reach and interact with its customers.

The effective IT implementation has enabled Dell to match supply and demand through excellent information sharing. This allows Dell to know what he must be able to supply in real time and then very quickly and precisely meet that demand while maintaining low inventory. These computer configurations are built up from components that are available. Dell's strategy is to provide customized, low cost, faster, and quality computers that are delivered on time. Dell successfully implemented this strategy through its efficient manufacturing operations, better supply chain management and direct sales strategy. Dell also saves time on processing orders that other companies normally incur in their sales and distribution system. In addition, by directly dealing with the customer Dell gets a clearer indication of market trends. This helps Dell to plan for future besides better managing its supply chain.

Dell has succeeded in exploiting the advantage of the IT to improve performance, and establish a unique e-commerce model by embracing IT in its supply chain. Dell brings products to market faster than its competitors: Dell uses direct sales via Internet, whereas traditional PC manufacturers previously assemble PCs ready for purchase at retail stores. PCs have life cycles of only a few months. Thus, Dell enjoys early-to-market advantage. As shown in Figure 3, how Dell attracts large business customers is o facilitate B2B sales, the Dell site offers each customer an individualized interface where purchasing managers log on and order using an interface customized for their company's needs while Dell's consumer sales are highly visible, its business sales are much bigger revenue source.

5. RECOMMENDATION

Dell incorporates a highly efficient built-to-order business model which buyers can click through Dell and assemble a computer system piece by piece based on their budgets and needs. Dell employs supply chain tools to provide global views of forecasted product demand and materials requirements as well as improved factory scheduling and inventory management. Although Dell, Inc. has successfully integrated new IT and human knowledge for success, but due to super competitive markets, it recommends that Dell should need to continuously design and develop new and innovative products, product development and enlargement, and technology innovation to meet customer satisfaction.

Cloud Computing has become the latest IT trends, because it reduced complexity, lower costs, and improved scalability afforded by enterprise clouds are growing in appeal to many organizations. Cloud computing is a big driving force in the IT industry today. The cloud computing landscape continues to realize explosive growth. The worldwide public cloud services market was projected to grow nearly 20 percent in 2012, to a total of $109 billion, with 45.6 percent growth for Infrastructure as a Service (IaaS), which is the fastest growing market segment. Whether they are scientists, business analysts, software developers or entrepreneurs, innovators can collaborate more easily when they are working in a shared cloud computing environment. Dell Inc. may consider Cloud Computing deployment to further reduce its operating costs.

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