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Digital Equipment Corp: The Fall of a World Leader in Technology

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# **Table of Contents**

Executive Summary	3
Orientation	3
In the Beginning	3
Changes	4
Downfall	5
Problem Statement	5
Analysis of the Problem	5
Management	5
Management of Structure	5
Management of Technology and Market Trends	5
Management of Marketing	6
Management of Corporate Culture	7
Management of Corporate Strategy	7
Beginning of the End – DEC's Solutions	8
Cabletron and DEC	8
Licensing agreement between DEC and Intel	9
The Merge of Digital and Compaq	9
Analysis Summary	10
Conceptual Model	10
Data Gathering	10
Solution	11
Standard Word-Widths	11
Personal Computer Strategy	11
Blind Strategy	11
Structure	12
Marketing	12
Conclusion	12
General Recommendations/Lessons Learned	13
Exhibit 1: Timeline	14
Exhibit 2: Net Income and Revenue	15
Exhibit 3: Net Revenue, Employees, and Income	16
REFERENCES	17

## **Executive Summary**

Ken Olsen is a visionary whose entrepreneurial drive created one of the world's most successful and long-lived computer companies: Digital Electronics Corporation (DEC). Under Olsen, DEC became a worldwide company and technological innovator, creating the minicomputer, network technology, robust operating systems, scaleable systems, and advanced CPU and silicon process technology for the most powerful RISC processors in the world. However, Olsen missed several key market opportunities. Management problems led to lost market share, ineffective organization, and eventually DEC's selloff of divisions and buyout by Compaq. Why did a leader in the computer industry with world leader technology fail? This paper explores some key management decisions at DEC and how those decisions affected the company. It explores the 'why' behind DEC's failure and draws some lessons learned.

# Orientation

### In the Beginning

Digital Equipment Corporation (DEC) was founded in 1957 by Ken Olsen and Harlan Anderson, two engineers at the Massachusetts Institute of Technology Lincoln Laboratory (refer to Exhibit 1 – DEC's Timeline). DEC started out successfully making printed circuit modules for memory testing, but soon started designing general-purpose computers. DEC introduced its first computer, the Programmed Data Processor (PDP-1), in 1959.

After five years of steady growth, the company started to flounder. Disagreeing on how to manage the company, Anderson left in 1963. Olsen then introduced matrix management to DEC, dividing the company and responsibilities by product line. The new structure encouraged communication between all groups, consensus decision making, and creativity. The new structure ended internal fighting and launched DEC into explosive growth.

The new organizational structure produced the highly successful PDP-8 in 1966, which was small enough to fit on a tabletop. The small size led a DEC salesman in London to coin the now standard term 'minicomputer', named after the miniskirt rage in Europe. The low cost PDP-8 also initiated a new market and sales channel, the Original Equipment Manufacturer (OEM), since companies were buying PDP-8 computers, adding their own application specific hardware and software, and reselling the units. The OEM market grew to comprise 50% of DEC's sales [1].

As DEC was growing, the market was changing. DEC, with its 12 and 18-bit word lengths, failed to recognize the importance of the market trend toward 8-bit and multiples of 8-bit word lengths. DEC asked its engineers to define a 16-bit computer, which they did, but management scrapped the idea. The architect of the 16-bit proposal left DEC and formed Data General, which became the hottest new minicomputer company in 1969 by tapping a market that could have been DEC's.

DEC brought out a 16-bit computer, the PDP-11, which put DEC back on top of the minicomputer market in 1972. Also in 1972, a group at DEC proposed an 'individual' computer based on the PDP-11 that could fit on a desk. This proposal was shot down, as was a subsequent proposal for a small computer for engineers, doctors, small businesses, and schools. Olsen and top management at DEC did not think there was a market for such computers, so DEC missed opportunities to establish the personal computer market.

The VAX-11 (Virtual Address Extension, with the '11' symbolizing compatibility with the PDP-11) was introduced in 1977, along with DECnet - a new technology for networking multiple computers together. IBM, which introduced a minicomputer in 1971, could not network its computers. Although DECnet worked, DEC was smart enough to adopt a more encompassing solution. In 1980, DEC teamed with Xerox and Intel to support Xerox's Ethernet technology.

Olsen finally recognized the tremendous market for a personal computer, but DEC applied its minicomputer heritage to its designs. The resulting expensive 'small systems' (the term 'personal computer' was not allowed at DEC) sold poorly and were eventually dropped.

DEC was struggling in 1983. Now a very large company with multiple products, DEC could not effectively manage itself. Olsen again reorganized the company, but this time things only got worse. New roles, people, and procedures in 1984 contributed to a 72% drop in third quarter earnings from the previous year. Luckily for DEC, they had too many customers with too much invested in DEC equipment to simply change to another computer system.

By focusing its resources back to its core business, DEC was able once again to pull itself back. DEC released its VAX-cluster technology – a method of connecting multiple VAX computers together, using a proprietary network, to get mainframe level performance. DEC released its VAX8600 in October of 1984, which was a four-fold improvement in performance over its previous top-of-the-line VAX. DEC's return to growth and prominence this time was due to its networking – a concept rather than a product.

DEC had record profits in 1987 and 1988 was its most successful year. DEC signed an agreement with Apple Computers to integrate the Macintosh into VAX networks. This finally gave DEC the low-end PC connection it had sorely needed but could not develop due to Olsen's inability to fully understand the PC.

With increased competition from Sun, IBM, and the UNIX operating system, DEC responded by introducing products that allowed it to share files with IBM and a UNIX compatible operating system. However, 1990 was another turning point for DEC. The recession in the U.S. and the industry shift from computers to software and services hit DEC hard. In addition, demand for computers shifted from corporations to individuals and from proprietary mini and mainframe computers to PCs, networks, and open-systems. DEC was not positioned for any of these trends and could not respond fast enough to them.

### Changes

By 1992, DEC had \$2.8 billion in debt and expenses consumed 44% of revenues. The company desperately needed to downsize, but Olsen could not do it. At the request of the board of directors, Olsen resigned from DEC. The new CEO, Robert Palmer, shut down factories, laid-off over 30,000 employees, and reorganized the company. New managers were brought in and the matrix organization structure was abandoned. Though initially DEC appeared to be recovering, it could not change to commodity products quickly enough. DEC posted a surprising \$183 million dollar loss in the third quarter of 1994.

More changes were instituted. Sales were shifted from DEC's direct sales force to resellers, unprofitable ventures were dropped, and the company again become structured into minicompanies based on products, with each one responsible for its own success. DEC again introduced its own line of computers in 1994, but this time with management that understood the PC market, and DEC started posting profitable quarters.

## Downfall

In the end, DEC could not respond quickly enough to market changes and was forced to sell off some of its divisions and technology in an effort to stay viable. That very act made it vulnerable to the eventual buyout by Compaq.

## **Problem Statement**

DEC had the most powerful workstation and embedded processors in the world, along with a tremendous legacy of defining and producing world-class minicomputer systems and network technology. Why then did Digital Equipment Corporation, one of the world's most successful and technologically advanced computer companies, fail?

## Analysis of the Problem

DEC had many problems over the course of its history, which help explain its final downfall. These problems were all due to management of the company. The following sections focus on the problems and bad decisions that plagued DEC, their answers to some of the issues, and their eventual downfall.

### Management Management of Structure

As with most startups, DEC had trouble managing its growth throughout its history. DEC's first crisis occurred after its first five years of successful growth. Profits stagnated, and disagreement on how to manage the company caused Anderson to leave. Olsen reorganized the company as a matrix structure, creating independent product lines that had to rely on each other's resources. This structure fostered communication, cooperation, and creativity, propelling DEC to new levels of growth and success.

Corporate structure again became a primary cause of problems in the late 1980's when DEC reached record size and success. The matrix organization that had fostered its growth became an anchor around the neck of DEC. The company was now too large to effectively coordinate the consensus that was needed to initiate product lines. DEC could not respond to market needs quickly enough. Olsen reorganized DEC three times from 1988 to 1991 in an effort to adapt to the changing environment. The resulting confusion and lack of direction caused turmoil in DEC and many managers resigned [2].

Unable to bring himself to make the drastic cuts required by the Board of Directors, Ken Olsen succumbed to the request for his resignation in October 1992. DEC's vice president of worldwide manufacturing, logistics, and component engineering, Robert Palmer, became the new CEO. Palmer immediately reorganized the company from a matrix organization into a traditional hierarchy, compressing 140 business units into three divisions. With people now dedicated to a particular product line, DEC could reduce time to market. Palmer sold 25 of DEC's 35 manufacturing plants and cut 20,000 employees in 1994 and another 7,000 in 1996. He created cross-functional teams to search for market opportunities. DEC was finally listening to the customer rather than telling the customer what they should do and how they should do it.

#### Management of Technology and Market Trends

Both Olsen and Palmer had successes and missed opportunities in managing DEC's technology. Olsen recognized the value of networking technology, and also the benefits of partnering to take

advantage of superior technology (such as the Xerox, Intel, and DEC agreement to introduce Ethernet). Olsen was an early adopter of any technology that could improve DEC's minicomputers, but often ignored changes in the industry that were not directly compatible with DEC's minicomputers. Olsen ignored the trend toward standardizing on 8-bit and multiples of 8-bit words, loosing first his 16-bit architecture design team and then significant market share as that design team left DEC to form Data General.

#### The PC Market

Olsen was blind to the personal computer market. He passed up multiple internal suggestions as early as 1972 to introduce a small computer system for individuals. After the explosive introduction of the personal computer, Olsen yielded in 1980 to the onslaught of proposals from virtually every product-line manager for a personal computer system. Olsen still could not bring himself to use the term 'personal computer', so DEC called the new product an 'applications terminal and small system'.

Even though Olsen conceded to producing a 'small system', DEC still did not understand the importance of an affordable, easy to produce machine geared toward new users. "DEC spent 18 months coming up with an elegant computer terminal that would not only stand alone but could also be networked with other DEC systems. To complicate things further, DEC continued its corporate policy of manufacturing all the component parts itself. In contrast, IBM was purchasing MS-DOS from Microsoft and drives, monitors and circuit boards from the Far East."[1]

In May 1982 DEC made a tactical error by introducing three new products to the market rather than putting more support behind a single product. The high-end 'Professional' was a quality product, but its high price kept it out of the reach of most users. The low-end Rainbow sold well to DEC's existing customer base, but went nowhere in the general market since it did not offer an advantage over IBM systems. These systems were eventually dropped from DEC's product lines.

#### Back to the Minicomputer

Even without a personal computer, DEC's continual refinement of its minicomputer systems and network connectivity buoyed the company to record profits and challenged IBM's number one position in computers. In October 1986, Fortune magazine called Ken Olsen "America's Most Successful Entrepreneur" and featured him on the cover.

DEC continued investing heavily in minicomputer research and development to the tune \$1 billion, in spite of analyst predictions that the time of mainframe and minicomputers were over. DEC posted a loss of \$617 million in July 1991, its first loss ever. DEC also cut its workforce for the first time in 1991, laying-off 6,000 employees. "The real story? Ken Olsen didn't handle change well. Committed to stretching the life of a robust but inevitably finite architecture, DEC let waves of potential opportunities swim past its doors". [1]

When Palmer took the helm of DEC, he recognized the technological advantages of DEC's RISC (Reduced Instruction Set Computer) processor architecture and their silicon process technology. The research and development efforts to push minicomputers into mainframe computing levels produced the Alpha RISC processor, the most powerful processor in the industry. Though Olsen largely ignored RISC technology, calling it "snake oil' and 'irrelevant'" [3], Palmer embraced it. In typical DEC fashion, though, Palmer kept the Alpha a proprietary chip for DEC.

#### Management of Marketing

Olsen was always first and foremost an engineer. He had little respect for marketing. Olsen said, "I believe technology is everything, if you design a good enough product you don't even need a salesman." [4] DEC particularly lost opportunities in its PC products and more recently in its workstation products due to a lack of marketing. As Olsen stated, DEC felt they did not need to market what they felt was clearly the best technology. Unfortunately, the huge corporate market for high-end computer systems could not differentiate the advantages offered by DEC, and preferred to stay with more mainstream and open-standard products. Having the world's fastest processors, most robust operating systems, and scalable computing platforms did not automatically give DEC the market share they felt they deserved.

Having the best product in a given market is of no benefit if no one knows about it, and DEC refused to adequately market its products. This problem persisted when Palmer became CEO. Palmer, too, was an engineer and did not fully appreciate the benefit of marketing.

#### Management of Corporate Culture

As with most entrepreneurial ventures, explicitly or implicitly the founder establishes the corporate culture. DEC was no different: Olsen is DEC, DEC is Olsen. Olsen had a very strong will and strong values that were clearly represented in DEC's corporate culture. Paul Evans, DEC's European desktop marketing manager, said Olsen was responsible for the company's internal culture. 'Olsen sets high moral values within the company on doing what you think is right, and being honest.' At the same time, though, Olsen's engineering centricity and distrust of marketing's product requirements also permeated the company. DEC was completely technology-driven, engineering focused, and largely ignored marketing's product requirement specifications. [5] [6] [3]

DEC was not customer focused. "At DEC, they always had the right answer: a VAX. Exploiting the relative scalability of the architecture, DEC cranked out VAXes in sizes, they said, to suit every need. Daddy DEC knew what was best; just sign here. By contrast, Hewlett-Packard under John Young became a fanatically customer-driven company. HP listened: 'And what would you like us to build for you next?' became HP's new-product-planning style." [7]

#### Management of Corporate Strategy

DEC had one basic strategy for 35 years: Produce the best minicomputer system in the world. DEC invested its resources into researching and developing technologies for its minicomputers. This very narrow focus caused DEC to miss key trends in the market, such as PCs, the Unix operating system, and Sun workstations. The following excerpt from an interview shows the blindness and denial of CEO Ken Olsen:

"Q: Have there been any changes in Digital's organization that says the company won't miss another Unix or DOS? It's admittedly late in the game in these two areas right now. Is there any change that says another Sun Microsystems won't come along in another market? A: No. You see, we were quite conscious of what we were doing all along there. We're very straightforward. We don't do anything very complicated in our strategies. It's very understandable, we explain it as we go along an we explained that one all along." [8]

"...For all the vision, for all the technical wizardry, Ken Olsen appears to have underestimated the gravity of the mitosis and metamorphosis of the computer industry ... Digital's greatest challenge is a complete modernization. The company must be rebuilt around the new market reality." [6] When Bob Palmer became CEO, he struggled to find a new and viable strategy for DEC to adopt. Operating at a loss, Palmer had to cut expenses and focus the company away from the minicomputer, which was no longer a profitable market for DEC. DEC's new direction would be systems integration:

Bob Palmer can read a balance sheet and, apparently, found the systems integration gig to be so compelling that he's willing to go ahead and have that be the company. Digital will sell commodity hardware, software and networking products; will integrate them; and, if need be, will outsource the data and network operations [9].

### Beginning of the End – DEC's Solutions

The beginning of the end really started when DEC failed to recognize the importance of the personal computer. From a corporate health viewpoint, the end started in 1991 with DEC's first posted loss and layoffs (refer to Exhibit 3). This was soon followed by a new CEO, more layoffs, and more losses. For DEC, the end came very suddenly. Though DEC was never at a loss for product plans, the company could not respond quickly enough to necessary restructuring measures and market realities. DEC's cash flow problem and new strategy called for serious measures. DEC started to sell-off valuable divisions, namely its networking division and its semiconductor manufacturing plants (with its StrongARM processor technology), in an effort to get much needed capital and refocus its activities on its core strengths. If these divisions were not valuable enough for DEC to keep, why would companies such as Cabletron and Intel want them?

#### **Cabletron and DEC**

After a series of acquisitions by other networking companies, Cabletron decided to buy Digital's networking division for \$430 million. Does this make them the "Reactor" by Fouts and Brown (PICMET 1)? The style of strategy by Cabletron is unknown; however they have now established themselves as strong competitors of rival companies like Bay Networks, Cisco Systems and 3Com. Digital's networking division's main product is the GIGA high-end switch, which is used to build large backbone networks for telephone carriers and Internet service providers. Cabletron was also interested in gaining access to Digital's reseller channels and the Digital name, which carries worldwide recognition.

"For Digital, shedding its network division...would let the company concentrate on its computer and network integration business." [10] At one time Digital had the overwhelming market share, however in recent years they had struggled against the pace of the changing market and their competitors' agility. Digital had leading edge technology, international presence, and valuable reseller channels. They even had an impressive list of customers including Sprint, Knight-Ridder, Inc. and Netscape [10]. One reason for the lapse in market dominance may be the change in corporate structure in 1992, when new CEO Palmer changed the corporate structure to a traditional hierarchy. While hierarchical structures tend to breed bureaucracy and overhead, it is more likely that the difficulty DEC had in adapting to the new structure, along with a lack of profits, caused the network division to loose market share. As stated by Dr. Shin it takes about 7 years for a corporate culture to change and he was right on the money for Digital. After 7 years the company collapsed.

"As one of the official developers of Ethernet in the early 1980s, Digital was in the vanguard in LANs, and later in the 1980s as the "connectivity company." No other company networked like Digital." [11]

Cabletron CEO Don Reed's main motivation was expanding and strengthening Cabletron's international channel, and here "Cabletron acquires all of DEC's (network product) channel capabilities." [12]

With the sell-off of its once vaunted networking division, Digital continues its overhaul-from an engineering company specializing in state-of-the-art hardware, to a systems integration and services provider. [13]

#### Licensing agreement between DEC and Intel

At the beginning of 1998, DEC and Intel reached an agreement to end legal hassles that stemmed from DEC's charge that Intel stole some of its Alpha technology. The settlement resulted in a cross-licensing agreement between the two companies for the next 10 years. This settlement cost Intel \$700 million for all Digital's semiconductor-manufacturing plants, as well as some other products including the StrongARM and the design team. DEC would retain the Alpha development team, and intended to continue developing and supporting the Alpha architecture for the time being as well as developing Digital UNIX for the new Intel-64 processor [14]. This settlement was supposed to let Intel do the production of Alpha chips for the next seven years while DEC continued to do the R&D work. DEC would also develop products that utilize the IA 64 microprocessor, which Intel and HP were currently developing at the time. The implication of this entire deal was that the Alpha chips would be abandoned in seven years, at which time DEC's product lines would work on the IA 64 microprocessor line [15].

#### Benefits of the Settlement for Both Sides

The potential benefits of the cross-licensing agreement for DEC can be summarized as follows: This settlement was expected to enable DEC to reduce its capital spending by about \$150 million as well as a \$10 million reduction in R&D spending over the long term. Due to the discount that DEC would be getting from Intel on its microprocessors, DEC's PC gross margins would have improved. Estimates indicated that Digital would be receiving licensing fees from Intel, which would be a nice bottom line benefit for DEC. Furthermore, these fees were estimated to bring in average \$50 million a year for the next 4 years. In addition, the deal would cut the DEC headcount by 2,500, relieving the cash flow problem for DEC [15]. As an additional benefit, this settlement allowed DEC to shed a "money-losing" facility [16].

Intel benefited from this settlement, not from a short-term monetary perspective, but more of a strategic/technology-leadership-in-almost-everything perspective. Intel's slogan for the next century has always been "Intel inside everything"[17]. However, a Pentium processor would be too expensive for a home appliance. Intel needed a processor that was cheaper and a more power-efficient, like the StrongARM from DEC. Intel had always ignored the portable, handheld, consumer markets [18], viewing them as distractions from its purposeful PC-centric plan. The fast growing market for such products left Intel with three alternatives: make, buy, or quit. This market is too large to ignore: The handheld companion market segment is expected to grow from 4.6 million in 1998 to 14.1 million units worldwide in 2002 [19]. The most economical and fastest entry into the market, especially with a position/rank of 'fastest/best in class', was embracing DEC's StrongARM processor [18]. It is remarkable to note that Pentium chips, at the time the deal was cut, cost close to \$100 while StrongARM cost \$29 [20].

#### The Merge of Digital and Compaq

In June of 1998, Compaq acquired Digital Equipment Corp. in a deal worth \$9.6 billion. The merger of Compaq and Digital made Compaq the 2nd largest computer maker in the world behind IBM. In response to the merge, Digital cut 15,000 jobs and Compaq trimmed its

workforce by 2,000 to aid their absorption of Digital. Overnight, a new management team was formed and started reporting to Compaq Chief Executive Officer Eckhard Pfeiffer. [21]

Compaq's motivation to buy Digital was, in part, to acquire a larger share of the enterprise computing market. Digital had an established worldwide service organization for high-volume customers, qualified engineers spread over the globe and an extremely large and valuable customer base in business computing. Compaq's PC business is the largest seller of Windows software and Intel chips. As a result of this merge, Compaq could be the flag bearer that pushes Wintel technologies upstream to servers for heavy-duty computing jobs. [22]

Intel and Microsoft stand to gain from this merger due to Compaq's stronger ability to push Windows NT and Intel-based servers into the heart of the corporate market. On the other hand, IBM, Sun Microsystems, Hewlett Packard, Gateway 2000, EDS, and Dell Computer all stand to lose from this merger due to the potential for market share to be taken from them by Compaq. [23]

## Analysis Summary

Ken Olsen was a strong, charismatic visionary regarding minicomputers. He built a wildly successful company but failed to recognize his own limitations, even to save the \$14B company he created. Olsen did not know when to step aside and do the role he does best. Ken Olsen is primarily a "Problem Solver" not an "Integrator".

Olsen's narrowly focused strategy ultimately led to the selling off of DEC's divisions. The sum of the pieces collectively was less than the individual parts, resulting in negative synergy. Under Olsen's guidance, DEC blindly pursued technical excellence, ignoring market realities. Olsen also felt that DEC could do it alone – he did not seek strategic alliances and would not fully embrace open-standards.

# **Conceptual Model**

The conceptual model for this paper is a case study to examine how DEC's management played a part in the downfall of one the world's most successful computer companies. Specifically, how did the management decisions regarding corporate strategies, use of resources, employment/deployment of technology, and corporate structure impact the failure of DEC?

# **Data Gathering**

The data gathered for this paper came from publicly available sources as well as limited, openended interviews with three former DEC employees. Publicly available data consisted of editorials, reports, and interviews published in trade journals and business magazines, as well as a wealth of information published on the web from reputable sources (DEC, established trade journals which now publish to the web in addition to print, and government sites for DEC's Annual Reports). The data from publicly available sources coincided with the interview data from former DEC employees. The raw interview information is presented in Exhibit 5. All sources are listed in the bibliography at the end of this paper.

# Solution

### Standard Word-Widths

DEC missed many opportunities for growing its business and market share. Early in DEC's history, Olsen was smart enough to create a team to define a 16-bit computer in accordance with the emerging industry standard word widths. Instead of following through with that architecture, Olsen abandoned it. When the system architect left DEC and founded Data General, producing minicomputers based on the 16-bit architecture that Olsen refused to implement, DEC lost significant revenue, market share, and years of development time since they had to hire new system architects and start all over again. Olsen found that the market pull for industry standard word-widths ended up being too much to ignore. While DEC and Olsen were able to recover from this shortsightedness, they failed to learn from it. DEC repeated the same mistakes in the personal computer industry and again when the mini- and mainframe computer systems reached.

The problem DEC faced and opportunity it lost regarding adoption of standard word-widths was characteristic of DEC's belief in proprietary systems and in its ability to come up with a better solution. DEC never fully appreciated the power of standards or open-systems. Had DEC been an early adopter of industry standards, it would have had 100% of Data General's market share. If DEC had adopted UNIX, even though in some ways an inferior operating system, DEC could have achieved significant penetration of the corporate environment and positioned itself for the lucrative workstation market that Sun eventually dominated.

## Personal Computer Strategy

Olsen founded DEC on the premise of building a smaller, lower cost computer system that was more accessible than mainframe computers. Ironically, he could not accept the concept of a truly desktop, one computer per person system. Had Olsen developed the ideas his employees had in the early 1970's for 'personal computer' systems, DEC could have owned the PC market. Instead, not only did Olsen refuse to invent a PC, he refused to follow the market as the PC became the most popular general computing platform in the world. Had Olsen at least followed the market with a true PC instead of a technically superior but too expensive 'small system', DEC still could have been a powerful force in the personal computer market.

## **Blind Strategy**

Olsen was single minded in his pursuit of minicomputer architectures, the VMS operating system, and proprietary technology. When the industry analysts all agreed that the mainframe and minicomputer had seen their day, Olsen stubbornly invested a staggering \$1 billion in research and development of next generation VAX systems. Had that money been invested in developing a new PC, workstation, or open-system solution, DEC may have hit upon another technology or product to propel it to another level of success. Instead, DEC rode the minicomputer technology curve up and back down. Olsen bet the company on the minicomputer concept when he founded DEC, and again 35 years later when he essentially ran DEC into the ground. Thirty-five years is an amazingly long time for the computer industry, but Olsen should have learned from his own mistakes and focused the company on market trends. Persistent companies learn how to reinvent themselves to stay viable. IBM changed from being essentially a mainframe computer company to a PC company to a workstation company (though not very successful) and is now investing in advanced integrated circuit and packaging technologies. DEC essentially refused to alter its strategy.

Arrogance was also a key contributor to the demise of DEC. Not only was Olsen single-minded of product, he also refused to listen to customer input. Olsen believed he knew what was best for

the customer and did it regardless of what the customer had to say. Due to Olsen's defining influence on DEC's culture, the employees either followed suit or left the company.

### Structure

DEC had no formal structure during its first five years. When DEC's ability to grow was hindered by its lack of organization, Olsen instituted his form of a matrix organization. This structure propelled DEC to significantly higher levels of growth and profitability. Olsen seemed to be blinded by the success of his matrix organization. When the company grew to over 120,000 employees, the matrix structure was too burdensome to be responsive to the market. Olsen spent three years trying to adapt the matrix structure to accommodate the large company, but was unsuccessful. Had Olsen been sensitive to the limitations of his matrix organization and adapted it regularly to meet the needs of the company and the market, DEC could have ridden the wave of its success a little longer. Changing the organization structure could not have saved DEC from its lack of vision and market adaptability. However, it was necessary to keep up with rapidly changing market demands, operate the company efficiently (46% of revenue in 1992 was consumed by operating expenses), and capitalize on the synergy of its 146 business units.

### Marketing

Olsen did not believe in marketing DEC's products and technology or in effectively using product plans based on requirements from DEC's marketing research. The distrust of all forms of marketing left DEC to develop technology for the sake of technology rather than to meet specific customer needs, and the technology that was developed did not get adequately conveyed to the market. So even though DEC operated from a market push strategy (which arguably is not a viable strategy since even the best technology may be worthless if it does not meet the needs or perceived needs of customers), it effectively operated with neither market push or market pull. To be successful, DEC needed to both listen to the market and aggressively market its technology as a desirable differentiator.

## Conclusion

DEC experienced many ups and downs as Olsen failed to take advantage of several market opportunities. These missed opportunities characterize Olsen's and DEC's fatal flaw – neither could adapt to change. The matrix organizational structure Olsen implemented at DEC was very successful while DEC was a small and medium size company focused on a single product. As DEC grew very large and developed multiple product lines, the matrix structure became stifling. DEC and Olsen were one in the same – both were outstanding at developing minicomputers and neither could adapt to changes in the industry. Even if Olsen had stepped down earlier, it is questionable whether DEC could have reinvented itself quickly enough to capitalize on market trends and its technologies.

DEC did not lack vision; it lacked the ability to change and adapt to customer demands and new technologies. DEC did not even capitalize on its technologies. It did not develop synergistic relationships between business units. It ignored the market and pursued pure technology. It was a single minded engineering focus that killed DEC. Technology-based companies must continuously watch for new technologies and market trends. They must listen to customer demands and reinvent themselves periodically to stay in the 'sweet spot' of rising technology curves. DEC founded the minicomputer, rode its growth as far as it could, then continued to ride it downhill until it became vulnerable to outside companies.

Being unable to effectively restructure DEC, Olsen's replacement and fellow engineer Bob Anderson had little choice but to streamline DEC through massive layoffs and selloffs. These drastic measures, coupled with its lack of financial resources, left DEC vulnerable to a buyout by Compaq.

Poor management led to the demise of DEC. Its inefficient structure, lack of marketing its products and technologies, limited acceptance of open-system concepts, refusal to listen to customers and market trends, and refusal to consider products and technologies that were not distinctly minicomputer related, all spelled the end for DEC. Given the limitations of its management, it is amazing that DEC lasted as long as it did. DEC pushed the technology of the minicomputer as far as it could, but when the minicomputer market died, the writing was on the wall for DEC.

### General Recommendations/Lessons Learned

Growth is hard to manage. Companies must be flexible and adapt to changing environments. Always watch industry trends and technology, and be quick to adopt new technologies. A single product, no matter how good or innovative, will not last forever. Recognize and adapt to new markets and channels. The new OEM market accounted for 50% of DEC's sales – this was highly profitable, but DEC missed the sweetspot for 16-bit computer architectures, missed the PC market, and missed open-systems market. Be sensitive to customers – technology alone is not enough. Enter strategic alliances when it makes sense. Marketing matters, both effectively marketing products and technologies and getting good market research. A company that can follow these principles has a much better chance of lasting success with fewer downsides due to missed opportunities.

# Exhibit 1: Timeline

# Exhibit 2: Net Income and Revenue



Net Income (\$000) and Total Operating Revenues (\$000) Over the Years





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