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SUCCESSFUL IMPLEMENTATION AND USE OF ENTERPRISE SOFTWARE:

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COMPAQ COMPUTER CORPORATION

An Academic Case Study

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Successful Implementation and Use of Enterprise Software: Compaq Computer Corporation¹

I. Introduction

Business Strategies and Use of Enterprise-Wide Information Technology

Intensifying global competition and increasingly sophisticated consumer preferences require that companies respond quickly and effectively to market opportunities. In this economic climate, effective implementation of a business strategy depends upon insightful use of enterprise-level information technology to redesign business processes, improve supply chain management and increase the value provided to the customer. To accomplish these goals, managers need timely and comprehensive information to make good marketing, production and distribution decisions. These strategic needs have motivated many businesses to implement enterprise resource planning (ERP) software.

Packaged software products provided by Baan, Oracle, Peoplesoft, SAP AG and other vendors provide effective ERP solutions. The potential benefits of implementing ERP software can be very compelling for management:

- (a) Common business software applications (e.g., for procurement, production scheduling, inventory management and financial accounting) are used for all organizational units worldwide;
- (b) ERP software facilitates business process redesign or reengineering efforts, permitting the enterprise to more effectively improve business processes, reduce costs and execute fundamental business decisions;
- (c) Real-time access to information is provided on the major economic activities of the enterprise for all organizational units worldwide.

Currently, the popular SAP AG R/3 ERP software provides the most comprehensive coverage of business processes and economic events. Using the R/3 software, executive management can monitor and lead the entire enterprise at the levels of business processes (e.g., worldwide production and forecasting) and customer demand (e.g., by product line and by geographical region). Managers and professionals also can be more aware of the economic status of their units, and be more responsive to the needs of their customers. These benefits of a successful R/3 implementation can enhance the competitive position of a firm significantly.

Objectives of this Academic Case Study

An academic case study is intended to present a well-reasoned and theoretically sound analysis of how an important issue was framed and resolved by an actual firm. The issue for the current study is how strategic business use of enterprise-wide software, especially SAP R/3, can improve the economic performance of a large-scale manufacturing company. We provide a comprehensive, richly detailed analysis of how

¹This research has been supported by grants from the U.S. National Science Foundation, the Industry-University Cooperative Research Program, and IBM Global Services.

changes in Compaq's business strategy and its use of enterprise-wide IT transformed the company.

Why Focus on Compaq Computer Corporation?

Compaq has relied on strategic use of enterprise-wide IT to enhance its competitive position. Compaq experienced rapid growth in the 1980s, gaining a well-deserved reputation for producing high quality (and high cost) computers. In the 1990s, however, the computer marketplace became increasingly competitive in every market segment. Competitors such as Dell, Gateway, and Micron started delivering high quality products at low prices through mail order operations. Giant corporations such as IBM, Hewlett-Packard, and DEC were vying for market share in the large and medium business computer market. Large electronics companies like Packard-Bell and NEC were producing high volumes of low cost computers for the retail market.

Compaq felt the effects of this competition: it lost sales and market share. In 1992, its annual revenues dipped by more than \$300 million to \$1.5 billion while its operating costs continued to rise. Earnings per share dropped by over 70%. Compaq's management needed to respond--to develop a new business strategy that would allow them to compete successfully while remaining financially strong. The success of any change in strategy would depend directly heavily on how wisely Compaq used information technology across, and into, the entire organization. These issues constitute the theme of this case study.

Organization of the Case Study

This case study is organized as follows. The economics and competitiveness of the PC industry, and the role of information technology, are evaluated in section two. In section three, we concentrate on changes in Compaq's business strategy and its use of enterprise-wide information technology to implement strategic changes. Next, the impact of the strategy changes and use of IT on the economic performance of Compaq are evaluated using a Balanced Scorecard causal and performance analysis (Kaplan and Norton, 1996). The final section provides a summary of our insights and conclusions.

II. The Personal Computer Industry: Competition and Strategic Use of IT

Overview

It is not an exaggeration to assert that rapid and relentless economic Darwinism has prevailed, and continues to prevail, in the personal computer industry. "Compaq participates in a highly volatile industry that is characterized by fierce industry-wide competition for market share. Industry participants confront aggressive pricing practices, continually changing customer demand patterns, growing competition from well-capitalized high technology and consumer electronics companies, and rapid technological development carried out in the midst of legal battles over intellectual property rights." This statement from Compaq's June 30, 1997 SEC 10Q report describes accurately the highly competitive conditions in the industry.

These competitive conditions and demands have taken their toll on a number of firms. Companies such as Apple Computer, AST Research and Packard Bell are fighting for their survival. Others are leaving the market (e.g., Unisys Corporation) or have been acquired (e.g., Digital Equipment and Tandem Computer, both of which were acquired by

Compaq). And some have suffered substantial losses: Dell Computer lost \$36 million in 1994, IBM lost over \$8 billion in 1993, and both Gateway and Micron Electronics reported disappointing financial results in 1997.

Survival in the PC industry requires that firms continuously re-evaluate and improve their business processes, especially their value chains. ERP software, e.g., SAP AG's R/3, is used to implement changes in business processes. Leveraging this technology enabled companies to restructure resources, gain efficiencies, improve market reach, and implement corporate strategies more effectively.

Strategic Initiatives by the PC Manufacturers

While Hewlett-Packard and IBM are formidable competitors for Compaq, they are large, highly diversified companies; therefore, they are not readily comparable with Compaq. We will, therefore, contrast Compaq's operations and use of enterprise IT directly with Dell and Gateway. We note, however, that third quarter 1997 PC industry results indicate that Hewlett-Packard has made substantial gains in the PC market—and IBM's inability to compete on price has caused it to restructure its PC operations in late 1997. It is also important to recognize that IBM's dramatic financial performance improvement over the last few years appears to have been buoyed by the success of its Global Services and Storage Systems (SSD) divisions. (The success of IBM SSD's implementation of SAP R/3 has been well publicized.)

The continued growth and success of PC manufacturers depends on their ability to implement their strategic objectives in a changing market. In the last quarter of 1997, the overall market for PCs increased 15% over the same quarter in 1996. Compaq enjoyed a clear lead in PC market share in both the reseller (commercial) and the retail (consumer) channels. Figure one shows the distribution of U.S. market shares for the major PC manufacturers as of the end of 1993 and for the fourth quarter of 1997. Compaq had a 16.6% market share; Dell was number two with a 9.5% market share, and Gateway was number five with 7% of the market. All three recorded substantial increases in the number of units shipped during 1997.

In Tables 1 and 2, we compare the performance of Compaq, Dell, and Gateway. Compaq is two to four times as large as the other two in annual revenues (prior to its acquisition of Digital Equipment Corporation). Compaq is three and one-half times as large as Dell in total assets and seven times larger than Gateway. From a return on equity (ROE) standpoint, however, Dell has a big lead. Although Dell carries no long-term debt to lever the common equity, it still produced a 76% ROE in 1997 whereas Compaq's was 23.6% and Gateway's dropped to 12.6%.² It is apparent that Dell's management has created a highly effective and efficient operation.

What aspects of the corporate strategies are driving company performance? The direct marketing and build-to-order strategies employed by Dell and Gateway give them clear advantages in terms of reduced inventories. Dell averages less than 11 days to sell its inventory; its inventory turnover was over 39 times for the fiscal year ending February 1, 1998. Gateway averages 18 days to sell its inventory, and its inventory turnover was 19.8 times. Compaq, however, uses the reseller channel to resell its products;

² Based on company financial reports for fiscal years ending December 31, 1997 for Compaq and Gateway, and February 1, 1998 for Dell.

consequently, it took over 30 days to sell its inventory with an inventory turnover of just over 12.6 times for the year ending December 31, 1997.

Compaq controls almost 12.5% of the global PC market by designing, manufacturing, and marketing a wide range of computer products, including desktop and portable computers and network servers. From 1994 to 1997, Compaq has averaged 33% growth in annual revenue and 51% growth in annual net income. This growth was accomplished by leveraging its strategic use of information technology, e.g., by starting to change from "build-to-forecast" to "build-to-order" production. Also, Compaq increased its reach (product offerings) by acquiring both Microcom Corporation and Tandem Computer in 1997. These acquisitions allowed Compaq to compete more aggressively with Dell Computer and Gateway; its acquisition of Digital Equipment Corporation in 1998 will allow it to confront HP and IBM in the market for large-scale enterprise networks and service.

Compaq is the leader in the reseller channel with over 35% of unit sales. While Dell and Gateway enjoy significant sales to businesses, they were not major players in the reseller market in 1997 for two primary reasons:

- Dell and Gateway are direct retailers and, therefore, they do not typically use the reseller channel;
- Dell and Gateway have, until recently, focused on selling workstations and individual computers, rather than servers and completely bundled network hardware.

Compaq has also done well in the retail channel. Compaq leads there as well with over 25% of the market.³ Intense price competition and other factors have caused several PC manufacturers to lose market share and then regain it in late 1997 as they brought out competitive models that sell for less than \$1000. For example, Packard Bell's share dropped by 40% but then rebounded to over 20% of the retail market by gaining over 30% of the under \$1000 segment. Both Acer's and Apple's share declined significantly because of their small share of the fast growing sub-\$1000 market.⁴ Dell and Gateway avoid the retail channel with their direct marketing strategy and have not joined the competition for desktops priced under \$1000 (Gateway recently began offering a limited selection of computers for under \$1000). Their ability to price their products without that additional retailer markup, however, has allowed them to market high performance (Pentium II™) systems for well under \$2000 and has contributed to their strength in the consumer marketplace.

Dell, however, has continued its success in the commercial (business) marketplace in 1997, actually passing Compaq in sales in the second quarter of 1997. The world's leading direct marketer of computer systems, Dell's sales growth rate is building: 54% over the last 12 months, 42% over the last 36 months, and 40% over the last 60 months.⁵ Dell's ability to leverage technology has fueled its dramatic growth in an industry characterized by declining prices. Dell maintains lower costs by bypassing distributors and

³ PC Data report for June 1998.

⁴ According to Computer Intelligence, Acer held only 0.9% of the under \$1000 market in October 1997, that jumped to 11% in November 1997 and fell to 3.8% in December 1997; Apple had not entered the under \$1000 market in 1997.

⁵ Hoover's Online market data for Dell Computer Corporation as of September 1998.

other resellers. Dell was the first to use a build-to-order (BTO) methodology to manufacture and distribute computers given customer orders. Enterprise IT is used wisely to minimize inventories and more effectively manage its supply chain. In fact, Dell's newest factory converts customer orders into desktop PCs ready for delivery in an average of 8 hours.⁶

Gateway, the second largest direct marketer of computer systems, is also responding to competitiveness in the industry. In 1997, it acquired Advanced Logic Research and announced entry into the corporate network server market. At the same time, Gateway modified its distribution model to increase the use of channel resellers. It will continue to sell most of products directly, but will use VARs when large corporate clients need specific services.⁷ Gateway also announced expansion of its own chain of retail stores, Gateway Country, building on the success of its store in Great Britain.⁸

Business Strategies and Use of Information Technology

In the PC business, sagacious use of enterprise-level IT is essential to implement business strategies and be fully competitive. Moreover, Mata, Fuerst, and Barney (1995) suggest that managerial IT skills are likely to be the only source of sustained competitive advantage using information technology. They define managerial IT skills to "include management's ability to conceive of, develop, and exploit IT applications to support and enhance other business functions" (Mata, Fuerst, and Barney, 1995, p. 499).

The following excerpt from Dell's 1997 SEC 10K report, although addressing only the customer awareness aspect, highlights the importance of IT in implementing business strategies. Great emphasis is placed on customer service and understanding of market trends--and use of the enterprise software that provides the necessary information.

"Dell's information systems enable the company to track each unit sold from the initial sales contacts, through the manufacturing process to post-sales service and support. Dell is able to track key information about many of its customers and target marketing activities specifically to particular types of customers by using its database to assess purchasing trends, advertising effectiveness and customer and product groupings. This database, unique to Dell's direct model, allows the Company to gauge customer satisfaction issues and also provides the opportunity to test new propositions in the marketplace prior to product or service introductions."

Gateway's annual reports indicate a similar emphasis on tracking customer satisfaction and sales. Since Compaq has used, and continues to use, resellers as intermediaries, Compaq obtains customer-oriented information that is both less complete and less timely.

More generally, their uses of direct marketing and build-to-order strategies permit Dell and Gateway to enjoy strategic advantages over Compaq. The two companies are able to reduce the relative size of their inventories, obtain more direct and timely feedback from

⁶ Dallas Morning News, Sep. 2, 1997.

⁷ Computer Reseller News, Sep 22, 1997.

⁸ Computer Retail Week, Sep 5, 1997.

their customers, and, with comprehensive sales tracking systems, they obtain immediate information regarding changes in customer preferences. These advantages could not be achieved without effective implementation of enterprise software to accomplish the tasks.

The continued growth and success of these PC manufacturers depends on their ability to improve and implement their strategic objectives in a changing market. Wise use of enterprise software is an essential tool. Compaq is now deploying enterprise software to obtain the information and logistical advantages enjoyed by its competitors.

III. Compaq: Business Strategy and Use of Information Technology

In section II, we profiled the intense competition that prevails in the PC industry—and why effective use of IT is a competitive necessity. Now, we will investigate how Compaq's use of IT permitted the firm to change its corporate strategy, transform several critical processes and compete more successfully in the PC industry.

Context and Background

In 1997, headlines in the business press extolled Compaq's accomplishments: "Compaq Announces Record Third Quarter Sales, Earnings, and EVA," "Compaq Scores with Cheaper PCs," "Dataquest, IDC Q3 figures put Compaq atop of PC sales heap," "Domination – Compaq and Dell surge."⁹ At the same time, some of Compaq's competitors were not faring as well. For example, Micron Electronics, Inc. announced on November 24, 1997 that its quarterly earnings would be lower, Gateway reported a third quarter 1997 net loss of \$107 million, and Apple Computer was just returning to profitability. These different results are surprising since there appears to be little to distinguish one PC from another--each uses almost the same components often from the same vendors. The prices are similar; so is the performance of the products. Why, then, is was Compaq doing well when many others were not?

Before we address that question, some understanding of Compaq's history may be helpful. Founded only 15 years ago, Compaq presents a model for a growth company. In 1983, it reported first year sales of \$111 million and, by 1984, Compaq had subsidiaries in Germany, France, and the United Kingdom. By 1985, Compaq stock was trading on the New York Stock Exchange. Compaq reached \$1 billion annual sales by 1987. Compaq introduced the first business-class laptop computer in 1988 and a PC-based multiprocessor server in 1989. By 1990, Compaq's international sales exceeded its North American sales. The Compaq Presario line of personal computers for the home was launched in 1993. Compaq became the largest global supplier of PCs in 1994 and the fifth largest computer company in the world in 1995.¹⁰

Dynamic growth in the 1980s, however, caught up with Compaq in the early 1990s. Compaq experienced its first quarterly loss in 1991; essentially, the company had outgrown its ability to manage its growth. In addition, responding to competitive pressures had become more difficult. More specifically, Compaq's information system lacked the

⁹ Planning Review July, 1994. Business Wire Oct 16, 1997; Wall Street Journal Oct 17, 1997; Business Wire Oct 27, 1997; and ZDNN Oct 27, 1997. The authors recognize that Compaq Computer Corporation generated certain of these headlines via press releases.

¹⁰ Compaq 1996 Annual Report.

process integration necessary to provide management with timely information. Its organizational structure was no longer applicable or efficient.

Compaq Changes its Business Strategy

Compaq seemed to manifest the common problem that Michael Hammer described in his 1990 article,¹¹ *Reengineering Work: Don't Automate, Obliterate*: "processes have not kept pace with the changes in technology, demographics, and business objectives." When CEO (and Compaq founder) Rod Canion failed to develop a comprehensive plan to reengineer the corporation, the board of directors replaced Canion with Eckhard Pfeiffer. In 1993, based on Pfeiffer's new business strategy, Compaq began an enterprise-wide reengineering effort that encompassed changed strategic business processes, a more effective organizational structure, and a comprehensive, integrated enterprise information system (compare the process flows in Figures 5 and 6).

Three major strategic objectives were emphasized:

- Build-to-order manufacturing. Before this objective could be fully implemented, however, Compaq needed to reengineer its processes to reduce cycle time (the time from receipt of an order until the products fulfilling that order are shipped) from two weeks to 5 days.
- Multi-channel distribution. Compaq planned to add additional sales channels, such as mass-market retailers, but the success of this strategy hinged on not alienating the computer retailers and resellers with whom Compaq already had highly productive relationships.
- Pricing, promotion, and customer service. Compaq began implementing this initiative immediately by cutting prices an average of 30%, increasing advertising by 60%, offering on-site installation, extending warranties, and building remote diagnostic capability into its PCs.¹²

Compaq's Redesigned Business Processes

Compaq's management identified three major business processes that were critical to its strategy implementation: 1) product design and development, 2) manufacturing and distribution, and 3) pricing. These processes not only had to be improved; they had to be completely redesigned.

1. Product design and development process.

Compaq already excelled in product design and development. Now, it had to design products to specific price points--price targets that would position the company's products favorably in the market. In addition, its goal was to be, if not the first, among the first to market with products based on the latest technology.

¹¹ Harvard Business Review, July-August, 1990.

¹² Planning Review, July 1994.

A cross-functional process was necessary. Designers and engineers needed market information on both market requirements (e.g., interoperability of systems components, reducing cost of ownership, typical uses, and configuration preferences), and on competitors' innovations. Also needed were data from suppliers and manufacturing information to design-for-manufacturability; SAP's R/3 software is designed to provide much of this information. A "best practice" team approach dictated that the marketing members of the team specify the product requirements and the manufacturing members set the production constraints.

2. Manufacturing and distribution processes.

Dell's efficient "build-to-order" model gave Compaq a target for its manufacturing and distribution processes. Compaq had relied on "build-to-forecast," an inherently more efficient manufacturing process characterized by large production runs and low unit costs. In the PC industry, however, any unsold product has a very short shelf life. New products are introduced constantly and product lines often have only a life of a few months. Like others in the industry, Compaq had to deal with obsolete products in both its inventory and the inventory held by its retail dealers and resellers. Obsolescent inventory--with lowered prices--competed with new products. In addition, Compaq was faced with substantial product returns each time a new product was introduced. The extra handling and disposition was wasteful and costly.

Build-to-order should eliminate these problems by eliminating the extra inventory levels. Build-to-order, however, requires a much higher level of supply chain integration and management. Compaq plans to replace inventory with information. Compaq's suppliers will need to know the firm's requirements as soon as Compaq does. Compaq must balance demands placed on suppliers while keeping the manufacturing facilities operating smoothly and efficiently.

3. Pricing process

Compaq's pricing objectives are ambitious: It wants to set the prices for the market. At the same time, it also wants to create value for its customers in ways that will differentiate its products.

To achieve these pricing goals, detailed and timely sales information is essential. In the retail channel, Compaq requires sales information on a daily basis to price its products correctly without compromising its profit margins. In the reseller channel, Compaq needs to understand its customers' requirements and develop solutions that will add more value than competitors' products at a lower total cost of ownership.

One aspect of pricing is product quality, i.e., does the product meet all of the customer's requirements. Compaq's success in the major corporate market hinges on its ability to deliver complete enterprise-wide solutions. Its customers typically seek to avoid dealing with multiple vendors and they do not want to struggle to integrate potentially incompatible products. Compaq must provide complete solutions and then price the products appropriately. Consistent with these objectives, to add the necessary expertise and product lines, Compaq acquired both Microcom Corporation and Tandem Corporation in 1997, and Digital Equipment Corporation in 1998. Also, Compaq has formed alliances with major software vendors such as SAP AG, BAAN, PeopleSoft, and Microsoft.

Compaq's Restructured Organization

Ultimately, the performance of any business process depends on the both the abilities and knowledge of the people that perform that process, their incentives and management's practices. Reengineering efforts align decision-making with operation of the company's major processes. Consequently, management becomes both cross-functional and cross-process in scope, with decision making assigned to "put the decision point where the work is performed and build control into the process."¹³

The culture at the process level, the degree of centralization of common processes, and the nature of information sharing are also salient. Unless the organization is committed to implementing an enterprise-wide information system and integrating its processes, there is little hope of achieving best in class performance. Hammer's 1990 article advised companies to "organize around outcomes," and Compaq did just that. In July 1996, Compaq announced a new organization consisting of three groups:¹⁴

- PC Products Group - desktop and mobile computing businesses, a new communications business, and products for the small to medium business market;
- Consumer Products Group - personal consumer market;
- Enterprise Computing Group - enterprise software solutions, especially customer use of SAP AG's R/3 software.

This new structure aligned the organization along its value chains and gave Compaq's managers an integrated view of the company's critical business processes. At the same time, Compaq's alliances and acquisitions allowed it to increase the scope of its services, broaden its markets, and expand its level of expertise in the enterprise computing business. However, these structural changes also created greater demands for information sharing. Compaq's managers more than ever needed to communicate, collaborate, and coordinate their activities around the world.

Compaq's New Enterprise Information System

Restructuring an organization around new business processes requires an enterprise information system that can capture and integrate information across the entire value chain. One recurrent theme among Compaq's process improvements is the role of information, integrated enterprise-wide, to support and measure process performance. Moreover, as decision rights are assigned at the process level, timely decision making becomes dependent on access to necessary information. Therefore, successful implementation of Pfeiffer's strategy depends critically on the ability to deliver information in a timely, reliable, and usable manner.

To obtain the required technology, Compaq tapped both its own resources and those of its major partners. Compaq became its own customer. The solutions that it was developing for its largest corporate customers were also applied within Compaq itself.

¹³ Hammer, 1990, Reengineering Work: Don't Automate, Obliterate, Harvard Business Review.

¹⁴ InfoWorld Electric, July 8, 1996.

First, Compaq committed early to use of its own servers and the Windows NT™ operating system software. Second, it further developed relationships with the major vendors of enterprise-wide information systems. One question it faced was whether its servers running Windows NT™ could support enterprise-wide implementation of SAP and other systems; this was its opportunity to show that its products could provide a complete solution for its largest customers.

During the period 1994 to 1997, Compaq designed and implemented an enterprise-wide computing solution--the Total Order Planning System (TOPS)--based on SAP R/3 software and Compaq's own Windows NT-based ProLiant servers. The R/3 system implementation was a major effort, with at times over 100 concurrent users performing programming, configuration, and testing.¹⁵ As a part of its enterprise system, Compaq is also building an extranet--Compaq On Line--which will serve its distribution and reseller channel across 80 countries. Channel members will be able to configure, price, and order products online. Compaq On Line will be integrated into TOPS (the Mansion project) to create links spanning the entire value chain, from suppliers to customers, and to employees (see Figure 2). Sales force automation and electronic commerce engines will be provided. Figure 3 depicts the information flows throughout the system. Compaq eventually will be able to match orders with manufacturing and distribution in real time, allowing Compaq to adjust manufacturing plans and schedules every eight hours at plants in North and South America, and at distribution centers in Europe.¹⁶

The extranet and SAP R/3 systems are critical to Compaq's achieving its build to order strategy (Optimized Distribution Model); production costs may be reduced up to 20%. "A customer in Paris could access Compaq On Line from a browser and indicate the company's requirements. Based on the geographic location and needs of the customer, that call will be automatically sent to the most appropriate dealer. The system will then automatically configure and price the customer's requests."¹⁷ Compaq expected over a million transactions per day over the extranet by the end of 1997.

Compaq's IT architecture will permit distributors and resellers real time access to information on available systems, configurations, and order status. At the same time, Compaq will gather information on worldwide demand and customer preferences, and respond accordingly. Compaq's enterprise-wide system will allow it to:

1. Monitor supply and demand factors around the world on a daily basis, and better understand customer requirements. Compaq's senior management sees--in real time--a global representation of the market and can respond promptly to market changes;

¹⁵ Compaq's implementation of SAP did not follow the "big-bang" approach where several SAP R/3 modules are implemented simultaneously. Instead, Compaq implemented SAP modules with various other software systems to meet Compaq's specific requirements (e.g., its use of the Siebel sales tracking software). It is likely that Compaq will continue to upgrade its R/3 system and implement other modules.

¹⁶ Compaq SAP Partnership paper, Compaq Corporation; Communications Week August 11, 1997.

¹⁷ CommunicationsWeek, August 11, 1997.

2. Implement the Optimized Distribution Model to reduce inventory levels and improve productivity: “We can shift resources rapidly to respond to changes anywhere in the world, making our planning process much more agile”;¹⁸
3. Automatically make the foreign currency translations required for global markets and provide the necessary currency information to reduce risk;
4. Conduct business and serve customers in a consistent manner. Integrated processes and shared data permit Compaq employees to be more aware of their roles and responsibilities--and how their actions affect others. For example, the marketing people share information with members of the design and manufacturing team, thereby enabling product development efforts to be more consistent with known demand and customer preferences. Compaq is able to respond rapidly to any competitive pressures;¹⁹
5. Share information throughout the enterprise and across its supply chain. These systems allow a leaner, more focused structure because of the electronic commerce capabilities, improved inventory management, and automated processes such as the “configurator” applications that allow customers to configure, price, and order systems (see Figure 4). By sharing information electronically with suppliers, Compaq can effectively outsource many of its component assembly processes. These changes have resulted in a steady increase in Compaq’s sales per employee.²⁰

Compaq’s Strategy at the End of 1997

Compaq continues to aggressively develop the initiatives that were started in 1993:

- Build-to-order manufacturing. A goal in 1993, it was not fully articulated until early 1997 when Compaq announced its Optimized Distribution Model (ODM) to be phased in over the next year. Although Compaq improved its inventory turnover to 12.6 times for 1997, Dell achieved an inventory turnover of over 39 times for 1997 and continues to improve. With the ODM, Compaq plans to integrate business processes spanning the supply chain from suppliers to final customers.²¹ Compaq hopes to achieve a level of two weeks’ of dealer inventory across its entire product line.²²
- Multi-channel distribution. Compaq has already shipped products built under the ODM model, i.e., Deskpro products built to reseller orders. It also has announced the channel partners who will be qualified to perform final product configuration under the Channel Configuration Program (CCP). Part of the model involves Configure-to-order (CTO)

¹⁸ John White, Compaq CIO, Compaq SAP Partnership, Compaq Corporation.

¹⁹ Compaq SAP Partnership paper, Compaq Corporation; Communications Week August 11, 1997.

²⁰ Compaq SAP Partnership paper, Compaq Corporation; Communications Week August 11, 1997.

²¹ Compaq press release July 29, 1997.

²² New York Times, CyberTimes June 16, 1997.

where Compaq will configure products to reseller specifications at Compaq facilities and ship the machines to customers.

- Prices, promotion, and customer service. Compaq is using its manufacturing and distribution improvements to cut prices. Its aim is to lower the total cost of ownership for its corporate customers. At the same time, Compaq has acquired the capabilities it needs to deliver complete solutions to the largest corporate customers. In 1997, it acquired Tandem Computer, as well as the networking company Microcom, and it invested in Ramp Networks, a maker of small-business networking gear. Tandem provides powerful computers to transaction-intensive customers such as financial institutions. IBM and Hewlett-Packard marketed their services to large corporate customers claiming that Compaq products couldn't scale to fit the enterprise-- after the Tandem (and DEC) acquisition, that is no longer true.²³

In October 1997, Compaq announced new IT initiatives aimed at its goal of being number one in customer satisfaction. It enhanced its Compaq On-Line system to form a new Internet-based system called COLinqPlus (Compaq On-Line Linq). This tool will allow resellers and retailers to order and track parts movement electronically in real-time. It eliminates paperwork requirements for things like warranty labor reimbursements and saves time. At the same time, Compaq announced its automated "My Voice" on-line customer satisfaction tracking systems. This system collects customer responses after service calls to measure satisfaction and evaluate the level of service provided.²⁴

IV. A Balanced Scorecard Analysis of Compaq's Performance and Use of IT

Overview

In section three, we indicated Compaq's new business strategy, and the technology-enabled changes Compaq made, and is continuing to make, to its business processes. But how do we *measure* the payoff from its investment in information technology? It has been suggested that the payoff from IT should be evaluated in terms of the business objectives that it supports.²⁵ We have adopted this perspective. We address the impact of improvements in the efficiency and effectiveness of the affected business processes. Most important, we consider not only past results but also implied future benefits.

Financial Accounting Measures of Enterprise Performance

Executive management needs performance measurements that indicate the extent to which the company is achieving its strategic objectives. While they are used extensively, traditional financial accounting measurements do not reveal adequately the benefits of

²³ Mark Tebbe, InfoWorld Electric June 30, 1997, Reuters Sep 10, 1997, InfoWorld Electric July 7, 1997, PC Week July 4, 1997.

²⁴ Business Wire, October 8, 1997.

²⁵ For example, Mooney, Gurbaxani, and Kraemer (1995) recommend measuring IT value against its support for intermediate process goals that form part of overall strategy; Brynjolfsson (1997) indicates that "[t]echnology must be aligned with the core competencies of the company to deliver true value."

investing in information technologies. Financial accounting measurements do inform management of historical outcomes but do not indicate why those results were achieved or what management must do in order to improve future results. More specifically, excessive reliance on financial accounting performance measurements will be inadequate at best, and can be very misleading, due to the following limitations:

1. Financial accounting provides very little indication of why results were (or were not) achieved or how to improve the firm's strategy;
2. Only ill-defined linkages are revealed between the effectiveness and efficiency of business processes and financial results;
3. Extensive use of historical cost versus current value indications;
4. Management's subjective treatment of economic events given their selection among feasible accounting methods.

A Balanced Scorecard View of Evaluating Enterprise Performance

Kaplan and Norton (1996) developed the Balanced Scorecard (BSC) to link a firm's strategic objectives to performance measurements. The BSC theory also suggests measurements that guide a firm towards its strategic objectives. In addition to traditional financial accounting measures, the BSC integrates measures of the causal determinants of financial outcomes. Furthermore, the BSC's concentration on operation of business processes permits more accurate capturing of the benefits that result from investments in information technology.

The BSC aligns business process measurements with a firm's strategic objectives. Cause and effect linkages are identified from the execution of daily activities to eventual results. For example, related to the financial measures are results from the customers' perspective (e.g., unit sales, market share) and measures of the performance of internal business processes (e.g., cost savings, inventory turnover). Consistent with this theme, performance measurements are considered from four perspectives (see Figure 7):

- 1. *Learning and growth for the organization and its members.* The focus is on the firm's employees, their skills, satisfaction, motivation, innovation and productivity. These attributes precondition process improvements, customer satisfaction, and ultimately financial success;
- 2. *Operation of internal business processes.* The focus is on optimizing costs, quality, throughput, and time attributes of each process;
- 3. *Satisfaction of customers.* The focus is on customer satisfaction and the resulting changes in market share, new customer acquisition, customer retention, and customer profitability;
- 4. *Financial results.* Based on the above three perspectives, the focus is on outcome measures of revenue growth, cost reduction, and asset utilization. Clearly, innovative new products that are accepted enthusiastically by the market and are produced efficiently will result in superior financial performance.

The first three perspectives yield sets of performance measurements that are directly implied by the firm's strategic objectives. However, corporate stakeholders ultimately want to see results in a language they understand--financial results.

Both financial and non-financial performance measurements are essential in a BSC analysis. Measurements are also identified as being either leading or lagging indicators. Leading measurements motivate future action to improve the firm's business processes. The leading indicators are linked to future results; in contrast, the lagging measurements represent the firm's *effectiveness* in achieving its objectives. Since the lagging measurements document past results, they may also be studied to achieve more *efficient* use of the firm's resources.

The BSC analysis also facilitates understanding of the economic impact of IT investments. The BSC's emphasis on the performance of business processes (see Figure 8) permits the impact of IT investments to be direct and measurable--and the impact of IT-induced improvements will eventually be manifested in measures of customer satisfaction and financial performance. More generally, strategic business initiatives may *require* IT innovations such as use of ERP software to be feasible.

Performance Results: Financial Outcome Measures

Tables 1 and 2 provide measures of Compaq's performance contrasted with that of Dell and Gateway. The results depict the success of Compaq's changed business strategy and the benefits achieved from its use of enterprise-wide IT. From 1992 to 1997, Compaq's net sales rose from \$4 billion to over \$24 billion. The firm sustained a revenue growth rate of over 31% over 60 months.²⁶ Annual net income increased from \$213 million to over \$1.8 billion over the same period.

During the fourth quarter of fiscal 1997, Compaq's unit sales jumped 52% versus fourth quarter 1996.²⁷ Over the same time period, Compaq's gross profit margin edged up to 27.6%, and inventory turnover increased from 7.1 to 12.6 times. Compaq's cash balance improved to \$6.8 billion (up \$3.8 billion in the nine months since the end of fiscal 1996), and the Economic Value Added (EVA) grew by over 150%. The \$300 million long-term debt balance at the end of fiscal 1996 was eliminated early in 1997; Compaq is essentially free of long-term debt²⁸

All of these results occurred in a competitive environment where prices for PC products were decreasing as fast as 15% per quarter. Consistent with one of its strategic objectives, Compaq itself drove some of the price reductions, yet it was able to maintain one of the highest gross profit margins in the industry. Compaq's use of IT to improve its processes and implement its strategy contributed to its economic success in a very competitive market.

We note that these results were achieved despite a significant investment in information systems development and implementation. We prepared this case study based on publicly available information. We have no specific information on the cost of

²⁶ Hoover's Online Market Data for Compaq Computer Company as of September 2, 1998.

²⁷ International Data Corporation report.

²⁸ Compaq press release dated January 21, 1998 and Compaq annual report for 1996; long-term debt is \$0, down from \$375 million at December 31, 1996.

Compaq's enterprise information system. We do, however, estimate that the total cost of that effort--including hardware upgrades, systems development and implementation labor, training, software, user involvement and other development costs--ranges between \$100 and \$150 million.

Compaq's strategy through 1997 was to both expand their current markets and to create new ones. For example, Compaq created a strong presence as a supplier of client-server Microsoft NT based systems, and it was the first major PC manufacturer to offer desktop PCs for the home priced at under \$1000. In a 1996 article, Business Week Magazine reported that Compaq "will move aggressively into all sorts of new product areas that will make it a full-line information-technology company—capable of competing across the board with companies such as IBM and Hewlett-Packard...[to] produce everything from computers for toddlers to mainframe-class servers able to run global financial networks."²⁹ Alternatively, in the words of Compaq CEO Pfeiffer, "Compaq will participate in every opportunity."³⁰

Kaplan and Norton (1996, p. 37) "approach strategy as choosing the market and customer segments the business unit intends to serve, identifying the critical internal business processes that the unit must excel at to deliver the value propositions to customers in the targeted market segments, and selecting the individual and organizational capabilities required for the internal, customer, and financial objectives." Using this approach, let's examine the cause and effect relationships that drive the performance of Compaq (see Figures 8 and 9).

Customer Objectives

Ultimately, a company must deliver value to its customers. Kaplan and Norton describe value as a function of product attributes (e.g., functionality, quality, price, and timeliness), company image, and customer relationships. Compaq intends to deliver value through its pricing, promotion, and customer service initiatives to increase market share. As shown in Figure 1, Compaq has steadily improved its market share from 9.3% of the U.S. market in 1993 to 18.1% in the fourth quarter of 1997.³¹

Market share provides one important measure of customer satisfaction; it reflects marketplace acceptance of the price and performance of Compaq's products. It also clearly indicates the effect of the effort that Compaq has made to create a positive image and develop relationships with its customers. Hanspeter Eiselt, Compaq senior business manager for desktop PCs, described the company's high ranking in the 1996 annual VARBusiness Magazine Report Card: "In 1997, Compaq made a conscious effort to work and communicate with its reseller community - an effort that paid off in first-place scores for both support and partnership."³² However, while the firm continues to excel at product

²⁹ Gary McWilliams, "Compaq at the 'Crossroads' ", Business Week, July 22, 1996

³⁰ "Compaq Reengineers Again", VARBusiness Magazine, May 15, 1997

³¹ International Data Corporation PC sales data.

³² Peter Jordan, "Compaq Reengineers Itself Into Top Desktop Vendor", VARBusiness Magazine, Oct 15, 1996.

quality and functionality, Compaq slipped in the 1997 Annual Report Card Compaq in terms of product availability and profit potential for value added resellers (VARs).³³

Compaq is competing in a dynamic marketplace. Customers' requirements change. Relationships can be short-lived. Therefore, retaining a customer can be difficult. Compaq is betting that it can create and sustain value by expanding its product lines and increasing its service capabilities,³⁴ combining the resources of Compaq, Tandem, and Digital to "deliver the best computing solutions and innovative products and technologies, all backed by global services and support."

Business Process Objectives

Kaplan and Norton describe two process cycles that span the gap between identifying and satisfying customer needs. First, during the first innovation cycle, products are designed and developed. Then, during the operations cycle, products are made, marketed, and serviced. It is the effectiveness and efficiency of these two cycles that create value for the customer and for the business itself. Moreover, suitable use of information technology can profoundly improve these cycles.

Let's examine the causal links between the innovation cycle and customer value. According to Kaplan and Norton, "[t]he innovation process, the long wave, of value creation, is for many companies a more powerful driver of future financial performance than the short-term operating cycle." For Compaq, the innovation cycle is focused on speed. "Compaq thrives on speed--speedy revenue growth, speedy market share gains, speed in entering new business, speed in manufacturing."³⁵ John Rose of Compaq summed it up: "The environment is changing, and you'd better be innovative--not just in your products but in every part of your business."³⁶

Compaq's product innovation focuses on specific market objectives and price points, reducing time to market, and designing products to match customer requirements while considering component availability. A recent example is the under-\$1000 PC. Compaq was first to offer significant PC performance at that price. Compaq's PCs quickly captured almost 40% of the under-\$1000 retail market in 1997, attracting buyers that had previously been unable to afford PCs.³⁷ In addition, and perhaps most important, Compaq was able to design and develop this product at a price point that allowed them to maintain their gross profit margin.

Compaq's reengineering efforts have reduced the time-to-market of its new products. These new products emphasize enhanced functionality, or price advantages, which in turn improve customer satisfaction and product image. Compaq's Hanspeter Eiselt cited the

³³ Kathleen Melymuka, "Hewlett-Packard Wins and Digital falls to back of the pack", VARBusiness Magazine, Oct 15, 1997.

³⁴ **Compaq CEO Ekhard Pfeiffer press conference, June 12, 1998.**

³⁵ David Kirkpatrick and Sheree R. Curry, "Fast Times at Compaq", FORTUNE, April 1, 1996.

³⁶ Ibid.

³⁷ Vladimir Zlotnikov, "PC Sales Growth Remains Down", Electronic Buyers' News, Nov 3, 1997.

July 1997 announcement of the new DeskPro line as an example. At the time of the announcement, Compaq already had 100,000 units in the channel.³⁸

Compaq also seeks to differentiate its business products by pre-configuring systems with complex software products. For example, large businesses can order Compaq servers with SAP R/3 software already installed, and small businesses can get Microsoft Small Business Server software pre-loaded. The Microsoft/Compaq combination allows small businesses to purchase or lease a ready-to-run server capable of networking up to 25 users.³⁹ Thus, Compaq addresses customer requirements and differentiates its products by simplifying their acquisition and by reducing their total-cost-of-ownership.

Next, let's examine the causal links between the second operations cycle and customer value.⁴⁰ For Compaq, the operations cycle encompasses sourcing parts and components, manufacturing, configuring, marketing, distributing, and servicing products after the sale. The operations cycle has been a major focus of Compaq's reengineering efforts over the last three years. In 1994, CEO Pfeiffer stated, "Reengineering of the business process is our No. 1 priority. The reorganization brings us a higher level of customer focus."⁴¹ And, Ross Cooley, Compaq's vice president of North American operations, elaborated on the reengineering projects which included "expansion of the company's distribution center, the implementation of a new inventory tracking system and an overhaul of the company's information management system to facilitate how the product flows through the line."⁴²

Compaq's ongoing reengineering efforts continue to emphasize process efficiency. In 1996, Cooley said, "I've been asked what worries me at night; one thing is our ability to reengineer Compaq for the size it is today and will be tomorrow. And the reengineering effort is a long effort. It requires changing our business processes first and then our information systems to support the new business process."⁴³ In 1997, CEO Pfeiffer announced the Optimized Distribution Model (ODM) with build-to-order and configure-to-order initiatives "geared to improving our efficiency. ... We don't want to build something that will be sitting anywhere more than five days." He also described the objectives for any cost savings that would result: "All those cost savings will not end up on the bottom line. They will flow back into our prices being more competitive, pushing our market share...to get the inefficiency out and refunnel the money into those things that really create success and customer satisfaction."⁴⁴

³⁸ Peter Jordan, op.cit.

³⁹ "PC Software/Reseller remarketing", Computer Reseller News, Nov 18, 1997.

⁴⁰ Kaplan and Norton's operations cycle is similar to the concept of a supply chain.

⁴¹ Kelley Damore and Brian Gillooly, "Compaq Reorganizes U.S. Operations", Computer Reseller News, March 21, 1994.

⁴² Ibid.

⁴³ Tom Farre, "Compaq Pushes Beyond the PC", VARBusiness Magazine, Jan 1, 1996.

⁴⁴ "Compaq Reengineers Again!", VARBusiness Magazine, May 15, 1997.

The ODM extends Compaq's marketing and customer service efforts through relationships with VARs while also improving delivery to its largest customers.⁴⁵ The build-to-order (BTO) phase of the ODM, expected to cover most of Compaq's products by mid-1998, is aimed at reducing cycle times and limiting costs (see Figure 6). The BTO process, facilitated by use of SAP's R/3 software, has already produced efficiencies. For example, Compaq improved its inventory turnover from 8 times in 1996 to 12.6 times in 1997.

Compaq relied heavily on enterprise-level information technology to achieve the reengineering gains. In 1994, Jeff Held, consultancy partner with Ernst and Young, noted, "Compaq remade its business from top to bottom and made technology the basis on which it operates." It has been pushing the envelope on emerging technologies. Its own IT system includes 15,000 nodes with 2,000 servers in more than 30 countries. Originally running UNIX-based systems, Compaq committed to the use of Windows NT before it was fully proven in such an environment.⁴⁶

By 1997, Compaq was using SAP R/3 software to integrate its business processes and sales information worldwide.⁴⁷ It was building a global extranet that will span 80 countries to support electronic commerce and facilitate the exchange of information with its VARs and other major customers (see section three). These customers will then use "configurator" applications to automatically configure and order PCs and servers.⁴⁸ In mid-1997, Compaq opened its Internet shopping service, allowing customers to order Compaq products directly from Compaq's At Home website.⁴⁹ These innovations allow Compaq to achieve process efficiencies, including the following:

- * Linking orders electronically with production and suppliers, improving cycle time; facilitating just-in-time manufacturing, and making production status information available so that customers can track their own orders;
- * Sharing information with suppliers allows them to anticipate changes in Compaq's demand and improve their efficiency, thereby reducing costs of supplies and improving on-time delivery;
- * Exchanging information on parts and component availability with suppliers allows products to be configured with the most economical and readily available components, reducing costs and improving cycle time;
- * Integrating orders with SAP's financial management and production planning modules, reducing time and cost of orders processing for both Compaq, its resellers, and its other customers;

⁴⁵ Cara Cunningham and Ed Scannell, "Compaq executive brass tout new, three-phase distribution model", InfoWorld Electric, July 10, 1997.

⁴⁶ Caryn Gillooly and Mary E. Thyfault, "Practicing What They Preach," InformationWeek, Oct 10, 1994.

⁴⁷ According to Compaq, the SAP system, implemented site-by-site beginning in December, 1995, with its largest manufacturing site, Houston, to come on-line in early 1998.

⁴⁸ "Compaq Builds Global Transaction System", Communications Week, Aug 11, 1997.

⁴⁹ Michael Kanellos, "Compaq tests web sales waters", CNET, Oct 16, 1997.

- * Capturing customer information after a sale to provide individualized service as well as additional marketing based on information about the specific products and configurations ordered by each customer.

These process efficiencies would not have been possible without the large investment in information technology made by Compaq. In addition to creating the systems, Compaq's employees must take on the daunting task of learning the new systems and continually improving them over time.

Learning and Growth Objectives

A company cannot innovate or operate well without creating long-term learning and growth. Organizational learning and growth come from three principal sources: people, systems, and organizational procedures. We have already outlined how Compaq's systems and procedures provide information about business processes, customers, and the competitive environment. Compaq's people must then have the requisite skills and incentives to accomplish its changed business strategy.

Compaq has always relied on its "virtual organization" for the capabilities that it lacked to develop innovative products and deliver superior customer service. Mark Specker, a partner at Gartner Group, described Compaq as having a "partnership-integrated model" of business.⁵⁰ Compaq's research and development budget is relatively limited, so it uses partnerships and alliances with other industry leaders for mutual benefit. Compaq's Bob Stearns expressed the importance of these relationships: "Our partnerships are part of our research and development budget."⁵¹

Compaq, for example, uses alliances with value-added resellers to extend its own capabilities to meet customer requirements and obtain information on customer needs and preferences. For example, large business customers are accustomed to the kind of handholding for which IBM is famous. The VARs provide this capability for Compaq, so "Compaq gets to play in the big-iron business without incurring the costs of running its own services and software business."⁵²

Partnerships allow Compaq to focus on its core competencies. For example, Compaq management determined that product warranty repairs and service is not a core competency, so it contracted with Digital Equipment as its worldwide service provider.⁵³ Partnerships also open new markets and create synergistic demand for both partners' products: for example, the partnership with Siebel Corporation where Siebel promotes Compaq products and vice versa.⁵⁴ Compaq's extranet and electronic commerce systems are designed to achieve efficient exchange of information to and from its partners. Well

⁵⁰ David Kirkpatrick and Sheree R. Curry, op. cit.

⁵¹ Ibid.

⁵² McWilliams, op.cit.

⁵³ Farre, op.cit.

⁵⁴ The Siebel/Compaq partnership includes testing of Siebal software to ensure that it operates properly on Compaq hardware; Siebel then recommends that its customers use Compaq products to ensure proper operation of the software; in return, Compaq preloads the software on machines and promotes Siebel to its customers.

before the extranet, Compaq was an early user of Lotus Notes™, placing Notes servers in large customer sites to exchange business and technical information.⁵⁵

Where capabilities are particularly important to its strategic objectives, making partnerships less desirable, Compaq has used its financial strength to acquire them. The recent acquisitions of Microcom, Tandem Computer, and Digital Equipment Corporation are examples. With these acquisitions, Compaq now has the expertise in networking and transaction-intensive systems for the large business market.

A Performance Model of Compaq

We described Compaq's performance prior to 1998 based on the four BSC perspectives and their linkage with Compaq's strategic goals. We now emphasize how performance along one dimension drives performance along other dimensions.

In section III, we described Compaq's growth strategy, which emphasizes build-to-order manufacturing, multi-channel distribution, and pricing, promotion, and customer service. To achieve growth, any company needs to keep current customers and acquire new ones--it must create customer satisfaction. What are the drivers of customer satisfaction for Compaq?

Compaq determined that the most important driver of customer satisfaction was price. Reductions in prices should be accompanied by reductions in costs. Compaq reduced its costs through its ongoing build-to-order initiative and by achieving process efficiency. Since 1993, Compaq has been engaged in a series of process reengineering efforts, involving the use of enterprise systems such as R/3, that have reduced cycle times, increased inventory turnover, and reduced the cost of raw materials. These efficiencies allowed Compaq to reduce prices as much as 15% per quarter during 1997, thereby driving customer satisfaction.

A second driver of customer satisfaction is brand image. In addition to its aggressive advertising and promotional programs, Compaq reinforced its brand image by improving the functionality of its products and scope of its product line. This is where the innovation cycle and the speed with which Compaq innovates are most important. By reengineering its product innovation processes, Compaq was able to reduce time to market and enhance product functionality while designing products that were less costly to manufacture. Product innovation allows them to meet changing customer requirements and drives customer satisfaction.

A third major driver of customer satisfaction is service. Compaq uses its multi-channel distribution model to increase customer service. Its VAR network allows it to provide the specialized level of customer service that major business customers expect. But, its VARs are also its customers. Therefore, it implemented information systems that make it easier for them to do business with Compaq, for example on line ordering via the extranet (Compaq CoLing). Compaq serves its resellers so they can provide a higher level of customer service and again drive customer satisfaction.

Achieving these process level improvements to enhance customer satisfaction requires organizational learning and growth. Compaq's management needs to become

⁵⁵ Gillooly and Thyfault, op. cit.

even more knowledgeable about customer requirements. It needs to constantly monitor and improve its processes to keep driving costs down. Its enterprise-wide systems feed Compaq's management with information that allows them to make better decisions and drive process improvements, which in turn drive customer satisfaction.

And finally, Compaq's growth objective, driven by process improvements which are in turn driven by enhanced learning, results in more revenue dollars, higher net income, and a greater return on investment for Compaq's stockholders. Figure 9 provides an example of how initiatives along one balanced scorecard perspective drive performance at the next, ultimately creating increased customer satisfaction and increased market growth.

Compaq Falters in 1998

In 1997, Compaq's financial performance was the best in its history. Their strategy was highly successful, as indicated by their results along all the Balanced Scorecard perspectives. In 1998, however, Compaq's financial performance suffered. During the first six months of 1998, they lost over \$3 billion. Not counting write-offs attributable to the merger with Digital Equipment Corporation, their net income was barely positive. Revenues grew less than 5% over the same period in 1997. Industry analysts blamed Compaq's problems on its return to the old practice of "channel stuffing"⁵⁶, while intense competition in the industry was driving prices down and sales were slowing.

Just as the Balanced Scorecard presented a performance model for Compaq in 1997, it also provides insights into Compaq's misfortunes during 1998. The four Balanced Scorecard perspectives provide a causal model that allows us to understand some of the complex reasons for Compaq's rapid performance decline in 1998.

Compaq's performance began to suffer as Compaq pursued the acquisition of Digital Equipment Corporation. The DEC acquisition was much larger and more complicated than Compaq's earlier acquisitions of Tandem and Microcom. There was significant overlap between Compaq's and DEC's product lines. There were legal and regulatory issues. There were financial and organizational issues. Addressing these myriad issues competed for management attention at all levels in Compaq.

Although the DEC acquisition gave Compaq the service infrastructure that it needed to compete in the enterprise computing market, overall Learning and Growth suffered as Compaq's workforce contemplated the impact of the merger. As many as 20,000 workers might be laid-off.⁵⁷ Some of those layoffs would be within Compaq. Reorganization and planning for the combined company took precedence over improving the old company. Information systems had to be redesigned. Coordination at all levels became more complicated. Formal networks to support the operation of the company were in some measure supplanted by informal networks addressing merger issues.

The consolidation of facilities and business processes was more important than process innovation in the short run. Compaq could not focus on faster cycle times and lower inventory levels until it decided which products it would keep, which facilities would

⁵⁶ Channel stuffing refers to selling inventory to channel partners in excess of anticipated end user sales.

⁵⁷ Computer Reseller News, June 26, 1998, reports first 5,000 employees cut as Compaq consolidated operations.

remain, and how separate workforces would be combined. Compaq failed to follow its own plans for implementing the Optimized Distribution Model. Build-to-order was delayed. At the same time, Compaq's growth objectives pushed it to overestimate sales volumes and deliver excess levels of inventory to its channel partners in late 1997. The competition for management attention may have limited its ability to monitor sales and balance inventory levels. Or, the desire to meet growth objectives unduly influenced its actions. In either case, the result was disastrous. Instead of the targeted level of two weeks inventory in the channel, there was five to six weeks inventory in the channel in early 1998.

Compaq was forced to take drastic action to eliminate excess inventory before the products became obsolete. They cut prices and began aggressive marketing campaigns. They shut down assembly lines for two weeks. While these efforts were successful in reducing inventory, they disrupted internal business processes, delaying new product introductions, and actually causing some shortages. Compaq couldn't bring out the latest Pentium II machines without adversely affecting the value of their products in inventory, so Compaq lost ground to companies using build-to-order production. In 1997, Compaq said its goal was to increase inventory turnover to 30 times by the end of 1998, but after the first six months of 1998, inventory turnover still sits at 10 times per year.

Compaq's customers began to worry. They worried that the merger would reduce competition and lead to higher prices. The DEC customers wondered whether their products would be supported or phased out. DEC had been known for innovation in the industry, and there was substantial question whether Compaq would continue that level of research and development. The VARs were upset about high inventory levels, slow implementation of channel assembly programs, and potential competition from Compaq's new service organization.⁵⁸ In general, customers were concerned about the effect that the merger and its attendant changes would have on them. Compaq's market share dropped to 14.4% of the U.S. market, while Dell's jumped 72% to also record 14.4% of the market in the 2nd quarter. Worldwide, however, Compaq remained the clear leader.⁵⁹

In March, 1998, Compaq announced that it would accelerate implementation of the ODM and aggressively reduce industries. By April 1998, those levels were down over \$300 million from 4th quarter of 1997. By July, channel inventory levels had dropped to 3.5 weeks.⁶⁰ The cost of that success, however, was significant. The price reductions and production cutbacks drove gross profit margins below 20%, down over 8% from the gross profit margins that were among the highest in the industry in 1997. Compaq barely broke even in the 1st quarter, earning only \$16 million versus net income of \$414 million in the 1st quarter of 1997. By the end of the 2nd quarter, Compaq's management believed that this setback was now behind them. Earl Mason, Compaq's Chief Financial Officer stated that "we are now moving aggressively to achieve targeted levels of performance and growth."⁶¹ Wall Street is not convinced. Analysts predict that 3rd quarter results will not show much improvement, although earnings are expected to jump up to \$0.36 per share in the 4th quarter. That would bring 1998 earnings per share to about \$.045 (excluding

⁵⁸ Computer Reseller News report of Compaq's "channel summit" aimed at easing DEC strife.

⁵⁹ ZDNN report, "Compaq clear no.1 in Q2", July 26, 1998 – reporting both IDC and Dataquest figures.

⁶⁰ Compaq Press Release July 27, 1998.

⁶¹ Compaq Press Release, "Compaq Reports Second Quarter Results", July 15, 1998.

special charges), a far cry from the \$1.17 achieved in 1997.⁶² Table (3) compares Compaq's 1998 financial results date with those of Dell and Gateway.

Thus, Compaq's performance model in 1998 looks much different than the model for 1997. Figure (10) presents a Balanced Scorecard causal model for Compaq's performance in 1998. Competition for management attention and the problems of merging two large companies seemed to disrupt performance along every dimension. To return to the performance of 1997, Compaq must rebuild its infrastructure, reestablish high levels of learning and growth, refocus its processes and make new innovations, and win back customers.

V. Summary and Overall Conclusion

Better information drives learning and growth and enables more efficient business processes. Better information is necessary if Compaq is to understand and meet its customers constantly changing requirements. Compaq's enterprise-wide systems must give its managers and employees, suppliers, and VARs access to that information to coordinate their activities across the value chain and continuously improve their business processes.

The causal linkage among the various Balanced Scorecard perspectives drives the resulting financial measures and market share results. Compaq's improved sales volumes result from delivering value, increasing customer service, innovating new products, and reducing time-to-market. The growing sales volume more than offset decreasing prices to generate higher revenue. Improved cycle times and decreasing costs enabled Compaq to operate more efficiently in 1997, which resulted in higher net income levels and higher revenue per employee.

As Kaplan and Norton noted, "Financial measures are inadequate for guiding and evaluating organizations' trajectories through competitive environments. They are lagging indicators that fail to capture much of the value that has been created or destroyed by managers' actions".⁶³ Therefore, we have also emphasized leading indicators to assess the contribution of information technology to Compaq's economic success.

It is not enough to excel at one aspect of business; successful companies, like Compaq, use IT as an integral part of all aspects of their businesses to gain and sustain a competitive advantage. Our Balanced Scorecard analysis of Compaq indicates that, rather than a single factor, it is the well-managed combination of factors, facilitated by access to- and prudent use-of information, that leads to good performance. For example:

- Business strategy - a clearly defined and communicated business strategy is important. There is a difference, however, between strategy formulation and strategy implementation. We noted how Compaq formed its strategies, and how it immediately also identified the processes that were necessary to achieve its strategic objectives. It also used these strategies as a basis for prioritizing IT investments, including SAP's R/3 software.

⁶² Microsoft Investor, "Jubak's Journal", August 25, 1998.

⁶³ Kaplan and Norton, p. 24.

- Process efficiency - a number of firms succeeded with reengineering or total quality management efforts. However, even Michael Hammer admitted that less than one-third of reengineering efforts succeed.⁶⁴ Compaq has reengineered several times in a successful search for greater efficiency and effectiveness.
- Information technology - many firms implement ERP systems, as is indicated by the impressive growth of ERP vendors such as SAP AG, Peoplesoft, and Baan. Often firms use such comprehensive software applications as a means to achieve reengineering, but the success of the IT investment is then inextricably linked to the success of the reengineering effort. If either the system implementation or the reengineering fails--both of which are risky--firms face the large write-offs such as Gateway reported in 1997.⁶⁵ Compaq implemented SAP incrementally, ensuring that other systems were linked with SAP to provide the information to support its business strategy. And, it reengineered its processes first, then implemented the IT to support the process.
- Alliances - alliances provide the leverage for firms to extend their own resources to achieve growth and reduce costs. Compaq leveraged its relationships with Intel and Microsoft to establish strong footholds in both the consumer and corporate market. It worked with its resellers to leverage its sales and support resources. In addition, as it grew, it used its size to obtain favorable prices and to ensure availability of components. To manage these important relationships along its value chain, Compaq's use of enterprise IT became more critical.
- Skilled and motivated workforce - it is obviously the workforce--from the CEO down--which determines how well a firm innovates and operates. Compaq's culture rewards both innovation and efficiency.

Thus, a synergistic combination of factors has driven Compaq's success. Processes create innovative products and address customer requirements. Process efficiencies allow lower product prices and improve the return on resources applied. Of course, the better customer requirements are met, the greater the customer satisfaction and the larger the market share. But, the "bottom line" is a firm's profitability. All the other actions must be taken with that long-term financial result in mind. During the period 1992 to 1997, Compaq focused on bottom line results, but it also has understood the performance drivers of those results. In 1998 Compaq is facing the challenge of merging two large companies, combining their resources, and linking their IT systems. The question remains whether the new Compaq can achieve the same level of performance along all the balanced scorecard perspectives.

During 1997, Compaq CEO Eckhard Pfeiffer announced an ambitious goal of achieving annual revenues of \$40 billion by the year 2000 from \$18.1 billion in 1996. In September 1997, he revised the goal upward 25% to \$50 billion annual revenues by the year 2000. Compaq's goal is to become one of the top three (passing NEC and Hewlett-Packard to challenge IBM and Fujitsu). To accomplish his goal, Pfeiffer must turn Compaq

⁶⁴ Slavin, Roy H. Re-engineering: A productivity paradox. *Quality* v33, n6 (Jun 1994):18.

⁶⁵ Gateway 3rd Qtr 1997 10Q Report cites a \$47 million write-off of information systems.

into more than a PC manufacturer. The acquisition of Digital Equipment Corporation makes Compaq a full service information technology company able to deliver complete solutions to the largest companies.⁶⁶ Compaq's success, however, will be determined by its use of information and information technology to improve its products and processes to sustain a competitive advantage.

Jim Manzi, former CEO of Lotus Development, could have been describing Compaq when he said, "the key to productivity lies not in the computers themselves but in how they are used. "Use," in this instance, refers to how information technology fits into the overall structure of the organization and how it helps achieve organizational goals. The potential of information technology is realized only when that technology is integrated into the strategic vision of the organization and when it is used to redefine job structures, processes and lines of authority."⁶⁷

⁶⁶ New York Times – CyberTimes, June 16, 1997.

⁶⁷ Manzi, Jim. Productivity: Faith Isn't Enough. Computerworld v26, n18 (May 4, 1992):29.

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Table 1 Selected Financial Measures - Major PC Manufacturers

<u>Category</u>	<u>COMPAQ</u>	<u>DELL</u>	<u>GATEWAY</u>
Effectiveness			
• Market Share (U.S.)	16.6%	9.5%	7%
• Revenue	\$24.584Bn	\$12.327Bn	\$6.294Bn
• Units Sold	5.1 Million	2.8 Million	2.2 Million
• Gross Margin	27.5%	22.1%	17.12%
• Net Margin	7.5%	7.7%	1.8%
• Net Income	\$1855MM	\$944MM	\$109.8MM
• ROA	13.76%	26.03%	5.92%
• ROE	22.2%	90.0%	12.6%
• Mkt to book value	454%	2468%	551%
• % Revenue -International	45%	31%	16%
Efficiency			
• Operating Cycle Time	77 Days	44 Days	46 Days
• Current Ratio	2.31	1.45	1.54
• Inventory Turnover	12.6 X	39.7 X	19.8 X

Based on annual financial results for year ending
 12/31/97 for Compaq and Gateway;
 2/1/98 for Dell Computer.
 (Data obtained from Ziff-Davis Interactive Investor)

Table 2 IT-Enabled Enterprise Performance

	Compaq (1997 vs 1996 4th qtr)	Dell (1998 vs 1997 4th qtr)	Gateway (1997 vs 1996 4th qtr)
1. Effectiveness	Sales increased 23%. 4 th quarter U.S. unit sales jumped 51%.	Sales increased 55%. 4 th quarter U.S. unit sales up 67%.	Sales increased 27%. 4 th quarter U.S. unit sales up 23%.
	Gross margin increased 85 basis points to 27.5%.	Gross margins held steady at 22%	Gross margins dropped to 3% from 18.9%.
	Net income increased 37%.	Net income increased 51%.	Net income increased 5%.
	Build to order strategy better matched market demands	Build to order strategy better matched market demands	Build up of high-end PC inventory in 3 rd qtr reflects inability to match market demands.
	ROE increased to 29.6%.	ROE increased 76%.	ROE rebounded to 42% after loss in 3 rd qtr.
1.1 Reach	Gained new customers - with under \$1000 computers, new business products, servers, notebook line.	New server and network products aimed at increasing corporate and government customers.	Announced new server products to reach corporate customers; opening retail stores.
	76,000 of 112,000 sub \$1,000 PCs in August.		
	Still leads with 16.6% of U.S. PC market.	Improved market share to 9.5% of U.S. PC market.	Improved market share slightly to 7% of U.S. PC market.
	Uses 7000 partners in channel to reach customers around the world (extranet better integrates supply chain).	Sells direct w/o retail and reseller channel.	Sells direct but uses some resellers and has own stores at a few locations.
	Introduced Compaq On Line to expand market reach.	Web sales exceeding \$3 m per day.	Web sales at \$2 m per day; using channel to reach new business customers.
	Passed Toshiba to become number 1 in notebook sales.	Passed Compaq to be number 1 in sales to medium and small business.	Named number 1 in customer service by major journal.
1.2 Strategic Structure	Acquisitions of Microcom and Tandem enabled new products, services, capabilities.	Committed to direct sales model and "Dell-ocity" - short cycle times.	Acquisition of ALR enabled new server products.
	Outsourcing to improve asset utilization. (First International Computer Inc.	Close relationship with small group of responsive suppliers.	Announced reorganization to streamline processes.
2. Efficiency	Improved inventory turnover to 12.6 times from 8.8.	Improved inventory turnover to over 39 times from 18.	Rebounded after caught w/obsolescent inventory, turnover increased from 15 to 19.8 times.
	Reduced days sales in inventory from 60 to 30 days.	Only 8 days sales in inventory.	Now, only 15 days sales in inventory.
	Build to order manufacturing strategy lowered costs.	Leader in build to order strategy.	
	Gross margin increased to 27.5% from 26.4%.	Gross margin increased to 22% from 21.7%.	Price pressures drove gross margin from 18.5% to 3%.
	Operating expenses declined to 12% of sales.	Operating expenses increased 2% to 9.9% of sales.	Operating expenses increased 1% to 10.9%; but down 25% from 3 rd qtr % of sales.
	Better utilization of manufacturing capacity by allocating 25% more run time to sub \$1,000 machines.		Build up in high end PC inventory with revenue growth below expectations reflect misallocation of manufacturing resources
	Smaller unit size allowed more units to be shipped per truck.		

Table 3 Selected 1998 (6 months) Financial Measures - Major PC Manufacturers

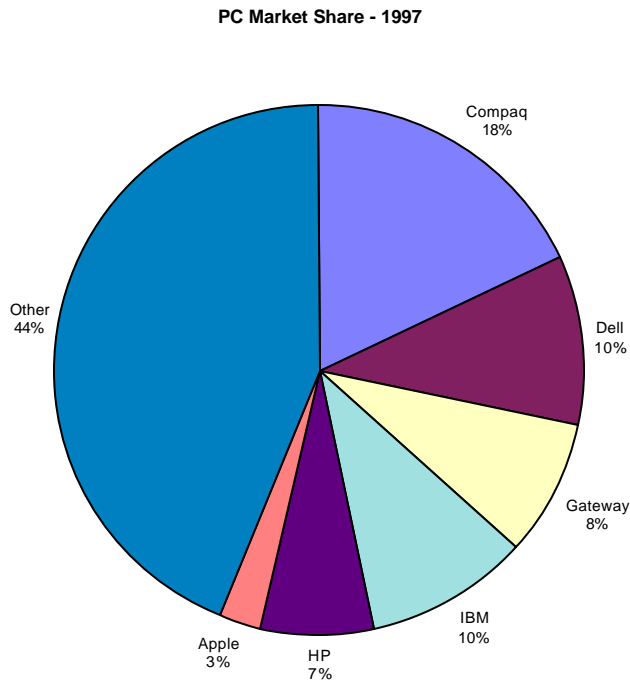
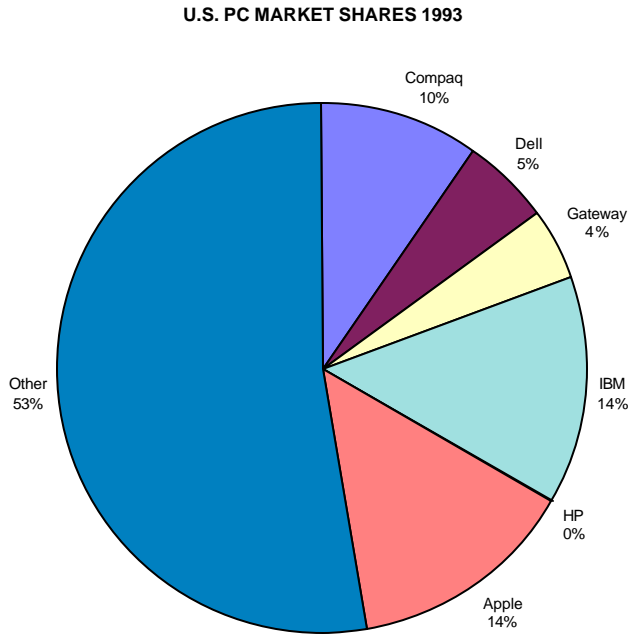
<u>Category</u>	<u>COMPAQ</u>	<u>DELL</u>	<u>GATEWAY</u>
Effectiveness			
• Market Share (U.S.)	14.4%	14.4%	7.7%
• Revenue	\$11.519Bn	\$8.251Bn	\$6.294Bn
• Units Sold	5.2 Million	3.2 Million	1.4 Million
• Gross Margin	18.5%	22.5%	20.01%
• Net Margin	< 0%	7.9%	4.1%
• Net Income	-\$3616MM	\$651MM	\$136.6MM
• ROA	< 0%	23.4%	12.0%
• ROE	< 0%	81%	24.7%
• Mkt to book value	235%	1267%	322%
• % Revenue – International*	45%	31%	16%
Efficiency			
• Operating Cycle Time	na	na	na
• Current Ratio	1.40	1.62	1.62
• Inventory Turnover	9.6 X	44.4 X	34.6 X

Based on annual financial results for 6 months ending
6/30/98 for Compaq and Gateway;
8/2/98 for Dell Computer.

(Financial data obtained from Hoovers, company 10K reports, and company financial statements)

*figures for previous fiscal year

Figure 1 Relative Shares of the PC Market



Source: International Data Corporation

Figure 2 IT Impact on the Value Chain

VALUE CHAIN, INFORMATION FLOW, AND INFORMATION TECHNOLOGY

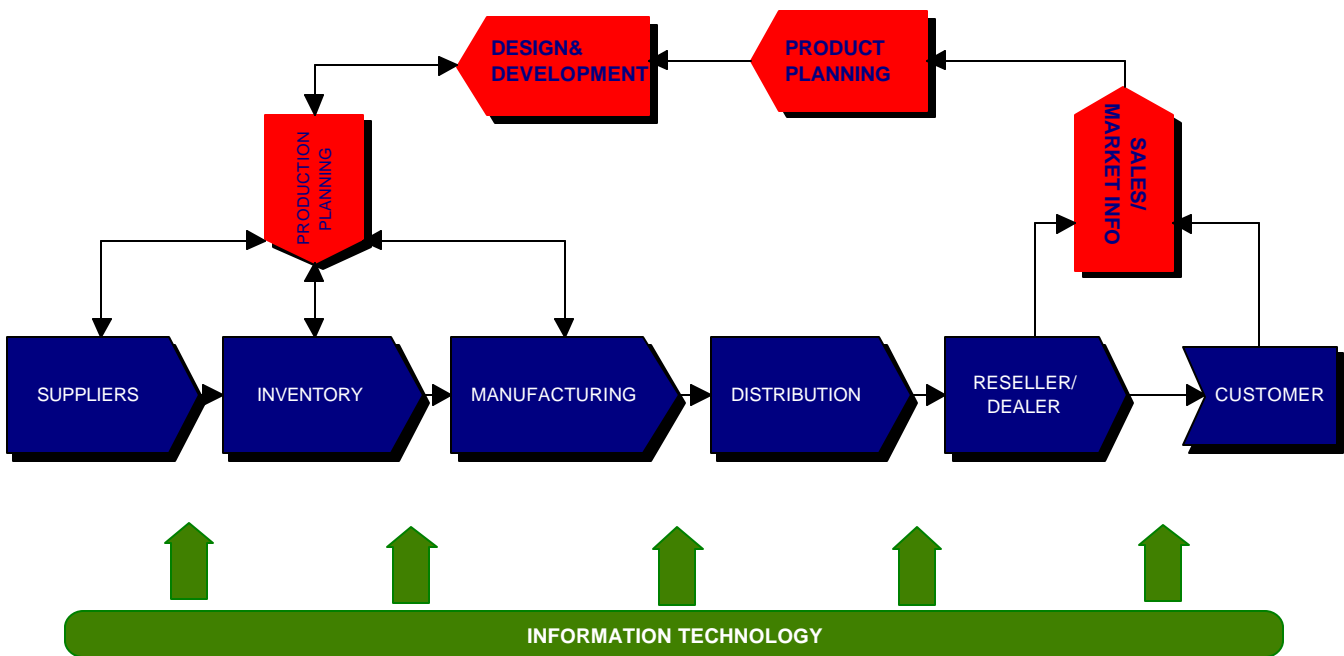


Figure 3 Compaq's Information System Relationships

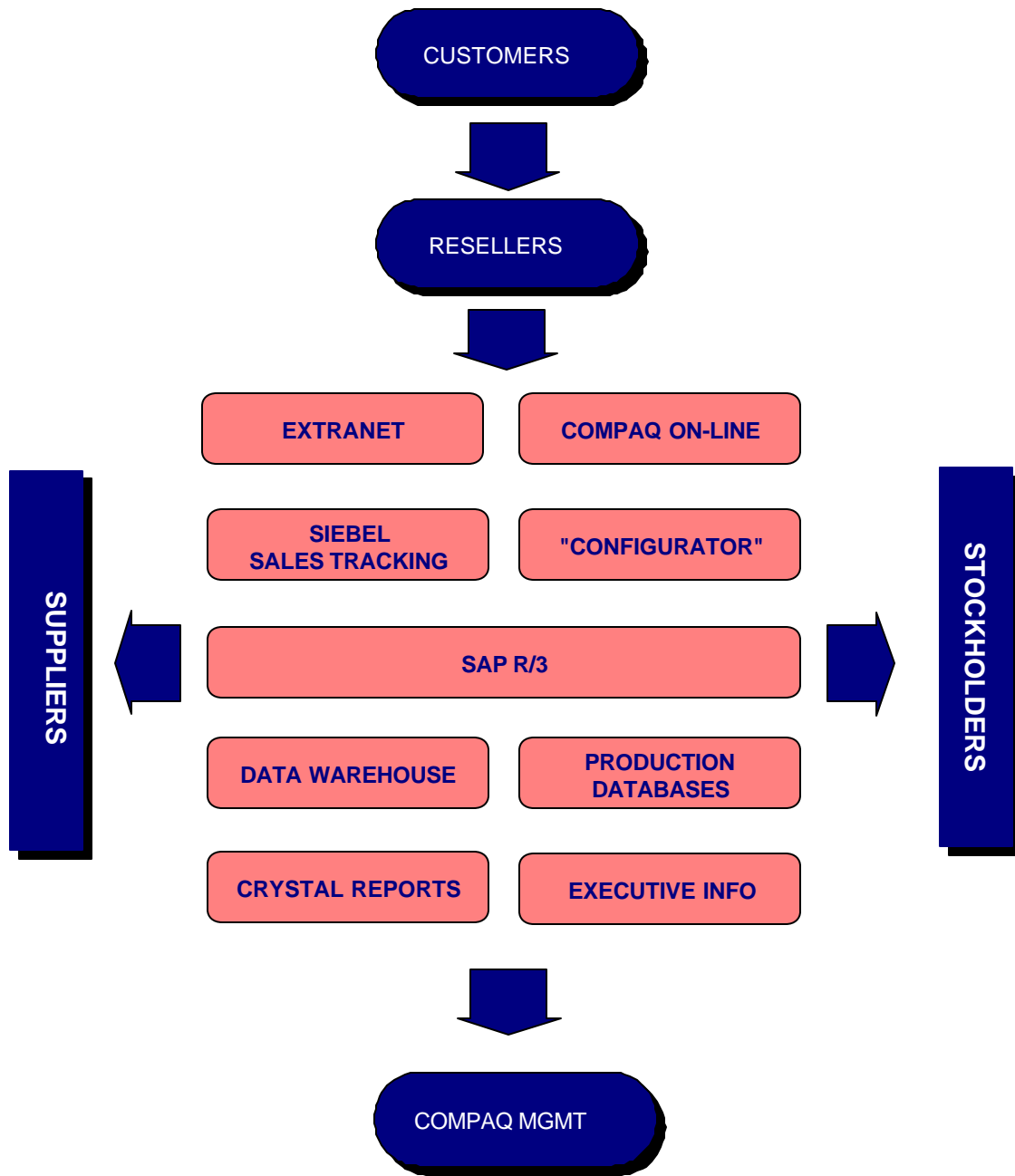


Figure 4 Compaq's Global On-Line Transaction System

COMPAQ'S GLOBAL ON-LINE TRANSACTION SYSTEM

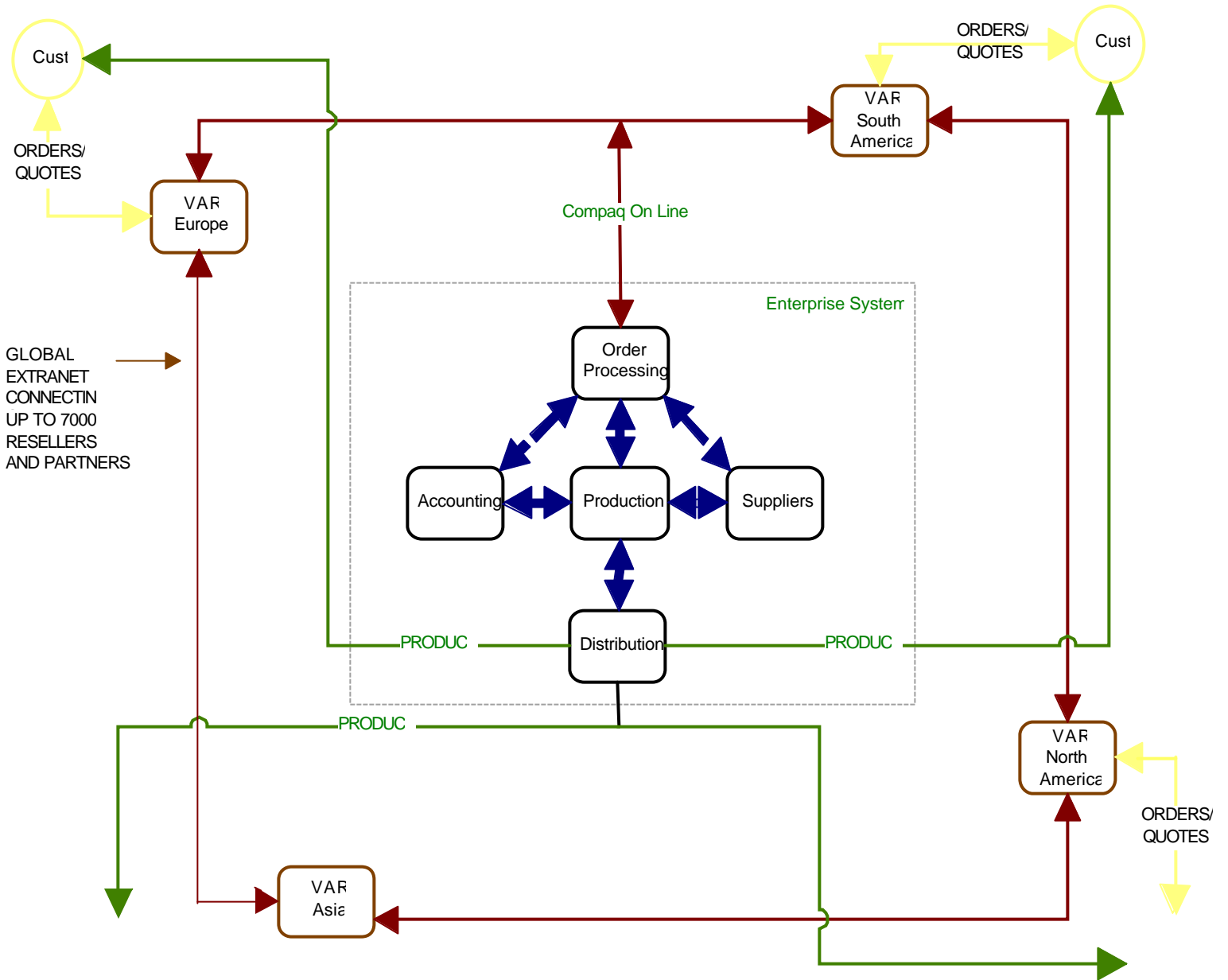


Figure 5 Compaq's Build-to-Forecast System

COMPAQ'S BUILD TO FORECAST SYSTEM

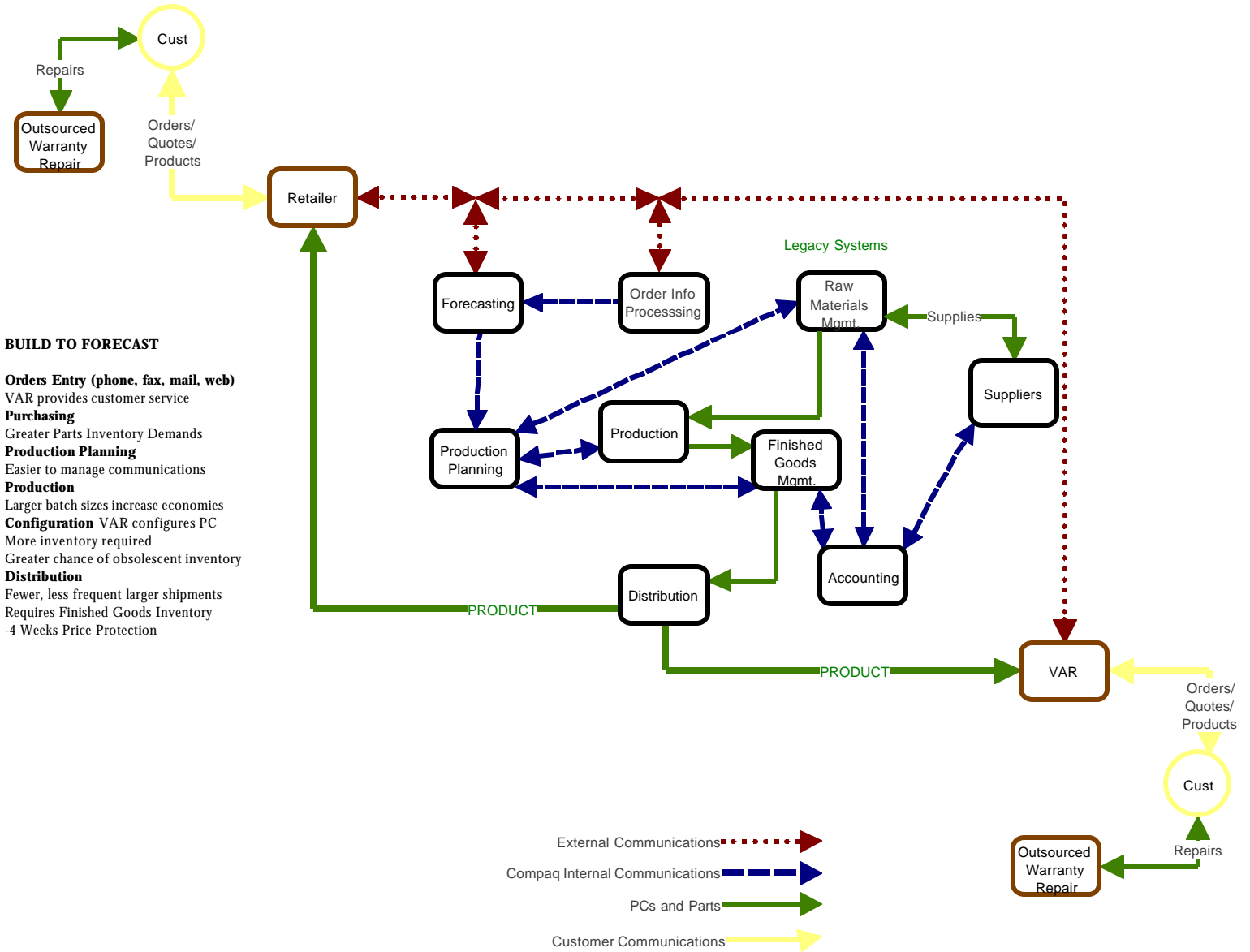


Figure 6 Compaq's Build-to-Order System

COMPAQ'S BUILD TO ORDER SYSTEM

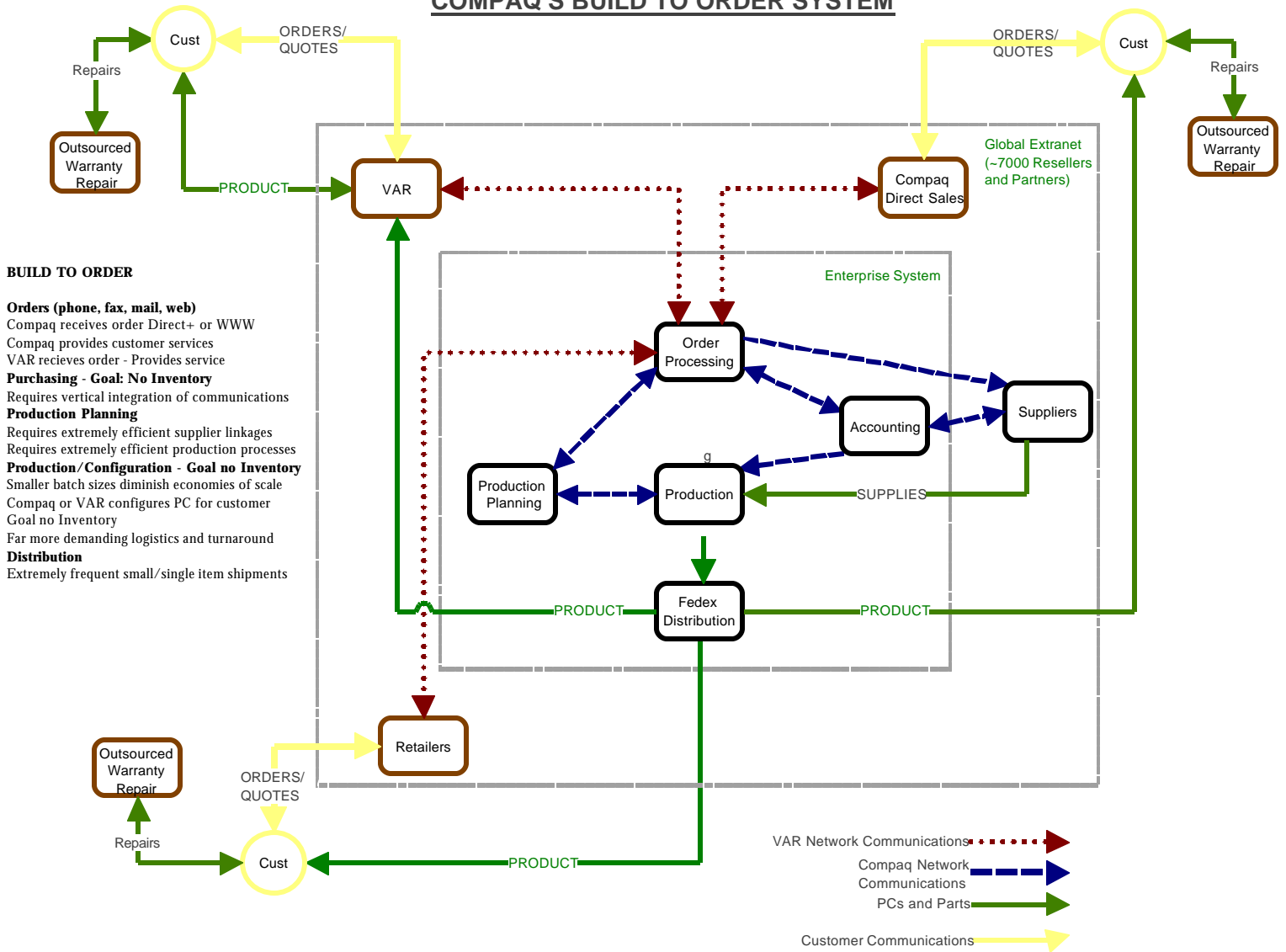


Figure 7 Balanced Scorecard Representation of Causes and Effects

**INFORMATION TECHNOLOGY AFFECTS
THE BALANCED SCORECARD TO IMPROVE REACH AND PERFORMANCE**

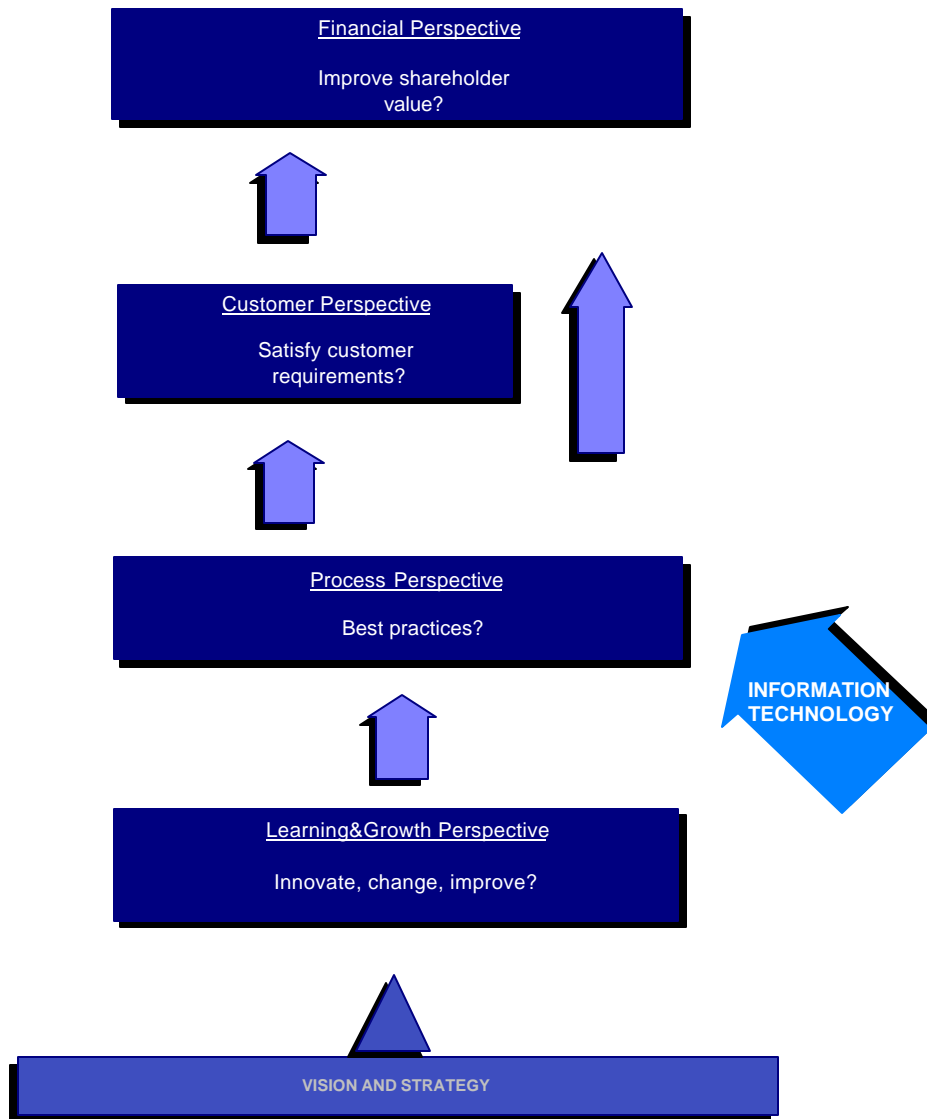


Figure 8 Compaq's Balanced Scorecard Objectives

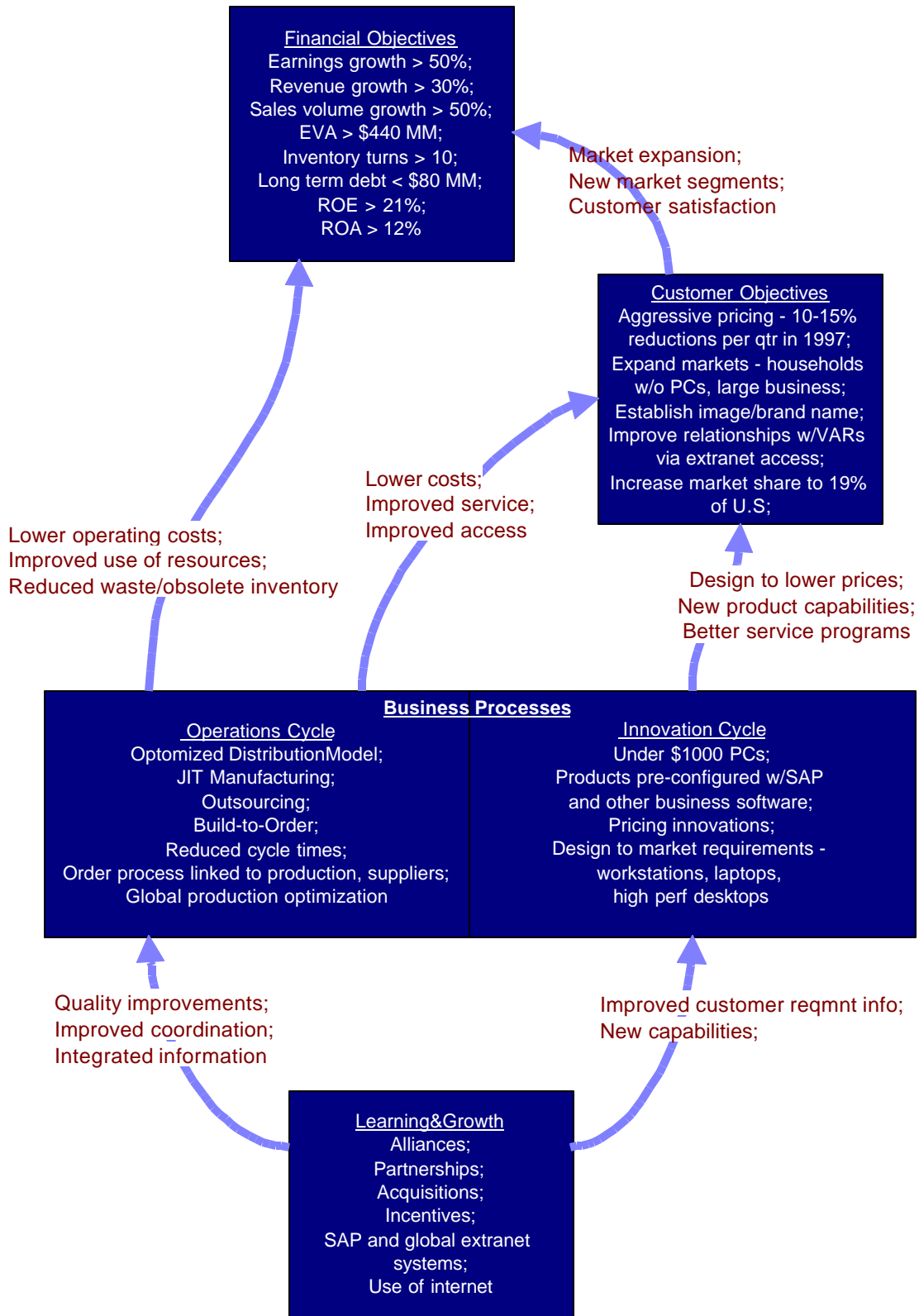


Figure 9 Compaq's 1997 Performance Based on the Balanced Scorecard

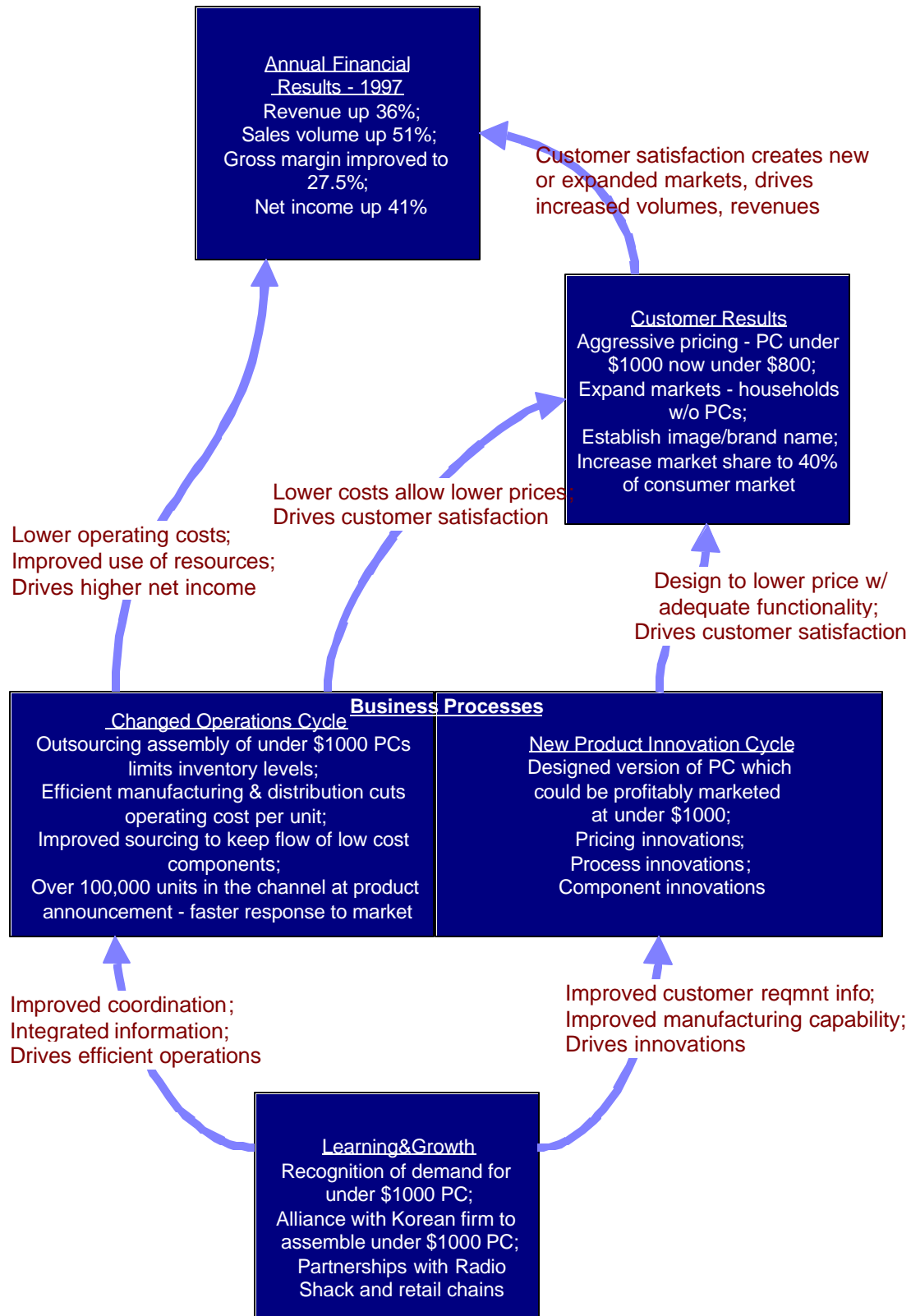


Figure 10 Compaq's 1998 Performance Based on the Balanced Scorecard

