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The Internet: Business Efficiencies of Merged Voice and Data Communications

Companies that have deployed Internet protocol (IP)-based applications in their core business processes have realised business efficiencies emanating from supply chain integration, just-in-time inventory management, real-time price and availability quotes for products, increased productivity and improved, albeit less costly, customer support. Several of these applications, particularly web-based customer support, will be adopted by a majority of companies within the next 3-5 years. In leading-edge companies, however, the re-engineering and integration of internal and external business processes was a prerequisite for the successful adoption of these applications. Although such re-engineering and integration are fraught with technical and organisational complexities, it may well reflect how successful global corporations have responded to the challenges and pressures of the new networked, and competitive business environment.

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Introduction

The phenomenal growth of the Internet, coupled with stellar increases in Internet-based sales by companies such as Amazon.com and Dell Computers, has generated tremendous interest in the consumer benefits of e-commerce, and the Internet consumer market. However, while some retail companies will experience meteoric increases in Internet-based sales in the next 3-5 years, many will not. Indeed, even the most optimistic projections of \$200 billion in Internet sales by the year 2000 would represent less than 5% of total retail sales by US consumers, and would be negligible if it accrues to all sectors.

However, a more pervasive, though less trumpeted, use of the Internet has already been occurring in the business-to-business sector. A large number of companies have already deployed IP-based applications, from the now common place web-based customer support functions to more elaborate applications, such as inventory management. By studying Marshall Industries, the Automotive Network Exchange (ANX), Cisco Systems and Wal-Mart, this paper examines cases where the Internet and IP-based applications have been reshaping the business landscape and revolutionising the business model, and identifies business efficiencies that have been attained through the merging of voice and data applications.

In summary, such efficiencies extend beyond cost savings from a single voice and data network, to include more extensive benefits accruing to just-in-time inventory management, real-time price and availability quotes for products and improved, albeit less costly, customer

support. For example, this paper estimates that Marshall Industries, through its use of IP-based applications, has achieved cost savings of some \$145 million from reduced sales, general and administrative costs between 1994 and 1998. Similarly, Wal-Mart has been able to shave some 0.04% annually off its sales, general and administrative costs, which translates to some \$400 million in savings for the retail giant. Based on a survey of US companies by CTM, this paper shows that several of these IP-based applications will be deployed extensively by a majority of businesses within the next 3-5 years. The results of this survey, together with a review of findings from other surveys, support the view that the Internet revolution is rapidly and 'insidiously', albeit unglamorously, revamping business processes.

Marshall Industries

With revenues of \$1.46 billion in 1998, Marshall Industries, is the fourth largest electronic components distributor in the United States and operates in an industry which is highly competitive and characterised by rapid technological change and fast product cycle times[†]. The industry, in general, has been experiencing tremendous growth, and many companies have seen their annual revenues double between 1993 and 1998, due to the increased global demand for electronics and computer equipment*. Marshall has

[†] The largest two distributors, Arrow Industries and Avnet Incorporated, had net sales of some \$8.34 billion and \$5.92 billion in fiscal 1998, respectively.

* Part of the growth in net sales for some of the companies were due to acquisitions.

developed a strong intranet/extranet strategy that has made the company more successful than its competitors at delivering some 125 000 different products from more than 150 suppliers to over 100 000 customers, and tracking these deliveries each day.

Marshall's reorganisation

Although many observers have credited Marshall Industries' growth and performance to its implementation of information technology (IT) systems, it is important to note that several significant changes preceded the implementation of IT. First, beginning in 1991, Marshall Industries reorganised its corporate structure and adopted a 'very flat' organisational structure to speed up decision making and direct contact with customers. The IT department at Marshall was eliminated in 1993. Many IT projects were late or had failed to meet user expectations, and Marshall Industries felt that the best way to overcome these problems was to integrate IT into the business units¹. Secondly, in response to growing competition in the industry, it abolished the Management by Objective System and adopted a customer-oriented global performance measure. It abolished all sales commissions and management incentives based on specific objectives in favor of one criteria: overall corporate profits. This was done to prevent friction between traditional sales processes and the new sales channel of cyberspace. Marshall Industries made the customer the primary focus with the object of delivering the lowest possible price, with the highest quality and service, and in the fastest possible time, as captured by its impossible mantra, 'Free, Perfect, Now'.

Since its web efforts began in 1994, Marshall has gained nearly 200 000 new distinct customers through a network which handles nearly 700 000 transactions per day. In addition, productivity per employee has increased from \$360 000 in 1991, to \$635 375 in 1998². However, this represents a decline from \$846 150 in 1997, primarily due to an increase in staff as a result of its acquisition of Sterling Electronics Corporation. As Figure 1 also shows, Marshall's sales, general and administrative expenses, as a percentage of net sales, have decreased with the introduction of its web efforts, from 16.6% in 1993 to 11.2% in 1998³.

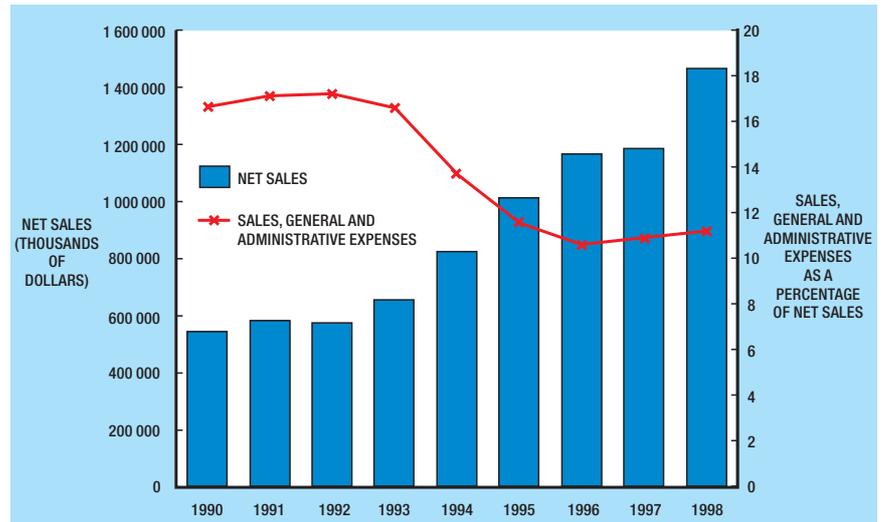


Figure 1—Marshall Industries

To a large extent, Marshall's success is the result of effective management of technology—applications are tailored to their specific operations, and are thoroughly integrated throughout all units of the company—sales, marketing, and corporate management. Furthermore, greater communication among its customers, suppliers, and partners was achieved through: a restructuring of the company which forced employees to focus on the customer; implementation of a 24 hour help desk for customers to talk to a live person via telephone or the Web; and through Marshall's international partnerships and alliance activities. The corporate redesign was facilitated by the implementation of the IT systems⁴.

Marshall's intranet

Marshall's web site was designed to provide customers with information on products, pricing and availability via an object-based relational database. The site currently registers over 1 million hits each week from customers in over 59 different countries. It contains information about 170 000 part numbers, 100 000 pages of data sheets and real-time inventory pricing and availability from over 100 suppliers. The site provides customers with their purchase history and allows them to order parts, request samples and track their orders on-line, in conjunction with United Parcel Services. Marshall's site also provides customers with electronic industry news using RealAudio broadcast. In addition, visitors can chat with Marshall's engineers on-line and in real-time 24 hours of the day to

attain product information or help in trouble-shooting problems. Suppliers are also provided with customised pages on the site.

Marshall Industries' intranet, christened GlobalNet, was commissioned on 24 July 1995 at an undisclosed cost, although industry estimates put it at some \$50 million. Marshall's intranet is part of a global wide area network (WAN) upon which 13 client/server platforms sit. It includes an IBM 3090 400J mainframe running a DB2 relational database. The company has been deliberately vague about the specific technical aspects of its intranet for proprietary reasons. Mobile workers use Lotus Notes when they are on the road. A systems integrator DPI Services coordinated the project of automating of the sales force. Key applications include⁵ the Distribution Resource Planner (DRP) system, a database management system that supports customers and suppliers' inventory and shipping scheduling²; the Quality, Order, Booking, Resell Application (QOBRA), a proprietary system used for day-to-day order management; the Automated Shipping and Receiving System (AS/RS) that interfaces with the automated warehouse for robotic movement of the inventory²; and the Education, News and Entertainment Network (ENEN) that allows suppliers to give live seminars about their products, and archive the presentations for potential customers in the future². GlobalNet thus affords Marshall's salespeople real-time or near real time price quotes and inventory status from customer premises and provides virtual interaction between potential customers and suppliers to

design new products through use of web-casting technology.

Marshall Industries' performance

The increasingly competitive nature of the electronics distribution industry has generated intense downward pressure on gross margins. Following Marshall's lead many distributors have implemented, to varying degrees, IT solutions in their business processes, such as Arrow Industries' Worldwide Stock Check System and, Pioneer Standard's Systems Integration Value-Added Center (SIVAC). Although use of IP-based solutions in business processes is not unique to Marshall Industries, they have utilised these applications more comprehensively and more effectively.

Marshall Industries' seemingly phenomenal success is testimony to the power of customised IT solutions and the Internet as a means to differentiate companies from competitors. As net sales have increased in the electronics distribution industry, many of the larger firms have responded by increasing the number of employees. However, Marshall has managed to accommodate a near doubling of its revenue since it began its comprehensive shift to e-commerce four years ago, while keeping the number of employees relatively constant. Although accurate quantification of gains in employee productivity and customer service attributable solely to IT-based applications is not easily calculable, the evidence strongly suggests that greater efficiency and service have been achieved. This is reflected aptly in Figure 2.

Two features in Figure 2 are noteworthy. First, Marshall Industries has been able to achieve higher levels of employee productivity compared with some of its competitors. Secondly, it has been able to achieve greater increases in productivity between 1992 and 1998 than its competitors. Increased competition in the industry has pressured distributors to find ways to lower or contain costs, particularly through the adoption of IP-based applications in business processes. Marshall appears to have been successful in this respect, as shown in Figure 3. Juxtaposing Marshall Industries' sales, general and administrative costs against the industry average, and accepting a natural downward trend of these costs for the industry, Marshall's ability to lower its costs below the industry average translates to an estimated total savings of some \$143.7 million between 1994 and 1998.

Wal-Mart

Wal-Mart is considered the leader in quick-response merchandise replenishment, using massive parallel processing, and supply-chain management to ensure the uninterrupted flow of goods to its 3400 stores around the world. Tightly knit relationships have been formed with business partners in order to streamline the supply chain, and to keep inventories low. In 1997, Wal-Mart, embarked on an aggressive programme to increase IT development staff by 40% and quickly deliver applications aimed at reducing store inventories and speeding the supply chain. As a result, profits grew 14% on a 12% sales jump for the first nine

months of Wal-Mart's 1997 fiscal year, and third-quarter profits jumped by 16% on an 11% revenue advance. More crucially, third-quarter inventories at Wal-Mart's US stores were lower than year-earlier levels, an achievement directly attributable to better and faster information in the supply chain⁶. Currently, more than 90% of Wal-Mart's software is developed internally by 1000 full-time programmers. Despite the company's expertise in making software, they spend less on technology as a percentage of sales than other retailers, 0.5% in 1998, versus 1.43 % for the industry⁷.

Data warehousing

Wal-Mart's extranet, Retail Link, is a private network for sharing inventory and sales data with some 5000 merchandise suppliers and is one of the first large-scale examples of vendor-managed inventory over the Internet. Wal-Mart has built one of the world's largest data warehouses which is used to track everything possible about their merchandise⁸ and meant to essentially streamline the information supply chain⁹. Its multimillion dollar data warehouse stores some 43 terabytes of data and enables detailed analyses of data on point of sale, inventory, products in transit, market statistics, customer demographics, finance, product returns, and supplier performance. The data is used for three broad areas of decision support: analysing trends, managing inventory, and understanding customers. What emerges are 'personality traits' for each of Wal-Mart's 3000 or so outlets, which Wal-Mart managers use to determine product mix and presentation for each

Figure 2—Net sales per employee for selected distributors, fiscal 1992–1997 (in thousands of dollars)

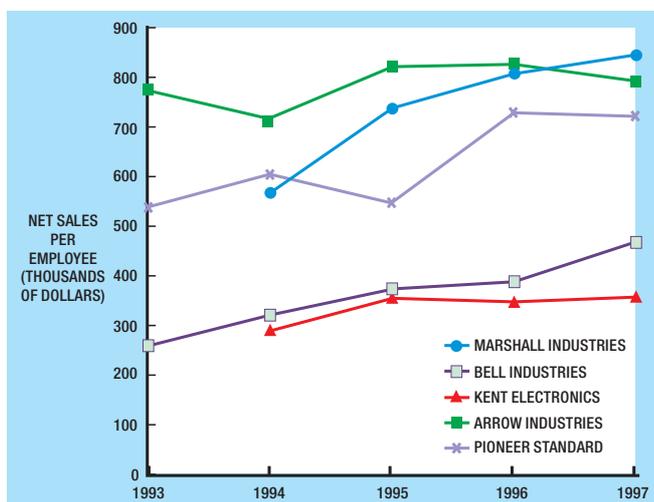
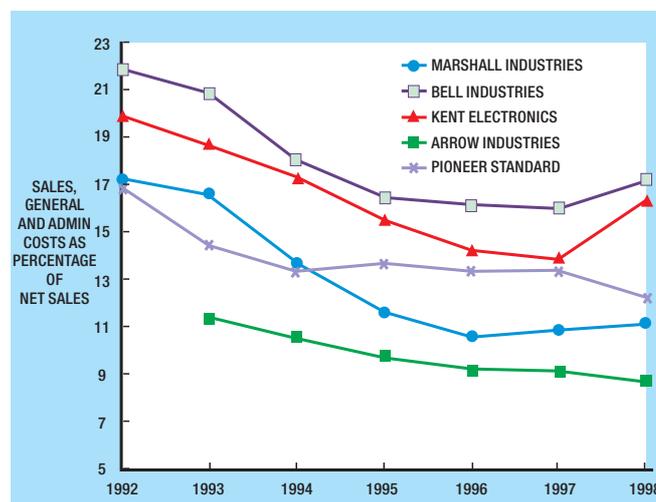


Figure 3—Sales, general and administrative costs as percentage of net sales, fiscal 1992–1998



store. The information helps Wal-Mart determine the right product on the appropriate shelf at the lowest price and the optimum placement of goods in the store so as to maximise sales of related products and cross-marketing. The purchasing information is sent to product manufacturers over the Internet which allows manufacturers to re-supply or cut prices if a product is not selling well. This affords Wal-Mart a major advantage over most of its competitors¹⁰.

Since information from the individual operational databases is copied into the data warehouse at regular intervals, anyone in a retailer's organisation can access information from the data warehouse without disrupting the often critical applications the donor databases were designed to support. Techniques using three-dimensional visualisation tools show data and make predictions about what consumers will buy based on factors like ethnicity, weather patterns, local sports affiliations, and 10 000 other traits¹⁰. The company has a network called *CarrierLink* for firms that haul goods to its distribution.

Wal-Mart's cost of sales as a percentage of net sales for fiscal year 1998 was 79.2% as compared to 79.6% for its 1997 fiscal year, as shown in Figure 4. The company attributes the 0.4% decrease to improvements in the mix of merchandise sold and to better inventory management¹¹. This translates to a savings of some \$456.56 million. Because of its success, Wal-Mart is beginning to introduce a demand-forecasting application, based on neural networking software and a 4000 processor parallel computer from NeoVista Solutions Inc. The application will look at individual items for individual stores to decide the seasonal sales profile. The NeoVista system keeps a year's worth of data on the sales of 100 000 products and predicts which items will be needed in each store. Wal-Mart also plans to expand its use of market-basket analysis. Data is collected on items that comprise a shopper's total purchase so that the company can analyse relationships and patterns in customer purchases. Currently some 3500 users make 10 000 database queries a day¹².

Automotive Network Exchange (ANX)

ANX represents an unprecedented collaboration by the Big Three automakers, Chrysler, Ford and

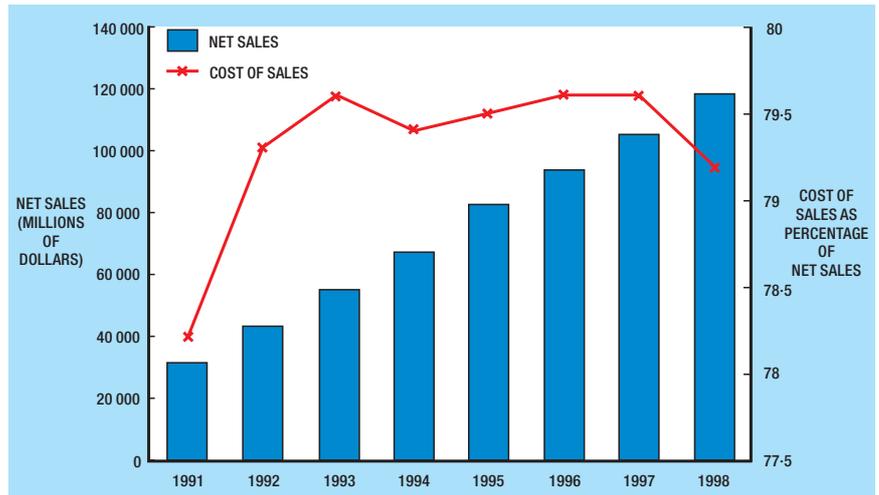


Figure 4—Wall-Mart Industries

General Motors and their top suppliers. ANX is an extranet that will establish a standard way for parts suppliers to communicate with manufacturers. The system is owned by the Automotive Industry Action Group, (AIAG). It has been under development since 1996, and began full operation at the end of 1998. ANX could ultimately link as many as 40 000 automakers, parts suppliers, dealerships, and financial-service companies to share everything from computer-aided design (CAD) files and groupware applications to e-mail and electronic data interchange (EDI) over a single IP network, replacing a complex and costly network system of multiple connections formerly existing in the automotive supply industry. Although private TCP/IP networks are currently well-established and reliable in the automotive industry, they fall short of industry-wide connectivity, which is the aim of ANX. Because ANX combines industry-wide connectivity with a protocol that is application-independent, it will encourage higher speed connections among trading partners.

ANX will interconnect automakers and trading partners using certified service providers (CSPs)—Internet service providers that meet ANX criteria for network performance, reliability, security, and administration—connected to a private ANX exchange point. An 'overseer' will continually measure the connected CSPs for packet loss, latency, link utilisation and other metrics, and will be equipped with disaster recovery plans¹³. Digital certificates are intended to help industry overcome the security concerns over the Internet. The electronic certificates used by ANX allow its various participants to

authenticate one another's identities as they pass supply information back and forth over the extranet. Digital Signature Trust Company (DST), one of the premier providers of digital signature authentication and certification services, is the exclusive provider of digital certificate directory services to ANX.

ANX is using the Internet protocol security (IPSec) standard to secure its virtual private network (VPN). As a result, subscribers can conduct business-critical applications such as EDI via a ubiquitous and cost-effective alternative to private leased lines. Limited entry and exit points will let automakers securely share real-time data, such as changes to a production design, and confidential business information with suppliers. ANX is designed to be more reliable, more secure and faster than the public Internet¹⁴. By limiting access to the network and by using extra encryption, ANX hopes to move beyond security concerns that have hobbled the industry's move to increased reliance on computer networking in the past.

ANX, believes that the suppliers furthest downstream in the supply chain will stand to benefit the most from ANX¹⁵. In this respect, Chrysler expects to save millions by consolidating communications links onto ANX, through fewer T1 and satellite connections, and through the use of a standardised IP protocol in infrastructure support¹⁶. Similarly, LucasVarity, another participant in ANX, hopes to save at least 20% of the \$6 million the company spends on private networks[†]. In addition, UT Automotive,

[†] LucasVarity is a \$7 billion company based in London whose Detroit division supplies brake systems to automakers in 20 countries.

the \$3 billion auto parts subsidiary of United Technologies, asserts that ANX relieves it financially from having to build a telecommunications infrastructure¹⁷. Table 1 compares the cost structure for traditional telecommunication connections with those that would be incurred under the ANX system. As shown, for a large automotive company with annual revenues of \$8.3 billion, this translates to an annual cost of \$151 532 under the current structure as compared to \$54 680 under the ANX system¹⁸. For a medium company with annual revenues of some \$1.7 billion, this amounts to an annual cost of some \$78 000 using traditional connections as compared to some \$25 850 under the ANX system.

Cost-savings through streamlining the supply-chain

Usually, when a supplier is connected to an original equipment manufacturer in order to access an application, a new link is established. Consequently, there are redundancy and higher costs, and many different skill sets must be maintained in order to handle every communications flavour that customers require¹⁸. Currently,

50–60% of a car's cost is due to the supply chain. If ANX is successful in cutting the time it takes for information to move through layers of the supply chain to 4 days from the 4–6 weeks that is normally spent, cost savings will be enormous. Since substantial cost is embedded in the supply chain, the challenge of redesign lies outside of each company rather than internally¹⁹. Overall, estimates of annual cost savings for the auto industry range from \$1 billion to \$2 billion, with savings per car estimated at \$70 to \$76²⁰. Through ANX, auto suppliers can reduce the time it takes to turn around an order. The faster the parts come in, the faster the cars leave the assembly line. Ford, for example, hopes to compress some work order communication from three weeks to five minutes²¹.

ANX has announced that it intends to link up with the European Network Exchange (ENX), although some European industry officials are doubtful if the ANX system can bridge the cultural, political and legal barriers separating the two markets²². As of March 1999, ANX had signed up only 34 customers.

AT&T hopes to sell leased lines and dial-up access to ANX members, although the cost for customers to buy services from ANX certified providers tends to be 4–5 times higher in price than non-ANX certified providers. It is still unclear if auto-industry customers will switch away from value-added networks, with the myriad of proprietary protocols running disparate financial, procurement and engineering design applications, and private lines to IP-based connections for sending mission-critical traffic.

Cisco Systems

Founded in 1984, Cisco Systems is a leading global provider of Internet-working solutions for corporate intranets and the Internet. It primarily manufactures multi-protocol computer communications equipment but also develops pre-packaged network communications software. For the 1998 fiscal year, it reported revenues of some \$8.46 billion, an increase of 31.3% over fiscal 1997 and a significant increase from the \$700 million it posted in 1993. Sales to international customers accounted for some 40.9% of total sales in 1998²³. Currently, about 60% of Cisco's business is enterprise, 30% is service providers and 10% is small/medium businesses. It should be noted, however, that much of Cisco's growth has come through a spate of acquisitions, including the \$4 billion purchase of StrataCom in April 1997, which has boosted Cisco's share in the ATM switching market²⁴.

Cisco's web site accounts for 70% of its customer support activity and 15% of product orders. Cisco's web site was designed from the ground up and went on-line in early 1994 as a means of providing technical applications support to their customers, including software downloads²⁵.

Strategic objectives

When the Cisco Marketplace went on-line in March 1996, it offered customers the ability to configure their own products, price an order and route it within the company without having to depend on a salesperson. Cisco was reputed to be the first company to reach an annualised run-rate of \$1 billion worth of products sold over the Internet by June 1997. According to the company, by October 1998, 69% of Cisco's orders were placed on-line which translate into \$21 million per day, or \$7.7 billion a year²⁶. The overall

Table 1 Telecommunications Connections Cost Comparison for Company (annual revenue of \$8-billion)

Existing Connections		
Purpose/Applications	Types of Service	Annual Costs (\$)
X.400 Mail	19.2 kbit/s X.25 leased line	9 072
Chrysler SMART	9.6 kbit/s SNI leased line	10 272
Ford CAD file transfer	56 kbit/s IP VAN leased line	7 752
Ford DDL	9.6 kbit/s SNI leased line	1 272
Ford supplier CAD file transfer	56 kbit/s X.25 leased line	9 672
Navistar EDI on-line	19.2 kbit/s SNI leased line	5 052
Mack Trucks EDI on-line	56 kbit/s SNI leased line	8 232
Volvo EDI on-line	14.4 kbit/s SNI leased line	11 040
EDI VANs	9.6 kbit/s bisynch dial	53 808
Supplier dial-up access	9.6 kbit/s bisynch dial	35 360
Total		151 532
New Connections		
	One-Time Cost	Annual Cost
Subscription assessment	2 400	
IPSec software	11 000	
Training	10 000	
Systems integration		
Total	23 400	
Digital certificates		250
Registration		1 600
Subscription		4 800
Connection		48 000
1.422 Mbit/s leased line		
Total		54 650
Payback period (years)		0.38

objective has become thorough streamlining of their business, by taking advantage of the Internet's ubiquity, and the suitability of their product portfolio to on-line support and sales.

Cisco's e-commerce site, Cisco Connection Online (CCO), offers 24-hour global support for customers with technical and service questions. By most accounts, this site has been successful in increasing the company's accessibility to customers and in forging and building relationships²⁷. Order status was one of the first processes to go on-line, prompted primarily by the frequent telephone call requests by customers. Some 70–80% of inquiries that used to be handled by Cisco's call centre are now answered electronically. The monthly log of incoming calls is increasing at 6.5% per month, but the CCO log-ins are increasing at a monthly rate of 10–15%²⁸.

Overall, extranet and Internet applications have allowed Cisco to cut costs and intensify its relationships with all its customers. They built up their on-line business by requiring their suppliers to link into Cisco's procurement system so that there would be a common network²⁸. In Cisco's case, its extranet connections to its reseller and distributors are the heart of its e-commerce business, in contrast to other companies that usually begin with intranets to improve internal business efficiencies, and then gravitate towards IT solutions for improving customer relationships²⁵.

Benefits of e-commerce

Through its on-line operations, Cisco has been able to generate several economic advantages for itself as well as its customers:

- *Lower marketing and support costs:* Cisco's marketing and product-support costs are being held in check as a result of having all technical documents and marketing information sent to resellers and customers over the company's intranet for partners, also accessible through the web site. Cisco expects

to save \$280 million over the year, which in theory should translate to lower costs for customers[†].

- *Increased accuracy of orders:* Cisco, by building into the web-based system an intelligent and sophisticated sales-configuration, has eased the burden on its order-entry staff who must typically correct 10% to 15% of all orders that come in by fax, about 350 000 in the last fiscal year. As a result, orders are correct the first time, reducing the delivery time for Cisco's customers by two to three days.
- *Reduced order processing time:* Cisco has reduced the time required for negotiating contracts, determining pricing, calculating lead times, checking on status and verifying shipment dates. With prices of Cisco products posted, customers can choose their prices and configure their products electronically with the Configuration Agent which walks them through the combination of components, and then gives them the price automatically²⁶. Customers can pursue tracking orders, payments, reconciliation of returns against invoices and the status on their line of credit. The system now integrates with the largest customers' accounts-payable systems using traditional EDI networks, allowing all transactions to be reconciled without manual intervention.
- *Increased customer support:* Cisco's sales partners, resellers of the company's networking products, as well as customers who have been granted access to do business with the company on-line, can use the e-store 24 hours a day from anywhere in the world. This allows customers to get their own information at their own pace, rather than having to wait for a salesperson to return their calls or to track one down through the traditional mediums of e-mails or voice mails, which significantly benefits the large number of its international customers. Since customers have instantaneous status checks of their orders, they have been able to save time by not having to wait for a Cisco customer service representative to field their call. For example, in December 1996, the company logged some 50 000 status checks on orders in progress or service orders via the web site. In January 1997, 66 000 product order inquiries were handled similarly.

Cisco's performance

Cost of sales for the industry, generally has been increasing since 1994, reflecting the increasing competitiveness in the industry. Cisco's costs of sales at 33% compares favourably with the industry average. Sales, general and administrative costs for the industry ranged from 5% to 48% in 1995 and averaged 19.3% in 1995 which is an increase from 15.3% in 1994. Cisco's sales, general and administrative costs amounted to some 22% of sales. This has prompted many firms in the industry to search for ways to reduce these costs. Cisco's cost of sales amounted to about 22% of total revenues²⁹. Cisco, however, has been able to maintain lower comparatively costs of sales than its competitors, as shown in Figures 5 and 6.

Several qualifications on Cisco's success are necessary. First, the actual extent of sales being completed on-line cannot be independently verified*. Initial research suggests that Cisco may be employing a much broader definition of on-line sales than is used in this study, where such sales would include any part of the process, including attaining pricing and product information on-line. Secondly, many companies' current procurement requirements and procedures prevent sales orders actually being placed through Cisco's on-line commerce agent. The growth of Internet commerce thus will depend on companies and institutions altering their procurement procedures and processes. Thirdly, it is highly unlikely that Cisco's commerce agent will completely replace the traditional sales team approach. The commerce agent is not designed to provide some of the services that the sales team does, such as availability of price discounts and after-sales support. Finally, it should be

† According to government data, cost of sales in the computer communications equipment sector range from 5% to 46% of sales. Cisco reports 22% cost of sales in its 10K filing. (Note: 10K is the name of a form that public corporations are required to complete by the Securities Exchange Commission.)

* For example, the network systems manager at Stanford University, in an interview with CTM, stated that the 27 April 1997 *Industry Week* article that cited Stanford University as having purchased a network systems on-line from Cisco was in error. All of the network systems managers interviewed by CTM reiterated that their company's internal procurement procedures currently prevent such on-line purchases.

Table 2 E-Commerce Revenues for Cisco Systems

	1997	1998
First quarter	81	629
Second quarter	126	778
Third quarter	231	960
Fourth quarter	339	na

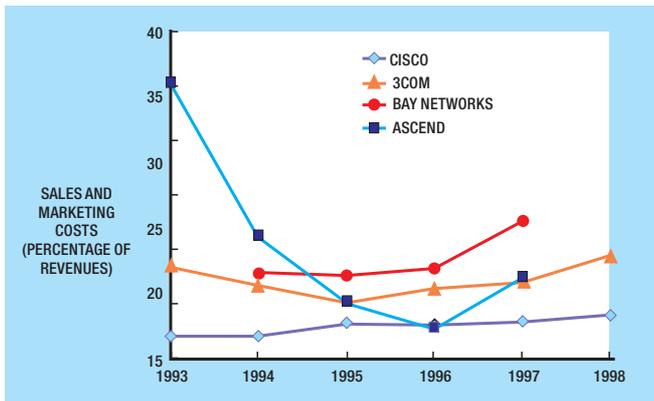


Figure 5—Sales and marketing costs as percentage of total revenues

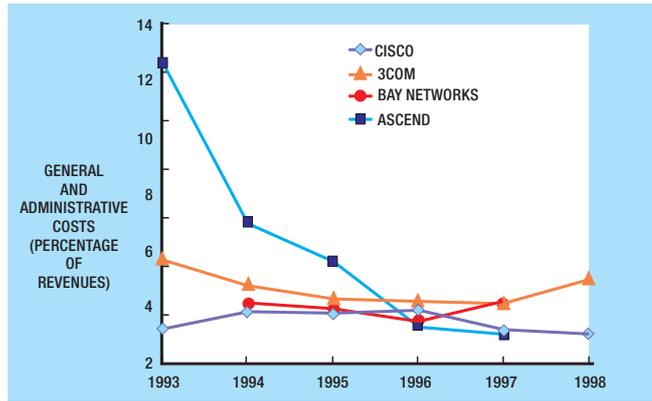


Figure 6—General and administrative costs as percentage of total revenues

noted that Cisco's products and customer bases are unusually well suited to Internet commerce. Cisco's customers are primarily network systems managers who are highly technical, who have the personal ability and organisational resources to conduct business in an on-line environment, and who are generally supportive of such an environment. Clearly, most business and consumer markets lack these particular conditions of success for Internet commerce.

IP Applications and Prospects for Adoption

The above discussion of Marshall Industries and other companies has demonstrated the ability of IP-based applications to lower costs, increase productivity, improve customer support and expand customer base. CTM's survey has found that over 70% rated improvement of the company's image, the use as a promotional tool and the low cost and rapid means of dissemination of information as important or very important reasons for the company to have a web site[†]. Similarly, some 50% of respondents see the Internet as an important or very

important way to increase sales, provide better customer support and expand the geographical scope of the company. Juxtaposed against results from a similar survey in 1997, it is apparent that the main reasons for companies to have web sites have not changed significantly.

Marshall Industries has demonstrated how the use of IP-based applications has enabled it to achieve significant savings in sales, general and administrative costs. However, only 30% of the companies currently see this as an important or very important factor in having a web site. It may well be that the web-based experiences of Marshall Industries and other companies are leavening, albeit slowly, through the economy as there were 10% more companies in 1998 than in 1997 which see cost reduction as an important or very important reason for companies to have web sites.

CTM's survey has also found that some 80% of companies in 1997 and 1998 use their web sites to provide product information. The extent to which companies have adopted other types of IP-based applications is shown in Figure 7. Currently, only 34% of companies allow their custom-

ers to order products on-line while only 15% of companies offer their customers the ability to access technical support, make payments or attain real-time pricing and inventory information through their web-sites. Furthermore, less than 10% of companies currently provide their customers with real-time customer support, order status and checking and purchase history through their web-sites. These are services that Cisco and Marshall Industries currently offer their customers on-line. The growth potentials of these applications, however, are shown by the significant increases in the percentage of companies which intend to offer these applications to their customers by the end of 1999.

The lessons and economic benefits of supply chain integration experienced by Marshall, Wal-Mart and ANX may, however, take a longer time to disseminate through the economy, as shown in Figure 8. Currently,

[†] CTM's survey of some 70 firms is meant to gauge the extent of penetration of some of these IP-based applications. 51% of these firms are large firms with over \$100 million in revenues in 1997 and 61% of the firms employed over 500 people.

Figure 7—Types of on-line services available to customers

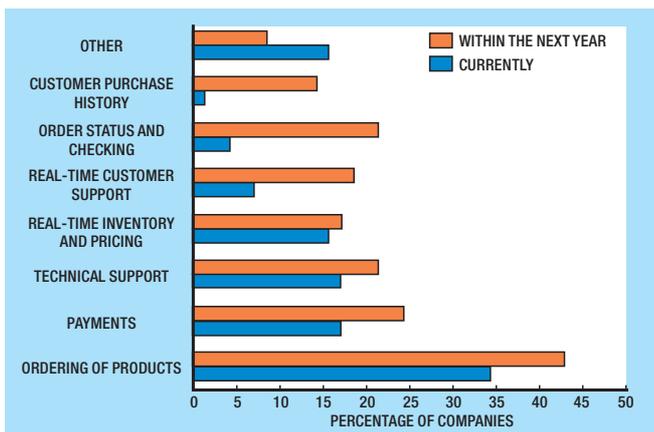
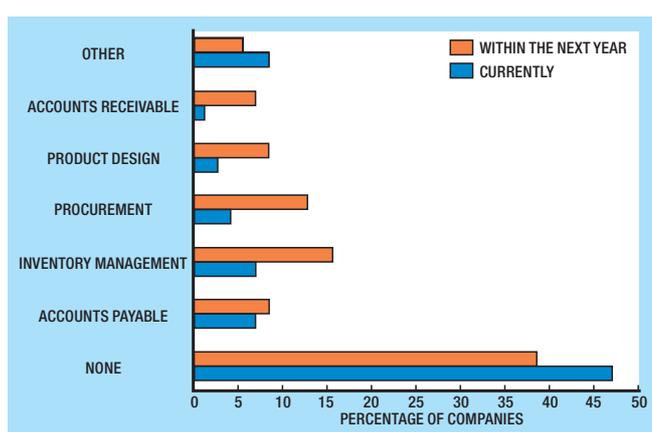


Figure 8—Types of on-line services available to suppliers



nearly 50% of companies do not offer suppliers any business applications through their web sites and most of these companies do not plan to offer any of these applications within the next year. However, although less than 10% of companies currently offer their suppliers account payment, inventory management or procurement services options on-line, Figure 8 shows that a dramatic increase in percentage of firms who will offer these services within the next year.

Wal-Mart and Marshall Industries, particularly, have been able to achieve significant business efficiencies across a wide range of corporate functions through the use of IP-based applications. CTM's survey reiterates two main points. First, a significant percentage of firms have yet to adopt any of these applications in their business processes. Secondly, among those firms that have implemented some of these IP-based applications, a large percentage of them have not been able to fully duplicate the level of success Marshall Industries has achieved. This, in part, may be due to the fact that most firms have not re-engineered their corporate processes first, as in the case of Marshall Industries to fully exploit the advantages of IP-based applications.

Conclusions

Several leading-edge companies have significantly utilised IP-based applications in their business processes and have demonstrated the existence of business efficiencies from the use of these applications. These efficiencies, attained by incorporating IP-based applications and services into the business model include: the lack of need to build proprietary telecommunications and data networks; cost-savings by transferring large data files between clients on the Internet; reduction in customer support personnel; better inventory management; increased customer-base; cost savings in business transactions; and increased employee productivity. However, these efficiencies have been achieved only through the re-engineering and integration of internal and external business processes. Although such re-engineering and integration are fraught with technical and organisational complexities, it may well reflect how successful global corporations have responded to the challenges and pressures of the new networked albeit competitive business environment.

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