

IT-INTENSIVE VALUE INNOVATION IN THE ELECTRONIC ECONOMY: INSIGHTS FROM MARSHALL INDUSTRIES¹

By: Omar A. El Sawy
Marshall School of Business
University of Southern California
Los Angeles, CA 90089-1421
U.S.A.
elsawy@bus.usc.edu

Arvind Malhotra
Kenan-Flagler Business School, CB# 3490
University of North Carolina at Chapel Hill
Chapel Hill, NC 27514
U.S.A.
malhotra@icarus.bschool.unc.edu

Sanjay Gosain
Robert B. Smith School of Business
University of Maryland
College Park, MD 20742
U.S.A.
sgosain@rhsmith.umd.edu

Kerry M. Young
Marshall Industries
9320 Telstar Avenue
El Monte, CA 91731
U.S.A.
kyoung@marshall.com

Abstract

The emerging electronic economy is bringing with it new forms of IT-enabled intermediation,

¹Robert Zmud was the accepting senior editor for this paper. Also, an earlier version of this paper won first prize in the 1997 SIM Paper Competition.

virtual supply chains, rapidly changing electronic commerce technologies, increasing knowledge intensity, and unprecedented sensitivity for time-to-market by customers. Customers are demanding more value, customized to their exact needs, at less cost, and as quickly as possible. The enterprises that will survive in such a demanding environment will need to innovate and invent new ways of creating value, and will require different enterprise architectures and different IT infrastructures. This article focuses on providing a framework for guiding an enterprise as it transforms itself to function more effectively in the electronic economy. Using the distribution industry in general and Marshall Industries in particular as a context, the article draws insights for transforming an extended enterprise's architecture and its IT infrastructure to enable new ways of creating value in the electronic economy. The article provides a staged junction box model for guiding the transformation and also articulates the elements of the new value logic for enterprises in the electronic economy.

Keywords: Electronic value chains, electronic economy, intermediation, distribution industry, supply chain management, intranet, extranet, Internet, electronic commerce, value innovation, time-based competition, fast response, CIO, IT architecture, strategic information systems, total quality management, systems approach, e-business

ISRL Categories: AF0101, AF10, AH05, CA09, DA06, DA10, DD0, DD05, DD0402, EG, EL06, FA, FB04, FC02, GA01, HA07

Electronic Economy Quiz

True or False About Managing a Business in the Electronic Economy?

1. In the electronic economy, the middleman role will disappear and be disintermediated by information technology.
2. In the electronic economy, the movement of physical goods will be replaced by the movement of information.
3. In the electronic economy, the value chain model is a good model for thinking about an extended enterprise.
4. Ubiquitous access of product information and self-service transactions through open networks such as the Internet will make product pricing a more critical differentiator.
5. In the complexity of the electronic economy, incentive and reward schemes such as pay-for-performance will still be effective.

True or False About Managing Information Systems in the Electronic Economy?

6. Web-enabling your IS applications is a technical job that can be easily outsourced.
7. Do not deploy an IS application on open networks until it is thoroughly tested.
8. It is better to develop integrated architecture solutions for electronic commerce rather than continually adding incremental functionality.
9. In building your IT architecture, decide on one standard platform and use software products that conform to it.

True or False About the CEO-CIO Relationship in the Electronic Economy?

10. In the networked environment of the electronic economy in which the CIO's role will increase in importance, complexity, and centrality, the CEO's role and the CIO's role will be increasingly intermingled.

True or False ? Read on

Value Logic and Enterprise Architecture in the Electronic Economy

The electronic economy quiz at the outset of this paper brings into the foreground several issues that enterprises will grapple with as they adapt to the demanding requirements of the electronic economy. The electronic economy brings with it new forms of IT-enabled intermediation, virtual supply chains, rapidly changing electronic commerce technologies, increasing knowledge intensity, and unprecedented sensitivity for time-to-market by customers (El Sawy and Bowles 1997; Mougayar 1998; Tapscott 1996). This demanding environment presents new challenges and opportunities for enterprises, and the ones that will survive will need to continuously innovate and invent new ways of creating value (Kim and Mauborgne 1997). Conventional business logic and traditional strategic approaches for value

creation are becoming increasingly challenged due to a number of factors that include:

- **Time compression:** While the strategic concepts of time-based competition have been known and used for the past 10 years (Stalk and Hout 1990), product lifecycles in high-growth industries are becoming amazingly short as products are being developed on "Internet time" (Iansiti and West 1997). For example, product obsolescence is so prevalent in the IT industry that IT products have been likened to fresh produce that spoil and have sharp price drops if not moved quickly (Kraar 1995). Short product lifecycles are also accompanied by very frequent and rapid new product introductions. Time-to-market considerations and fast customer response thus become overriding issues in value creation logic.
- **Strategic discontinuities:** Major discontinuities are being triggered by time compression,

technological advances, and complex global interdependencies (Bettis and Hitt 1995). Discontinuities may quickly change some core competencies into core rigidities, while simultaneously requiring new core competencies to be developed rapidly to take advantage of new opportunities (Prahalad 1998). In an environment of rapid and unpredictable changes, traditional approaches to strategy tend to collapse. Traditional approaches assume it is possible to predict which industries, competencies, or strategic positions will be viable and for how long. In an environment of strategic discontinuities, enterprises have to compete on the edge of chaos where success and value creation are based on the execution of continual reinvention (Brown and Eisenhardt 1998).

- **Blurring industry and organizational boundaries:** The electronic economy blurs clear industry boundaries as technological changes trigger convergence across some industries and regrouping across others. With such industry volatility, competition for migration paths becomes a critical value proposition (Prahalad 1998). Similarly, the boundaries between an enterprise and its suppliers, customers, and partners are increasingly blurred and their destinies increasingly interdependent (Hagel 1996). Conventional logic, which seeks to maximize value at an individual company level, becomes questionable, and value-creating processes become increasingly interlinked with those of partners (Norman and Ramirez 1994).
- **Knowledge intensity:** The speed of new knowledge creation and knowledge transfer across markets and enterprises becomes a key determinant of enterprise success in an environment which is fast, discontinuous, and volatile. Knowledge is critical to satisfying customer needs for customized products and services, and speedier and improved service (Davenport and Klahr 1998). Harnessing the value of knowledge through information systems is becoming key to learning and value creation for the enterprise (El Sawy and Bowles 1997).
- **Increasing returns to scale:** Increasing knowledge intensity in products and services brings

with it increasing returns to scale. Increasing returns means that the value from a product or service increases through positive feedback loops as the number of users of the product or service increases (Arthur 1996). This further solidifies the incentive to be fast, as early movers control the market size and enjoy the increasing returns. Conventional industrial-age economic value models with diminishing returns no longer apply in such conditions.

- **IT-intensive strategic options:** New maps of competition are being drawn up as enterprises use networking technologies intensively to form "virtual keiretsus" to add value for each other (Reinhardt 1998). In such an environment, "silicon-powered" intermediaries are increasingly performing the role of collaborative coordination of value-creation for business partners (Huber and Korn 1997). Small companies are using the Internet to build interactive relationships with customers and suppliers. This undermines the competitive advantage of established businesses that rely on brands and physical distribution relationships, to the extent that the new Internet-based intermediaries threaten to destroy their value proposition in the physical world (Ghosh 1998).

In combination, the above factors challenge the concepts and assumptions of value creation for enterprises. Enterprises in the electronic economy compete in an IT-intensive, time-compressed, discontinuous, knowledge-intensive environment in which they are inextricably linked to the value creation processes of their customers and suppliers. This leads to the first question that this article seeks to answer:

How does an enterprise maximize value creation in such an IT-intensive environment? What is the new value logic in the electronic economy?

In order to effectively execute value creation strategies in the electronic economy, enterprises will need to transform their organizational architectures appropriately. Core business processes may need to be rethought and redesigned, new organizational forms that foster collaboration and partnering may need to be developed, and human resource and reward systems may need to be

redesigned. It has been argued that enterprises pass through levels of IT-enabled transformation (Venkatraman 1994) that range from localized automation through business process redesign to business scope redefinition. Organizations then proceed to the higher levels of transformation as the demands of competition and value creation for customers increases. Such a model could still apply in the electronic economy. Furthermore, given the volatility of the environment in the electronic economy, enterprise architectures will have to be designed for dynamic stability (Ghemawat and Ricart i Costa 1993). Dynamic stability implies a continuous transformation as conditions change and new opportunities arise, again suggesting that a stage model may be appropriate. This leads to the second question that this article seeks to answer:

How does an enterprise transform its organizational architecture to function more effectively in the electronic economy? What are the stages that an enterprise goes through as it transforms itself?

An IT infrastructure is integral to the transformation of enterprise architecture to suit the needs of the electronic economy. IT infrastructure capabilities are vital for success of business initiatives in industries going through dynamic change, and IT infrastructure investments can account for over 50% of the total IT budget in large companies (Broadbent and Weil 1997). The challenges to building an IT infrastructure in a rapidly changing environment are many and include the presence of legacy technical architecture, the need for distributing responsibilities within traditional structures, and making the whole organization aware of the infrastructure (Keen 1997). Building IT infrastructure that is dynamically aligned with the enterprise's business strategy has become one of the most critical core activities for the IT organization of the late 1990s (Rockart et al. 1996). This leads to the third question that this article seeks to answer:

Can we identify new practices for IT organizations for building and managing an evolving IT infrastructure for the electronic economy?

In order to answer these three questions, we sought the context of an exemplary enterprise that transformed itself to manage the challenges and opportunities of the electronic economy while in the precarious position of being a middleman in a highly competitive industry. The company selected was Marshall Industries, which is in the electronic components distribution industry. We believe what has started to happen in the distribution industry is a harbinger of things to come.

The Distribution Industry as Harbinger

Although every business will be impacted by the coming of the electronic economy, distributors are at the forefront of the changes by virtue of being in the middle and operating on thin margins. They are facing a squeeze from both the customers and the suppliers to add more value in the value chain. The conventional structures and strategies in the distribution industry are being torn apart by new IT-intensive business models. Information technologies, such as the Web, make disintermediation of existing channels a serious threat; at the same time, they provide an opportunity for some distributors to succeed by reinventing their value logic. Distributors that do not add significant value in a value chain and simply move the product through the channel are the most threatened species. Other players, such as shippers and logistic providers, are encroaching on the competitive space of distributors. Faced with the squeeze from customers, suppliers, and new entrants, some progressive companies in the distribution industry are adopting a proactive strategy of reinventing themselves.

In the past, distributors played an important role in the value chain by allowing manufacturers to reach a broad range of customers without having to maintain an extensive distribution setup of their own. However, faced with the pressures of reinventing themselves, distributors have gone beyond ensuring the movement of the physical product. They are increasingly taking on roles such as providing technical service support to customers, processing payments and accounts

receivables for the manufacturers, offering credit, and making investment in inventories, personnel, and information technologies. Component suppliers and system producers are increasingly turning responsibilities over to distributors to do contract manufacturing for them. The benefits to customers are in the form of rapid deliveries of products customized to their needs.

The electronics distribution industry offers an example of the changes that are brought by the electronic economy. Large customers have globalized their business processes and require global sourcing of electronic components. Emphasis on time-to-market has compressed product life-cycle to unprecedented levels (some as short as three months). There is a growing demand from customers for distributors to take over their inventory management and to play a greater role in auto-replenishment and just-in-time deliveries. Sharing of information rapidly along supply chains and to develop effective coordination has become crucial. The growing pressure of mass-customization in manufacturing is further complicating the distribution process. Concurrently, the power of new information technology networks with distributed architectures, bandwidth proliferation, and increasing user friendliness are providing new opportunities for conducting operations in the distribution business.

The competitive situation faced by the distribution industry is succinctly captured by Rob Rodin, the president and CEO of Marshall Industries, an electronic components distribution company:

The traditional form of middleman is becoming obsolete and our company is by definition in the middle. We are a junction box between suppliers and customers. The forces around us are so intense. Our suppliers compete with each other, but they all want the same thing—100% share of mind. No two customers have the same need but they all want the same thing—Free. Perfect. Now.

How Marshall Industries transformed itself to meet those challenges in the period from 1991 through 1996 is examined below.

Systemic Alignment of the Enterprise: The Case of Marshall Industries

Box 1. About Marshall

Marshall Industries is the fourth largest distributor of industrial electronic components and production-supplies in the USA. It is a publicly held, medium-sized company with approximately 1,450 employees and 1996 sales of nearly \$1.2 billion. Marshall distributes 125,000 different products manufactured by over 100 major suppliers in the USA and Japan to over 30,000 business customers. It has a network of 38 sales and distribution branches and three corporate support and distribution centers in North America. It has a sizeable investment in SEI, one of the largest electronics distribution companies in Europe, and it is also a major distributor of Japanese semiconductor products in the USA. Over 75% of Marshall Industries' sales are from semiconductor products. Their product line also includes passive components, connectors, computer peripherals, instrumentation, and industrial production supplies. In addition, it provides customers with value added services such as inventory management, kitting, and testing and programming of programmable logic devices.

Much like a subtle spider which doth sit
In middle of her web, which spreadeth wide;
If aught do touch the utmost thread of it,
She feels it instantly on every side.

Sir John Davies,
The Immortality of the Soul

In 1991, when Rob Rodin took over as CEO of Marshall, misalignments in their organizational system were distorting the voice of the customer and prompting behaviors that were not conducive to serving the customers well (Hartman 1997). While the choice of the little medieval poem above is ours, it epitomizes how Marshall Industries started to think about its future in its

web of customers and suppliers. Drawing on Deming's (1993) ideas on systemic thinking, Rodin began to transform Marshall to cope with the challenges of intense competition in the emerging electronic economy. It involved rethinking quality in terms of the voice of the customer, developing an organizational strategy, structure, systems, and process to deliver quality, and building the necessary IT infrastructure.

The Misalignments

The company's 600 salespeople and branches operated on an independent basis that resulted in suboptimal performance for the company as a whole. Everyone was paid based on an MBO (management by objectives) incentive system. The credit department was paid on days outstanding, regional managers were paid on the profit and loss of their own divisions, salespeople were paid on gross profit dollars, and product marketing managers were paid on sales versus forecast and on inventory budgets. Complicating matters was Marshall's practice of allowing their suppliers to run contests and promotions (sometimes as many as 20 at the same time) for salespeople whenever a new product was to be introduced. This system of incentives and promotions caused distortions: 20% of total sales were shipped in the last three days of the month or quarter; salespeople would ship ahead to make a quota, a number, or win a prize even, if that was not best for the customer. There were constant conflicts between departments about corporate cost allocations, and rampant were practices such as divisions hiding inventory from each other for their own customers, resulting in shortages. Selling of products in inventory was pushed even though it could mean the customer not getting state-of-the-art products. While the customers were interested in solutions to their problems, Marshall's internal processes were geared toward selling products to them. The voice of the customer was lost in this web of conflict. Additionally, the hierarchical organizational structure and accompanying culture were driving employees to work with the overriding objective of satisfying their boss in the hierarchy, rather than the customer.

Rethinking Quality

It became imperative to remove the obstacles to serving the customer. The voice of the customer

had to be heard by all, and customer responsiveness had to become the highest priority. In accordance with Deming's (1993) *system of profound knowledge*, Marshall had to adopt a broader view of quality. They had to go beyond instrumental use of quality management concepts such as statistical quality control and quality circles implemented at the worker level. Rodin realized that quality is made in the boardroom and it is the responsibility of top management to study systemic effects and adopt a management philosophy that aligns the organization with the voice of the customer. As Deming points out, noise from conflict and distortion can be a major source of waste in the system and it is important to effect individual transformation at the deepest level of commitment in all parts of the organization to better serve the customers (Deming 1993; Rodin and Backaitis 1994). In addition, this requires increasing and leveraging the intelligence of the organization.

Operationalizing the Voice of the Customer: Free. Perfect. Now

The first step in aligning the organization and its processes with the voice of the customer was to understand the voice of the customer. It meant operationalizing customer needs in a simple way that all employees and customers could understand and aim to fulfill. Marshall realized that customers, if given a choice, wanted everything: products and services at the lowest possible cost, highest possible quality, greatest possible customization, and fastest possible delivery time. At the limit, this translates to the impossible goals of "Free. Perfect. Now." That was the bull's-eye that Marshall Industries would use to rally people to move toward greater customer intimacy. That would be the guiding light for aligning the voice of the process with the voice of the customer. In addition, being in the distribution industry, their definition of the customer had to encompass both the suppliers as well as their customers.

Marshall Industries knew they needed to work on all three aspects in order to satisfy the customer. They would need to further elaborate and operationalize the dimensions of each aspect. Furthermore, they needed to find a way to prioritize when tradeoffs among aspects or their dimensions were involved. The elaboration of the three aspects of the voice of the customer is

shown in Figure 1. Marshall realized that it was no longer adequate for longer-term minded customers to think of "Free" in terms of cost of individual transactions and expanded that to include the total cost of value-added services such as inventory management and testing for customers. Marshall also realized that it was obviously inadequate for "Perfect" to be thought of in terms of conformance to specifications and no defects, and that quality could be enhanced by features and benefits, customization, and the anticipation of future needs. The "Now" aspect was also articulated to include increased accessibility (7 x 24), reduced delivery time, and time-to-market for customers' products.

With ever shortening product life cycles, the customers needed all the assistance they could receive to get their products to market faster. Thus, while all three aspects of the voice of the customer had to be worked on, it appeared that the "Now" aspect and the customization dimen-

sion of the "Perfect" aspect would need the most attention and would drive the others. This is consistent with the findings of time-based competitors that taking care of speed and flexibility takes care of quality and cost while the reverse is not true (Stalk and Hout, 1990).

Rethinking Strategy, Structure, Compensation, and Process

Marshall's processes and thinking were internally focused and this was forcing it to be reactive. All work was centered on meeting deadlines and short-term financial goals. There was a need for a more proactive approach to achieve the perfect dimension of the customer voice. Customer needs had to be assessed and anticipated to deliver total solutions. This required development of a strategy with the input from employees, especially the ones closest to customers, to drive the vision of "Free. Perfect. Now." The strategy then had to be complemented with an appropriate organizational

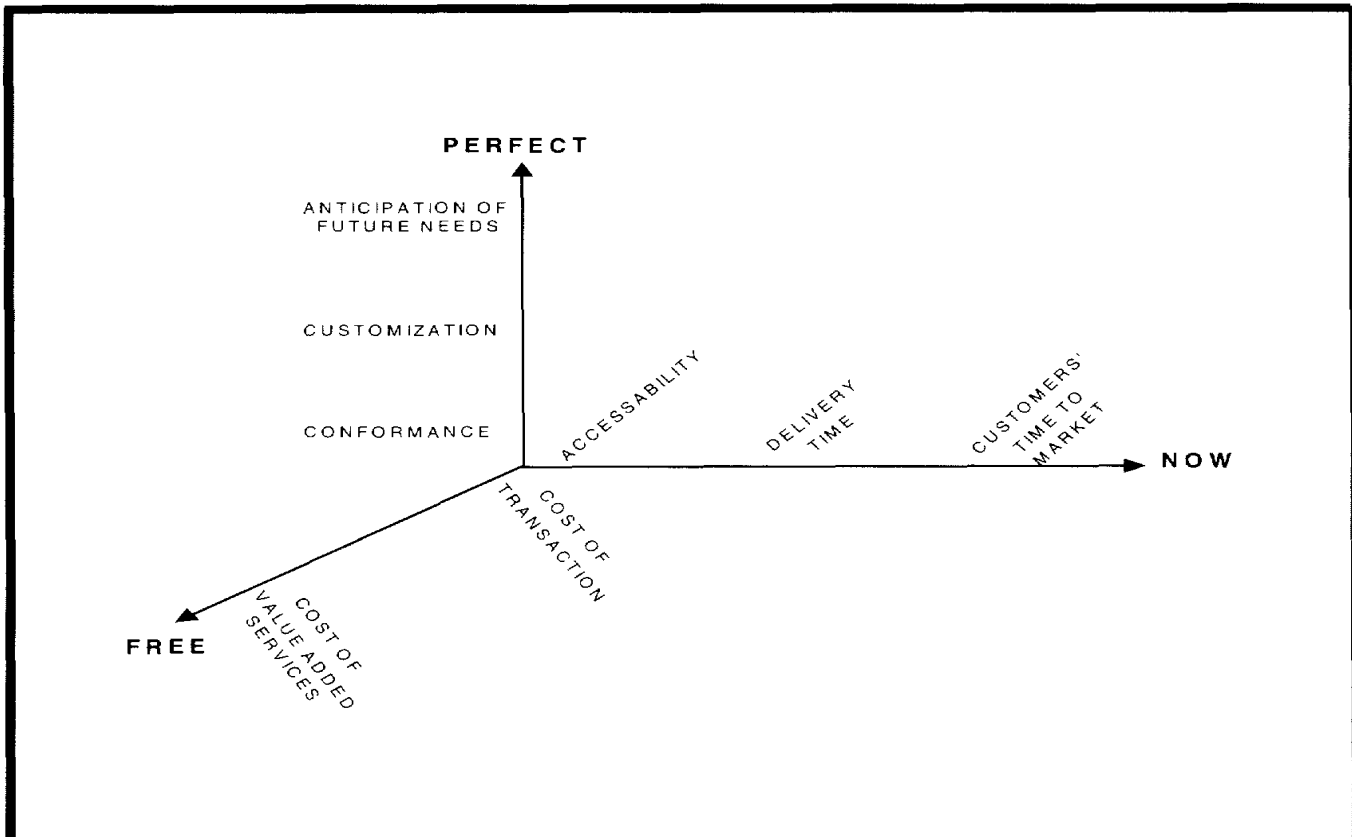


Figure 1. Aspects of Voice of the Customer

structure, compensation scheme, and a process to achieve "Free. Perfect. Now."

The new strategy called for conceptualizing Marshall as a junction box between customers and suppliers, focused on adding value, seeking to create a brand name by emphasizing the services through partnerships with customers and suppliers. Marshall wanted to manage itself as an externally focused system where every employee had the responsibility for developing closer relationships with the customers. This new organizational philosophy was mirrored in its organizational chart, with customers on top (Figure 2). It was meant to emphasize that employees were more accountable to customers than any internal supervisor. This "inverted" organization structure symbolizes the importance of the contact person in delivering the company's full capabilities at the moment of customer contact (Quinn 1992). It emphasizes that every employee in the organization has to support the contact person in his or

her relationship with the customer. The traditional line executives and systems and support staffs now "work for" the front-line person. Marshall takes this concept of inverted organization a step further, such that there are no permanent "line" or "staff" functions. At any point, anyone in the organization could be the contact person for a particular customer. At that point, others in the organization become the support functions for the contact person. Another interesting variation in Marshall's inverted pyramid organizational chart is that they have the chief quality officer instead of the president at the pointed end. It is indicative of Marshall's beliefs that everyone in the organization is driven by the goal of providing the highest quality service to the customers. Every action taken and every decision made at Marshall, even the president's, is guided by quality goals set forth by the chief quality officer.

The chart is devoid of functions and departments, reflecting Marshall's "surround strategy," where

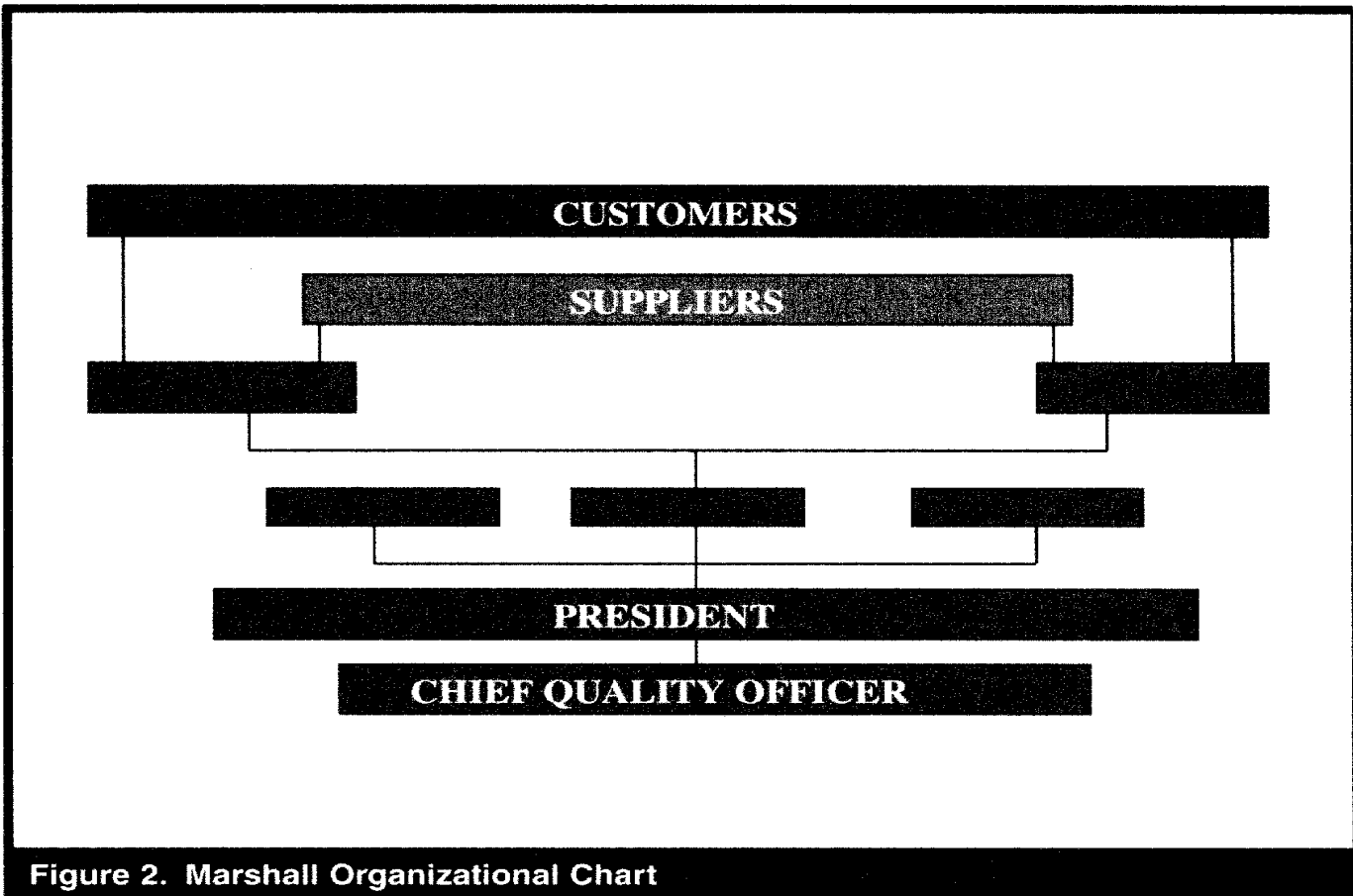


Figure 2. Marshall Organizational Chart

work is organized around needs of the customer rather than according to rigid functional boundaries. This boundaryless philosophy extends to customers and suppliers, driving Marshall to develop close relationships with them.

In order to develop a customer-solution oriented team-based cooperative culture, Marshall had to redesign its compensation structure. It meant taking a very controversial step that went against the established industry norm of compensation for salespeople based on commissions, promotions, and contests. To foster a collaborative organization, Rodin decided that each employee at Marshall would be paid in the same way and share in a company-wide profit-sharing bonus pool. This change did not come easy, as several salespeople were apprehensive about losing their commissions. Compounding the situation were the doubts that Marshall's suppliers expressed: whether Marshall would be able to adequately promote their products without the driving force

of promotions. The employees' concerns were addressed through educational seminars for months after the change, whereby stability and even flow of workload were pointed to as the benefits of the new incentive system. Star earners under the old compensation structure were enlisted to promote the virtues of the new structure. Marshall developed its information systems to support its sales force and enable them to gather and leverage market intelligence, thereby demonstrating to suppliers that it had developed capabilities to effectively support the sales of their products.

In addition to the new compensation scheme, a standard process, called the *Marshall process* (Figure 3), was instituted to provide a framework to orient all activities in the organization. Quality considerations and constant feedback were the cornerstones of all the internal activities whether they were marketing, operational, information systems related, etc. The aim of the process was

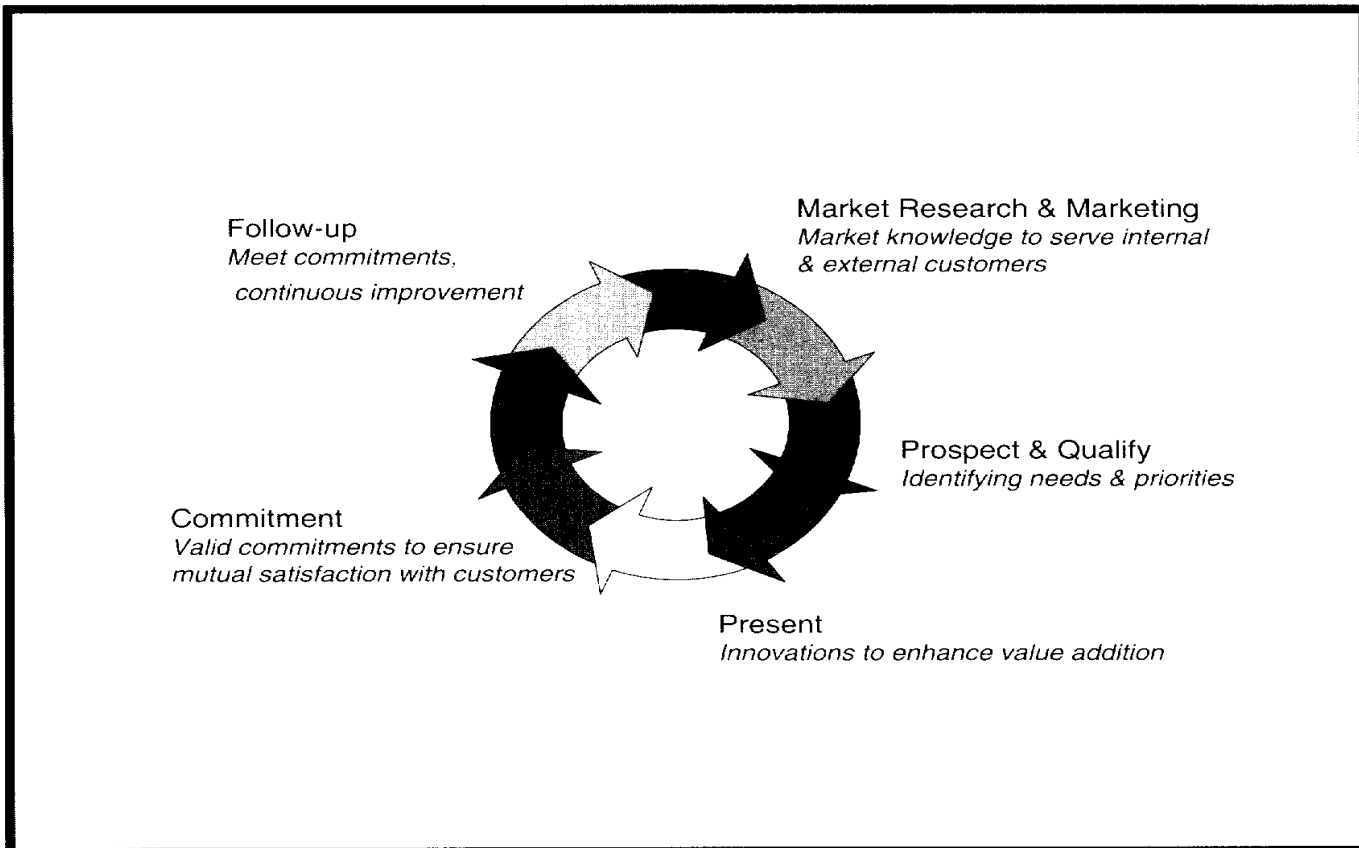


Figure 3. The Marshall Process

to satisfy customers rather than meeting internal financial goals. It was the foundation for building an infrastructure for market penetration through closer relationships with customers. Each employee was assessed in terms of their business skills, customer knowledge, supplier and product knowledge, system knowledge, and personal development and leadership to ascertain their competency in performing the customer-focused activities of the Marshall process.

Roles were assigned based on suitability of individual skill and knowledge for each phase of the Marshall process. Current performance level and areas for performance improvement were constantly evaluated based on assessed competence level in the requisite skill area. For instance, the "prospect" and "qualify" tasks in the Marshall process refer to *"looking, learning and listening to identify needs and priorities."* Business skills needed for this include the ability to understand and communicate industry and business processes. Therefore, as part of business skills assessment for prospect and qualify tasks, a Marshall employee, such as a sales manager, would be evaluated on the applicability of his or her time and territory analysis and richness of his or her account profiling.

The "present" task involves introducing innovative products and offering ideas to customers congruent with their business priorities that would help them enhance their business processes. It requires thorough knowledge of the customers' processes and needs as well as the knowledge of new value-added offerings available. The ability to make valid and achievable commitments with customers to ensure mutual satisfaction is the characteristic of the "commitment task." Quarterly planning sessions are held with suppliers so that Marshall is in the best possible position to make viable commitments to customers. Finally, the "follow-up" task ensures that the results delivered to the customers are aligned with the commitments made to them. Marshall collects and analyzes data to continuously improve its processes and set new quality goals.

The key elements of the organizational change instituted in order to achieve alignment with the voice of the customer are summarized in Figure 4. These elements are similar to theoretic

cal frameworks advanced to transform organizational architecture (cf. Nadler et al. 1992): work, people, informal structure and process, and formal organizational arrangements. In the case of Marshall, a coherent change in each of these elements was achieved by using a framing lens based on Deming's ideas on orchestrating the efforts of all components toward achieving systemic goals.

Finally, there was a need to build IT infrastructure and take advantage of information technologies while keeping all of these elements aligned and moving toward "Free. Perfect. Now." That is what is described in the next section.

Reinventing the Junction Box: IT-Intensive Value Innovation ■

With the organization reinvented to be aligned to the voice of the customer and a collaborative structure in place, Marshall was now ready to begin its journey of pursuing "Free. Perfect. Now" and to push that envelope by leveraging the power of evolving information technologies. They reinvented the way in which value was created for customers and suppliers and transformed the business to one that was advantageously positioned for the electronic economy. They reinvented themselves to be a different kind of intermediary—or, as Marshall Industries likes to call it, a different kind of "junction box."

This section describes how Marshall's value proposition changed through various stages of IT-enabled organizational transformation (Figure 5). Extending the framework provided by Venkatraman (1994), Marshall's transformational trajectory is traced as they progress from achieving operational excellence to being a value innovator. Figure 5 shows the stages of organizational transformation, the IT infrastructure that enabled the transformation, and the resulting value proposition for customers along the "Free. Perfect. Now" axis.

Marshall considers itself as a "junction box" that connects customers with suppliers. In the initial stages of its transformation, Marshall used IT infra-

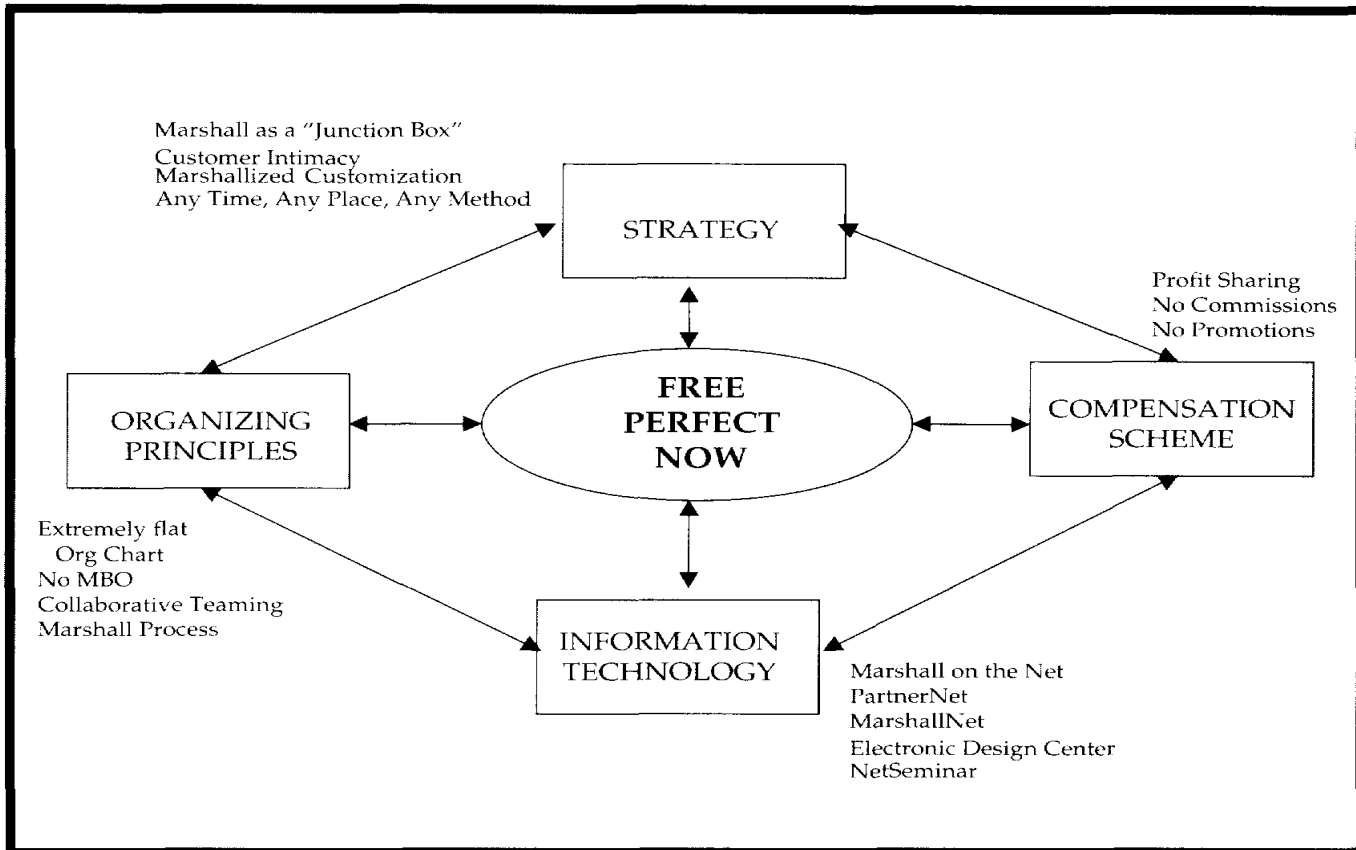


Figure 4. Key Elements of Organizational Alignment

structure to be a clean conduit for transactions—a junction box that created the least friction in the automation of transactions. The focus was on creating value by achieving cost savings through efficiency gains from automating internal processes. Internal integration was the focus to move to the next level of the junction box. Marshall focused on the interconnectivity and interoperability of its internal systems using technologies such as intranet. At the same time, they continued to harvest the collective knowledge of the people in the organization by building a collaborative environment. A data warehouse was built to capture and exploit this knowledge. The result of these changes was improvement in the quality of Marshall's products and services. Customer benefits in terms of speedy delivery of customized products and services were delivered by combining the IT infrastructure with appropriate organizational changes to achieve higher manifestations of the junction box. As Marshall progressed as a

junction box, processes were redesigned and organizational boundaries were blurred through the use of IT to link and form interdependencies with business partners and customers. Finally, the junction box became one that anticipated and met the future needs of the customers and business partners by prototyping future opportunities. Marshall redefined and extended its business scope by undertaking technology initiatives that positioned it for value innovation in a turbulent, competitive environment. Throughout its transformation as a "junction box," Marshall Industries bootstrapped the capabilities of its existing IT systems to create new systems that complemented the evolving business strategy. The underlying IT architecture leverages the Internet, client-server and groupware platforms, and mainframes and is shown in Appendix A. The transformation levels of the junction box model that capture the progression in a way that is hopefully generalizable to other enterprises is outlined below.

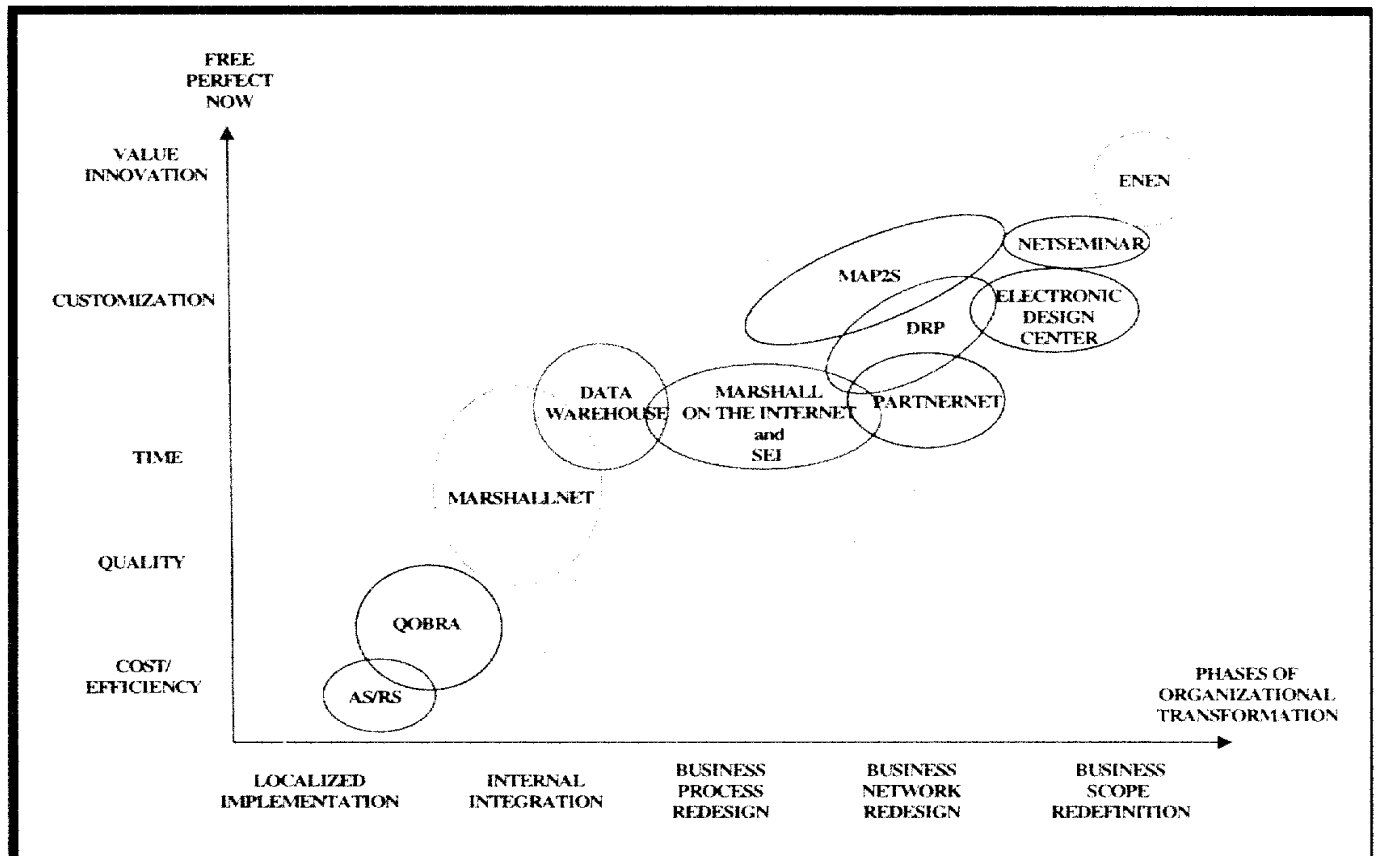


Figure 5. IT-Enabled Transformation at Marshall Industries

Level 1 Junction Box: Clean conduit for transactions. The first step was to pursue operational excellence through streamlining for cost, efficiency, and basic reliability. As an intermediary, these were necessary qualifying factors for market participation and transaction processing. The systems developed initially (QOBRA and AS/RS) were aimed at supporting Marshall's basic operational capabilities (see Box 2, Backbone Systems).

Level 2 Junction Box: Internal integration—intelligently connecting the insides to better connect to the outside. Marshall had adopted a flat organizational structure based on information sharing, and they needed IT to support information flows that were more networked in nature. The technology also had to automate routine processing and free up employees to leverage and share their expertise in providing value to customers. In order to make the external connection better, it was expedient to connect the insides so that expertise of the organization could be avail-

able to anyone at anytime. In order to enable employees to obtain information at their fingertips

**Box 2. Backbone Systems—
QOBRA and AS/RS**

Core operational systems supporting the business. Implemented in 1992, QOBRA (Quality order booking, resell application) is the day-to-day order management system based on an IBM-DB2 platform. Internet and EDI based front-ends pass transaction information to QOBRA. A Sun/Unix-based data warehouse is the repository for archived transaction information as well as product-related information. AS/RS, implemented in 1991, is the automated shipping and receiving system that interfaces with the automated warehouse for robotic movement of inventory. These systems are the service providers for the Internet infrastructure.

so as to serve the customer better, Marshall instituted an intranet (see Box 3, MarshallNet).

Box 3. MarshallNet—The Intranet

MarshallNet supports approximately 400 field sales employees equipped with laptop computers who travel to customer sites. It enables them in real-time to check inventory and product specs datasheets, quote orders, communicate with other employees, collaborate on projects, and make presentations.

The salient feature of the intranet is Compass, the "marketing encyclopedia." It consists of 2,500 different documents, containing details about suppliers and their product lines. Employees can prepare and make presentations to customers, on the fly, and adapt them to needs of both the engineering types of customers as well as buyers. Further, if the customer is interested in buying products from more than one supplier at the same time, the field sales employee can seamlessly integrate presentations from different suppliers.

The marketing personnel directory informs field personnel about who to contact for more information when they call the branch office, as well as the person's supervisor or their backup. Compass also informs employees about key programs, new products, advertising campaign details, Internet Web site visibility, and services.

The intranet was successful due to its customizable interface. Each user can organize the information according to his or her preference. For example, if the customer wants products from a specific supplier, the sales person can arrange the information according to supplier name, product category type, etc. MarshallNet is now integrated with Marshall's Web-based extranet, PartnerNet. Another piece of MarshallNet is the "intranet"—a combination of LotusNotes/Domino and Web applications. It includes visibility of the applications that were developed for the sales force plus others that are meant to be used specifically by their operations and marketing organizations.

Level 3 Junction Box: Empowering the outsides to more intelligently connect to the insides through multiple modes of service. This stage focused on redesigning the business processes around the customer for anytime, anywhere, any method access with more intelligence and convenient self-service. The voice of the customer was clamoring for 24 x 7, easy accessibility of services. Marshall sought Web browser technology in the early 1994 Mosaic days directly from the University of Illinois to provide an easier interface to users. That was the start of Marshall's effort to build a Web site that would provide the customers with a round-the-clock, fully-automated, hands-free order fulfillment process (see Box 4, Marshall on the Internet). Marshall, how-

**Box 4. Marshall on the Internet
(www.marshall.com)**

Commissioned on July 24, 1995, it started out as an effort to present customers with information on products, pricing, and availability. Using an object-relational database, visitors to the Web site are presented a dynamic view with different information text, banners, new products, etc., each time they visit the site (see Appendix B).

Today the site gets over a million hits each week by customers from over 59 countries. It contains information about 170,000 part numbers, 100,000 pages of data sheets, and real-time inventory pricing from over 100 suppliers. Visitors can search for products by part numbers, part description, or the name of the manufacturer. Marshall's endeavor is to make the navigation as easy as possible for the visitors. The site also allows the customers to order the parts, request samples, and track their orders online.

Order tracking is made available by Marshall in conjunction with its partner, UPS. The innovative part about it is that customers can track their orders without ever having to leave Marshall's site. In the beginning, UPS did not have such a provision so the IS people at Marshall wrote an API themselves to connect to UPS's order tracking system.

Besides offering customers valuable product information, the site also provides electronic

Box 4. Continued

industry news using RealAudio™ broadcast. Visitors can also chat with Marshall's engineers online, real-time, and 24 hours a day, getting help in buying products, troubleshooting problems, and obtaining expertise in product design. The site also provides links to Marshall's other Web sites, Electronic Design Center, NetSeminar, and the PartnerNet.

SEI on the Internet (www.sei.com)

Marshall formed a strategic alliance with a European distributor (SEI) and developed a Web site for them that offers features of Marshall on the Internet with customized interfaces in 17 different languages. The idea was to develop an Internet Web site that felt local to the particular market place it was trying to serve, yet make sure that the total Europe perspective was still there. The customers enter the main site and are able to navigate to their local home page, which is not only in their local language, but also includes local events, specials, etc

ever, does not restrict itself to the Internet to provide access to customers. EDI, fax, and an innovative phone system (see Box 5, Open 24 Hours) complement the Internet efforts. For instance, large customers with fairly well defined requirements over time can use an auto-replenishment channel using EDI, while small customers with idiosyncratic orders can order in through the Internet and pay using credit cards.

Level 4 Junction Box: Customizing the connections to the outside for added value. Marshall realized that creating value for the customer requires the formation of close links with the customers and suppliers that are customized and targeted to their needs. It established an extranet to implement this strategy (see Box 6, PartnerNet). There was also a pressing need to understand how customers' notions of value were changing and how they could be enabled to create value for themselves. The Marshall Account Profile Planner (see Box 7, MAP²) is the system that enabled the acquisition and management of market intelligence for that purpose.

Box 5. Open 24 Hours

In line with Marshall's philosophy of "any time, any place, any method" is the telephone ordering/assistance system. Marshall on the Internet and PartnerNet caters to the information needs of customers who work from 6 p.m. to 6 a.m. Complementing the Web efforts is the telephone system that satisfies the customers' need to speak to or order from a real person on the other end. This facility goes beyond the industry norm of nine to six business hours.

Customer calls to East Coast offices after 6 p.m. are rolled over to the El Monte, California, office where a live voice greets the customers. The testament to the success of this effort is folklore of how Marshall won the business of a New Hampshire manufacturer. On a night before Christmas when the parts began to run out, the customers frantic and desperate employees called several of its regular distributors, only to find that the earliest the parts could get to them was on Monday morning. Upon calling Marshall's Boston office, their call was redirected to California. It being Christmas Eve meant that the warehouse and packing facility operations were closed. This did not stop the telephone operator from taking the initiative to page key operations personnel. Marshall's 24 by 7 operations were then mobilized, the operations were cranked up, and the parts were picked and packed. They were then placed on the next flight and the parts were on the customer's floor on Sunday morning, keeping their operations going without stopping.

Level 5 Junction Box: Leveraging knowledge in the insides and outsides for value innovation. Marshall has been augmenting and reinventing its role as a junction box by building the IT infrastructure that leverages the knowledge of its customers and suppliers and its own thinking and expertise to answer such questions as "What happens to memory prices when IBM launches its new thinkpad?", "What happens if a certain supplier goes on allocation?", and "How can I predict the demand for X component two months in advance?" (see Box 8, DRP). Marshall's IT ini-

Box 6. PartnerNet (partnernet.marshall.com)

A secured connection behind the firewall for the registered customers and suppliers, PartnerNet draws visits from approximately 1,300 suppliers and customers daily. QOBRA, the Smart system (DRP), and Marshall's sales force applications tie into PartnerNet. It enables customers and suppliers to access Web pages customized to their requirements. Customers can obtain information such as purchase history over a specific period, consolidated as well as breakdown orders for multiple order points, and prices that are unique to each customer based on their profile. It enables Marshall to coordinate the entire purchasing cycle—from product information to customer support. PartnerNet also affords customers the ability to name the components, whatever they choose, and place future orders based on the name they have chosen. Marshall has been working with DigiCash and credit card companies to give their customers the ability to pay for their purchases online. Suppliers can utilize PartnerNet to track sales patterns by product line, by region, and by customer, as well as get a view of customer opportunities, registrations, and lead tracking.

Box 7. MAP²: Manufacturing Account Profile Planner

This marketing intelligence system profiles all customer projects, down to the part number level, for every Marshall account. It allows Marshall to better target its marketing efforts and to provide its suppliers increased visibility into the types of applications its customers are building along with trending information about the sales patterns by product line, by region, by customer, etc. The system ties into an opportunity tracking/design system and lead management system that provides Marshall and its suppliers with an end-to-end closed-loop sales and marketing system. The MAP² system profiles all the visitors to Marshall on the Internet requesting samples as well as using information fed in by field sales employees through the intranet. This enables them to follow up on the marketing leads generated by the system.

tatives also leverage the intellectual capabilities of its salespeople and engineers. This is complemented by acquiring an acute understanding of current customers as well as the future customers (see Box 7, MAP²). Marshall is also providing new ways of transferring expertise within its network of partners (see Box 9, Electronic Design Center).

Level 6 Junction Box: Prototyping future opportunities for value innovation. Marshall Industries has seen very clearly that, in the electronic economy, the rate of change will accelerate further and new information technologies will increasingly shape rather than support corporate strategies and create entirely new opportunities for value innovation. Marshall also knows that it has to seek to maximize its share of future opportunities if it is to remain competitive—even if that means reinventing the whole industry. It must also anticipate and provide answers to problems suppliers and customers don't even know they have.

Box 8. Distribution Resource Planner (DRP) system

Smart—the DRP system—is a database management system to support both the customers' as well as the suppliers' needs. It enables both Marshall and its suppliers to formulate plans for replenishment and scheduling shipments. For the customer, this means that Marshall is able to recognize their needs better than they can themselves. For customers that have multiple order points, it means that Marshall can keep track of consolidated requirements, provide price discounts based on the consolidated order, and also plan for the consolidated requirements of the customer. Marshall harnesses the market intelligence to plan for the customer and provide expertise in design and selection of components. It uses the customers' bill-of-materials as an input and also tracks the events that would affect the suppliers of the requisite components. Utilizing the customer's demand plan, it tracks the customer's stock and replenishment needs for the period of six months or up to a year. This system is the harbinger of Marshall's effort to manage the whole supply chain for the customer.

**Box 9. Electronic Design Center
(www.electronicdesign.com)**

Provides customers with technical specifications of chips carried by Marshall. Further, it enables customers to download software code to simulate the performance of those chips in their product design by modifying the code to incorporate their design parameters. Prior to this, the customers had to purchase separate testers for different chips. This not only makes testing "virtual components" inexpensive but also reduces the time. If they like the results, customers can request Marshall to use the software testing code to produce physical chips as samples, which can then be used by customers for prototype design. This process has helped customers to significantly reduce their time-to-market.

As is often said, the future is here but it is unevenly distributed. Marshall has sought to take advantage of that by building IT platforms that serve to prototype the future. That is their strategic R&D effort, which is unusual for a mid-size company in the distribution business. These efforts link the present to the future (see Box 10, NetSeminar, and Box 11, E.N.E.N) and provide opportunities for developing new competencies. Other such R&D efforts to build competencies and IT infrastructures for the future normally (now) outside the usual scope of a distribution company are also underway.

There are a number of insights that can be gained from the junction box model level progression that may be useful for enterprises transforming their IT infrastructures for the electronic economy. First, the model articulates the focus of each level and the sequence as a guideline for building an IT infrastructure for the electronic economy. Second, the sequence of level progression is important and one cannot move to the next higher level until a threshold level of functionality that satisfies the focus of that level is attained. That does not mean that work focusing on a particular level's intent should stop when there is a progression to a higher level; rather, work continues to improve the functionality and technology for that junction box level. At any given time, the work centered around the higher junction

Box 10. NetSeminar™ (www.netseminar.com)

NetSeminar™ virtually brings together potential customers and suppliers who design new products. It is also used to provide customers with after-sales training for new technologies. From its studio at El Monte, California, Marshall can broadcast real-time video and audio streams over the Internet using products like RealVideo and RealAudio. The presenter's presentation material can be browsed simultaneously by participants, who can also, in real-time, ask questions and provide feedback to the presenter using GlobalChat. Registration is required in advance, by choosing a password to allow access to the seminar. Participation ranges from a few thousand to over 30,000 for some presentations. The live presentations are archived for future use.

Box 11. E.N.E.N. (www.enen.com)

The success of the NetSeminar™ was the driving force behind the creation of a separate consulting arm called Education News and Entertainment Network. It enables clients to hold real-time seminars over the Internet live for the purpose of interactive public product announcements, sales training, etc. Another service of ENEN is the NetPresentation™ that any business can use to deliver self-running, synchronized audio-visual presentations. NetInterview™ enables businesses to provide their customers with interviews delivered over the Internet. Capitalizing on the popularity of information push to employees within a company, NetHeadline News™ affords businesses the ability to broadcast a "radio-like" show over the Internet every day, weekly, or monthly. Further, these shows can be archived to allow them to be played after the initial show has been delivered.

box level is more leading-edge and exciting, and it is a challenge to motivate people who are no longer working with the higher levels of the junction box. Third, the higher the junction box level, the more knowledge sharing and creation is leveraged and the higher the degree of value innovation. Thus, there is an enlargement of

focus as we move up the junction box levels from data to information to knowledge. Fourth, as mentioned earlier, there is a requisite organizational transformation effort that must accompany the change in IT infrastructure as explained earlier in the section of the article on systemic alignment. That transformation comes with the typical organizational and technical challenges of large-scale transformational efforts.

This progression of six levels of the junction box depicts what went on at Marshall Industries from 1991 through early 1997. Some of the impacts of this progression are outlined in the next section. Will there be higher levels of junction boxes which create value in new ways? The answer is a resounding yes at Marshall Industries. The pursuit of "Free. Perfect. Now" will continue, and the junction box will continue to be reinvented through the forward-looking use of existing and emerging information technologies.

Assessing the Impacts

The journey that began at Marshall in 1991 in response to changing dynamics of business was very successful. It has helped Marshall reinvent its role as a distributor while satisfying the demands of their customers and suppliers and anticipating their future needs and demands. Along the journey, the company's revenues more than doubled from \$582 million in 1991 to a \$1.2 billion in 1996 (see Figure 6).

The remarkable aspect of this growth is that it was achieved without ballooning of the company in terms of number of employees. In fact, the company in 1997 had 250 fewer people than it had in 1991, the year they began their upward swing and productivity per employee has soared from \$360,000 to \$740,000 (see Figure 7).

The innovative use of Internet technologies at Marshall has also been substantiated in a recent

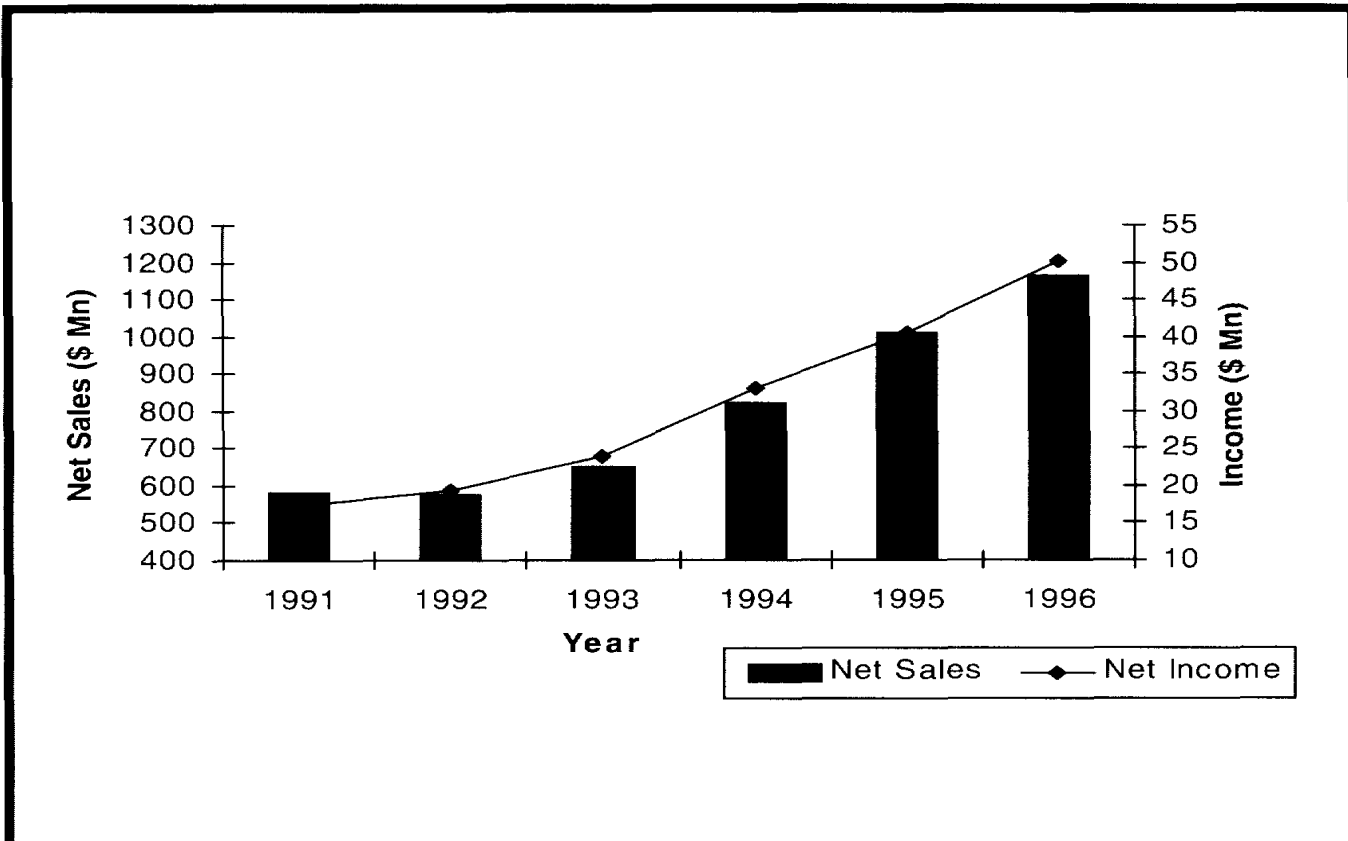


Figure 6. Marshall's Sales and Net Income: 1991 to 1996

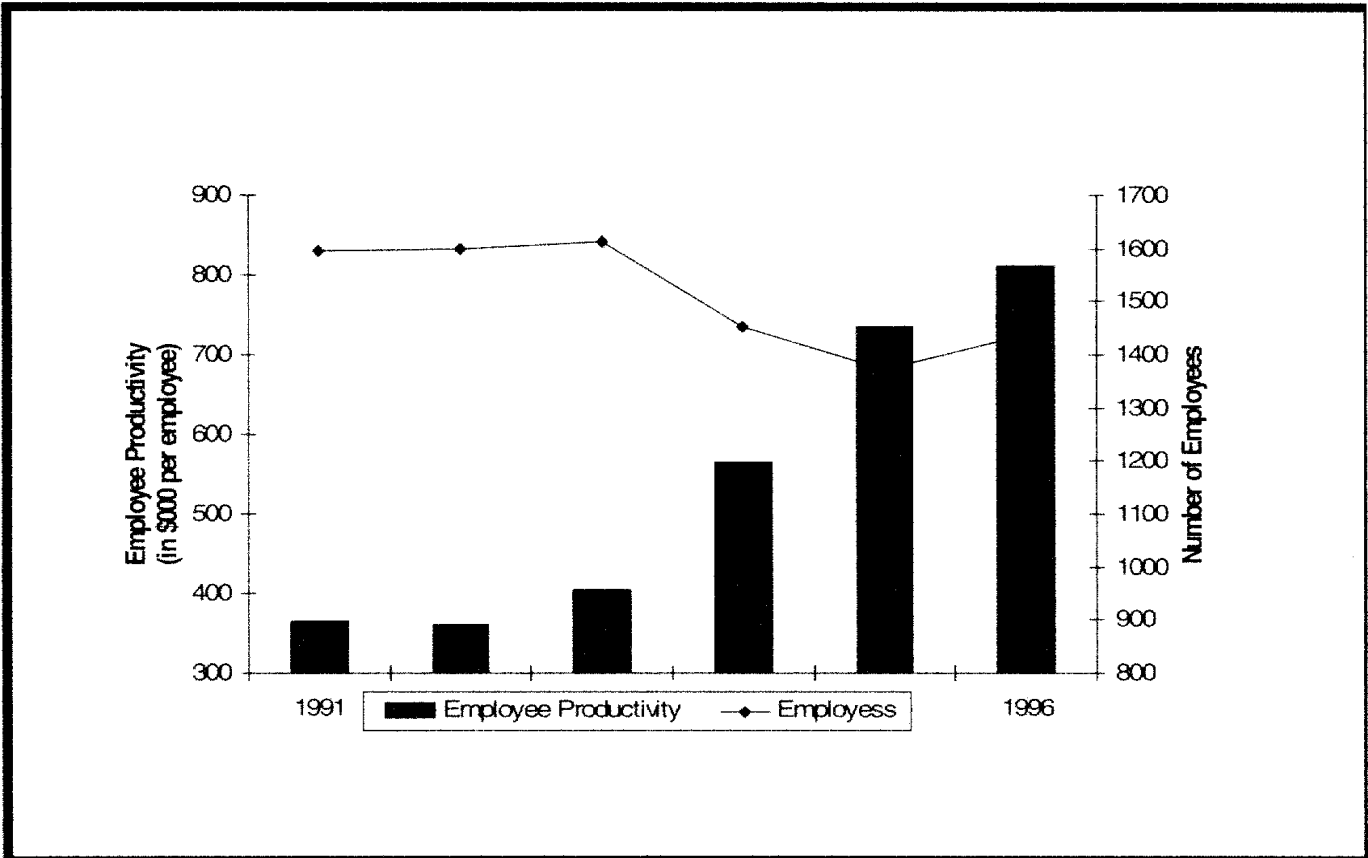


Figure 7. Marshall's Employee Productivity: 1991 to 1996

survey by Shaw (1997). Marshall was ranked first as the best business-to-business Web site among 200 major U.S. corporations in the survey, which ranked larger companies with substantial electronic commerce business presence such as Cisco, Dell, and Federal Express.

Just as it listens to the voice of the customer when formulating strategies and building the IT infrastructure, Marshall feels that the success of their endeavor is best reflected by the voice of the customer. The IS group receives numerous accolades from customers who perceive greater value from the services that Marshall is now able to provide them. As a sample of a recent mail sent to the IT group by a field sales employee indicates,

I was in to see the folks at [Customer] yesterday and was told how impressed and grateful they were for the existence of the Marshall Net. [Customer] received an order for 15 micro controller boards, with delivery

required in one week. With the aid of the Net stock check, [Person] at [Customer] was able to design the bill of material based on what we had and finally ship to their customer in one week of receiving their P.O. [Person] said that if it wasn't for Marshall's Net access with its ease and accurate information, they would never have been able to satisfy their customer. Another convert . . . you think???

The impact of Marshall's value innovation initiatives can be assessed from the acceptance they have received from customers. One of them, upon using NetSeminar, commented

It is this type of groundbreaking that continues to set Marshall apart from the rest of the electronic components industry. We are excited about using this technology to deliver seminars and training to our mutual customers.

Marshall's innovative adoption of technology to reduce time to market for customers has also enabled it to make in-roads into customer segments that are extremely sensitive to the issue. For instance, WebTV, the consumer-electronic start-up, did not do any business with Marshall initially, but with Marshall's accessibility through the Internet, its volume of business with Marshall went up to \$1.5 million per month.

Marshall's strategy and technology has also had a significant impact on its relationships with supplier. Traditionally, many powerful U.S. electronic suppliers have refused to share shelf space with Japanese manufacturers, opting to go through separate distributors. In late 1995, Advanced Micro Devices (AMD) chose Marshall, who also carries Japanese products. This was seen as "a major coup" in the trade press and a sign that "the silent code between U.S. and Japanese manufacturers is starting to crack." The development highlights Marshall's strategy of changing the ground rules and was especially significant given that AMD had not franchised a new distributor in almost a decade.

Identifying New Practices for IT Organizations

Can we identify new practices for IT organizations for building and managing an evolving IT infrastructure for the electronic economy? That is the third question that this article sought to answer. In order to help answer that question, some of the distinctive practices at Marshall are outlined. These practices are grouped into three familiar sets as shown in Table 1, and then compared to conventional practices in building and managing IT infrastructure for large enterprises. Based on this comparison, some insights are drawn about new practices that we believe can be useful to IT organizations in other enterprises preparing to take on the challenges of the electronic economy. Despite the lack of systematic validation of these practices in other contexts and larger enterprises, it is important to explicate these new practices and their underlying principles to the IS community so they can be further developed. The practices are presented in Table 1 and the text that follows.

Marshall's business strategy is driven by the need to continually improvise to better target the voice of the customer and find new ways of creating value through the use of information technologies. The resulting IT strategy and the enterprise strategy can be viewed as being mutually co-adaptive (Brown and Eisenhardt 1998). They derive mutual advantage from each other, while evolving individually. Co-adaptation entails that the two strategies unfold in a connected and dynamic fashion as *one*. The unfolding is not haphazard but is guided by clear, predetermined values surrounding the voice of the customer as the company seeks to target higher levels of the junction box (see examples given above in Level 6 of the junction box model). This approach takes advantage of both chaos and order and can perhaps be termed *strategic improvisation*.

Strategic improvisation is different in principle from conventional "one-way" strategic alignment in which IT strategy tracks specified enterprise strategies to ensure that IT investments are targeted to strategic priorities. It is also different in execution from conventional "two-way" strategic alignment (Rockart et al. 1996), in which the CIO as a member of the top management team of the enterprise provides an IT vision which identifies the business threats and opportunities that IT poses and the business options that it shapes. In the strategic improvisation approach, it is the guiding business values rather than the articulation of the specifics of business and IT strategies that are predetermined. Furthermore, the CEO takes on a much more proactive role and is a full participant in shaping the IT vision jointly with the CIO. It goes beyond the typical CEO role in progressive enterprises that have the strong CIO-CEO relationships needed for IT-based transformation (Cross et al. 1997; Feeny et al. 1992; Martin 1995). For strategic improvisation to work effectively, not only does the CIO share the business language and vision of the CEO, but also the CEO shares the IT vision of the CIO and together they shape it through a common mental framework. This is consistent with what has previously been called for: in dynamic business environments, business managers and IT managers must jointly share responsibility for the development of IT infrastructures for their enterprise (Broadbent and Weill 1997). At Marshall Industries, the CEO is

Table 1. Building and Managing IT Infrastructure for the Electronic Economy

Organizing Element	Marshall's Distinctive Practices	Conventional Practices
Managing the connection between IT strategy and enterprise strategy	<ul style="list-style-type: none"> • Strategic improvisation: IT strategy and enterprise strategy co-adaptively unfold based on clear guiding values • CEO proactively shapes IT vision jointly with CIO as part of enterprise strategy • IT initiatives colocated holistically with business initiative to form centers of IT-intensive business expertise 	<ul style="list-style-type: none"> • Strategic alignment: IT strategy tracks specified enterprise strategy • CEO endorses IT vision shaped through CIO • IT initiatives functionally organized as technological solutions to business issues
Managing application deployment and technology platforms	<ul style="list-style-type: none"> • Perpetual application development based on continuous learning from rapid deployment with incomplete functionality • Best-of-breed approach to IT infrastructure in which effective match with business needs takes precedence over commitment to technology platforms choices and vendor homogeneity 	<ul style="list-style-type: none"> • Phased application development based on learning from pilots • Approach to IT infrastructure may sacrifice match with business needs for vendor homogeneity and technology platform choices
Managing the IT organization	<ul style="list-style-type: none"> • Hire "best athlete" who can flexibly integrate new IT and business competencies • Evolving work-groups organized around emerging IT-intensive business initiatives with little explicit delegation of tasks • IT funding typically based on value proposition around business opportunity related to building services for customers. IT project inseparable part of business initiative 	<ul style="list-style-type: none"> • Hire "best by position" who can bring specific IT expertise • Departments organized around IT expertise with business liaisons and explicit delegation of tasks • IT projects have separable cost/value considerations. Funding typically allocated within constraints of yearly budget for IT function

very actively involved with IT initiatives. He proactively helps to project each nascent technology or application "several iterations beyond" in order to determine what it could do for the customers and the business.

At Marshall Industries, the meshing of IT and business issues is also pervasive from the top to the bottom of the organization. IT initiatives are meshed with business issues and holistically addressed in an embedded way. Thus, the work-groups that are overseen by the director of information technology are organized around busi-

ness initiatives. The only exception is the computer/communications operations group, which maintains the hardware and operating systems infrastructure. The balance of the 135 people who report to the director of information technology are organized into four main work groups along key business initiatives: (1) enterprise integration, (2) electronic commerce and supply chain management, (3) marketing and visibility initiatives, and (4) global alliances. The IT function at Marshall is perhaps best conceived as an orbital structure in which the CIO and CEO collaborate closely and form the nucleus [Figure 8].

The constellation of groups is then organized in orbits around the nucleus based on business initiatives rather than technologies. This approach is close in orientation to what has been observed about the way that Japanese managers frame IT management: there is much meshed organizational bonding at all operational and strategic levels (Bensaou and Earl 1998). In retrospect, it is not surprising that Marshall Industries' approach to IT management would be closer to Japanese practices given their adherence to the teachings of Deming.

This continuous learning strategy is also carried over to managing application deployment and building IT architecture within the work groups. Given the speed at which IT applications need to be deployed in the electronic economy to respond to emerging business needs, and given the rapid technological change in Internet-related technologies, applications are developed in small chunks and deployed very rapidly (typical-

ly a one- to three-month cycle). It is assumed that much learning and redevelopment will occur from feedback in use, and that there will be perpetual application development as well as rapid technology change. This is not a new practice in terms of similarity to prototyping practices, rapid application development, and piloting. What is somewhat different at Marshall is that the philosophy is extended to deployment rather than just development and piloting. Thus there is much more direct codevelopment with customers. At Marshall, an application solution may be deployed to customers even if it is 50% complete in terms of full functionality if the deployment helps to generate more business quickly. The new way of thinking about application development for the electronic economy is perhaps reflected in a question and a statement: "What can we turn on next week?" and "We will never design the absolute best product." This works at Marshall because of an enterprise culture that

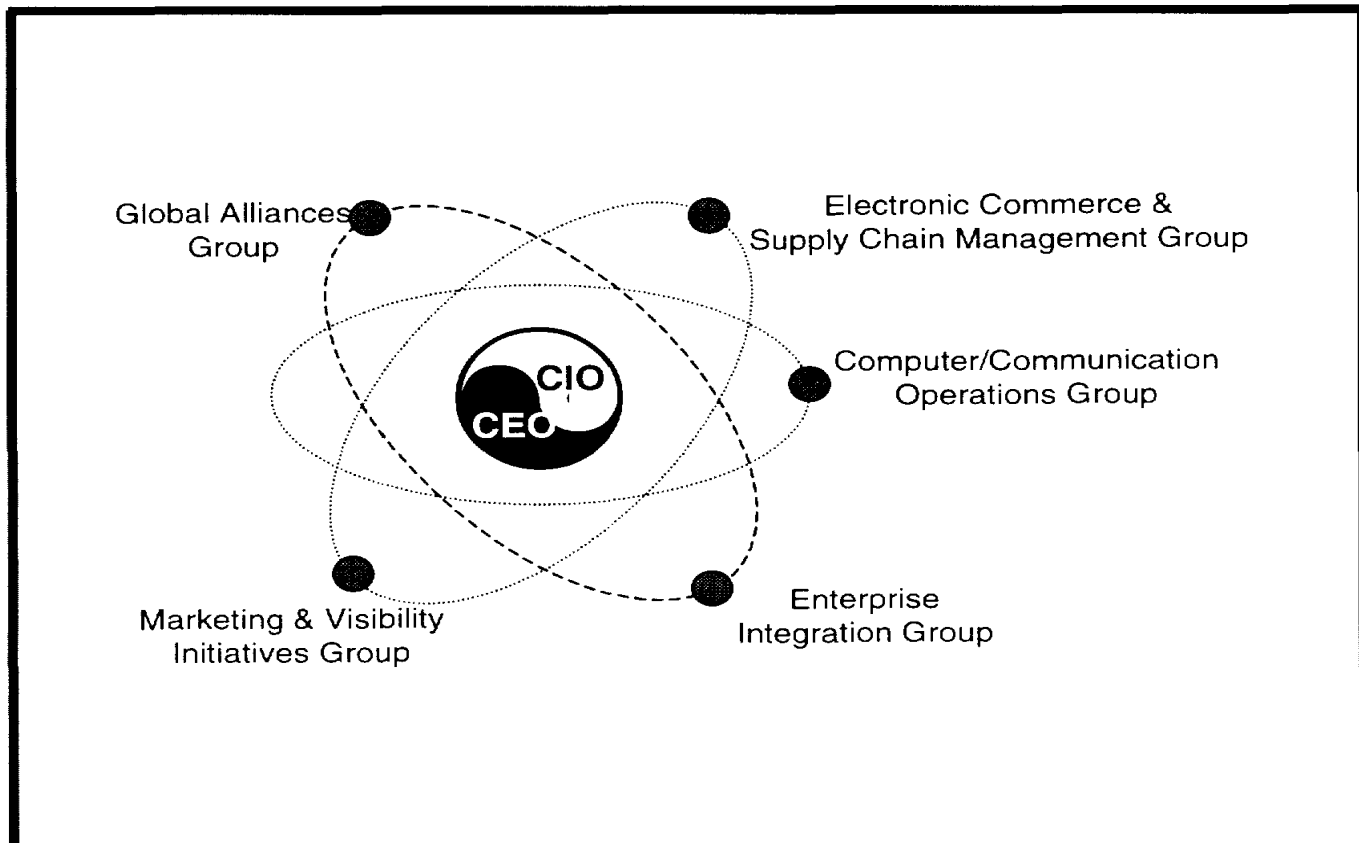


Figure 8. Structure of IT Function at Marshall

fosters learning with and from customers. Mistakes are not hidden from customers and are viewed as joint learning experiences.

In terms of IT application architecture, Marshall uses a best-of-breed approach rather than going in for off-the-shelf applications that do not effectively serve individual business needs. For instance, when Marshall developed its sales-force automation application, no off-the-shelf product satisfied what it wanted to do through its Intranet. They did not hesitate to attempt to integrate several technology platforms and software products to rapidly satisfy their business need. They used LotusNotes as a base platform, MFJ International's Overquota for sales automation, Quality Decision Management's Business Builder for work management layer, and Workflow Design's @ScheduleBase for group calendar/scheduling. This best-of-breed approach is being increasingly used by businesses to achieve better fit to business needs. In recognition, ERP software vendors such as SAP, Baan, Oracle, and PeopleSoft have announced aggressive programs for certifying third party products to extend their application packages. Also, these vendors have been moving to convert their application packages to components that can be better adapted to business needs (Weston 1997).

There are obvious tradeoffs when choosing between off-the-shelf packages and custom best-of-breed applications. Integrating best-of-breed applications may be challenging because of lack of uniform interfaces and interoperability. Nevertheless, given appropriate IS skills, the additional functionality that accrues may be worth the effort. It may be pointed out that enterprise software vendors are forging alliances and using modular approaches to make this strategy more viable for the future (Warren 1997).

Marshall allows business needs to take precedence over standardized technology platforms and vendor homogeneity. This has allowed it to make application software choices independent of the operating system platforms needed to run them—based on the view that if business needs warranted, they would add a new operating system platform. In contrast, traditional IS organizations sometimes limit their application choices

based on the kind of hardware and operating systems platforms they have. The value of homogeneous technology platforms as an ideal is not disputed; however, there is a lesson to learn from Marshall. The realities of a more rapidly changing business and technology environment in the electronic economy may make it desirable to sacrifice technology homogeneity for pressing business needs on a more frequent basis than in the past.

Marshall also has some distinctive practices for managing the IT organization. As mentioned above, work groups in the IT organization are organized around business issues rather than around IT expertise. They look to hire people who are "best athletes" who can flexibly integrate new IT and business competencies in a learning-by-doing environment, rather than "best by position" (an athletic term), who can bring specific IT expertise to business problems. Furthermore, all individuals in the IT groups at Marshall interact directly with customers and suppliers in the marketplace, and it is estimated that these interactions comprise roughly 50% of their time. This fosters both customer intimacy and bonding between business and IT issues for all staffers. It also reinforces the incentive structure for all Marshall employees (and IT staffers are not any different), which is based on listening to and satisfying the voice of the customer. However, it requires staffers who are comfortable in a flexible, ill-defined environment where tasks are molded rather than delegated, and collaboration across groups is necessary for coordination. This is very different from IT departments that are organized around specialized IT expertise with business liaisons and well-specified tasks (cf. Clark et al. 1997).

Funding decisions at Marshall are usually based on a value proposition that centers around a business opportunity related to building services for customers. Thus, an IT project is an inseparable part of a business initiative, and cost/value assessment is made based on the total business initiative. Funding is allocated and negotiated on a business "project-by-project" basis rather than a yearly IT budget. This method of funding is suited to the strategic improvisation approach that Marshall follows, the external customer orientation of the IT function, and the way that the IT function is organized. Expenditures are

tracked and monitored through the office of the chief financial officer, but are based on business initiative budgets rather than a total IT budget. One caveat of such a funding method is that IT projects that are for general infrastructural improvement can be neglected from a funding perspective.

By looking at Marshall Industries, some distinctive practices in building and managing IT infrastructures for the electronic economy have been identified. These practices depart from some of the conventional practices. An attempt has been made to articulate the logic behind these practices and their underlying principles to the IS community. The logic suggests that they might be useful to IT organizations in other enterprises. We hope that IS practitioners will examine their suitability to their own business contexts and that IS researchers will further develop and test the validity of those principles.

Elements of IT-Intensive Value Innovation in the Electronic Economy

Conventional logic no longer applies in the electronic economy! In the quiz at the start of the paper, allusion was made to the ways in which the electronic economy is impacting the logic of managing businesses and information technology. The Marshall story has highlighted new ways of thinking that reflect this logic. In this section, four shifts in logic that will increasingly supersede the older conventional logic are presented (see Table 2).

Shift #1: From Traditional Value Chains to Value Constellations

The traditional value chain model, with its sequential assembly-line processes and linear point-to-point information flows, is no longer an adequate representation. Increasingly, interorganizational processes aimed at creating value for customers are being characterized by non-linear flows of information and knowledge (Rayport and Sviokla 1995). The Marshall Industries case has demonstrated that the value chain metaphor is inadequate for the electronic economy: Marshall has organized a constellation of customers and suppliers who are engaged in a rich web of relationships that are instantiated in various ways and directions. The junction box metaphor is a variant of the value constellation model (Norman and Ramirez 1993) and combines some elements of virtual communities (Armstrong and Hagel 1996) and value networks (Stabell and Fjellstad 1998). In a value constellation, there is a move from a focus on activities performed by enterprises to a focus on reconfiguring roles and relationships among a constellation of suppliers, business partners, and customers in order to mobilize the creation of value in new forms by new players. The dynamic aspects of the constellation are captured through the progression in capabilities of the junction box.

Shift #2: From Conventional Strategy to Value Innovation

Conventional strategy formulation based on the principles of competitive advantage stresses the leveraging of given resources and competencies vis-à-vis the competition. The electronic econo-

Table 2. The New Logic of the Electronic Economy

Conventional Logic	New Logic
Sequential Value Chains	Concurrent Value Constellations
Competitive Advantage Logic	Value Innovation Logic
IT-supported Innovation	IT-Shaped Cybermediation
Alignment of IT Strategy and Business Strategy	Managing the Dynamic Unfolding of IT Strategy and Business Strategy

my is characterized by fluid industry and organization boundaries, shifting alliances, and changing technologies. In this scenario, the competitor is no longer a given entity, and an enterprise need not be constrained by existing resources if it can leverage its intellectual assets. The new logic is based on value innovation (Kim and

Mauborgne 1997) and derives strategic direction from what is valued by the customer, without being constrained by existing industry rules. Marshall has embarked from an earlier emphasis on operational excellence to one of satisfying higher order conceptualizations of "Free. Perfect. Now." Marshall is forging new relationships with

Table 3. Value Innovation Logic at Marshall (Adapted From Kim and Mauborgne 1997)

Strategy Dimensions	Conventional Logic	Value Innovation Logic
<i>Industry Assumptions</i>	Play by the old given rules <ul style="list-style-type: none"> • Pay-for-performance • Business hours 8 a.m.-6 p.m. • MBOs, P&Ls, budgets, etc. 	Marshall: Out with the old in with the new, industry assumptions can be reshaped <ul style="list-style-type: none"> • Profit Sharing • Open 24 hrs/day, 7 days/week • No budgets, no MBOs
<i>Strategic Focus</i>	To beat the competition—benchmark and improve. Benefits are <i>marginal</i>	Marshall does not believe in competitors as benchmarks. Goes for the quantum leap in value—benefits in <i>multiples</i> <ul style="list-style-type: none"> • First in the industry on the Internet, one of the earliest among all businesses • First in the industry with lap-tops and intranet to connect employees
<i>Customers</i>	Expand and retain current customers through further segmentation.	Expand customer base through strategic alliances and new offerings: <ul style="list-style-type: none"> • SEI on the Internet • E.N.E.N.
<i>Assets and Capabilities</i>	Leverage what you have	Marshall not constrained by what it already has—IT platforms or infrastructure. Fresh starts and whiteboards—builds what complements the strategy: <ul style="list-style-type: none"> • Marshall on the Internet • PartnerNet • MarshallNet
<i>Product and Service Offerings</i>	The industry you are in determines the products and services you offer. The goal then is to add as much value as you can	Marshall not constrained by the industry boundaries. Thinks in terms of total solutions for the customer as well as suppliers. This has taken it in new directions beyond the routine offerings: <ul style="list-style-type: none"> • NetSeminar • E.N.E.N.

its customers and suppliers to create offerings like E.N.E.N. and Electronic Design Center and management of the whole constellation through its DRP system. In doing so, they have not hesitated to extend their traditional business boundaries and go against the conventional logic. Table 3 shows the shift to value innovation logic as it applies to Marshall Industries.

Shift #3: From IT-Supported Intermediation to IT-Shaped Cybermediation

The literature suggests that the intermediaries will be under pressure as value chains reconfigure to take advantage of the electronic networks (Benjamin and Wigand 1995). The logic behind this argument is that producers of goods and services will use new technologies, such as the Web, to forge direct links with the customers. This will create value for both the pro-

ducer and the customer by lowering costs related to transactions and coordination with intermediaries. A contrary opinion is that electronic networks will reinforce the position of traditional intermediaries and will rise to “cybermediaries” (Sarkar et al. 1995). This phenomena, labeled “disinter-remediation,” occurs as the electronic networks lower transaction costs and the volume of transactions increases (Saffo 1997). With the rising volume and greater customization, business becomes more complex for any single producer to handle on its own, giving rise to new opportunities for intermediaries. The new intermediaries utilize the knowledge derived from transactions to add value for the customers as well as the producers (Prahalad 1998). Web-based businesses are finding new ways to act as intermediaries—portals—based on close relationships and expert understanding of the needs of a specific customer segment (Ghosh 1998).

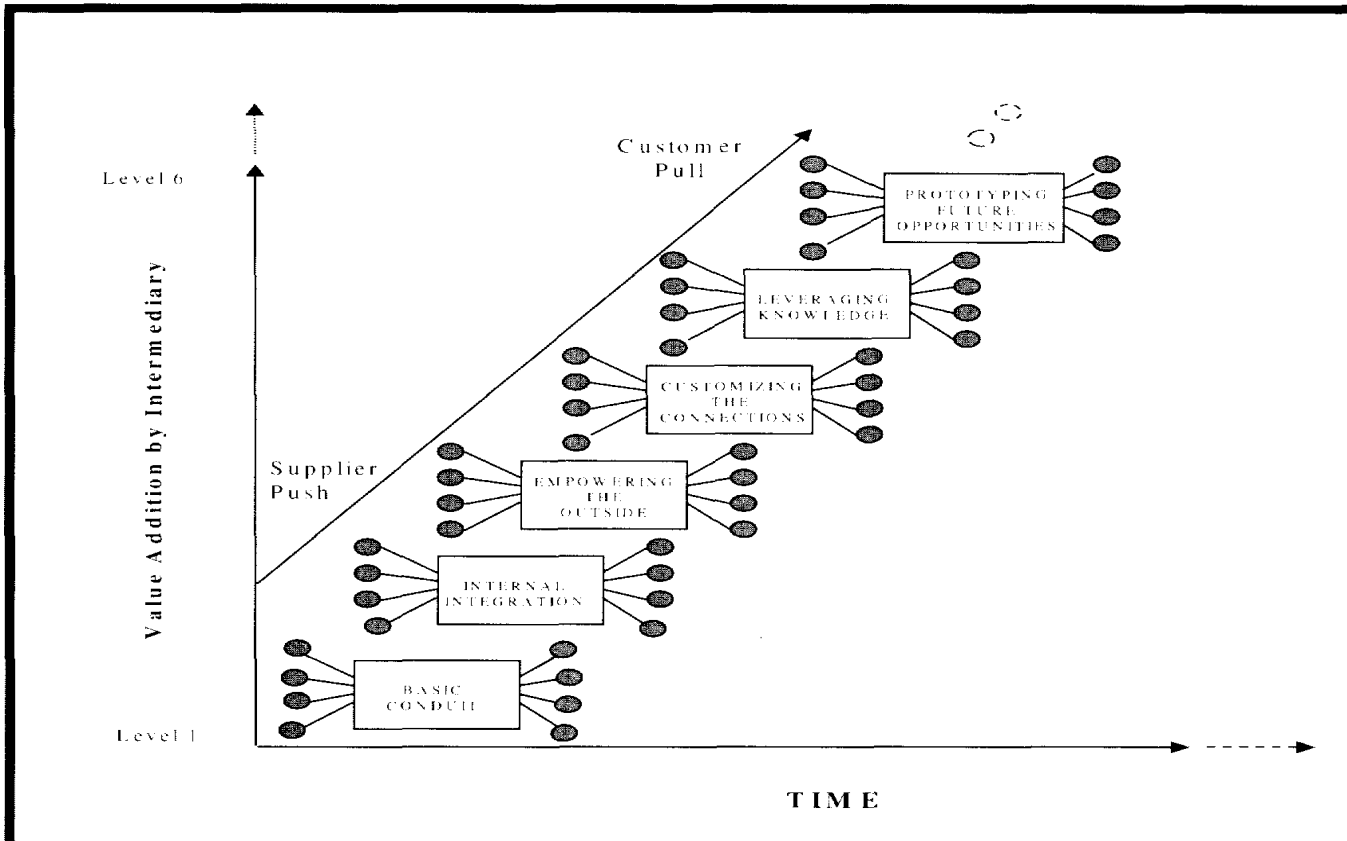


Figure 9. Evolving Intermediary Roles: Reinventing the Junction Box

The experience of Marshall supports the latter view of "cybermediation." It serves as an example of the need for intermediaries to constantly evaluate the needs of customers and producers. Intermediaries have to assess their value creation logic and its match with the needs of the market to avoid being bypassed in the electronic economy (Konsynki 1996). In doing so, Marshall has been evolving the role of an intermediary—from a mere conduit for transactions to creating value in new ways in cyberspace (see Figure 9). As elaborated earlier, the new roles are supported by a change in processes, information systems, knowledge management, and supplier and customer relationships. At the lower junction box levels, Marshall used information technology to support the creation of value, but at the higher level junction boxes, it is information technology that shapes and defines new options and strategies that create value.

Shift #4: Managing the Dynamic Unfolding of IT Strategy and Business Strategy

The electronic economy will be characterized by increasing complexity and opportunities derived from information technology. The change in the role of the middleman—from IT-supported intermediation to IT-shaped cybermediation—strongly suggests that information technology will become more embedded in the essence of business strategy and become less separable. As discussed in the section on the identification of new practices for IT organizations, it will no longer be a question of aligning corporate strategy and IT strategy, but rather managing their joint unfolding as one. Furthermore, Marshall's new ventures such as E.N.E.N. suggest that it is prototyping its strategy through different IT-shaped initiatives. This requires more of what is here called strategic improvisation in which it is guiding business values and principles, rather than the specifics of the business and IT strategies that are predetermined. Furthermore, this will mean that CEOs will be more proactively involved in shaping IT visions with CIOs as part of enterprise strategy.

The four shifts in logic articulated above are but the beginning of the new logic of the IT-intensive electronic economy. While insights have been drawn from a medium-sized distribution compa-

ny, we believe that the lessons and insights apply to any organization that sits between demanding customers and fast-moving suppliers. Every enterprise can be viewed as an intermediary or a junction box that can create value through the use of IT. The IT infrastructures of the electronic economy are just emerging, and the future needs of business customers are not known. However, we do know that customers will relentlessly continue to demand the holy grail of "Free. Perfect. Now," and enterprises will continue to stretch and seek ways to help find it through IT-intensive value innovation strategies.

Acknowledgements

We wish to thank Robert Rodin, Robert Watson, and Steve Knipping at Marshall Industries for their valuable insights. We also wish to acknowledge the help received from Sam Hariharan, Ravi Kumar, and Jim Sutter. We would also like to thank Bob Zmud, senior editor, and the anonymous associate editor for their most helpful suggestions.

References

- Armstrong, A., and Hagel III, J. "The Real Value of On-line Communities," *Harvard Business Review* (74:3), May-June 1996, pp. 134-141.
- Arthur, W. B. "Increasing Returns and the New World of Business," *Harvard Business Review* (74:4), July-August 1996, pp. 199-109.
- Ashkenas, R., Ulrich, D., Jick, T., and Kerr, S. *The Boundaryless Organization*, Jossey-Bass, San Francisco, 1995.
- Bakos, J. Y. "A Strategic Analysis of Electronic Marketplaces," *MIS Quarterly* (15:3) September 1991, pp. 295-309.
- Benjamin, R., and Wigand, R. "Electronic Markets and Virtual Value Chains on the Information Superhighway," *Sloan Management Review* (36:2), Winter 1995, pp. 62-72.
- Bensaou, B., and Earl, M. "The Right Mind-set for Managing Information Technology," *Harvard Business Review* (76:5), September-October 1998, pp. 118-129.
- Bettis, R. A., and Hitt, M. A. "The New Competitive Landscape," *Strategic Management Journal* (16:1), 1995, pp. 7-19.
- Bowman, E. H., and Hurry, D. "Strategy Through the Option Lens: An Integrated View of Resource Investments and the Incremental-

- Choice Process," *Academy of Management Review* (18:4), 1993, pp. 760-782.
- Broadbent, M., and Weill, P. "Management by Maxim: How Business and IT Managers Can Create IT Infrastructures," *Sloan Management Review* (38:3) Spring 1997, pp. 77-92.
- Brown, S. L., and Eisenhardt, K. M. *Competing on the Edge: Strategy as Structured Chaos*, Harvard Business School Press, Boston, 1998.
- Clark, C. E., Cavanaugh, N. C., Brown, C., and Sambamurthy, V. "Building Change-Readiness Capabilities in the IS Organization: Insights from the Bell-Atlantic Experience," *MIS Quarterly* (21:4) December 1997, pp. 425-456.
- Cross, J., Earl, M. J., and Sampler, J. L. "Transformation of the IT Function at British Petroleum," *MIS Quarterly* (21:4) December 1997, pp. 401-423.
- Davenport, T. H., and Klahr, P. "Managing Customer Support Knowledge," *California Management Review* (40:3), Spring 1998, pp. 195-208.
- Deming, W. E. *The New Economics for Industry, Government, Education*, MIT, Center for Advanced Education Services, Cambridge, MA, 1993.
- El Sawy, O. A., and Bowles, G. "Redesigning the Customer Support Process for the Electronic Economy: Insights from Storage Dimensions," *MIS Quarterly* (21:4), December 1997, pp. 457-484.
- Feeny, D. F., Edwards, B. R., and Simpson, K. M. "Understanding the CEO/CIO Relationship," *MIS Quarterly* (16:4) December 1992, pp. 435-447.
- Ghosh, S. "Making Business Sense of the Internet," *Harvard Business Review* (76:2), March-April 1998, pp.126-136.
- Ghemawat, P., and Ricart i Costa, J. "The Organizational Tension Between Static and Dynamic Efficiency," *Strategic Management Journal*, Winter Special Issue (14), 1993, pp. 59-73.
- Hagel III, A. "Spider versus Spider," *The McKinsey Quarterly* (1), 1996.
- Hartman, C. "Sales Force," *Fast Company*, June-July 1997, pp. 134-146.
- Hess, C. M., and Kemerer, C. F. "Computerized Loan Origination Systems: An Industry Case Study of the Electronic Markets Hypothesis," *MIS Quarterly* (18:3), September 1994, pp. 251-276.
- Huber, P., and Korn J. "The Plug-and-Play Economy," *Forbes* (159:14), July 7 1997, pp.268-272.
- Iansiti, M., and West, J. "Technology Integration: Turning Great Research into Great Products," *Harvard Business Review* (75: 3) May-June 1997, pp. 69-75.
- Keen, P. "Tomorrow's Infrastructure and Its Implications for IT Organizations," *SIM Network*, August 1997, pp. 9, 16.
- Kim, W. C., and Mauborgne, R. "Value Innovation: The Strategic Logic of High Growth," *Harvard Business Review* (75:1) January-February 1997, pp. 103-112.
- Konsynski, B. "Electronic Commerce and the Extended Enterprise," in *Competing in the Information Age*, J. N. Luftman (ed.), Oxford University Press, New York, 1996, pp. 216-241.
- Kraar, L. "Acer's Edge: PCs to Go," *Fortune* (13:9), October 30, 1995, pp. 186-194.
- Martin, B. L. "The End of Delegation—Information Technology and the CEO," *Harvard Business Review* (73:5), September-October 1995, pp. 162.
- Mougayar, W. *Opening Digital Markets: Battle Plans and Business Strategies for Internet Commerce*, McGraw-Hill, New York, 1998.
- Nadler, D., Gerstein, M., Shaw, R., and Associates. *Organizational Architecture: Designs for Changing Organizations* (1st ed.), Jossey-Bass, San Francisco, 1992.
- Norman, R., and Ramirez, R. "From Value Chain to Value Constellation," *Harvard Business Review* (71:4), July-August 1993, pp. 65-77.
- Norman, R., and Ramirez, R. *Designing Interactive Strategy: From Value Chain to Value Constellation*, John Wiley & Sons, New York, 1994.
- Prahalad, C. K. "Managing Discontinuities: The Emerging Challenges," *Research Technology Management*, May-June 1998, pp. 14-22.
- Quinn, J. B. *Intelligent Enterprise*, The Free Press, New York, 1992.
- Rayport, J. F., and Sviokla, J. J. "Exploiting the Virtual Value Chain," *Harvard Business Review* (73:6), November-December 1995, pp. 75-85.

- Reinhardt, A. "Log On, Link Up, Save Big." *Business Week*, June 22, 1998, pp. 132-138.
- Rockart, J. F., Earl, M. J., and Ross, J. W. "Eight Imperatives for the New IT Organization," *Sloan Management Review* (38:1) Fall 1996, pp. 43-55.
- Rodin, R., and Backaitis, N. *Beyond the Sounds of Silence*, Marshall Industries, El Monte, CA, 1994.
- Saffo, P. "Disinter-remediation: The Surprising Impact of Information Systems on Market and Organizations," Report from CIO Perspectives, CIO Conference Coverage, 1997.
- Sarkar, M. B., Butler, B., and Steinfield, C. "Intermediaries and Cybermediaries: A Continuing Role for Mediating Players in the Electronic Marketplace," *Journal of Computer Mediated Communication* (1:3), December 1995.
- Shaw, R. "The Best of the Best," *NetMarketing*, November 1997, pp. 15-19.
- Stabell, C. B., and Fjeldstad, O. D. "Configuring Value for Competitive Advantage: On Chains, Shops, and Networks," *Strategic Management Journal* (19:5), May 1998, pp. 413-437.
- Stalk Jr., G., and Hout, T. M. *Competing Against Time: How Time Based Competition is Reshaping Global Markets*, Free Press, New York, 1990.
- Tapscott, D. *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*, McGraw-Hill, New York, 1996.
- Venkatraman, N. "IT-enabled Business Transformation: From Automation to Business Scope Redefinition," *Sloan Management Review* (35:2), Winter 1994, pp. 73-87.
- Warren, L. "Making Ends Meet: Enterprise-Wide vs. Best-of-breed Systems," *Computer Weekly*, August 28, 1997, pp. 22-24.
- Weston, R. "Users Want It All: Full-blown ERP Systems, Best-of-breed Products and Integration Between the Two," *Computerworld* (31:47), November 24, 1997, p. 6.

About the Authors

Omar A. El Sawy is professor of information systems at the Marshall School of Business at the University of Southern California. He holds a Ph.D. from Stanford Business School, an MBA from the American University in Cairo, and a BSEE from Cairo University. He was previously

with NCR Corporation and the Hoover Institution, Stanford University. His current research interests include the redesign of business processes and electronic value chains in turbulent environments, and the improvement of knowledge management practices. He teaches and consults in the areas of information systems management for global operations, knowledge management, and fast response management. He is active in Asia and Europe, has been an advisor to the United Nations Development Program in Egypt, and was recently a Fulbright Scholar in Finland at the Swedish School of Economics and Business Administration. El Sawy is a four-time winner of SIM's International Paper Awards Competition and a member of the Executive Committee of SIM's Southern California Chapter. This is his sixth *MIS Quarterly* article.

Arvind Malhotra is a faculty member at the Kenan Flagler Business School, University of North Carolina at Chapel Hill. He is completing his Ph.D. in information systems at the Marshall School of Business, University of Southern California. His current research interests are in the areas of e-commerce business models, value innovation in electronic economy, knowledge management, supply-chain management for e-business, and virtual communities and their implications for marketing. He won the SIM International paper award competition in 1997 based on his research on how companies can exploit IT infrastructures to reinvent themselves for e-business. He was awarded the Jim S. Ford Doctoral Fellowship in 1997. He has presented research papers at the International Conference for Information Systems, Association of Information Systems conference, and Workshop on Information Systems Research and Development.

Sanjay Gosain is a faculty member at the Robert H. Smith School of Business at University of Maryland. He is completing his Ph.D. in information systems at the Marshall School of Business, University of Southern California. His current research interests are in the area of electronic value chains and knowledge management. Sanjay is the recipient of the Jim S. Ford Doctoral Fellowship for 1998. He has presented research papers at the 1997 International Conference for Information Systems, Association of Information

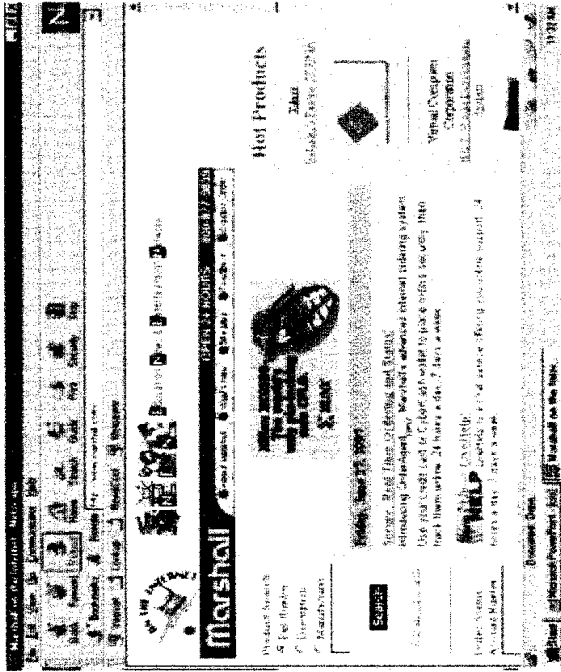
Systems conference, and Workshop on Information Systems Research and Development. He has also written several cases on the role of global information technology in multinational organizations. He has held management positions in the Global Consumer Banking division of Citibank N.A. and has worked on large software development projects.

Kerry M. Young is director of Information Technology at Marshall Industries. He is responsible for all facets of Marshall Industries' infor-

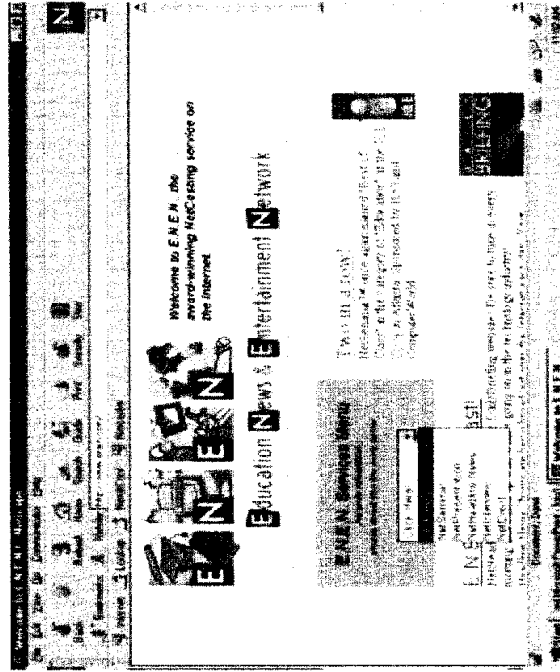
mation technology activities—including electronic commerce, internet, sales force automation, and data warehouse strategies. He is also responsible for Marshall's technology consulting practice. Before joining Marshall Industries in 1993, he held several positions at McDonnell Douglas in Long Beach, including management positions in IS and manufacturing. Young received a BS in computer science from Cal Poly San Luis Obispo and an MBA from Cal State Fullerton. He is a member of SIM's Southern California Chapter.

APPENDIX A

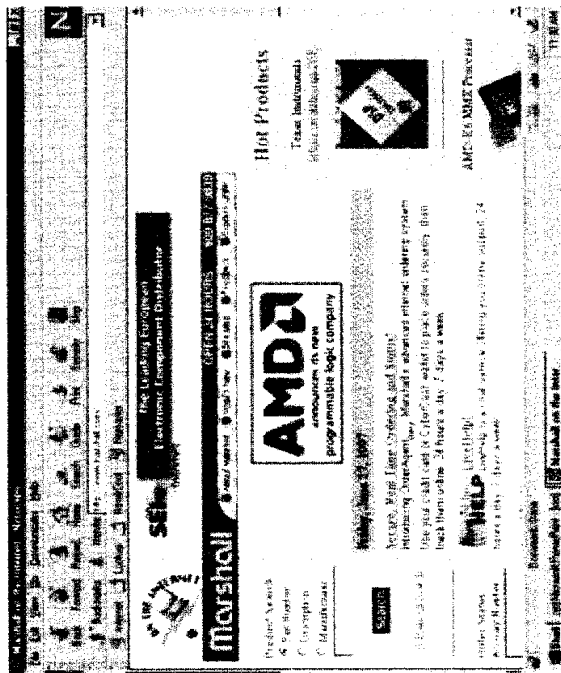
Screen Shots



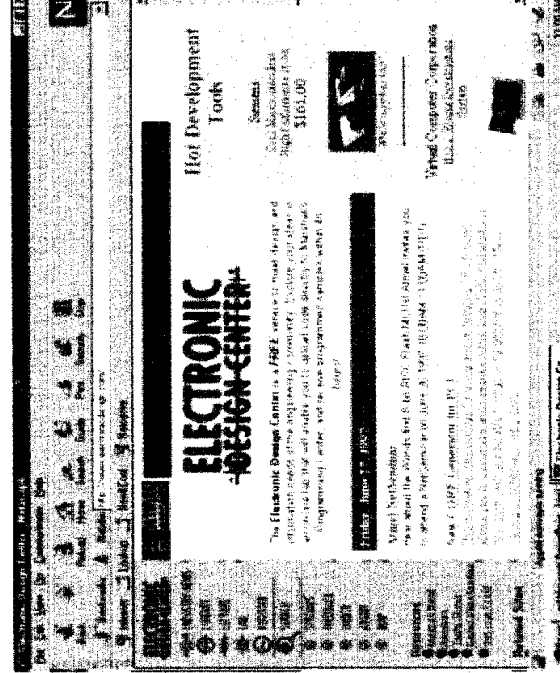
MARSHALL ON THE NET @ 11:36:15 on 06/27/97



ENEN: EDUCATION NEWS & ENTERTAINMENT CENTER



MARSHALL ON THE NET @ 11:35:06 on 06/27/97



ELECTRONIC DESIGN CENTER

APPENDIX B

IS Architecture at Marshall

