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Leadership was crucial in the rise and fall of DEC

Review of Schein's *DEC is dead; long live DEC* by Paul F. Ross

Why did a computer company come into being in the U.S. in 1957, grow to being the second largest computer company in the world with $14 billion annual revenue by 1991, then also being listed among the Fortune 100, and disappear in 1998, all in a period of just over forty years? The causes for DEC's demise are the insights that Schein seeks in this book. Edgar Schein – social psychologist, faculty member at the Sloan School of Management at MIT, and nearly-enterprise-long consultant (from 1966 to 1992) to Ken Olsen and Digital Equipment Corporation (DEC) – looks back on DEC's rise and fall with nearly exclusive attention to the role of DEC's culture (that is, Schein's understanding of DEC's culture) in producing DEC's end as a corporate entity.

While the central question in Schein's history, as well as in this review, is 'Why did DEC die?', there are other important questions that can be asked, and should be asked, about the experience at DEC like 'Why was DEC so innovative?' I will return to this thought.

DEC was founded in 1957 by Ken Olsen and Harlan Anderson with financial support from Georges Doriot (p 36-37). In its lifetime DEC grew from a start-up that turned a profit in its first year to a Fortune 100 company with 121,000 employees and revenues of $14 billion in 1991 (p 152). Ken Olsen was its leader from start-up until 1992 when he resigned suddenly, some saying he was forced out. Robert Palmer presided over the denouement, an unnecessary wind down (Bell, p 293-294). DEC was sold to Compaq Corporation in 1998.

Schein testifies (p xiii) that Ken Olsen's "support for this book was unflagging. He has spent many hours in the past couple of years giving me his thoughts on what happened and why, sent me many documents, and encouraged me to reveal to the world how his vision of science and technology created a

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Schein, Edgar H. *DEC is dead; Long live DEC: Lessons on innovation, technology, and the business gene – The lasting legacy of Digital Equipment Corporation* 2003, Berrett-Koehler Publishers Inc., San Francisco CA, xv + 319 pages

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unique kind of organization and culture." The book presents inputs from many DEC alumni. For those who admired DEC's industry-leading technology at many points in its history, and the excitement that gave birth to those innovations, know that you will not find that technological excellence and leadership coherently described in this account. I am advised that Pearson (1992) provides an account more completely focused on DEC's technology with the dates and numbers showing its rise.

Schein's account divides the DEC story into three parts: the creation of DEC and its culture as Part I, DEC's late life crises as Part II, and the lessons and legacies as Part III. Of the fifteen chapters, thirteen are by Schein, one is by Tracy Gibbons and another by Paul Kampas. There are five appendices, one each by Edgar Schein, Michael Sonduck, Debra Rogers Amidon, Peter DeLisi, and Gordon Bell. In addition there are excerpts from letters and memos from a wide variety of within-DEC sources scattered through Schein's account.

Encapsulated in a paragraph, Schein's story of DEC is that, under Olsen's leadership and built around Olsen's personal values, DEC initiated many industry-leading products and concepts, growing at times at rates of 30 and 40 percent per year. This happened because Olsen sought and supported engineering excellence, independent thinking ("push back"), and doing the right thing by the customer. Olsen believed that the creator of a new idea knew better what was possible as a marketable product than anyone else. Olsen supported getting that product to market. Schein's analysis concludes that these habits, well learned by the entire DEC family and well rewarded for thirty years, prevented DEC from adapting to

changes in computing and the marketplace that were occurring during its forty year history. So DEC failed as a business because its internal culture interfered with its adaptation to new challenges.

Schein was consultant to Olsen and to many others at DEC for twenty six years. Schein was at DEC because Olsen wanted him there. Schein's report of Olsen's support for the preparation of this history, support I don't doubt, signals Olsen's trust that Schein could and would capture the strengths of Olsen's contributions and leadership. Schein knows that he, Schein, cannot be objective – in the sense of being remote, examining evidence dispassionately – about his friend and career-spanning client. Schein also knows that Schein has perspectives and sources of data that others do not have. So Schein has accepted an absolutely impossible task, a task as impossible as writing a dispassionate history of one's own marriage. To help manage the impossible, Schein brought in Gibbons, Kampas, Sonduck, and DeLisi as major contributors and "push back" readers of the work in progress. Schein even includes a memo about this book with a strongly different view of the answer to Schein's quest, a memo from Gordon Bell. I admire Schein for including these voices that dissent from Schein's views. It is a more useful book because of Schein's openness to a variety of views.

Gordon Bell was a technical contributor and corporate leader at DEC from 1960 to 1966, then again from 1972 to 1983 as vice president of engineering. Bell went on to work with the U.S. National Science Foundation on the task of creating the DARPA network of computers that, in time, became the internet which, in turn, became the platform for the world wide web. Bell then went to Microsoft in 1991. Bell is credited with being the architect of the line of VAX computers at DEC. Bell writes, about the reason for DEC's downfall, …

> "It was simply ignorance and incompetence on the part of DEC's top handful of leaders and, to some degree, its generally ineffective board of directors. Given the DEC culture of openness, honesty, letting the data decide, and taking personal responsibility, this straightforward explanation should suffice [and with that sentence, Bell avoids naming names]. The data [in Schein's account] clearly support the need to take individual responsibility for DEC's problems rather than believing that it was the 'events and the culture that made us do it.' (When former chairman and CEO Louis Gerstner arrived at IBM, the company was in the same relative position [with respect to the industry and its competitors] as when Olsen resigned from Digital; leaders can be responsible for the success or failure of a company [as Gerstner was responsible for IBM's successful turnaround].) These leaders [at DEC] lacked understanding of the nature of the computer industry in nearly every critical technology and product area." p 293-294

So, about Schein's account, Bell says: 'Rubbish! DEC's demise was a failure of leadership, not the consequence of internal cultural forces out of which DEC could not fight its way.' Bell's memo (p 283-301), undated but apparently written shortly before Schein's book went to press in about May, 2003, is packed with ideas, is very disorderly, and presents a conclusion – that DEC's demise was produced by a failure of leadership. Peter DeLisi, corporate leader in sales, first at IBM and then later at DEC, points to (p 283-291) Digital's "failure to value strategy, reluctance to make strategic choices, inability to redefine its core identity, inability to reposition itself, inability to capitalize on emerging markets, [and its fateful decision to enter a] head-to-head attack on IBM, [hiring 26,800 people between 1986 and 1988 at the time the market for centralized batch processing reached a plateau and the client/server, desktop, and network markets, for which Digital was well positioned, were visible but not yet growing.]." DEC died because of a failure of leadership say these two vice presidents of DEC.

From this reviewer's perspective, there is truth all around although, overall, the evidence supports the view that serious shortcomings in DEC's leadership were the proximal causes of DEC's demise.

Before continuing with this review, I had better report the background that I bring to it. I, too, was a DECie from about 1988 to about 1996. I worked in temporary jobs doing very humble things in different parts of DEC's organization in various offices within 30 miles or so of its beloved Maynard, Massachusetts "mill." As early as 1988, I experienced email at DEC with its influence on peer-to-peer communication, discussion of corporate news, and employee chat rooms. I recall the act of forwarding from Massachusetts,

over Digital's private network, the newly prepared images to be used in a presentation in Belgium a few hours later while the presenter was still in the air en route to the meeting site. I recall being in Massachusetts and on the phone with a colleague in Belgium at the same time that I pressed the Enter key to send the file containing presentation materials, then hearing the beep on the recipient's workstation by telephone feedback followed by my colleague's voice saying the file had arrived. On another assignment, I was in the sales organization that was responsible for Digital's effort to sell PCs of its own design and manufacture in the early 1990s, PCs that were IBM clones and very highly rated in journals like *PC Magazine*. That DEC effort to gain share in the PC market receives not a single sentence of mention in Schein's history. It was my job to receive the sales forecasts from the PC salesmen each month and roll them up into a corporate PC sales forecast for the various PC models. Those forecasts kept rolling in month after month. I wanted to compare each salesman's forecast with the actual sales and feed that information back to the salesman, but I could not persuade those around me to do that. I never saw a comparison of forecasts with actual sales, month after month, at any level of aggregation, undoubtedly because my role did not offer me an overview of the use of this information. Month after month, quarter after quarter, we built sand castles describing the sales that were to be. Manufacturing built PCs to those sales forecasts. Compare that management practice, about 1992, with what Dell computer does now, in 2003, taking each individual order direct from the customer in all its detail of hardware and software specifications, building that particular PC to the customer's order, and shipping it within hours of receiving the order!

Residing in Lincoln, Massachusetts for 34 years within about a mile of Ken Olsen's home in that town, I was a local during the period that spanned nearly the entire time within which DEC was born, matured, and was sold. I never met Ken Olsen. Like Schein, I am a behavioral scientist, an industrial/organizational psychologist, and have had my turn at management consulting as a member of staff with Arthur D. Little, Inc., of Cambridge, Massachusetts. Schein's career has been almost entirely in academia at the Sloan School of Management at MIT, experience enhanced by Schein's consulting. My 45-year career has been entirely in business and industry serving Fortune 100 companies. My career always had one foot in computer science, using computers in the work of managing an organization and using computers in scientific/business analyses. Schein has an organic, development-and-growth, organizational-climate way of viewing human behavior and organizations. I have a learning, response-to-feedback, measurement, and information's-influences-on-decisions approach to understanding and explaining human behavior.

Schein's book is a mess, a real jumble of information in which the nuggets of information themselves are often very valuable. Schein's history needs a plan, a single voice that emerges as the story-teller, the historian, with respect for the time line and the conclusions toward which the book is headed. Schein, as much as any author I've read for some time – and I've read some very able authors – , is nearly perfect in his construction of a paragraph. His first sentence tells you what the paragraph is about. You can count on it. But, in organizing the book, he seems not to have seen where he was going although, of course, there is much evidence that he knew exactly where he was going. It is a strange book. I've not read others of Schein's works, so I don't know his general style. The fragmentation, the looking-here looking-there aspects of this work as one moves from page to page, may follow from the anguish Schein felt as he was reporting the weaknesses of the leadership his friend, Ken Olsen, provided at Digital as well as the sand-papering ("push back") that his colleagues may have given him during the book's preparation. Schein also reports Olsen's strengths, as he should, with assurance.

Schein himself seems never really to take responsibility for his own role as a leader at DEC just as Bell and DeLisi imply that Olsen failed to take responsibility for Olsen's role as a leader at DEC. In this failure to set priorities, to take responsibility for the direction things are going, whether it be for the corporation as a whole or for the book that the author is writing, Schein and Olsen seem to have a shared weakness. One must step up and give one's world the structure it needs. When your team's performance depends on knowing that structure, the structure must be shared. Cultural styles – like "do the right thing" for the customer, and "push back" in order for the team to be able to discover the whole truth that is unavailable to any individual, and get "buy in" so that everyone works toward the same goals – are useful, creating value for the organization as demonstrated in DEC's extraordinary ability to innovate, but they are not sufficiently tight to provide guidance for allocation of resources: time and money. While DEC's people

were very aware of the world around it, the trends in its markets, customers' views, DEC had no way to integrate this information and make that integrated view into something useful for shaping its own plans. You find in this history concerns about what customers think, but not even a glimmer of the idea that the corporation must assemble what customers think into a form useful to the corporation. You find in this history a report of the relatively frequent changes in people who fill the chair of the Chief Financial Officer, but you find not a wisp of the idea that the corporation needed information about whether a product was profitable as the product moved through the product's life cycle. You find Gordon Bell's rhetorical question: 'Where were the CFO and his associates?' (p 298) indicating that Bell expected something from Finance that was not provided. You find Gordon Bell's 1981 graph, Figure E.2 (p 295), that should have informed decision making about the Aquarius program, a program that all retrospective viewers agree should have been cancelled well before it was ended, a program that does not even appear on the charts in Kampas' history of DEC's technology (Figure 9.1, p 133, and Figure 9.2, p 136).

Two technical aspects of corporate management merit attention, one relating to understanding attitudes, both customer and employee attitudes, the other relating to identifying corporate leaders through job performance measurement. Schein reports that he personally surveyed (p 117f) (or approved the survey of, p 226f) management attitudes by interviewing managers, integrating what was heard, then feeding that information back to managers in a group discussion so that the managers could validate its truthfulness and plan action based on the information. That's no way to measure attitudes! It requires a perfect listener, perfect integrator, and perfect trust. It can capture almost none of the many influences bearing on attitudes and motivation. 'Here's DEC's consultant to the CEO interviewing us,' say the managers to themselves. 'He's not heard half of what we told him, but are we going to tell him he's wrong? This stuff is so fuzzy it is not actionable. Are we going to tell him that?' Schein knows, or should know, that his was not an appropriate way to dig into the entrails of attitudes and motivation and inter-group problems. That Schein reports what he did as "surveying attitudes" without apology or explanation is a grave disservice to the knowledge accumulated in our science. As a matter of fact, being the nerd with respect to measurement that I am, I can testify that no measurements of attitudes that I have seen in use in my career in corporate and community America – settings where attitude measurement may be further advanced than anywhere in the world – have used measurement technology and analysis, in combination, that are state-of-the-art. Understanding employee and customer attitudes is vital, but attitudes are never measured in current practice at state-of-the-art levels of skill and prospective insight into multiple causes.

On the even more crucial point about management process, Schein's history reports (and my casual observations at DEC between 1988 and 1996 saw) no systematic state-of-the-art attention to the measurement and feedback about job performance that is so essential to any organization's success. (See Ross, 2001, also 2003 to understand state-of-the-art.) Schein even implies that measurement of individual performance reduces the individual's contributions to teamwork ('I must work for my own good showing, not for the team's good showing; doing both is impossible'). Nonsense. Job performance measurement at DEC in 1990 and in corporations throughout the world now, as my paper argues (Ross, 2003), were and are no more advanced than job performance measurement was in 1900 although research and knowledge-in-hand could support much more complete and much more useful measures. DEC used essays, graphic ratings, and sometimes ranking in evaluating individual job performance in the early 1990s, the immediate supervisor being the only performance evaluator. With DEC operating as it did, clearly Schein's leadership (as a behavioral scientist) and the leadership from DEC's human resources people failed to introduce DEC's engineering and corporate leadership to the technologies they needed to understand markets and to manage people's performance. But so it was in every corporation, thus it can be argued that these shortcomings were not factors contributing to DEC's demise but were only marks of the incompleteness of the contributions of behavioral science to DEC through Schein's unique relationship with Olsen. Responding to that thought, I urge that, when inadequate leadership is contributing to sub-optimal performance of an organization, then the means by which the organization evaluates leaders' performance, decides when replacement is needed, and identifies the new leaders are crucially important.

Weakness in leadership was of key importance in DEC's demise … as it has been, for one reason or another, in so many corporate (organizational) failures in recent memory – at WorldCom (Jeter, 2003), Enron (Swartz, 2003), Salomon Brothers (Lewis, 1989), Tyco, Credit Suisse, Parmalat, Fannie Mae, Polaroid, organizations for overseeing the stock market in the U.S. (NYSE), mutual fund management of

trading practices, professional processes for overseeing auditing practices, and on and on. Ken Olsen is and has been a highly principled person, a leader with clear respect for those who worked at DEC, respect for customers, respect for the communities in which DEC lived, and respect for the technology that so enamored Olsen. He had the opportunity, as a board member at Polaroid Corporation, to watch Edwin Land continue leading when Land should have stepped aside. Olsen promised himself and others that he would not do what Land was doing. But Olsen did stay too long in the CEO's position at DEC, as Schein recognizes, and both Polaroid and DEC have been grandly reduced if not lost to the Boston region and to the many other communities in which they had important presence because those corporate organizations – like every other corporation in existence – had no reasonable, no valid, means for measuring performance at the highest leadership levels (board, executive, managerial) and removing/replacing those who were not contributing. See Ross, 2002. At least as important, DEC had no procedures in place for sensing how the organizational structure – committees, reporting relationships – was performing so that it could be restructured as changes were needed. Schein does report a series of changes in organizational structures along with the attitudes among DEC's leaders that organizational structure was being changed too often at DEC. Schein's history is essentially mute about how these structural/personnel changes were planned except to point to Ken Olsen's key role in determining structure. One suspects that there were more people involved in designing changes in organizational structure than Ken Olsen alone, and those aspects of DEC's leadership history are not reported in this account.

A matrix organizational structure was in place at DEC for a long time, "staff" people having primary responsibility to the "line" managers in the line organizations ("line" organizations included organizations that built product, made software, serviced customers) and having functional reporting relationships to their functional organizations ("staff" organizations being finance, marketing, human resources, facilities management, law, perhaps purchasing). While DEC may have carried 'reporting to two or more bosses' to an extreme (with its expectation that "buy in" be achieved from all those contributing to a project), there is general agreement in this collection of reports that 'confidence that I know what I am doing and can carry forward on my own authority' was practiced at high levels to the occasional detriment of the overall company. There is no evidence in this history that driving toward organizational objectives and, at the same time, satisfying criteria for excellence in practices overseen by the staff functions, need result in conflict that interferes with organizational success. Various forms of the matrix organization can work, may even be essential in today's organizations.

The degree to which this history fails to report concurrent events within DEC, in the marketplace, and among competitors is startling. The author focuses almost entirely on events internal to DEC and, within that, primarily on organizational culture and its concomitants. One has to wonder, with Schein so close to corporate leadership for so long, if this book's lack of attention to things outside DEC was a longstanding myopia common to DEC leaders. 'Our products are world leaders, so why look elsewhere for ideas?' Perhaps that is arrogance. Perhaps it is myopia.

Readers interested in the history of computers can consult Cringely (1996). With respect to the integrated circuit, see Reid (2001), for the growth of the world wide web see Segaller (1998), for the development of software see Lohr (2001), and for the use of computers at sea in the U.S. Navy see Boslaugh (1999).

Schein comments repeatedly that DEC had no 'gene for money' meaning DEC paid too little attention to making a profit and keeping that goal at high priority. Bell says that Schein's view about DEC's inattention to profitability is wrong. Other longtime observers of DEC say also that Schein's view on this point is wrong. With respect to economic winners and losers in DEC's history, Bell says, somewhat bitterly, "Palmer's severance [Robert Palmer, CEO who followed Olsen in 1992 and oversaw the sale of DEC to Compaq in 1998] from the acquisition by Compaq made him the first-prize winner. The board came in second. Employees, customers, and stockholders all lost." (p 301)

DEC employed many able leaders in computing and communications technologies. That they found other places in the computing and communications industries in which to lead is not a surprise. Shein gathered the views of his high-level interviewees about DEC's technical contributions, integrating

their views in Appendix A. The list is impressive and supports DEC's view of itself as an innovator producing industry-leading ideas and excellent engineering products.

DEC was extraordinarily innovative. It is its innovativeness that produced DEC's real legacies for the computer/communications industry. Understanding why it was innovative can inform the process of general management if only we can discern and learn what DEC's experience can teach us. Understanding how innovativeness can be supported at the same time that we know what's happening in performance and outcomes for the organization – some think, foolishly, that measuring organizational performance and having an innovative culture cannot coexist – is insight that organizational leaders need. Few scientists have access to DEC's data in the way Schein has access to that data. Few organizations have had as meteoric a growth as did DEC. Additional questions need to be asked about DEC's experience, thus causing the examination of more dimensions of organizational performance and a greater variety of influences on that performance. Perhaps Schein can be induced to return to the canvas to paint another picture of DEC, more comprehensive and with greater artistic looseness in subject matter. Or perhaps Schein can be persuaded to mentor others at that task who can pick up where Schein left off. The task demands someone of piercing insight and mature judgment along with the seldom-found skills for articulating what is being learned. Interviewing everyone and then summing across what they said won't produce a useful result. It will take a much, much higher order of scientific effort than an interview survey. It takes an effort that can integrate people's insights, economic data, events paralleling each other in time, the meaning of advances in technology, a detective's insight into the connection between events, the limits of technological advances, market responses to new technology, and the like, even devising a way to test the guesses about what produces innovative behavior (Ross, 1971).

Returning to Schein's history of DEC now in hand, those who want to understand DEC and what happened to it will want to read Schein for its data in the form of stories and opinions as well as for Schein's insights. Those who want to understand DEC's contributions to computer and communication and software technologies of its day will find information of that kind in Schein in bits and pieces, not well organized, not in a form in which one can understand its historical sequence, and not persuasive with respect to its completeness. Those who want to have a history that is based in the reporter's relative non-involvement in the events being reported, competent in understanding computer-communications technology, and complete in review of engineering R&D management, social and economic trends, and general management including the technologies that are needed today to support the process of general management will have to write their own history of DEC or wait for a work not cited in Schein's book nor known to me.

Reflecting on an untimely death, one may hear the spouse say that job stress contributed to the death, the physician observes the absence of a healthy lifestyle, the parson regrets the deceased was not in touch with his Maker, the family lawyer has private knowledge that the trust funds were approaching zero, and the artist understands the deceased lacked *joie de vivre*. Perception and analysis will ever be so … as it has been for this review.

Bellevue, Washington
20 January 2004

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DEC: The mistakes that led to its downfall

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In 1987 Digital Equipment Corporation (DEC) was the number two computer manufacturer in the world with its founder being named the "'most successful entrepreneur in the history of American business" by Fortune magazine in 1986. This paper looks at the later history of Digital Equipment Corporation and asks how an organisation that was so successful in 1988 could sink to become a takeover target for a PC hardware company ten years later. The management styles and company culture have been extensively described in Edgar Schein's book "DEC is dead, long live DEC" but there is much more to the story. The technology that the company developed and the business decisions made in the development and the direction of that technology had a major bearing on the fate of the company. Many mistakes were made over the last fifteen years of the company's existence and this paper offers a suggestion as to what those mistakes were.

In this paper, extensive use is made of interviews with people involved at the time as well as material from the Ken Olsen Archives at Gordon College which contain many of the memos that Ken Olsen sent in his long career at DEC. It considers DEC as a case study set in the context of literature on business change and the impact of downsizing. It looks at DEC's initial attempt to break into the business market for personal computers in 1983, the personalities involved and the competing products that the company developed. There is also an investigation of the Workstation market, DEC's surrender of leadership and the various architectures that were considered and chosen over the years, in particular the decision to kill various programmes only to resurrect them a few years later. Discussion of the VAX 9000 is included and the drain that the product had on the company resources as well as the semiconductor business which also drained the company resources at a time when product profitability margins were being eroded by the technology change that was happening in the late 1980s. The VAX 9000 is compared with its follow on system built using a different technology at a fraction of the price and offering comparable speeds.

OpenVMS, UNIX and Windows NT opportunities were also missed due to internal struggles and some management naivety which will be considered in terms of company profits and sales. Also analysis of why the Alpha processor failed when it was years ahead in terms of performance is made, including the potential of Apple using the chip in its new system. The final mistake involved the Internet business which is analysed to understand why DEC did not succeed when it was ahead of most other businesses in this sector. AltaVista was the preferred Internet search engine of choice in the late 1990s and many other Internet technologies were being introduced by DEC when they lost management focus, not understanding what they had to offer and its potential for the future.

Digital Equipment – What went wrong?

Brief History of DEC

Digital Equipment Corporation (DEC) was founded in 1957 by Ken Olsen and Harlan Andersen with a loan of $70,000 from American Research and Development led by General Georges Doriot [Ante, 2008]. It built on experience gained from TX-2 work that Olsen led at Lincoln Labs, MIT. The company began by building DEC LAB Modules which were based on the TX-2 concepts.

Olsen himself was born in Stratford, Connecticut in 1926 and held Christian fundamentalist beliefs which were a major influence on the DEC values that Olsen held dear. In 1986 Olsen was named "Americas most successful entrepreneur" by Fortune Magazine [Petre, 1986] marking the pinnacle in his long career at DEC. The Corporation enjoyed strong growth year on year peaking in 1988 when it had its best ever year, but its growth was not without issues. There were a number of testing times as they switched product sets in the 1970s and they were unprepared for the worldwide recession in the late 1980s. There was also a slow recognition of the shift in the computer industry as DEC focussed on IBM's business in the high end. This was spurred on by the public statement from Jack Shields that DEC would overtake IBM by 2007. This chasing of IBM resulted in the hiring of a large number of personnel in the mid 1980s which in turn resulted in the earnings per employee being 30% less than HP, a company of similar size and customer base to DEC.[1] This coupled with management

[1] SEC filings of the period

difficulties and missing some key technological opportunities left the company in difficulties from 1988 onwards.

Downsizing

DEC was forced into downsizing by the reckless recruiting and being caught by the recession and change in direction of the industry. The downsizing at DEC started in a compassionate manner with regard to the employees, driven by Olsen's personal values. Many have commented in feedback to a survey on downsizing conducted in 2008 that the package was very generous, some going as far as saying it was too generous given the problems with the company finances. Even board members when interviewed said that the compensation packages were unsustainable[2]. Analysing the company reports adds weight to this theory, the reduction in staff and facilities resulted in a cost to the company of $550 million in 1990, $1.1 billion in 1991, $1.5 billion in 1992, $1.2 billion in 1994 and $420 million in 1996. A total of almost $4.8 billion in six years covering a reduction of staff of 50%. A simple calculation puts this at a cost of around $80,000 per employee. Part of the DEC downsizing included the closing of manufacturing facilities and consolidation of these facilities. Although this might have appeared a sensible and prudent move on behalf of the company it resulted in facilities that had just geared up to produce product and achieving best in class, suddenly being relocated to another manufacturing facility. This resulted in a gap in production as well as the loss of experienced production workers. This was one of a series of errors that DEC made during its downsizing.

The first rounds offered voluntary redundancy and early retirement which cost DEC greatly, not only financially but also their reputation for company stability. Howard [1988] looked at the motivation of those who considered early retirement and whether there is in fact a detrimental impact on the company. A number of ex-employees have recalled their joy at being able to volunteer in 1992-94. This led to a loss of valuable skills as the company did little to categorise those who were able to volunteer. Cascio [2002] covered ten mistakes to avoid when restructuring, all of which DEC managed to implement at some stage. Later rounds were across the board cuts with no regard to business requirements for growth, whole departments were sold off to erstwhile competitors together with the staff.

This left a gap in the support of customers' products as the escalation path was often no longer available for the service arm of the company. This in turn led to a loss of confidence in the company's ability and future and hit sales. This type of downsizing is not efficient as skills needed for the future are often lost, requiring a round of hiring in extra people and causing a further round of redundancies. Sales organisations stagnated whilst they waited for reorganisation as a result of downsizing. At the same time they went from non-commission to commission based sales. Unfortunately the commission basics were not in place which again led to demoralisation of the workforce. Fifteen years later HP is still having problems with the commission tracking software, Omega, used by DEC.[3] The manner and increasing rounds of downsizing had a major impact on the company in terms of morale and attitude to management and impaired recovery to a great extent. These issues were investigated by Goodwin [2008] in a paper delivered to the Association of Business Historians conference.

What went wrong?

There were many mistakes in the years prior to 1988 that contributed to the downfall of DEC, some minor, some major but it is the contention of this paper that none of them were serious enough that the situation could not have been recovered by the end of the 1990s with the correct strategy and management. DEC along with many other companies had been on a roller coaster ride through the economic cycles of the previous two decades. Every time DEC had managed to weather the storm without downsizing, Olsen moved his workforce around to compensate and so maintained the company's no layoff policy. The final problems at DEC started in the early 1980s but were not immediately recognised. This was due to the success of the VAX range which had resulted in increased sales, market penetration and high profit margins. However DEC did not see that the market was changing and they were caught out by the rate of change and the fact that they were successful with the VAX. DEC didn't see their customers moving downward to server based PC computing and were late in the realisation to such an extent that their position was not as a leader in this growth area. They had invested in large mainframe type systems when technology was moving in the other direction. Other startup companies such as SUN grew to take DEC's traditional market and were much more able to develop rapidly without the overheads. The majority of these startups were in Silicon Valley where there was much more mobility of the workforce

[2] Interview with Tom Phillips (board member) by Ben Strout, Televerse productions.

[3] Article in The Register "HP sued by own sales reps", 10th August 2009 available at http://www.theregister.co.uk/2009/08/10/sales_reps_sue_hp/ last accessed 10/8/09

rather than the more traditional Massachusetts attitude of a single company for life. DEC had hired for their assault on IBM whilst IBM were moving into DEC's services space. This led to DEC having far too many employees doing nothing when there was a downturn. This was a great drain on DEC's finances at a time when margins were decreasing. DEC had approximately 30,000 more employees than it needed, which at an average salary of $25,000[4] was costing DEC $750,000,000 per year in salary alone, not including the company's contribution to pensions and other employee benefits. Olsen's puritanical ideals led to his wanting to redeploy the extra personnel rather than lay them off, utilising them in other roles although he did agree to substantial layoffs. Olsen had done this successfully before in downturns, however this time DEC had hired the excess personnel recently rather than previously productive workers being redeployed. The board had different ideas from Olsen and wanted even deeper cuts. This led to conflict and eventually the removal of Olsen as the company leader. Olsen was amenable to losing 15,000 but the board wanted more.[5] According top Tom Phillips, a board member at the time, the board were unanimous in their request for Olsen to step down.[6]

Loss of Doriot and the consequences

The death of General Doriot had a big impact on Olsen and his relationship with the board. Olsen had relied on General Doriot as his management mentor, friend and counsellor. Doriot was also a calming influence on the board and advisor to Olsen. The board itself was very weak and driven by Olsen and Doriot as witnessed by many senior managers spoken to. Many of the board members didn't understand the technology or the business. After Doriot's death Olsen's relationship with the board worsened, he was cut off from many of the activities of the company by his senior management who kept certain things from him. He was working with a board who did not fully understand the DEC culture or market. The board membership also changed bringing in a number of younger members who were not steeped in the old DEC way of working. When the stock price worsened their main driver was to prop up the price quarter by quarter rather than look long term at growth. Eventually in 1992 they appointed Robert Palmer to replace Olsen. The board looked inside the company running a number of secretive interviews with senior managers. One thing they were asked was for a presentation on what they would do to turn the company around. Palmer was a slick presenter, which helped his selection, but had little understanding of the DEC culture. He had been in semiconductor manufacturing for most of his career so it was an odd choice, especially as he didn't have the broad experience of the market DEC sold into. This proved a costly error by the board as, even though Palmer tried, his comprehension of what was required to turn DEC around was lacking. He tried to run the company from the top down paying little respect to the feedback from the field or the existing DEC culture. Downsizing was carried out with little concern for skills and requirements, rather making numbers was the priority. This led to a stagnation of innovation and sales were impacted. Palmer even changed the colour of the company logo to try to signify the new DEC but all this did was annoy the employees and confuse the customers.

DEC had also lost many key employees at critical times that impacted its operations, the main ones being Gordon Bell in 1982 and Dave Cutler in 1988 but there were many others in technical and managerial positions that had an impact. Also a few, such as Edson de Castro of Data General, left to create companies that were to challenge DEC in its traditional marketplace. Many senior managers left around 1988 to 1992 creating a problem at the executive level in the company. Palmer hired many ex-IBM staff into these senior management positions. This created a clash of ideals as Palmer tried to force a top down management regime on DEC who were used to a more liberal management style. Many of these managers left within a year with large severance packages.

Paul Ross [Ross 2004] suggested that DEC was flying without looking at the readings on the instrument panel. He suggests that Schein [Schein 2003] was only partially correct in his hypothesis that it was a lack of the money gene that brought about DEC's downfall and that it was really a lack of reliable management information that was at the heart of it. He suggested that DEC seemed to lack insight into and an interest in using management metrics of all kinds. Many contacted agree with Ross that there was a lack of management information and this contributed to the problems, especially in the early years of its problems. Olsen recognised there was a lack of accurate budgeting within the company and tried desperately over a number of years to get his senior management to give him realistic budgets for the forthcoming years. His frustration comes out in many of his memos located in the Ken Olsen Archives at Gordon College in Massachusetts.

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[4] US Bureau of the Census, Current Population Reports, Series P-60, No. 166, *Money, Income and Poverty Status in the United States: 1988 (Advance Data from the March 1989 Current Population Survey)* U.S. Government Printing Office, Washington, D.C. ,1989

[5] Memo in Ken Olsen Archives at Gordon College

[6] Tom Phillips interview with Ben Strout, Televerse productions 8/27/08.

The PC revolution

Many contend that DEC's problems began when Olsen said that no-one should need a computer in their home. This was a misrepresentation of what Olsen said. He was referring to the computers at the time, which ran large businesses rather than the personal computers we know today. It is the author's contention, and also that of many senior managers interviewed, that the PC business at the time was not right for DEC as the company was not a high volume low profit margin company and there were many others capable of filling that market. IBM found this out to their cost as did many other companies. In its time, DEC had a few opportunities to kill the IBM PC but did not take them. At one time there was a plan to sell a PDP11 based desktop which would have had thousands of applications ready made. Their initial entry into the market failed as they developed systems that were all over-engineered, "Rolls Royce" systems in a market that was cost driven. When they re-entered the market it took some time to gain momentum but eventually their server products gained market share because of their technical excellence in a sector where reliability was important.

When interviewed, Avram Miller, the project manager in charge of the developing the DEC Professional series, said that when DEC first went into the PC market, they did their usual engineering thing of starting three competing products in different places. This created an air of secrecy where competing groups didn't communicate and so developed to different standards instead of co-operating and using standard components. This in turn brought about the ridiculous situation that the floppy drive was a non standard format and there was no format program available for end users. The company also tried to make everything perfect, driven by Olsen's attention to detail in the packaging and presentation area, so they spent days refining the smallest piece, the monitor taking 12 months to complete. This resulted in a machine that was late, expensive and non standard. The system Miller created was the PRO series which ran a custom version of RSX which again would have had many applications at release but the custom version was not fully compatible with RSX11 and also slow. The PRO was eventually used as the front end to the 8800 series of large systems. DEC also attempted to sell via outlet stores, but again this was not a core competency for the company and so failed.

Giving up the OEM and workstation market

DEC in the 1960s and 1970s was full of engineers and managers in their twenties and thirties, dynamic and enthusiastic. In the 1980s these engineers and mangers had all aged and DEC's business had moved from the environment where the customer was technically astute to one where they were selling into business areas where the customer was not as computer literate as in the early days. At the same time in the West Coast around Palo Alto, many companies were starting up with dynamic products, young employees and fast development times. DEC didn't realise the danger of ignoring these startups and consequently lost their advantage in the upcoming workstation market. This forced DEC to start a workstation engineering group in Palo Alto to try to regain their market share.

Don Gaubatz[7] has been an extremely good source of information regarding DEC workstations and the way the market was lost, recaptured and then lost again. One of the major mistakes that the company made was reducing the OEM (Original Equipment Manufacturer) discount and thus driving away many of their loyal VARs (Value Added Resellers) and losing contact with the workstation market by going after IBM. DEC had built its business with the help of OEM's who used DEC computers and added their own peripherals to build systems for end users. In return, DEC gave good discounts to the OEM's. James Utterback [1996] observed that DEC 'dragged it's heels in making an investment in RISC and then did so in a half hearted way' and that 'its large established base of customers and installed equipment presented an obstacle to DEC's making the transition to the RISC architecture'.

Whilst this may be partially true DEC had been at the leading edge of RISC development. There were several projects inside DEC between 1982 and 1985, which researched the RISC area. One was the Titan project was begun as the initial project of the Western Research Laboratory (DECwest) in Palo Alto (California), supervised by Forest Baskett in April of 1982. By December 1985 they had a complete system running UNIX. A second was SAFE (Streamline Architecture For Fast Execution), supervised by Alan Kotok and David Orbits, HR-32

[7] **Dr Don Gaubatz** – VP of Workstations at DEC, developed Ethernet and disk controllers for the Microvax and ran the workstation team developing products based on MIPS, VAX and Alpha and also the first 3D graphics board for DEC. He is a founding member of the Computer History Museum and on the editorial board of the Microprocessor Report. He also holds a PhD in Computer Science from Cambridge University in England.

(Hudson RISC 32-bit), located at DEC's factory in Hudson (Massachusetts), supervised by Richard Witek and Daniel Dobberpuhl. Finally there was the CASCADE project at DECwest in Bellevue run by Dave Cutler. Eventually DEC decided to unite on a single architecture and the PRISM project was born in 1985. This was to be DEC's RISC system that would run both UNIX and VMS with Cutler working on the operating system codenamed Mica. The team tasked with developing it were Dave Cutler, Dave Orbits, Rich Witek, Dileep Bhandarkar, and Wayne Cardoza.

DEC was being severely damaged in the workstation space by companies such as SUN who already had a RISC system. According to Dr Dileep Bhandarkar[8] the sales team started to complain about losses to SUN and, along with Carol Peters and Tom Furlong, negotiated a deal with MIPS[9] for a quick fix. A small team in Palo Alto quickly put together a prototype workstation based on the MIPS chipset in a VAXstation box and demonstrated it to Bob Supnik[10]. This ran DEC's version of UNIX, Ultrix and was shown to be very competitive. A recommendation went forward that DEC should build their workstation based around the MIPS chip, which at the time had an aggressive roadmap including a 64-bit version. This product was well received and sold well, however it was not capable of running VMS and the roadmap proved to be very optimistic. According to Bhandarkar DEC had the rights to develop their own chips and extend the MIPS architecture. This would have enabled DEC to port VMS to it, however internal politics prevented this. Meanwhile the decision was taken to close the PRISM project in July 1988 even though they had developed it as far as the silicon stage. This decision was taken primarily due to DEC's financial situation. It was a decision that led to Dave Cutler resigning and immediately joining Microsoft with a number of his team and developing Windows NT which closely resembled VMS and Mica. Much of the technology they had been involved with in DEC was transferred into the architecture and code of Windows NT. Ironically, a few months later, Olsen started the project that led to the Alpha at the same time, using the accumulated knowledge and many of the people from the PRISM project. Had he taken this decision earlier, Cutler would have stayed and NT would not be the same.

DEC released the MIPS based workstation in early 1989 and it immediately made a difference to DEC's workstation penetration. DEC delivered a number of variants and they sold well giving DEC market share at last. DEC however did not have sufficient faith in MIPS delivering on their product roadmap and at a high level meeting DEC executives were informed that their fears were correct and the 64-bit MIPS chip was very late. This resulted in a change in direction for the workstation developers and a rethink of where the workstation development should be based. The choice was between Palo Alto and Maynard and eventually Maynard won. The move from Palo Alto to Maynard was not popular with the engineers in Palo Alto who were in the West Coast lifestyle and technology scene so most of them took redundancy and moved to competitors. Olsen saw to it that their redundancy package was a good one and many of them now occupy high level roles in West Coast corporations. Initially DEC promised to port MIPS Ultrix to OSF Alpha but later decided that to save costs it wouldn't. This led to the consequent loss of customer confidence in the investment in MIPS based workstations which DEC had built into the number two in worldwide shipments. This decision had even bigger impacts for the company as Microsoft was developing Windows NT on the MIPS workstation from DEC as well as Intel. The first time NT booted was on a DECstation 3100 with a customised boot rom. The compile statements for DEC MIPS were still in the NT build as far out as version 4 even though support was dropped almost immediately. Had DEC's commitment to MIPS remained, Microsoft would have delivered NT for the platform creating a new market for DEC and MIPS.

VAX 9000

[8] **Dr Dileep Bhandarkar**, joined DEC in 1978 and worked on the VAX architecture, the PRISM architecture, the MIPS architecture and finally the Alpha architecture.

[9] **MIPS** Computer Systems Inc. was founded in 1984 by a group of researchers from Stanford University

[10] **Bob Supnik VP**, Senior Corporate Consulting Engineer Digital Equipment Corporation June 1977 — June 1999 (22 years 1 month) Multiple positions including: VP of Corporate Research; Engineering Program Manager for Alpha (chips, systems, software); Group Manager of Microprocessor Development. Deliverables include VAX microprocessors starting with MicroVAX II; Alpha, all aspects; and new business/technology opportunities, such as the Palo Alto Internet Exchange and the Personal JukeBox (pre-iPod MP3 player).

In 1988 DEC had its best ever year with record sales, however this was the year after the stock market crash and recession in the US and Europe. DEC had two parallel development teams working on high end systems, the Midrange group and the High End group. Both these developments were expensive and divisive in terms of engineering rivalry within the company as well as management rivalry. The High End group did something DEC had never done before in that they used three new technologies in their product. This was at odds with DEC's normal conservative product development process and proved costly as delays occurred in development. These technologies were the multi-chip substrate technology inherited from Trilogy, a company they invested in heavily and lost a great deal of money, high-density ECL macrocells and a heavily micropipelined architecture.

The VAX 9000 was DEC's last system not based on microprocessor technology. DEC had invested billions in the creation of the VAX 9000, the 'IBM killer' which was two years late, a dying technology and was released when the world economy was in decline. According to Supnik[11], the use of multi-chip substrate technology alone cost the company a billion dollars to build a facility to manufacture them. Ho [1991] presents the design issues that DEC had when working on the multi-chip packaging and suggested that the design could be extended for several generations, illustrating the design team's belief that their product had a future even then. By 1987, according to Bob Supnik[12], it was clear to senior technical people in DEC that the VAX 9000 would be overtaken by CMOS technology within a year. Sales of the VAX 9000 were disappointing partly due to the lack of a version of UNIX that was robust enough for the system.

Bob Glorioso says, in a paper he wrote later and sent to the author, that he commissioned the UNIX team to build a system for the VAX 9000 but they spent the money elsewhere and only came up with a version that supported 256Mb memory. This led to a loss of sales to AT&T of around 100 machines. Sales were also hampered by the recession which meant that companies were not investing in hardware. The engineering committee had advised on a number of occasions that the VAX 9000 should not be built as there was, in their opinion, no way of selling enough systems to recover the investment. By 1991 they had sold a maximum of 350 systems at an average price of $1.5million recouping less than 25% of the startup costs without even taking into account manufacturing costs. Olsen was advised badly by his senior management team and constantly overruled the proposal to scrap the system. Bob Supnik in the same email recalls that he spoke to Olsen and De Vitry about the power of the NVAX and neither man could understand how a small chip could be faster than the "big iron". Olsen was later heard to say 'Do you mean we have spent billions on the VAX 9000 and the NVAX is just as fast?'. In the end the VAX 9000 cost DEC three billion dollars of much needed money at a time when they should have been investing it elsewhere. Uhler [1992] writes that the NVAX and NVAX+ used techniques traditionally associated with RISC microprocessor designs to dramatically improve VAX performance giving DEC a fast RISC type system with an upgrade path to Alpha.

Alpha

DEC invested heavily in Semiconductor Fabrication Plants (Fabs), $500Million in the early 1990s, Palmer having convinced the board that Alpha volumes would make it profitable. Failure to utilise the Fabs fully meant that they were much more expensive than competitors' facilities to run. This was a result of DEC's proprietary stance and mistaken belief that they were invincible. Had the Fabs been utilised 24hrs a day by alliances with other parties then much of the losses could have been avoided. DEC also failed to secure a second source for the Alpha until very late in its development.

DEC missed an opportunity with the Alpha to gain market share and visibility in the industry when negotiations with Apple, who were looking for a new chip at the time, failed. Apple engineers were keen to go with the Alpha as were DEC engineers. John Sculley the Apple CEO met with Olsen in June 1991 over dinner to discuss the proposition that the new Apple be based on the Alpha chipset. However Olsen was not convinced of the Alpha technology and still believed that the VAX would be DEC's future. He was not prepared to commit to the deal especially as there were conditions on the technology[13]. Apple went with the power PC and the rest is history. Sculley later said that DEC's board were distressed that nothing came of these discussions and that DEC lost a great opportunity.[14] DEC in fact developed an Alpha laptop which was licensed to Tadpole as DEC's PC manager decided that it was too much of a threat to it's Intel laptop line[15].

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[11] Email to D Goodwin 11-March-2009

[12] Email to D Goodwin 11-March-2009

[13] Email from John Sculley 16/6/2008 to author.

[14] Business Week April 28th 1997 page 94

[15] Roger Hannemann interview with Ben Strout, Televerse productions 8/26/08

The final humiliation on Alpha was the lawsuit with Intel where the settlement sold the Fabs and technology rights to Intel for much needed cash even though DEC kept the patents. Alpha was getting rave reviews although its impact in the market was slow due to mismanagement of getting applications ported. Tru64 UNIX on Alpha was beginning to build market share and the majority of Internet businesses were based on Alpha technology when the company was sold to Compaq because of its speed and memory addressing capability. With the settlement, Intel also gained access to the ARM technology but were unable to capitalise fully on it as all of the design team refused to join Intel. The ARM chip is now used in the majority of the world's mobile devices.

AltaVista

Near the end, DEC was focussed on the Internet Business, forming an Internet business unit and creating some excellent products. Russ Jones [Cronin, 1996] looked at DEC's Internet business and its leadership position in late 1994. DEC was the first fortune 500 company to have its own web site when it opened the first commercial home page on the Internet in October 1993. They had the majority of the business server market in the Internet arena with Amazon as a major customer. When they released AltaVista it was an instant hit and the name went from nothing to worldwide fame in six months being better known than DEC itself. DEC produced the first Internet firewall product, the first tunnelling software in 1991 and was well ahead of the competition. When the founders of Google came to DEC with an offer of joining with AltaVista, DEC's response was negative due to a 'not invented here' attitude and senior management preparing for the sale of the company. This was certainly another opportunity missed for DEC. Palmer didn't understand what he had in AltaVista. He didn't understand the potential of the Internet, valuing AltaVista at $0 when the sale to Compaq went through. In 1999 Compaq sold AltaVista to CMGI for $2.3 billion[16]. Bell in his appendix to Schein [Schein, 2003] stated that Internet business products were perfect for DEC, they had all the pieces including servers, software and networking, however they didn't understand how to organise to engage in a new market. In the November 2000 update to the Gartner Firewall Market Magic Quadrant there is a specific reference to AltaVista selling its firewall operation to Axent who appear in the leadership role quadrant. By 2003 AltaVista had fallen into the Niche Player quadrant due to lack of investment. A Gartner report in 1997 talks about the built-in redundancy and features in the implementation of AltaVista that enables it to be a model for E-Merchant and E-Marketplace design. It was a leader in 1997 and an example to others when the Internet boom was about to take off, processing over 20 million queries per day. DEC had the lead in this growth area but were sidetracked by a management that did not realise the potential and a desire to sell the company. Sheridan Forbes, director of Marketing for the Internet Business Group, recollected that DEC had the first online store, the first web-based election results, the first online city (Palo Alto)[17]. Unfortunately DEC, after Olsen had left, had an executive management who didn't understand how many computers would be sold as a result of the web. Forbes believed sincerely that if Olsen had still been in charge DEC would have owned the Internet because he understood the relevance whereas Palmer did not.

OpenVMS and UNIX

OpenVMS had, for many years, been a significant generator of profit for DEC. Many wrote at the time that it was outdated and past its time, but it had many features that customers wanted and there were many loyal customers. It had a reputation for its stability and security, VAXclusters were unsurpassed in their technology and they still offer features that many other manufacturers look at with envy. Even though Compaq did not promote OpenVMS, nor did HP, sales carried on increasing and profit continued to be made. In 2004 OpenVMS sales were growing at 14% without any real marketing. Open VMS is still used today when a stable/reliable/secure system is required. It is one of the few operating systems that have been classed as unhackable by Defcon. Even today there are millions of OpenVMS users in the most demanding environments. Over 90% of text messages pass through OpenVMS systems, many transaction on the worlds stock exchanges pass through OpenVMS still.

Another comment attributed to Olsen was that "UNIX was Snake Oil" whereas what he really said was that UNIX was sold like Snake Oil, promising much more than it really delivered. The press jumped on this statement and the idea that DEC didn't do UNIX was born. UNIX itself was originally written in PDP assembler and ran on most DEC systems. In fact the only systems it ran on in 1977 were DEC PDP's. According to Dr. John C. Kelly at the Spring UNITE Conference, 1995 "In the first ten years of UNIX's existence it only ran on Digital Equipment Corporation machines. That has to be one of the greatest missed opportunities of all time.

[16] Sam Fuller interview with Ben Strout, Televerse productions 8/28/08

[17] Sheridan Forbes interview with Ben Strout, Televerse productions 8/11/08.

DEC never capitalized on this. In fact, when AT&T got a VAX computer, an upgrade from the PDP system, Thompson and Ritchie refused to port it, or move it up to the VAX system, because Digital wouldn't support and endorse UNIX". DEC had an on and off relationship with UNIX over the years but its UNIX software development team was the same size as the VMS team in the 1990s. DEC finally got serious about UNIX and developed an enterprise ready version with its Tru64 system for Alpha which started selling well into the Internet market where the power of the Alpha was an asset. Meanwhile it had decimated the workstation market with the contradictory statements about migration paths for MIPS Ultrix users to OSF/1.

The final years

In the final years of DEC, Palmer sold off many of the businesses that were deemed to be 'not core'. These included the printing business that DEC had turned around from a -15% profit into a +9% profit business and a leader in laser printers by 1996. In 1997 the networking business that was leading in the GigaBit switch field which was to form a major part of the Internet connectivity was sold to Cabletron. The company's relational database system, Rdb, was sold to Oracle and is still making money, Oracle states on its web site that "Rdb is one of the software industry's most successful acquisition stories". DEC's tape technology DLT was sold to Quantum in 1994. Many other products were also sold resulting in a loss of income and a dilution of the company. The final part sold off were the Fabs which went to Intel after DEC filed a suit for patent infringement. Many believe this was a direct aim of the lawsuit in order to offload the Fabs before the sale. Eventually the company was reduced to a size and technology set that was of interest to Compaq and the company itself was finally sold in 1998.

Summary

To summarise, the main factors that led DEC to seek a buyer in 1998 were the three major investments that they made during the late 1980s and early 1990s. These were the VAX 9000 at $3 billion, the Alpha development $500 million in plant alone and the cost of downsizing running to almost $5 billion. These three factors together with too many employees led to losses and created a situation where Wall Street didn't have confidence in the company, the share price fell and so the rounds of redundancy increased. Had DEC not reported a loss in 1992 things could have been different; Wall Street did not like Olsen but would have had little to complain about had DEC carried on being profitable. The board might have been a little more tolerant of his ideals and given him more time to turn things around. One area that DEC was driven by the press and Wall Street was the notion that the VAX range was running out of steam. Olsen did not believe this and one of the reasons the Alpha did not sell well at first was that no-one needed the power that it gave. However the NVAX had all the power that users needed at the time, it was marketing that let the company down at the time, trying to sell the Alpha over VAX. Had DEC not driven Alpha so hard initially then many of its loyal customers might have remained, especially if DEC had given a VAX future roadmap including clustered systems to provide any required horsepower. DEC had been through this transition with the PDP to VAX migration so should have been aware of the pitfalls. Memos in Olsen's archives indicate that Olsen understood the importance of the VAX and was cautious about a headlong push for Alpha. This caused him to miss the Apple connection. His reluctance to remove excess personnel created a rift with the board resulting in their asking for Olsen's resignation. Removing Olsen without performing a serious search for an external replacement with a track record and replacing him with Palmer who had little experience with running a business the size of DEC let alone turning it around when in trouble was a major failure on the part of the board. Palmer was later heard by one senior engineering manager to say that he had run out of ideas. DEC sold many profitable parts of its business because they were not considered 'core'. However they were making a profit and so selling them resulted in a loss of income at a time when it was needed. Finally the methods used in downsizing caused great problems for the company and caused stagnation at a time when growth was needed.

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THE DEMISE OF DIGITAL EQUIPMENT CORPORATION: DOWNSIZING – CAUSE OR CURE

Abstract

The Demise of Digital Equipment Corporation: Downsizing – Cause or Cure

Digital Equipment Corporation (DEC) was founded in 1957 by two MIT engineers who had worked on the Whirlwind program, Kenneth Olsen and Harlan Andersen. By 1988 it had grown to be the world's second largest computer corporation. From this heady height it took a mere ten years for the company to disappear completely. Olsen implemented a corporate culture of benevolence to its employees creating a family atmosphere and as such it was generally considered to be a job for life with a no redundancy policy. In an unprecedented action for the company, it began to lay off people in the early 90s and followed this with a number of rounds of downsizing over the next few years. Downsizing was introduced as a reaction to the perceived problems the company had in terms of income per employee and an unfavourable stock market valuation. It had always been able to charge a premium for its products and, as the computer hardware moved towards commodity pricing, was caught unawares and had to react to counteract excessive costs. This paper looks at the way the downsizing activity was handled at DEC both in manufacturing and in the field organisations and asks whether this activity had a positive or negative impact on the future of the company. It argues that the downsizing caused anxiety amongst those employees that remained and created an air of tension and resentment within the company. Many of those that were left were dazed but often managed to get alternative employment with competitors and took with them essential skills and, even worse, customers. Those that stayed were always fearful of the next 'round' of cuts essentially causing stagnation of innovation. Downsizing, in effect, communicated to potential customers that the company was in trouble and so sales were lost as a result.

Introduction

There is a large literature about the downfall of Digital Equipment Corporation (DEC), with Edgar Schein's book *DEC is dead, long live DEC* particularly noteworthy.[1] Schein analyses the company's failure and concludes that it was the lack of the "money gene" in DEC management that caused the failure. Schein proposed that the management was the root cause of the company being in trouble by 1990, but he covers little of the final years of the company and the causes of its eventual failure. The failure, however, was far more complex than Schein suggests, and this paper looks particularly at the role of the downsizing process and its part in the downfall of DEC. Schein's book gives minimal consideration to the downsizing processes that were implemented during the 1990s, the people involved in devising and implementing them, the impact that they had on the company, and their part in the company's eventual downfall. Instead, he tends to focus on the management meetings, the conflicts at those meetings, and the lack of focus on money by DEC management. The other authoritative book on DEC is *The Ultimate Entrepreneur* by Rifkin and Harrar,[2] which tells the story of Kenneth Olsen and DEC, including the problems the company had in the last years of Olsen's tenure as president. This book, however, does not mention staff reductions at all, being written just before the main downsizing started.

Many of the ex-DEC employees have been very critical of Schein's writing in particular, feeling it was biased towards management and ignored technical aspects, thus not portraying the complete story. Peter de Lisi, one of Schein's co-authors, believes that Schein had rushed out the published version of the book without giving final editorial reference to the other authors who might have given it a more balanced treatment.[3] Schein's published views also led Gordon Bell to write an "appendix" to the book, which can be found on his website, offering his view on what went wrong.[4] But even Bell glosses over the downsizing process and its impact on the company's future.

This paper begins with a review of literature pertaining to downsizing generally, concentrating especially on its methodology and implications. It then turns to the challenges that DEC had to deal with, before critically examining the company's responses and their

[1] Edgar H. Schein and others, *DEC Is Dead, Long Live DEC: The Lasting Legacy of Digital Equipment Corporation* (San Francisco: Berrett-Koehler, 2003).
[2] Glenn Rifkin and George Harrar, *The Ultimate Entrepreneur: The Story of Ken Olsen and Digital Equipment Corporation* (New York: St Martin's Press, 1990).
[3] Interview with Peter de Lisi, Mountain View, California, February 2008.
[4] Gordon Bell's appendix to Schein's book http://research.microsoft.com/~gbell/CGB%20Files/DEC_Is_Dead_Bell_Appendix_Schein_Book.pdf <accessed 6 January 2009>.

outcomes in light of the literature. It considers the impact of downsizing on DEC, focusing on the question of whether this contributed to its eventual demise as a corporation. It explores the types of downsizing implemented at DEC and what impact this had on the restructuring of the company that was in progress during the 1990s. In particular, this paper analyses the methods employed during the different periods of downsizing and looks at the human aspect of the process and how that affected the company. Finally, it looks at the corporate values implemented by Kenneth Olsen, how they influenced the downsizing, and how the values were altered as management changed.

Background

Before the 1980s downsizing was hardly ever found in the computer industry and then only as a last resort; most jobs were assumed to be for life. In the 1980s and 1990s a number of firms turned to downsizing, some driven by stock market pressures demanding greater profitability, others by the desire to make their corporations leaner. Much of this began when the world economy went into recession, however many computer firms continued with the practice even after the recession ended as the industry changed focus from mainframe computing to client server.[5] The process is now endemic in the computer industry, often being the first course of action for many companies when times get tough. Quite often it has been carried out without due diligence and does not give the expected benefits.

The rise in downsizing activity led in turn to a number of papers being published in the 1990s which investigate the purpose, application, and impact of downsizing. The majority of these papers were published after DEC initiated its widespread layoffs. Hubiak and O'Donnell, for instance, reported in 1997 that downsizing affected over 8 million employees during the period from 1980 to 1993, and then went on to discuss the downside of downsizing, i.e. the harm it does to the company even when it is "well intentioned." They cited DEC as an example of where the downsizing had unexpected results, quoting the customers missing their support contacts and moving to IBM and HP as a consequence.[6] Cascio echoes this, arguing that many of the benefits of downsizing anticipated by companies failed to materialise owing to a failure to break out of the traditional approach to organizational design. Headcount reduction, he suggested, should be just a part of a process

[5] http://www.referenceforbusiness.com/management/De-Ele/Downsizing-and-Rightsizing.html <accessed November 2008>.
[6] W.A. Hubiak and S.J. O'Donnell S. J., *Downsizing: A Pervasive Form of Organizational Suicide*, National Productivity Review (1997), Issue 2: 31-36.

of continuous improvement. He went on to suggest that these benefits did not materialise because the downsizing has a negative impact on productivity, morale, and motivation. [7] This certainly appears to be the case in the downsizing activity that occurred at DEC, as will be shown later.

In a more theoretical paper, Budros offered some systematic thoughts on why firms downsize, proposed a conceptual framework for exploring organisational innovation, and differentiated between downsizing and restructuring. Many companies, he pointed out, combined downsizing and restructuring to reinvent themselves and return to profitability. [8] In a later paper, Budros distinguished between two types of downsizing: voluntary downsizing, in which firms are shielded from economic pressures; and involuntary downsizing, in which firms face combined pressures from the economy and from shareholder activism. [9]

Others have examined the relationship between the decision to downsize and other aspects of strategy and practice within the firm. Mone and McKinley, for instance, looked at organisational decline and innovation, postulating that politicking between coalitions exacerbates the difficulties in of coordinating innovation within a diffused power structure. [10] Folger and Skarlicki, on the other hand, have stressed the human resources angle, noting how managers have distanced themselves from employees to avoid criticism and antagonism. Examining the reasons for discomfort, they have suggested that distancing is not limited to those who made the downsizing decision. [11] For their part, McKinley and Scherer have noted the differences that exist within management itself, proposing that what top executives view as a type of cognitive order in their discussions of restructuring, is often perceived as a form of cognitive disorder by middle management and technical personnel. They thus suggest that there is often a disconnect between upper and middle management in their communication about the goals of the restructuring. [12] O'Neil, Lenn, and Caimano have gone even further along these lines, suggesting that middle managers play a crucial role in corporate

[7] W.F. Cascio, *What Do We Know? What Have We Learned?*, The Executive, No. 1 (February, 1993): 95-104.
[8] A. Budros, *A Conceptual Framework for Analysing Why Organizations Downsize*, Organization Science, No. 1 (Jan. – Feb., 1999): 69-82.
[9] A. Budros, A., *The Mean and Lean Firm and Downsizing: Causes of Involuntary and Voluntary Downsizing Strategies*, Sociological Forum, No. 2 (2002): 307-342.
[10] M.A. Mone and others, *Organizational Decline and Innovation: A Contingency Framework*, The Academy of Management Review, No. 1 (January, 1998): 115-132
[11] R. Folger and D.P. Skarlicki, *When Tough Times Make Tough Bosses: Managerial Distancing as a Function of Layoff Blame*, The Academy of Management Journal, No. 1 (Feb., 1998): 79-87.
[12] W. McKinley and A.G. Scherer, *Some Unanticipated Consequences of Organizational Restructuring*, The Academy of Management Review, No. 4, (Oct., 2000): 735-752.

downsizing, but are often ill prepared to make a full commitment. Only when the voices of middle managers are heard, they have argued, will downsizing efforts be successful.[13]

Once a decision to downsize has been made by a firm, however, there are unforeseen dangers if it is carried out in an uncontrolled way. One of them, for instance, is the potential loss of corporate networks.[14] There are ways of avoiding mistakes in downsizing through "responsible restructuring" for example, [15] but even here problems can crop up. Early retirement programs, for example, can have a positive influence on the stock price, but they carry with them, too, the potential for adverse selection issues: if the worst people stay and the best leave, this will clearly have a negative impact on companies' performance.[16] Although others have suggested that regardless of how carefully early retirement plans are implemented, the stock price reaction to downsizing announcements in general is normally negative. [17] It is generally agreed that early retirement programs need to be considered very carefully when deciding who to downsize. [18]

Downsizing, however, has a profound impact not just the employees who take early retirement or are made redundant. Those left behind tend to suffer from declining morale as successive rounds of downsizing continue over time. There is mistrust of management and its motivations, something which often comes into direct conflict with longstanding company culture. One study, for instance, looked at the impact of downsizing on those who remain with the company, finding that their self-esteem in the aftermath has an impact on their work motivation. The lower the self-esteem of the worker in the aftermath of downsizing, the higher was the likelihood of that employee working harder. This was not the case, though, for higher self-esteem staff. [19] Another study identified four types of responses from employees to downsizing. The first one was fearfulness: employees reduced their level of commitment, suffered from reductions in concentration, and procrastinated about decision making. The second type is the obliging response: the employee does not feel threatened, is faithful to the

[13] H.M. O'Neil and others, *Voices of Survivors: Words that Downsizing CEOs should Hear*, The Academy of Management Executive (1993), No. 4 (Nov., 1995): 23-34.
[14] P.P. Shah, *Network Destruction: The Structural Implications of Downsizing*, The Academy of Management Journal, Vol. 43, No. 1. (Feb., 2000):101-112.
[15] W.F. Cascio, *Strategies for Responsible Restructuring*, The Academy of Management Executive, No. 3 (Aug., 2002): 80-91.
[16] W.N. Davidson and others, *Early Retirement Programs and Firm Performance*, The Academy of Management Journal, No. 4 (Aug., 1996): 970-984.
[17] P.M. Lee, *A Comparative Analysis of Layoff Announcements and Stock Price Reactions in the United States and Japan*, Strategic Management Journal, No. 11 (Dec., 1997): 879-894.
[18] In addition to the works cited above, see also A. Howard, *Who Reaches for the Golden Handshake*, The Academy of Management Executive, No. 2 (May, 1988): 133-144.
[19] J. Brockner and others, *Threat of Future Layoffs, Self-Esteem, and Survivors' Reactions: Evidence from the Laboratory and the Field*, Strategic Management Journal, Special Issue: Corporate Restructuring (Summer, 1993):153-166.

company, and follows orders. The third one is labelled the cynical response. In this case, an employee feels threatened by downsizing and is active and destructive in their response, challenging and criticising management, and trying to sabotage the downsizing process. Finally, there is the hopeful response where the survivors do not feel threatened by the downsizing, but instead are active advocates who aim to help the organisations performance.[20] A follow-up study by the same authors went on to explore these archetypes in much more detail, exploring the causes of these reactions and their potential impact on the business. They conclude that trustworthiness in management has a direct impact on the retention of those who remain after the downsizing is over.[21]

However, as Hickok has argued, the most important consequence of downsizing is in the impact on the culture rather than savings on costs. This is due to the fact that there is a power shift to management, family relationships turn into competitive ones, and the employer-employee relationship moves away from stable to short term. [22] This was particularly evident in the case of DEC which had had an extremely long-standing and impressive culture up until the resignation of its founder Olsen, which we will return to shortly.

As indicated, most of these studies were performed after DEC began its downsizing and learned from the mistakes that companies such as DEC made. They all agree that downsizing should be performed only after a careful study of where precisely in the company excess spending and staffing are located. They also agree that middle management in most cases were not prepared sufficiently to communicate why the downsizing was necessary. There is some disagreement in the literature on the effect of downsizing on those that remain. Some suggest they find themselves stronger in their jobs; others suggest that fear reigns and kills innovation, with an impact on commitment to and regard for the company. There is also some disagreement on the likely impact on the share price of companies that embark on downsizing as a means to resolve financial difficulties, especially if it is accomplished by means of early retirement programs where loss of skills and motivation may have a detrimental impact for the company. The main conclusion of all the studies, however, is that downsizing should not be rushed. A strategic assessment of which areas should be cut, as well as on the other hand which ones should be built up, should be undertaken before

[20] A.K. Mishra and G.M. Spreitzer, *Explaining How Survivors Respond to Downsizing: The Roles of Trust, Empowerment, Justice, and Work Redesign*, The Academy of Management Review, No. 3 (Jul., 1998): 567-588.
[21] A.K. Mishra and G.M. Spreitzer, *To Stay or to Go: Voluntary Survivor Turnover following an Organizational Downsizing*, Journal of Organizational Behaviour, No. 6, (Sep., 2002): 707-729.
[22] T.A. Hickok, *Downsizing and Organisational Culture*, www.pamij.com/hickok.html < accessed 12 May2008>.

embarking on any form of downsizing. Not surprisingly, given that it was a "pioneer" in this area, DEC made many mistakes, including not analysing its business carefully before beginning its rounds of downsizing. Let us turn now to this case.

Downsizing in DEC

Digital Equipment Corporation, or DEC, was founded by Ken Olsen and Harlan Andersen in 1957 with a loan of $70,000 from American Research and Development Corporation, which was led by General Georges Doriot, one of the first venture capitalists. Olsen had worked for on a US government contract for SAGE, an air defence system at MIT in the 1950s. DEC built on experience gained from TX-2 work that Olsen headed up at Lincoln Labs creating test modules and eventually computers. Born in Stratford, Connecticut, in 1926, Olson held Christian fundamentalist beliefs which helped form the DEC core company values that he defined at the outset and which were later formally documented in the "Corporate Philosophy and Organization" paper which was approved by the DEC Operations Committee in 1974 and printed in 1977.[23] The corporate values dictated that the company was oriented towards its employees and customers and can be best summarised by the "First Rule" which states "When dealing with a customer, a vendor, or an employee, do what is 'right' in each situation."[24]

The company's first computer was the Programmed Data Processor, or PDP-1, launched in 1959. It represented a break with previous tradition in computer design, focusing on the user rather than the machine itself. The company soon followed this with other machines in the PDP range, releasing the PDP-8 in 1965, often referred to as the first minicomputer, which proved to be a very profitable product for the company. When Edson de Castro left DEC to form Data General, the company found itself lagging behind in the 16-bit market, but immediately filled the gap with the PDP-11 range, which sold over 600,000 in its long lifetime.

As a result of these innovative products, the Corporation enjoyed strong growth year on year, peaking in 1988 when it enjoyed its best year ever. But growth was accompanied

[23] DEC, "Corporate Philosophy and Organization" (April 1977). A paper copy of this is located in the Ken Olsen archives at Gordon College, 255 Grapevine Road, Wenham, MA 01984, USA (hereinafter Olsen Archives), but it is also available electronically at http://research.microsoft.com/en-us/um/people/gbell/digital/Dig_Corp_Philos_and_Org_7704.pdf <accessed 6 January 2010). The Olsen archives at Gordon College are being catalogued and so information on box and/or folder number is not currently available.
[24] Ibid., p. 4.

with some downsides. Like other computer manufacturers, DEC was heavily affected by the worldwide recession of the late 1980s, but unlike many of its competitors, it also suffered from an aging senior management population in a dynamic industry. These years constituted the start of the rise of the West Coast revolution in computing, which took DEC by surprise. The new companies were smaller and less hierarchical than the established firms and thus were more agile in their product development. DEC in particular was hindered by its sheer size—125,000 employees, over $10 billion income, and many different products to support—, but also by its traditional values. A job at DEC, after all, had always been considered a job for life, particularly at the lower levels. Nevertheless, faced with a crisis caused by the recession of 1982 and the sudden decline in the stock market value of the company in 1983 when the value of the stock dropped by 29% in three weeks, Olsen finally agreed to a voluntary round of layoffs in 1983 which was implemented over a two year period.

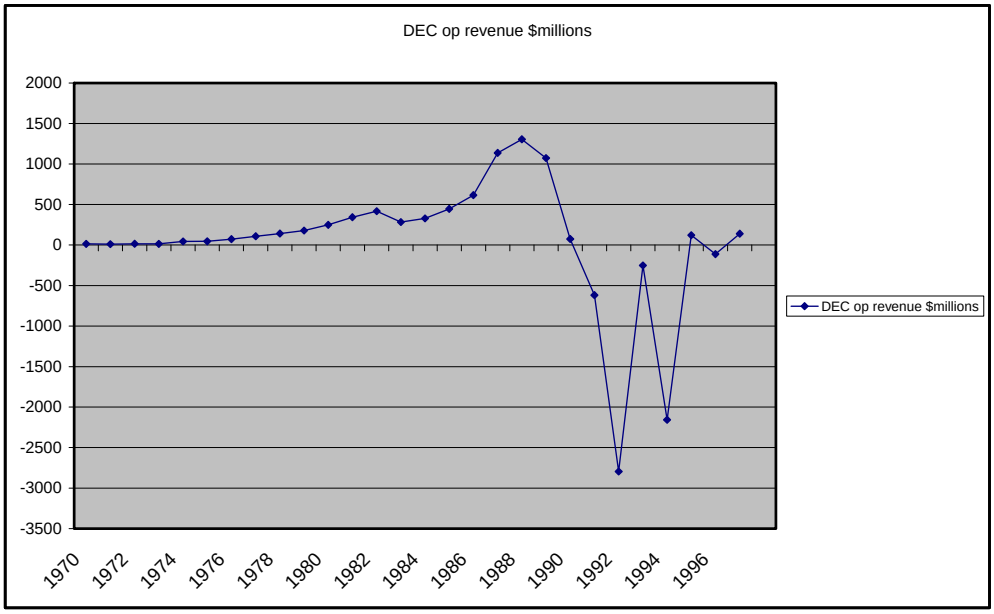
The methodology used in this initial round of downsizing was aptly described in the paper "Employment Security at DEC: Sustaining Values Amid Environmental Change" in which the authors discussed the values that of the corporation and described how they designed a policy of downsizing in the mid-1980s to maintain these core values while simultaneously delivering the desired headcount reduction in DEC's worldwide operations (although the majority of layoffs were in manufacturing, especially in the United States).[25] The reductions were gradual, being undertaken over a three-year period, with initial stages involving an analysis of where exactly reductions were needed, followed by a period of training and counselling. The result was that there was a minimal impact on the operation of the company and also minimal impact on the morale of the employees. In effect, DEC, in its initial foray into downsizing, implemented it in many ways according to the advice of the later studies of the practice as outlined above.

Things started to change dramatically in the late 1980s and early 1990s, however, when DEC was once again in crisis mode owing to the combined effects of its competitive strategy and the worldwide recession. In order to challenge IBM in the mainframe market—which DEC management believed represented considerable potential for growth—the company had increased its employee population by about 20,000 between 1987 and 1989, The worldwide recession of the late 1980s had an effect here, but more importantly markets were changing in the computer industry fundamentally, with mainframes accounting for an ever-decreasing share and being replaced by personal computers and networked systems. The

[25] T.A. Kochan and others, *Employment Security at DEC: Sustaining Values Amid Environmental Change*, Human Resource Management Journal, Vol 27 Issue 2 (Summer, 1988) 119-267.

upshot, however, was that DEC was left with too many employees for its income. Olsen, as indicated in multiple management memos, tried to get the company to realign its personnel for growth rather than to resort to downsizing, believing that this was the best course of action for the company, but the board and other senior managers disagreed.[26] Shareholder activism was also evident in the wish to downsize during the 1990s culminating in the activity of Herbert Denton who tried to lead a revolt of big shareholders in 1997.[27]

Figure 1: Operating revenue at Digital Equipment Corporation, 1970 – 1997

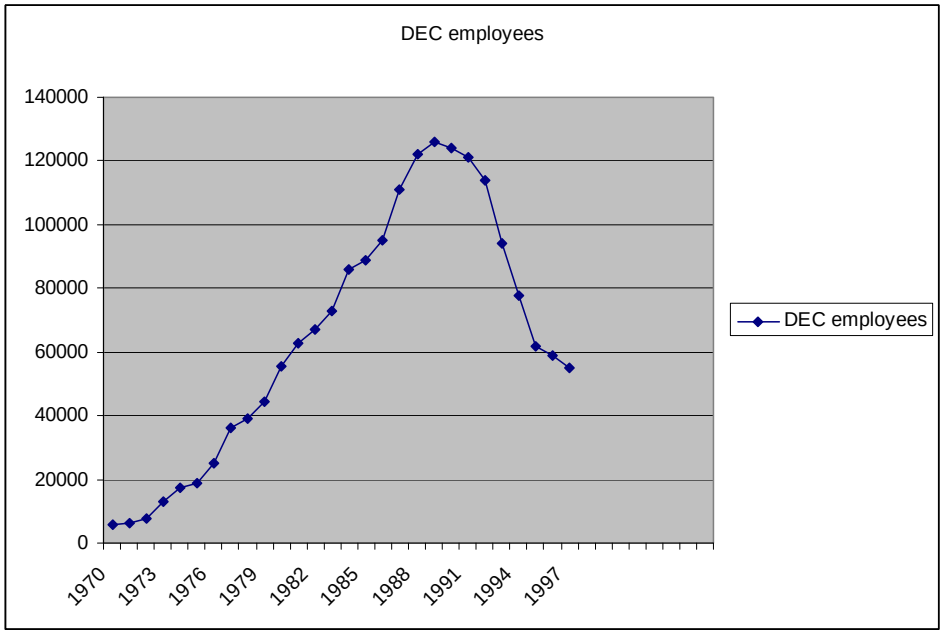


Source: SEC filings for DEC at Edgar-Online.com <accessed Sept 2009>.

As can be seen in Figure 1, DEC's operating revenue went into severe decline beginning in 1988 and culminating in a substantial loss in 1991/2. The company briefly returned to profitability in 1995 and 1997. Most of the losses experienced at DEC during this period can be accounted for by the cost of the downsizing that went on during this time and which resulted in the DEC employee population declining from 124,000 in 1990 to 55,000 in 1997 as shown in Figure 2. The initial motivation for this downsizing was to cut the excess staff that DEC had accumulated during its goal of overtaking IBM.

[26] There are multiple memos along these lines in the Olsen Archives, including for example Olsen, Memo to Palmer, 30 July 1992. These can be found in the memo section of the filing cabinets which is organised by date and indexed by year.
[27] *New York Times*, 25 July 1997.

Figure 2: Employee population at DEC, 1970 – 1997



Source: DEC Annual Company reports for the period[28]

The first round of redundancies in the early 1990s at DEC followed the earlier pattern, which emphasised the corporate values. They were carried out in a compassionate manner, although this time voluntary redundancy and early retirement were part of the solution. On the other hand, unlike the earlier pattern, this round was undertaken in haste. The early retirement programme, for instance, was developed so quickly that there was little time for deep consideration by volunteers. It was also undertaken with scant regard to the company's own interests: the voluntary redundancy scheme in fact led to a number of people with key skills deciding to leave the company, creating problems not only for those who were left behind, but also giving a distinct advantage DEC's competitors, which many of those made redundant joined. Although this had minimal impact on the morale of those left behind since the downsizing was deemed to have been done fairly and generously, it did have a detrimental impact on the skills that the company had available for recovery in the aftermath of the recession.

[28] DEC Annual Company Reports, available at Olsen Archives.

But this was not the only problem with the initial round of redundancies in the early 1990s. Changes in technology had been missed by DEC, and the company's organisation was inefficient with income per man running at around half that of its competitors, such as Hewlett Packard, as confirmed in the company reports.[29] The future demanded a leaner organisation, and it is clear therefore that retrenchment downsizing would have been in order, with the company downscoping to focus on core businesses with growth potential. Top management, however, resisted this, in particular Ken Olsen. He did recognise that deep cuts were necessary, and he finally agreed to a 10,000 headcount reduction in 1991. When the board insisted on more drastic reductions, however, Olsen would not be moved. This disagreement was the root cause of the board requesting Olsen's resignation in 1992.[30]

In August of that year, Robert Palmer was named chief executive of DEC to succeed Olsen. DEC's stock price initially rose to $71 when Palmer was appointed and he outlined his plans for a company turnaround, but as the downsizing continued the price once again fell back to $44, causing recurring rounds of redundancies. In the process, the company's core values were lost, as was any focus on who should go. In many cases, too, compensation levels deteriorated. Particularly evident in the case of DEC was that the employer-employee relationship moved away from stability—as part of a long-standing and impressive culture which had developed under the reign of founder Olsen—to much more short term in orientation.

As mentioned, DEC should have been in a retrenchment downsizing mode in the early 1990s. When it finally turned to downscoping under Palmer in the mid-1990s, it was undertaken with savagery to the extent that the company sold off so many of business lines (printers, Relational Data Base product [Rdb], training, networks, semiconductors) that by 1997 it ended up as a takeover target. In the meantime, rounds of redundancy were occurring with ever increasing frequency, with company management promising each time that this round would be the last one. Reducing staff numbers became the primary target rather than building the business. Meeting the staff reduction targets combined with and the tight timescales within which they had to be met meant that no adequate analysis was carried out of where and who to cut. This had in fact been identified as an issue by Olsen shortly after he was replaced by Palmer in summer 1992 and flagged to the management team, but nothing

[29] DEC Company Report of FY92, Olsen Archives.
[30] Statement to authors in 2008 from board member at the time; Memo Olsen to Charlie Holleran, 25 September 1992, Olsen Archives.

was done.[31] Morale started to suffer and customers began to question the ability of the company to recover, as did Wall Street, as reported in many of the newspapers of the time.[32]

The lack of targeting and overly hasty implementation is indicated, for instance, in the geographic balance of the downsizing effort. DEC had a particular problem in EMEA with across the board cuts, for example. France, Germany and certain Benelux countries had regulations making it difficult to cut staff numbers. In fact, in France, even if people were let go, they still had to be paid a salary. This led to disproportionately large cuts in "easier" target countries such as the UK, leading to even more resentment in the workforce. One UK senior manager recalled the time he had to make a husband and wife redundant, even though others had volunteered, just because they were on a list prepared by the human resources department.[33] He also mentioned that it was also "normal" behaviour to get rid of "difficult" or "controversial" staff in the process without taking into account their value to the company. This was evident in London where the database and network support engineers were downsized by management even though important customers were dependant on their skills.[34]

Prior to 1992, DEC had a number of powerful, independent managers who tried to maintain their power bases by arguing forcefully that their organisation was lean and suggesting that other parts of the organisation should downsize. This frustrated Olsen, impeded recovery from the recession, and stifled innovation.[35] Bob Glorioso, a DEC Vice President until 1993, recalled that the powerful STF (Strategic Task Force), headed by Bill Strecker, blocked many innovations that he and other engineering managers were trying to implement, an example of which was the PRISM chip that Cutler was developing in Seattle, thus hampering DEC's growth.[36] When Palmer took over, he removed a number of these managers, and thus eventually allowed some of the innovation to occur. But this was a small upside to his tenure in office. Peter De Lisi, founder of a strategy consulting firm after having spent 17 years at DEC, wrote of the plummeting morale, falling productivity, and people updating their resumes after Palmer took office.[37] Palmer, moreover, also brought in external managers to replace DEC's senior managers, many from IBM. This led people within DEC to

[31] Various memos in Olsen Archives from July and August 1992, including for example Olsen to Palmer, 30 July1992.
[32] An example is the *New York Times* article of 16 April 1994.
[33] Personal recollection of a senior finance manager to author.
[34] Interviews with downsized DEC engineers in London (2008).
[35] As illustrated in various memos in the Olsen Archives (1988-1992).
[36] Glorioso R., Private correspondence with author (2008).
[37] De Lisi, P., *A Modern Day Tragedy: the Digital Equipment Story*, Journal of Management Inquiry, No. 2, (Jun., 1998):118-130.

question why the corporation was bringing in executives who had not been able to keep IBM out of trouble. On the other hand, many of these managers were quick to leave the company when they realised that it was very different to IBM. Some of them lasted less than a year before moving on. [38]

The downsizing has an impact on social networks within the companies affected by it,[39] but there were also implications in the technical networks, too, in the case of DEC. The company had a worldwide network of technical people able to give advice to peers via the company Notesfiles. This was a type of networked common messaging application that enabled and encouraged employee collaboration on many topics, mostly technical, but also company related. These Notesfiles carried news of the downsizing within the company to its branches and factories around the world, informing people as well about the way it was being implemented. This added to the resentment of those remaining. As more people were laid off, the technical network dried up due to fact that those who had previously answered questions disappeared without warning. This led to a sense among many employees that the company was losing its technical expertise. But it was not only the employees that felt this loss. A fax sent to Olsen from the Ford account in September 1992 expressed concern that the experienced engineer from DEC who had worked with Ford had been laid off without prior notification, resulting in the automaker being offered an inexperienced replacement.[40] This had a direct impact not only on future sales to Ford, but also on the prospect of renewal of maintenance agreements with the company. A month earlier, in August 1992, the Ford account manager at DEC had written to Olsen and Palmer, complaining that he had to downsize two of his team even though the team had brought in $32 million. He suggested that instead of decreasing in size his team should in fact be increasing.[41]

There are many examples in the DEC story of the unexpected results of downsizing DEC reduced its headcount from 124,000 to 55,000 over a seven year period, removing positions from all departments with impacts on every aspect of the company and its activities, not surprising given that although Olsen had expressed concern that the cutbacks were not being focussed on areas that were overstaffed, such as marketing and engineering, they were instead carried out across the company and across the divisions.[42] In fact, Olsen

[38] Ibid.
[39] P.P. Shah, *Network Destruction: The Structural Implications of Downsizing*, The Academy of Management Journal, Vol. 43, No. 1. (Feb., 2000):101-112.
[40] Fax from Ford Dearborn to Thomas Smith, 2 September 1992, Olsen Archives.
[41] Memo from Ford Account Manager to Bob Palmer, 12 August 1992, in Olsen Archives.
[42] Memo from Olsen to the Product Committee. “Business plans,” 6 May 1992, Olsen Archives.

noted before he left the company in May 1992 that DEC was in fact hiring marketing personnel while at the same time laying off staff who were productive.[43]

An internal senior management presentation in 1994, estimated that a 5 percent loss in productivity would cost the company $113 million per year, while a 10 percent drop would cost $225 million.[44] A number of key indicators in the document indicated there were other problems, too, with the redundancy process, especially as it developed after the departure of Olsen. For instance, voluntary termination rates among employees rated number one (where one is the highest and five the lowest rating given to an employee in his or her performance appraisal) was running at 6.2 percent. However, in network engineering, one of the core competencies of the company, the rate was a whopping 17 percent, while sales specialists volunteered for redundancy at the rate of 9.2 percent. At the same time, employee litigation costs ran to $1.93 million in fiscal year 1993 alone. Thus, the company was losing key technical and other capacity while paying enormous legal fees. Not surprisingly, there was also an impact not just on morale, but also on productivity, which only added to losses.

In order to understand the internal state of the company in the mid 1990s, two employee surveys were conducted by Gallup in 1994 and 1996 at the behest of DEC senior management, copies of which were provided to the authors by a former DEC corporate strategist. The results demonstrate that things did not improve over the years, suggesting that senior management did not heed the feedback from the first survey or their actions were not successful in altering the perceptions of employees. In 1994 the Gallup Poll noted that concerns were voiced that the company had become a management by numbers, overly controlled organisation which was no longer customer or employee oriented. There was a concern that the redundancies were taking too long, and also that divisions and sections had reduced headcount without adjusting workloads. Employees believed, moreover, that the company was too short-term focussed, concerned only with the current quarter. Salary increases at senior level also did not sit well with employees, most of whose salaries were frozen. A Securities and Exchange Commission (SEC) filing of the time shows that five of the senior executives received 10 percent of the stock options granted by the company at the time. Palmer's salary increased from around $740,000 to $900,000 in 1994, while Charles Christ's (DEC's Vice President of Storage), increased from $290,000 to $315,000 from 1992

[43] Memo Olsen to Simms, "Marketers", 18 May 1992, Olsen Archives.
[44] Internal DEC 'Critical Path' report (1994) supplied by DEC strategy consultant to authors

to 1994. Bill Strecker, Senior Vice President of Corporate Strategy & Technology, had an increase from $305,000 to $427,000 during the same period. [45]

In 1996, the Gallup poll showed that job security was still a major concern and the company was still deemed to be too short-term focussed. Voluntary turnover was still higher than normal and redeploying work to those remaining during and after redundancies was not done consistently, leading to poor morale. Employees believed that reaching headcount goals seemed more important than reducing costs. This was evident in the feedback from the employee survey, to which we turn now.

Results of Employee Survey

In 1994, Bryan King surveyed information systems professionals at DEC and presented his results as a part of his first degree submission.[46] In it he looked at how the downsizing of 1990 to 1993 had affected the productivity and morale of those that remained with the company. His conclusion was that within the Information Systems (IS) function within DEC, there was adverse effect on productivity and morale; had the downsizing been implemented differently, there might not have been as great an impact. He also noted that the management in IS appeared to escape the downsizing intact.

King's research was, of course, based on a survey of just one department within DEC and for only a limited two-year period at the beginning of the downsizing process. In order to investigate the extent to which King's findings applied to the whole of DEC and throughout the 1990s, the authors carried out a survey in 2008 using DEC Alumni organisations around the world to contact ex-employees. The methodology used was an Internet survey, using survey monkey, a web-based tool used by many academic researchers since it is reputable, reliable, and also confidential for respondents. A survey based on this tool was also a means of ensuring that its potential reach extended to the whole of the former employee population around the world. Although every attempt was made to reach as many former DEC employees around the world as possible, there is perhaps a slight degree of bias in that the respondents were all members, or friends of members, of DEC Alumni societies and as such might have a degree of affection for the company.

There were close to 1,000 responses to the survey (1,800 potential respondents attempted the survey, but only 947 completed it fully), with about half of the respondents

[45] SEC filing, Schedule 14A, September 14, 1994. from Edgar Online <accessed 15 January 2010>
[46] Bryan King, "The Effects of Workforce Downsizing on Employee Productivity and Morale in the Computer Industry," unpublished BSc thesis, Lesley College, Massachusetts, 1994.

having experienced being downsized and the other half remaining with the company after it was bought by Compaq. This gave a good point of comparison. A sample of 382 was required to give an error rate of less than 5 percent and a 95 percent confidence rate. The survey achieved a return of 947 which gives a precision[47] of 3.5 percent. Given that a decade had elapsed between when the company was sold to Compaq and when the survey was conducted, and that fully twenty years had elapsed since the downsizing started, this is an exceptional response. The survey was completely anonymous for all participants, although some chose to provide contact details in the free text field for further follow up. The first two questions on the survey were to ascertain the geographical spread of the respondents and the area of work to ensure an even distribution of data. The analysis of the responses follows.

As illustrated in Table 1, the responses to the came from across the globe with about half in EMEA and about 40 percent in the Americas. This was approximately the same ratio as DEC's income from each of these regions, and ensures a degree of confidence that the responses cover an accurate cross-section of the workforce.

Table 1: Geographical distribution of responses to survey

	Answer	Count	Percent
1.	Americas	381	41%
2.	EMEA	476	51%
3.	GIA (General International Area)	30	3%
4.	Other	55	5%
	Total	942	100%

The results shown in Table 2 indicate that the responses came from a good cross-section of the functions represented in the company at the time of the downsizing in the 1990s. The percentages of the responses in each category mapped well onto the proportions of the DEC workforce in each category during the 1990s. Customer Services, Software Service, and Sales were the main field based units. Engineering and Manufacturing on the

[47] Precision is defined as "The property of the set of measurements of being very reproducible or of an estimate of having small random error of estimation" by the OECD. http://stats.oecd.org/glossary/detail.asp?ID=3791 <accessed 15 January 2010>

other hand were based in a small number of locations, while Human Resources and IT/MIS were country based.

Table 2: Job functions of survey respondents

	Answer	Count	Percent
1.	Administration	45	5%
2.	Finance	49	5%
3.	Manufacturing	60	6%
4.	Customer	147	16%
5.	Software	108	11%
6.	Human	41	4%
7.	Marketing	76	8%
8.	H/W	34	4%
9.	H/W	17	2%
10.	S/W	41	4%
11.	S/W	16	2%
12.	IT/MIS	49	5%
13.	Sales	141	15%
14.	Other	121	13%
	Total	945	100%
Standard Error		0.155	

The survey also asked the respondents to indicate the year they left the company, and this is shown in Table 3. This information helped us verify that all key periods of downsizing were represented as well as ensuring that there were a number of respondents who had survived the layoffs and progressed to work for Compaq. This was so that changes in attitude could be established both for those downsized and for those who had not been directly affected by being downsized and who had remained with the company.

Table 3: Year respondent to survey left DEC

	Answer	Count	Percent
1.	Before	21	2%
2.	1988	5	0.5%
3.	1989	7	0.5%
4.	1990	27	3%
5.	1991	36	4%

6.	1992	75	8%
7.	1993	73	7%
8.	1994	127	14%
9.	1995	55	6%
10.	1996	51	5%
11.	1997	45	5%
12.	1998	79	8%
13.	after 1998	346	37%
	Total	947	100%
Standard Error		0.106	

The next six questions were used to ascertain the range of downsizing methods deployed at DEC, their impact on attitudes to work and management, and the effects of downsizing on morale in the company. As can be seen in Table 4 DEC used almost all of the methodologies identified in the academic literature discussed at the beginning of this article. This indicates a company which has lost direction and one that did not understand the reason it was downsizing. There appeared to be little focus on how the company could increase profits and income after 1992, just a focus on reducing the headcount. Note that the responses are answers to the methodology used in the areas the respondents worked and do not indicate whether or not the particular respondent was downsized.

Table 4: Methods of downsizing used at DEC according to respondents to survey

	Answer	Count	Percent
1.	Percentage cut across	188	20 %
2.	Badly performing units	40	4%
3.	Functions with excess	102	11%
4.	People working in non	138	15%
5.	Voluntary?	126	14%
6.	Early Retirement?	89	10%
7.	N/A	99	11%
8.	Other	140	15%
	Total	922	100%
Standard Error		0.079	

The next questions were aimed at determining whether attitudes to management and the company changed after Olsen resigned. This was the period where the company values were being questioned and senior management were trying to differentiate between "old" DEC and "new" Digital. Two thirds of those who responded indicated that their attitude towards the company worsened over the period, and half of the total number of respondents replied that it had an impact on their work. (Surprisingly perhaps, 45 percent indicated there was no impact.) Most of those who indicated that there was an impact of the downsizing process on their work said that the impact increased as the number of rounds increased. What is more, almost 50% of the respondents reported that the compensation package got worse over time. This would have been guaranteed to create resentment among those who survived the first rounds. Finally, when asked about how their departure was handled, the majority of respondents found it was handled well which implies that the company culture of the earlier years had not been completely forgotten.

The final part of the survey was a free text field for additional feedback. Many of the comments were critical of management, although there was an underlying feeling of nostalgia for the company itself. However most felt that the company had changed in the 1990s and was no longer the company they joined. Many spoke of management undertaking percentage cuts across the board without reference to how it would affect the business. There were stories of people, in their cars with customers, being phoned up and told they were being downsized. There were also stories of survivors having increased workloads left by those made redundant and of the toll on morale by the endless rounds. A number spoke of having fifteen minutes to clear their desks before being escorted out of the building.

And it was not just individual employees who were affected by the downsizing, and the broader effects and the ethical issues associated with them were also touched upon by some of the respondents.[48] DEC, for instance, had intentionally opened manufacturing plants in the poorer areas of America and helped the people of those areas into useful employment. Closing these plants had a big impact on theses communities. One of the most disturbing comments in the survey was from an employee who recalls seeing "stacks of business cards left by psychologists" at the Marlboro offices in Massachusetts as a result of many employees suffering mental health problems as a result of the downsizing. Also one senior employee reported falling into severe clinical depression: he never recovered from his downsizing.

[48] J. Orlando, *The Ethics of Corporate Downsizing*, Business Ethics Quarterly, No. 2 (Apr., 1999): 295-314.

CONCLUSIONS

There were many factors that caused DEC to be a takeover target, and downsizing was just one of them. The company had recruited during the 1980s to challenge IBM as the number one computer company. In doing so, they invested heavily, indeed up to $4 billion, in a technology that was dying in the mistaken belief that they needed a high-end system to take market share from IBM. The board and Olsen were surprised to find out that the new Complementary Metal Oxide Semiconductor (CMOS) integrated circuit technology was just as fast, much smaller and much cheaper compared to the Emitter Coupled Logic of the VAX 9000. In fact Olsen was heard to say "do you mean we've invested billions in the VAX 9000 and the N-VAX is just as fast?"[49] The answer was yes: VAX 9000 was 40 – 157 times the power of a VAX 11/780 which was the standard of the time; DEC's N-VAX CMOS-based computers were virtually identical at 32 – 150 times the power of a VAX. The problems caused at DEC by failing to anticipate or respond adequately to changes in direction of the industry during the 1980s were compounded by the recession of the latter part of the decade. The company also changed direction on its Reduced Instruction Set Computer (RISC) policy a number of times resulting not only in loss of customers, but also of high-profile employees such as Dave Cutler, one of the senior designers of DEC's VMS operating system and subsequently the main author of Microsoft's WindowsNT.™

The downsizing at DEC started in a compassionate manner with regard to the employees. Many have commented that the initial package offered was very generous, some going as far as saying it was too generous given the problems with the company finances. Analysing the company reports adds weight to this theory. After all, the reduction in staff and facilities cost the company of $550 million in 1990, $1.1 billion in 1991, $1.5 billion in 1992, $1.2 billion in 1994, and $420 million in 1996. Note that the money was accounted for in the SEC filings of 1990 to 1996, but most was spent on layoffs during the period 1992 to 1997, and some carried over from year to year as layoffs did not necessarily coincide with financial reporting periods. This represented a total of almost $4.8 billion in six years "invested" in reducing staff numbers by over 50 percent, or about $80,000 per employee laid off. The first rounds offered voluntary redundancy and early retirement that was extremely generous, as evidenced by feedback from employees who volunteered, but they were undertaken without any regard to the worth to the company of those who volunteered. In fact, a number of ex-

[49] Comment by Bob Supnik 2009 VP, Senior Corporate Consulting Engineer Digital Equipment Corporation June 1977 — June 1999 (22 years 1 month) Multiple positions including: VP of Corporate Research; Group Manager of Microprocessor Development.

employees have recalled their joy at being able to volunteer in 1992-1994. Later rounds were across the board cuts with no regard to business requirements for growth, with whole departments sold off to erstwhile competitors together with the staff. This left a gap in the support of products, and led in turn to a loss of confidence in the company's ability to support future products and hit sales. Later rounds were also implemented with reduced compensation packages in the US where the law allowed and hence there was resentment amongst the employee population that had been spared in the earlier rounds.[50] The company's sales sections stagnated while they awaited reorganisation in the wake of downsizing.

Part of the DEC downsizing included the closing of manufacturing facilities and consolidation of these facilities. Although this may have made sense as part of an overall plan to rationalise production, in fact closure and consolidation of manufacturing was often as haphazard as was downsizing of personnel. Often, facilities which had just geared up to produce and having just achieved best in class were suddenly relocated to another manufacturing plant, resulting in a gap in production as well as loss of experienced production workers. Bob Glorioso, Vice President of High Performance Systems at DEC, in a paper he shared in an email but never published titled '*The Evolution of DEC: A personal perspective*' , tells of the VAX8600 manufacturing being moved twice, each time just as the facility had perfected its manufacturing process. This was one of a series of errors that DEC made during its downsizing.

All in all, although downsizing was needed to correct the excess hiring at DEC during the 1980s, the way the downsizing was handled, the people who were targeted, and the loss of focus on gaining market share all had a detrimental impact on the health of the company, contributing in turn to its demise. This together with the use of $4.8 billion to fund the downsizing and the lack of strategic planning added to DEC's problems when it was trying to regain market share and direction. It significantly delayed any recovery for the company and eventually led senior management to consider a merger rather than continuing as an independent company.

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The authors wish to express their appreciation to the 1,800 DEC Alumni worldwide who took part in the survey in one way or another, not only for their answers but also for the comments added and the encouragement in further work. Special thanks go to Dan Tymann at the Ken

[50] There are many references to the reduced compensation in the DEC internal Notesfiles of the period http://www.buschdorf.eu/vaxnotes/ <accessed 15 January 2010>

Olsen Archives at Gordon College for allowing access to the memos covering the period under study and permission to copy. The archives are a work in progress having taken Olsen's desk and office completely, and the archivist is actively indexing the contents supported by donations from many DEC Alumni.

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Recession, S-curves and Digital Equipment Corporation

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Keywords: S-curve, Digital Equipment Corporation, DEC, recession, exemplar

Digital Equipment Corporation (DEC) was founded in1957 by two MIT engineers . By 1988 it had grown to be the world's second largest computer corporation. From this heady height it took a mere 10 years for the company to disappear completely. This paper looks at DEC both in relation to the S-curve of technology and how it conformed to this model in the first thirty years but missed out on the disruptive technology of PCs and workstations in the late 1980s.Also how they did not see the wave in the late 1990s and missed the opportunity to lead the market once again.

Michael Mahoney wrote a number of papers[1] on the History of Computing and one thing he was always urging researchers and historical authors to do was to capture the history of failed computer companies as these are not usually written up and their archives are often destroyed, especially if they are US based. This paper goes some way to realising that goal.

Digital Equipment Corporation (DEC) was founded in 1957 by two MIT research engineers, Kenneth Olsen and Harlen Andersen. They obtained a loan of $70,000 from ARD one of the first venture capital companies, led by General Georges Doriot. Olsen created the business plan from books he had read and this plan is now housed in the Ken Olsen archives at Gordon College along with many of Olsen's memos. DEC was the jewel in the crown for ARD, making it more than $355million. In its first thirty years DEC became the second largest computer manufacturer worldwide. However over the next ten years it declined spectacularly to be taken over by a PC manufacturer. The reasons for its decline are multiple and interrelated as opposed to Schein's [1] straightforward view that it was the lack of the money gene in DEC management and its cultural DNA that brought about its downfall. Certainly, Olsen was not driven by profit, he was driven by technical excellence which defined the company direction.

DEC's early history is not one without its problems, it had to survive a number of trying times as competitors rose to challenge its traditional markets. It also had to resist a number of takeover attempts from companies such as A T & T. Each time DEC emerged a stronger company except for the final time. Their growth can be linked to disruptive technology, the 'S-curve' and also to the worlds financial 'wave'. The world went through four recessions and the US six, including one double-dip in the early 1980s, since the DEC was founded to the time that DEC was sold to Compaq. The data in Table 1 is from the National Bureau of Economic Research (NBER). The NBER is considered the official arbiter of recessions, but "*the NBER does not define a recession in terms of two consecutive quarters of decline in real GDP. Rather, a recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales*"[2].

Date	Duration	Time since last recession	Peak unemployment
Aug. 1957-April 1958	8	39 months	7.5%
April 1960-Feb. 1961	10	24 months	7.1%
Dec. 1969-Nov. 1970	11	106 months	6.1%
Nov. 1973-March 1975	16	36 months	9.0%
Jan. 1980-July 1980	6	58 months	7.8%
July 1981-Nov. 1982	16	12 months	10.8%

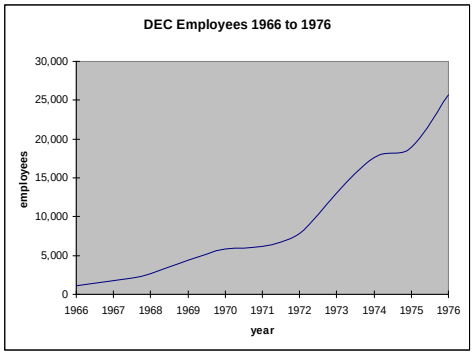
[1] http://www.princeton.edu/~mike/computing.html accessed Nov 2009
[2] National Bureau of Economic Research, http://www.nber.org/

July 1990-March 1991	8	94 months	7.8%

source: NBER

Table 1 Recessions of DEC period generated from NBER data[3]

There are a number of different recession shapes that occur in literature the most common being V-shaped, U-shaped and W-shaped. DEC suffered, like most other companies, in these recessions but shielded its workers from redundancy by redeployment until the late 1980s when economic circumstances and pressure from Wall Street forced it to resort to large scale layoffs. In the 1970, 1973 recessions, DEC reduced its hiring, stabilised its workforce and rode out the recession as can be seen in Figure 1. The result of the recessions on profit during this period is shown in Figure 2 and clearly demonstrates the impact of the recessions on the profit of the company and how it impacted growth.



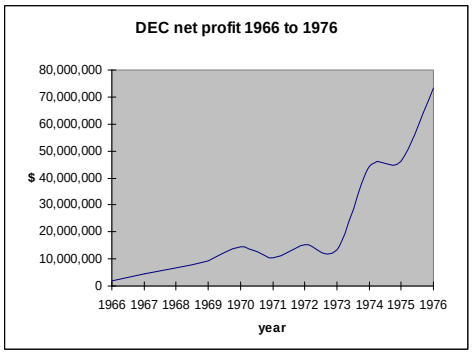


Figure 1 DEC employees 1966-1976 **Figure 2 DEC net profit 1966-1976**

In the recession of the early 1980s it appears that DEC did not apply the same rules on hiring as can be seen in Figure 3. This impacted the company in 1983. Ken Olsen said in a speech to the Newmans Society in 1982 that he had said publically "'*DEC didn't need recessions to straighten us out*,' but that it wasn't true, recessions made DEC strong".

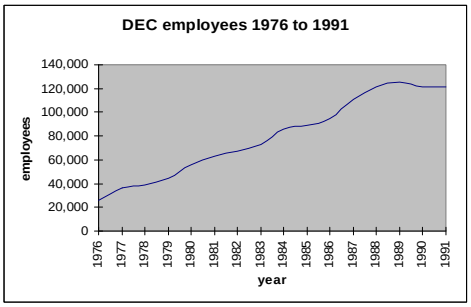
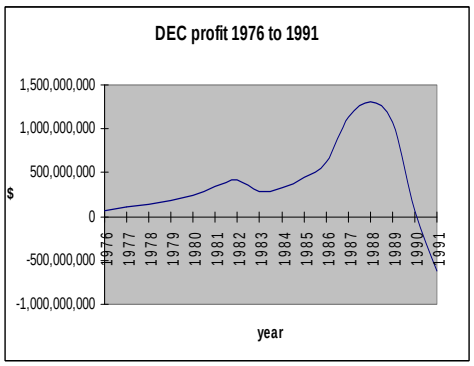


Figure 3 DEC employees 1976-1991

Again, this statement was true up until 1982 when there was no hiring freeze imposed and so expense grew and profits suffered for a number of years as can be seen in Figures 4 and 5. In the mid 1980s DEC was forced into staff reductions. The method they used is described in Allen and Scott Morton [2] who did a study of employment security at DEC. It showed how a firm could manage its workforce without enforced redundancies thus maintaining its reputation for employment security. The major proportion of the reduction was in the manufacturing areas, primarily in the US. This was a forced reaction to the sudden decline in the stock market value of the company in 1983 when the value of the stock dropped by 29% in three weeks due to reporting problems within the company. They finally imposed a hiring freeze, retrained 4000

[3]National Bureau of Economic Research, http://www.nber.org/cycles/cyclesmain.html

new manufacturing personnel and only had to make 600 redundant as illustrated by Rifkin and Harrar [3]. This was undertaken over a three year period from 1983.



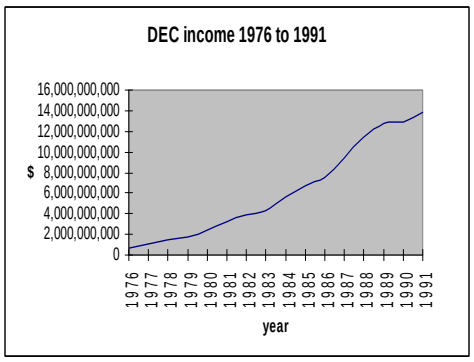


Figure 4 DEC profit 1976-1991 **Figure 5 DEC income 1976-1991**

The theory of the S-curve suggests that all businesses follow an S-curve in their development taking a certain amount of time to get to 10% market share and a similar amount of time to reach 90%. At which point, the company will fade away unless they can re-invent their product/industry and begin a new S-curve. Modus [4] states that "*The projected life cycle of consumer products and the rate at which substitute products will gain market share is of vital interest to any company*". He suggests that "*Business, in the form of products, companies and entire industries, goes through five cycles which align with the S-curve*". He also suggests that the S-shaped curve also shows up in other life cycles.

For example he states that :

- A product S-curve may typically have a life cycle of 6 quarters.
- A product family S-curve, consisting of a set of related products, will typically have a life cycle of around 5 years.
- Basic technologies or industry S-curves, consisting of a number of product families and associated companies, typically have a life cycle of approx. 15 years.

DEC followed this cycle successfully for many years. For product life cycles, they released a new major product almost every year from 1965, thus having overlapping S-curves. For family product lifecycles they released the PDP-8 in 1965. The last model in the family was produced in 1979 and they sold over 50,000 systems. There were 10 different models released in the 15 years. This is accepted as the first real minicomputer and heralded the start of affordable computing. Gordon Bell and Ed de Castro are credited as being the main designers of the PDP-8. Five years later in 1970 they followed it with the PDP-11, with the last product in the family being released in 1990. The PDP-11 family, excluding the 32-bit extensions, consisted of at least 23 models and was the leader in the minicomputer market for many years. In 1975 DEC released the 11/70, this was meant to be a stop-gap machine with 1000 planned. Eventually 10,000 were sold. Then, in 1977 the 11/780, DEC's first 32-bit machine, was released. In 1984 the VAX 8600 came out, in 1990 they released the VAX 9000 and finally in 1992 DEC released the 64-bit Alpha family. By the time DEC was taken over by Compaq, the VAX family consisted of around 135 models with the final VAX, in the Alpha range, being manufactured in 2005. These cycles fed DEC's incredible growth over the years.

Christensen [5] looks at technology S-curves and asks how value networks and the concept of S-curves relate to each other. He postulates that disruptive technology does not fall into the normal S-curve as it gets its commercial start in emerging value networks before invading established networks. Clearly DEC had disruptive technology with its minicomputer products, taking the mainframe makers by surprise and creating a new market for their product. With the PDP-11 they were forced into the market by Data General, which was formed by three ex-DEC engineers led by Edson de Castro who was disillusioned by DEC's decision not to go ahead

with the 16-bit system he had been designing. Having formed Data General he brought a system to market very quickly and forced DEC to respond with their very successful PDP-11 range. In this instance it was Data General who had the disruptive technology that forced a reaction from DEC. De Castro had worked on the design of the PDP-8 and was working on the next system codenamed PDP-X which was to be DEC's 16-bit offering. When he left to start Data General his name was effectively wiped from DEC's official histories. The Data General story is told in Tracy Kidders book "the Soul of a New Machine" [6]. In Rifkin's [3] book there is commentary on whether the team that left to form Data General were working on the Nova design whilst at DEC and Olsen is quoted as saying that DEC had a copy of their log of what they were doing for their last two years at DEC.

Looking at base technologies DEC had overlapping S-curves, starting with the PDP-8 family in 1965, the PDP-11 family in 1970 (forced by Data General's release of the Nova). The VAX 11/780 released in 1978 and the Alpha in 1992. This was fine when there were base technology overlaps but the Alpha was fourteen years after the VAX 11/780 and so at the limit of the S-curve creating problems for DEC in the area of uptake. This is graphically exposed in the Figure 6 which shows the gap in major product release during the 1980s. The effect of this was hidden from the company by good sales of the VAX, the mid-life kicker of the VAX 8600 and the sustained economic climate of the 1980s. When the recession came, it hit DEC hard especially as the VAX 9000 was two years late and released when the recession was at it worst.

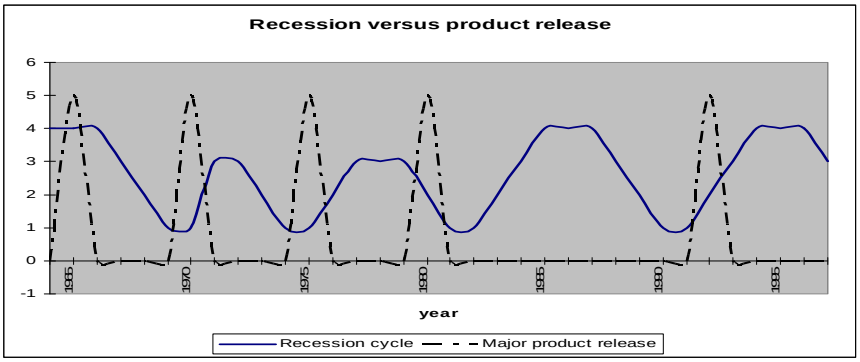


Figure 6 Recession versus major product release

Asthana [7] looks at S-curves related to disk drive technology and comments that a phenomenon that needs careful S-curve analysis is the moving technology target. Again, this hit DEC in the early 1990s when a major development program should have put them in a leadership position in disk technology. However it took them so long to get an acceptable mean time between failure rate of their first thin-film technology disk drive that the competition had released smaller cheaper disks. This was one of the largest development projects in the company history and included a number of new technologies in the one product. DEC made a similar error in the VAX 9000 design where they again introduced three new technologies at once which caused delays in product shipment.

DEC missed two disruptive technologies in the 1980s which could have kept them on the next S-curve. The company missed the advent of the workstation by focussing on the IBM market anticipating the VAX 9000 as their IBM killer. This allowed SUN amongst others to take what was once DEC's traditional market. DEC realised very late that the workstation market was important and started a workstation engineering group. This forced them into using a third party chip to challenge the competition and to cancel their own in-house project for a RISC chip codenamed PRISM. This gave them a successful workstation and market share but it was short lived as they decided that an in-house chip was needed and started the Alpha project. The other disruptive technology was the PC where DEC tried to create three products to compete in the marketplace when one would have given them a lead had they realised. They set up three competing groups to build a PC, the Rainbow, running both DOS and CP/M, a proprietary system, the Professional, and a word processing system. The groups didn't appear to know of

each others existence and did not use industry standard parts so were not compatible with each other or the IBM PC standard. The sales force were confused as to which was the PC competitor and missed out on sales of the Rainbow PC by putting the Professional forward as DEC's main offering.

DEC is quoted in Bower and Christensen's article on 'Catching the Wave' [8] as almost completely missing the disruptive technology of the personal computer. They blame arrogance, tired executive blood, poor planning and strangely 'staying close to their customer'. Many however contend that DEC were not in a position to take on the PC market as their processes were aligned to medium volume, high margin products and not the high volume low margin market. Had they recognised the workstation market then there might not have been a crisis of confidence a few years later.

In the mid 1990s there were two other disruptive technologies that DEC had a chance to lead the market with had the company not been fighting for survival and not focussing on building for growth. The first was fast networks linked to the requirements of the Internet where DEC was in a lead position in gigabit technology until Palmer sold off the network business in 1997 to concentrate on 'core' products. The second was the Internet and all that that brought. DEC was the leader in Internet business, forming an Internet business unit under Rose Ann Giordano and creating some excellent products. DEC, according to staff interviewed, were aware of the 'wave', DEC management was always talking about riding the wave. However as Figure 7 shows graphically they missed the wave of the 1980s, the Alpha S-curve was late in starting and they didn't really get back on track until the Internet wave of the mid 1990s. Unfortunately, by this time the board had removed the CEO installing someone who didn't understand the Internet and who was in the process of finding a merger/buyer for the company. Had he taken time to look at what was happening in 1997 things might have been different. It is clear that DEC had once again got back onto the S-curve and were well placed to ride the next wave. AltaVista. DEC had created AltaVista in its Western Research Lab as a way to use the power of the Alpha processor and had already established the Alpha as a force in Internet business suppliers such as Amazon because of its power. This was mainly on Unix based systems however rather than Open VMS.

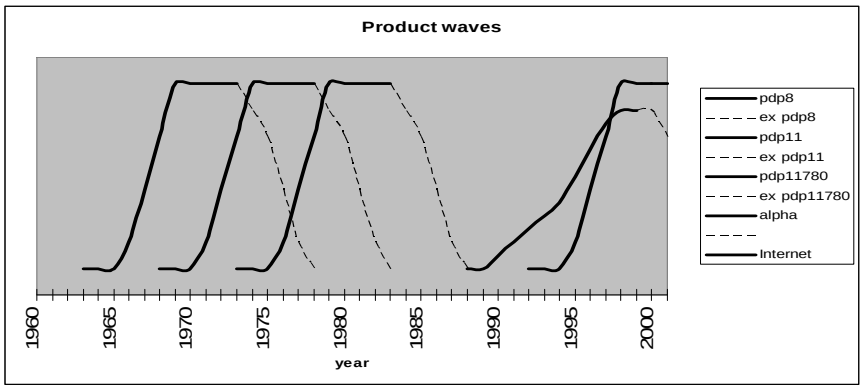


Figure 7 New product 'waves'

Russ Jones in a chapter of Cronin's book [9] looked at DEC's Internet business and its leadership position in late 1994. DEC was the first fortune 500 company to have its own web site when it opened the first commercial home page on the Internet in October 1993. They had the majority of the business server market in the Internet arena with Amazon as a major customer. When they released AltaVista it was an instant hit and the name went from nothing to worldwide fame in six months being better known than DEC itself. It was the search engine used by Yahoo, cementing its position as search engine of choice. DEC produced the first Internet firewall product, the first tunnelling software in 1991 and was well ahead of the competition.

When the founders of Google, Larry Page and Sergey Brin, came to DEC with an offer of joining with AltaVista for $1 million, DEC's response was negative due to a 'not invented here' attitude and senior management preparing for the sale of the company. This was certainly another opportunity missed for DEC. Palmer didn't understand what he had in AltaVista. He didn't understand the potential of the Internet, valuing AltaVista at $0 when the sale to Compaq went through. In 1999 Compaq sold AltaVista to CMGI for $2.3 billion. Bell in his appendix to Schein [1] stated that Internet business products were perfect for DEC, they had all the pieces including servers, software and networking, however they didn't understand how to organise to engage in a new market.

DEC, IBM and HP are all exemplars quoted by Peters and Waterman [10] as organisations with structures and strategies that are the ones to follow. Yet by 1990 all three were in deep trouble suggesting that the study by Peters and Waterman [10] was in some way inaccurate. In their updated version they add an author's note on Excellence 2003 where they try to justify their publication in terms of excellence value. They totally ignore DEC in this commentary. However a paper written by Crainer and Dearlove [11] analyses the companies in the book ten years later and report that Michelle Clayman found that '*the companies featured in the book beat the stock market by one percent, whereas the mass of unexcellent companies beat the stock market by around 12% over the five years following the book's publication'*. Sheth [12](page 4) comments that DEC was a fun place to work and suggest it was no wonder that Peters and Waterman [10] considered DEC as on of the 15 exemplars. However, he goes on to question DEC's status at the end of the decade and its late entry into the PC and workstation market, going on the describe the company as one where executives were fleeing, and layoffs, once an abhorrent practice in DEC, were now occurring.

McGrath [13] wrote of the product strategies of high technology companies and has a number of extremely pertinent comments to the situation the DEC found itself in the 90s. He explores the importance of strategy, and the need for changes in strategy as technology changes, the reaction to stagnation of strategy and the potential for diversification. He comments on the selection of Palmer as the CEO and also looks at some of the products that DEC had and their potential for strategic advantage that was not followed up on. He also has commentary on many of the competitive companies at the time and their strategies which either helped them survive or aided their demise. McGrath [13] implies that DEC strategy on the Internet was only developed by Palmer in 1997 which was, in his opinion a few years too late. This was taken from the company report of 1997. However this strategy had been developed a few years earlier within the company. Rose Ann Giordano had been made VP of the Internet Business Group in 1994 to develop the vision and strategy but this was not recognised as strategic by Palmer until later, many saying that he did not understand the value of the AltaVista product range.

Pettigrew, Thomas and Whittington [14] talk of the diversification index for the Fortune 500 companies declining from 1.0 to 0.67 in the period 1980 to 1990 as divestiture replaced diversification driven by the shifting of corporate goals from growth to profitability and pressure from shareholders and financial markets. This led to the ousting of many CEO's, including Ken Olsen, by increasingly independent boards. The move from diversification appears to go against some of the findings as quoted by Pettigrew, Thomas and Whittington [14] where related diversification linked closely to core business was superior to unrelated diversification.

General Georges Doriot in the address to the Newcomen Society[4] stated that when you have a strong president your directors should be very peaceful. In fact DEC directors were placid for most of DEC's history. Often board meetings were said to be more of a social event than a formal board[5]. The board members were weak according to many commentators and most, when contacted, were unwilling to talk about their time on the board of DEC. Many did not

[4] Digital Equipment Corporation, the First Twenty-five Years, Kenneth Olsen speech to the Newcomen Society, Newcomen Publication Number 1179, Sept 21st 1982

[5] Interview with former board member in Boston, October 2009

understand the technology or the business but still made decisions that impacted the company direction. One member that did agree to discuss their time on the board commented that the decision to replace Olsen was not voted on. He also stated that they decided on Palmer without looking outside the company as he appeared to understand the PC business. Their decision was based on videos they had asked senior managers to complete stating what they would do to rescue the company. Palmer took coaching in video techniques prior to recording his video.[6] Board meetings became increasingly acrimonious once DEC's profits declined and General Doriot died, leaving Olsen isolated. Olsen tried in vain for many years to get his senior managers to give him realistic budgets to give to the board.[7] In 1992 the board asked for an austerity budget and Olsen asked for a budget for growth. This clash plus a reluctance to cut as many heads as the board had asked for led to the board asking Olsen to leave.

In conclusion, one of the many factors contributing to DEC's downfall was missing the S-curve in the mid 1980s and not having a strategy to recover. They left it too late to move to RISC architecture allowing competitors to capture the workstation market. They were riding the wave during the 1960s and 1970s but their success made them try to get into larger markets rather than their traditional ones. They missed the PC and workstation revolution by focussing on IBM's business and their profits suffered as margins were eroded. However, they could have recovered in the late 1990s had they realised that they were on the next S-curve and a leader in the field of the Internet. The boards decision to select Palmer to succeed Olsen was taken in haste and with little apparent though as to what the company direction should be. He was chosen mainly because the board though Olsen had missed the PC revolution.

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[6] Interview with Olsen's personal assistant October 2009

[7] Ken Olsen's memos in the Ken Olsen Archives at Gordon College, Massachusetts

1 Financial Analysis

1.1 Introduction

In this chapter it will be argued that DEC had the finances to refocus on growth, as Olsen wished to, but instead it concentrated on maintaining cash reserves and reducing costs. The company had a problem with declining margins, which it did not handle well in the late 1980s. One of the major factors that provoked the financial problems at DEC will be shown to be the employment of approximately 30,000 personnel to target the IBM mainframe market, at a time when that market was declining. The other major factor was the investment needed for the development of the VAX 9000 and the company's semiconductor manufacturing facilities. An ancillary fact that impacted DEC's finances was the relatively poor investments that the company made.

The company's finances are analysed to identify a number of the issues facing DEC during the 1990s and also to identify whether a lack of money or a lack of product was creating the problems. The analysis of accounts is presented and the reasons for the losses are discussed, in order to understand why the management acted in the way that it did. The Wall Street crash of the 1980s had had a negative effect on the share price of DEC, together with the other companies in the market. However, whilst others recovered in the late 1980s, DEC's share price continued to decline and the reasons behind this are explored. DEC was always conservative in its handling of finance, maintaining an extremely low borrowing rate and relatively high reserves of cash. For many years it did not pay a dividend, relying on the increasing share price to satisfy investors while maintaining its growth.

5.2 Finances

Up until 1990, DEC's finances were looking very healthy with annual profits in the billions, and revenue itself was also healthy (but not growing) up to 1997. Kotter and Heskett reported that of 207 leading US firms surveyed, DEC was number 11 in the long term economic performance index over eleven years, with HP at 18.[1] They also reported that, for the average yearly increase in stock price for 1977 to 1988, DEC were at number 33, with HP at 47 and

[1] Kotter and Heskett, *Corporate Culture and Performance*, 166.

IBM at 146. In the early 1990s, DEC's problems affected customer confidence and consequently sales flattened out. However, DEC started to recover from 1994 to 1996; revenues were fairly flat but, taking account of the sale of 8% of its business to third party vendors, this equated to a growth in real terms. Its financial problems can be traced to:

- The high cost of sales at a time when margins were reducing in the mid-1980s.
- Too many employees, compared to similar sized organisations in the same business sector in the late 1980s.
- A relatively high cost of R&D.
- Delayed product releases, in particular the RA90, VAX 9000 and RISC systems as will be shown in Chapter 6.
- An overly generous redundancy package at the beginning of the company downsizing in the early 1990s.

All of this was widely reported in the business press at the time. In one of the many comments to the author by ex-DEC employees it was stated that 'Ken saw profit as a natural outcome of doing the right thing for customers, not an end in itself', although as mentioned above, profitability was the second rule in the company beliefs.[2] DEC was an ethical company that did not focus directly on profit; rather it focussed on technical excellence in its product. This was one of the reasons that remuneration for DEC salespeople was not commission-based, as Olsen believed they would only sell what the customer needed by not being rewarded for sales.

Schein argued that the root problem at DEC was, in his words, the lack of 'the money gene' in its management.[3] There are a number of definitions of 'the money gene' but, essentially, they all involve the desire to generate money. The author of this thesis believes that this has not been proven to be the root cause of the problems at DEC. In fact, DEC's management tried to hold on to its high margin business, thus maximising its income, when it should have foreseen the move towards open systems replacing proprietary systems, and thus reducing margins. Hence, it is suggested that it was clearly a lack of business acumen rather than a lack of 'the money gene' that caused the problems at DEC. Analysis of the company's products and technologies also point towards more of a lack of the 'marketing gene' than the

[2] Private communication with an ex-DEC employee.
[3] Schein, *DEC Is Dead, Long Live DEC: The Lasting Legacy of Digital Equipment Corporation*, 24-26.

'money gene', as will be shown in the next chapter. In Bell's appendix to Schein, he states that he refuses to believe that DEC lacked the 'money gene' and in fact, as mentioned, the second rule in the company was profitability.[4] Olsen preferred the comfort of DEC's VAX systems, believing that they were superior to any open systems and did not foresee the change to commodity computing or prepare the company for it. Consequently, DEC's problems in the 1980s were not solely technical but were also financial. It passed from healthy profits to substantial losses in a few years.

It does not necessarily follow that not focussing on profit implies that DEC management lacked the money gene. However, it is clear that DEC realised too late that sales and, more importantly, profits per employee were lower than those of comparable companies (Table 2) and that margins were falling as expenses rose. Even when expenses were cut through downsizing and rationalisation, margins still fell faster (Figure 1).

Table 1: Sales/profits per employee from internal mail reporting research in 1991.

Company	**Sales/employee**	**Profits/employee**
Apple	$440,000	$37,400
Compaq	$379,000	$47,900
IBM	$185,000	$16,100
SUN	$217,600	$9,650
HP	$139,000	$7,780
Digital	$104,000	$600

[4] Ibid., 295.

Figure 1: Expense versus margin.

(Supplied privately to author by member of DEC corporate strategy group and now deposited in the Computer History Museum Archives).

DEC also invested heavily in its research facilities, having a number of research laboratories across the world working on advanced technologies and producing many scientific papers.[5] These establishments produced a number of technologies that could have assisted DEC during its troubled times, but conflict with engineers at the corporate headquarters hampered the productisation of these technologies. Examples of these, as will be discussed in Chapters 6 and 8, are DEC's RISC systems, which began with Titan and AltaVista, both from Palo Alto. Palo Alto was regarded with suspicion in Maynard and Palo Alto had a number of ex-LCG (PDP-10) engineers who had a distrust of Maynard.

The author also suggests that DEC's financial problems could have been managed had it not increased its manpower by around 30,000 from 1986 to 1990. The company had recruited staff, prematurely in the author's opinion, for an assault on the IBM market with the VAX 9000. This increased the salary bill by up to $1 billion per annum at a time when a world recession was beginning. The VAX 9000 was late and the IBM mainframe market declining, leaving DEC with an unnecessarily large wage bill. DEC was also slow in recognising the move to server-based computing in the mid-1980s, and hence the reduced manpower required by computer manufacturers for the new paradigm. This, together with a stated goal of overtaking IBM and a company culture that created a reluctance to reduce the number of employees, resulted in a large excess of manpower.[6] By the late 1980s, DEC had far too many employees for the income the company was generating, given the reducing margins (Figure 2). This is an example of the company attacking the wrong market and investing in manpower without a clear view of the financial penalties of doing so. It is argued that the board must share the responsibility for these actions along with the senior management.

[5] Papers were delivered at many technical conferences over the years the company existed and a number were published in DEC's own technical journal, which is maintained online by HP. http://www.hpl.hp.com/hpjournal/dtj/past.htm (accessed August 15, 2012).

[6] Jack Shields publically stated that DEC would overtake IBM by 2007;Vogon News Service report October 10, 1989, citing Boston Globe article by Lawrence Edelman and Jane Fitz Simon, "The Trouble with Digital"; Email from Steve Wells in response to survey: Subject: Survey Comments; Email from Bob Brownson in response to request to DEC Alumni group, Subject: DEC Thesis. Also, comment from Richard Seltzer recorded at http://www.samizdat.com/dec.html (accessed July 30, 2012).

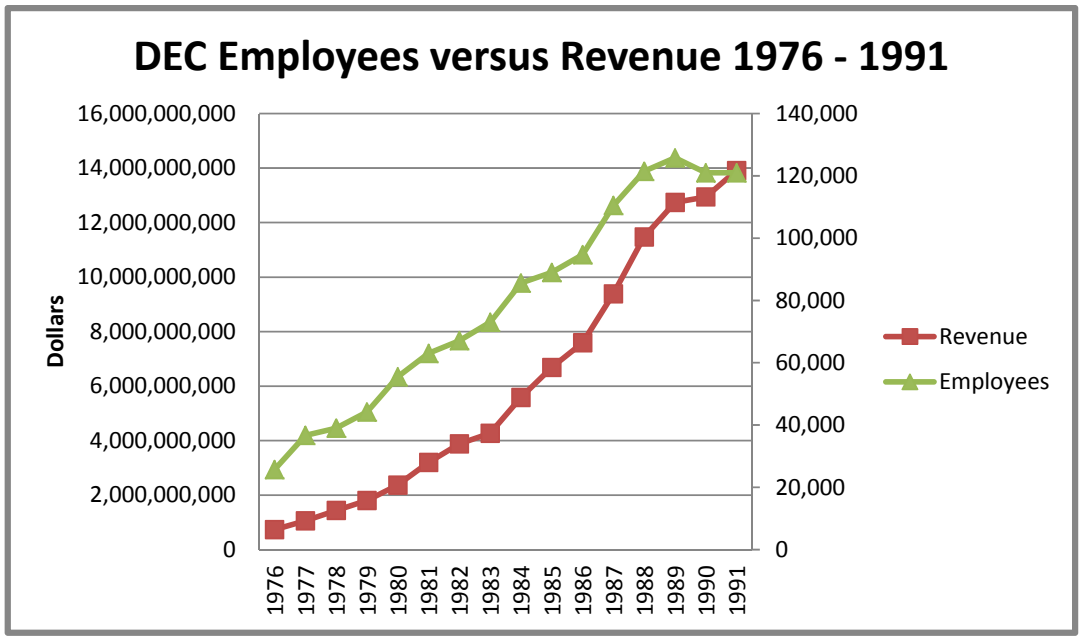

Figure 2: Employee population versus revenue (1970–1991). Plotted from SEC filings.

A number of internal and external commentators put this manpower excess at 30,000, as mentioned above.[7] In fact Peter Moyes, in a chapter of an unpublished book, stated that 'a colleague and a friend, Nicola Renshaw, did a comparison of the performances of Digital, Hewlett Packard and IBM as part of her MBA studies.....and she concluded that Digital was seriously overstaffed.'[8] He went on to say that Renshaw estimated that DEC needed to cut staff by about 50,000 to compete on level terms.

Olsen struggled with this for some time. Many memos in his archive relate to his attempts to persuade his senior management to set realistic budgets for a number of years or to the need for the senior management to realise the manpower reduction targets they had set themselves.[9] When DEC eventually resorted to redundancies, as will be shown in chapter 7, the initial redundancy payments were generous and very costly to the company, amounting to around $5 billion over six years from 1991 to 1997. The continued management failure to deliver the required redundancies in a timely manner prolonged the expense even further.

[7] Schein, *DEC Is Dead, Long Live DEC: The Lasting Legacy of Digital Equipment Corporation*, 207.
[8] Personal communication from Peter Moyes (ex-DEC) March 17, 2008.
[9] Ken Olsen Archives, Gordon College, Massachusetts. For example, memo August 26, 1991: Subject: What happened to the 1992 budget; Memo September 24, 1991 Subject: Questions for discussion at budget presentation; Memo April 11, 1990 Subject: April 18th Board of directors meeting.

The board itself was also concerned with the overgenerous redundancy compensation that DEC was offering, as witnessed by DEC director Tom Philips.[10] In fact, DEC's redundancy payments almost completely account for the losses it incurred during the six-year period of downsizing. Of course this does not take into account the employee costs that were saved by the downsizing. During the period 1993 to 1997, under Palmer, DEC decided to focus on core competencies and divest the company of a number of product ranges and associated employees, resulting in a reduction in on-going revenue of 8%, a reduction in headcount of around 5,000 and generating an income of around $1 billion.[11] In real terms, this was a reduction in revenue of $1 billion per year for a one off income of $1 billion, by selling off profitable product lines, whilst maintaining a number of non-profitable products. As Ann Jenkins put it, 'Palmer sold the crown jewels when we needed the income they generated'.[12]

Strecker suggested that DEC had too many product lines for the money available for R&D investment, which led to a dilution of product development, and that DEC needed to refocus.[13] This will be examined in Chapter 6. The author suggests that some divestment was necessary and agrees with Strecker's assertion that the company could not afford to invest sufficiently in its vast range of products, but believes that the ones sold in later years were not the correct option.

In the 1980s, Unilever had been in DEC's position with inefficiencies brought about by excessive diversification and increased overheads.[14] It began its renewal in the mid-1980s by identifying its core competencies and building on them. Unilever changed many of its key leadership team and its special committee became much more assertive in the running of the business.[15] Unlike DEC, the Unilever board consisted of around twenty-five executives, all of whom had long careers with Unilever. In the mid to late 1980s, Unilever sold over seventy companies but also bought over seventy companies, focussing on core business and high margin acquisitions, whilst restructuring and cost-cutting in its on-going business. In order to develop the core business, Unilever significantly increased expenditure on marketing. By the

[10] From transcript of interview with Ben Strout.
[11] Data from annual reports for Digital Equipment Corporation.
[12] Face to face, informal interview with Jenkins at Gordon College, October 12, 2009.
[13] Telephone interview with Strecker, February 7, 2011.
[14] Geoffrey Jones, *Renewing Unilever: Transformation and Tradition* (Oxford; New York: Oxford University Press, 2005), 93.
[15] Ibid., 92. The Unilever 'special committee' consisted of three members who effectively shared the role of CEO of the company.

end of the 1980s Unilever had become one of the largest companies in their industry. It had divested itself of time-consuming, loss-making businesses and had increased its core business. The main difference between DEC and Unilever, in terms of diversification, was that DEC sold profitable businesses and did not build on its core competencies. DEC's board was not well versed in the industry or in the company culture that Olsen promoted, and did not assert itself sufficiently in the setting of the company direction. Palmer hired a number of senior managers, but his choice was not always well founded, many only staying for a year and leaving with large payoffs. He also kept a number of existing managers, re-instating their previous responsibilities, even though Olsen had effectively demoted them.[16]

Palmer, when he took over in 1992, recognised the need to control costs and so instituted a number of measures to achieve this. He introduced a salary freeze for most of the company, but excluded the senior managers, many of whom were recruited externally by Palmer himself. These managers received large increases and share options, causing extreme resentment from the majority of the employees, as indicated in memos from Ken Olsen and from employee feedback in the Digital Notesfile.[17] He also began to reduce employee numbers in earnest, to remove the excess that had been hired over the 1988–1992 period. However, this thesis concludes that he acted hastily and did not conduct a full analysis of who should go; rather he implemented across the board cuts. It is proposed in chapter 7 that the downsizing could have been handled differently. Palmer could have spent six months studying the organisation before deciding which products were core to the business and thus focussed the downsizing on the excess staff in non-core activities, thereby maintaining growth (whilst reducing staff), instead of stagnating growth. Where Unilever increased marketing for its core business, Palmer, in fiscal year 1995, implemented a 40% cut in sales and marketing due to a move towards more indirect channels for sales. This was a policy put forward by Pesatori (according to Maremont in *Business Week)* and should have resulted in large savings for the company.[18] However, in October 1996, there was an unexpected loss for the quarter, which Palmer attributed to the fact that DEC had cut its direct sales force too deeply to focus on 1,000 accounts worldwide and he would now expand that workforce. This is clearly another example of acting without considering the consequences.

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[16] For example, Strecker, who was effectively demoted by Olsen, only to be re-instated by Palmer.
[17] Various memos in Ken Olsen archives at Gordon College. For example, Note 2784.86 Subject: opinions are dangerous; Note 3096.59, Subject: rumour time; and Note 4374.108, Subject: time to make up for cost, time – salary.
[18] Mark Maremont, "Digital's Turnaround: Time for Phase Two," *Business Week*, June 19, 1995.

Lesly and Light cite many companies that turned to downsizing without looking at growth; most did not achieve the results they had expected.[19] The article attributes this to a lack of strategy rather than a need to lay off staff. In DEC's case, the company struggled for a number of years to try to find a strategy, with many outside consultants being brought in to try to define the company strategy.[20]

With regard to the consequences of the downsizing on the company's financial performance, it proved difficult to calculate the exact cost of reducing the workforce, since different employees were reported via different lines of the SEC filing. Selling, General and Administration expense (SG&A) is normally held up as a measure of employee costs, although DEC bundled the costs of some employees into other reporting lines. Over the period 1986 to 1989, DEC's SG&A rose from 21.94% of revenues to 28.56% of revenues and their employee population went up by 30,000.[21] Average employee salary was therefore used to gain a rough estimate of savings. In the UK in 1983, the average cost of an employee in DEC was £11,000. By 1987 that had increased to £13,300, according to the UK Annual Reviews. The average salary for employees in the Boston area in 1991 was $28,500 per year.[22] From this it can be estimated that the annual cost of the 30,000 excess staff at DEC was around $850 million. Obviously the company could not carry this cost for an extended period and so the board was correct in requiring staff cuts. The alternative proposed by Olsen was to grow the company to meet the employee population. The assertion is however that DEC did not have the products at the time to grow significantly, so the best course of action was an immediate headcount reduction followed immediately by a strategy for growth.

By 1994, the company reports suggested that there was actually a reduction in overall operating expense of $4 billion. This should have resulted in healthy profits, but did not do so because the company's margin was declining just as rapidly as the cost reductions. An internal report by Bain and Company, one of the many strategy consultancies brought in by Palmer to advise on company direction, on the 'Digital Turnaround' suggested that DEC had a 'near-death experience' in 1994, when there was a surprise loss for the third quarter of $183

[19] Elizabeth Lesly and Larry Light, "When layoffs alone don't turn the tide," *Business Week*, December 7, 1992.
[20] This will be investigated in chapter 8, which discusses the Palmer years.
[21] Greg Scott, Scott Consulting MBMG708 spring semester paper, 'Digital Equipment Corporation: R.I.P. or Future Lean and Mean Competitor?', 1994. ftp://ftp.infrasupport.com/demise.pdf (accessed July 4, 2012), 8.
[22] Taken from http:// heinonline.org/ (accessed September 9, 2009).

million and the cash remaining was sufficient for only 90 days.[23] SG&A was excessively high at 53% of sales (compared to HP's 24%), but by 1995 DEC had reduced this to about 30% of sales. Furthermore, DEC demonstrated revenue growth of 6%, compared to IBM's figure of -7%. Bain and Company also reported that their effort was now focussed on strategy and operations rather than implementation. However, Palmer's response to this loss was to conduct another round of staff reductions.

1.2 Fortune 500 companies

The Fortune 500 data has proved to be a useful source for comparison of company performance.[24] The relative positions of competitive computer companies are shown both graphically and in tabular form in the following tables, starting in 1974, the year that DEC joined the Fortune 500 list. As can be seen, DEC moved steadily up the list, and from 1989 to 1994 was fairly stable around the high twenties (figure 3). Other companies such as Data General came and went, making little impact. Compaq overtook DEC in 1996 and moved up rapidly after the DEC takeover. DEC had overtaken HP in the mid-1980s but, by 1991, HP was once again ahead. Apple is an interesting case, as it lost position in the late 1990s and appeared to be in serious trouble, until it re-invented itself; it has since grown considerably.

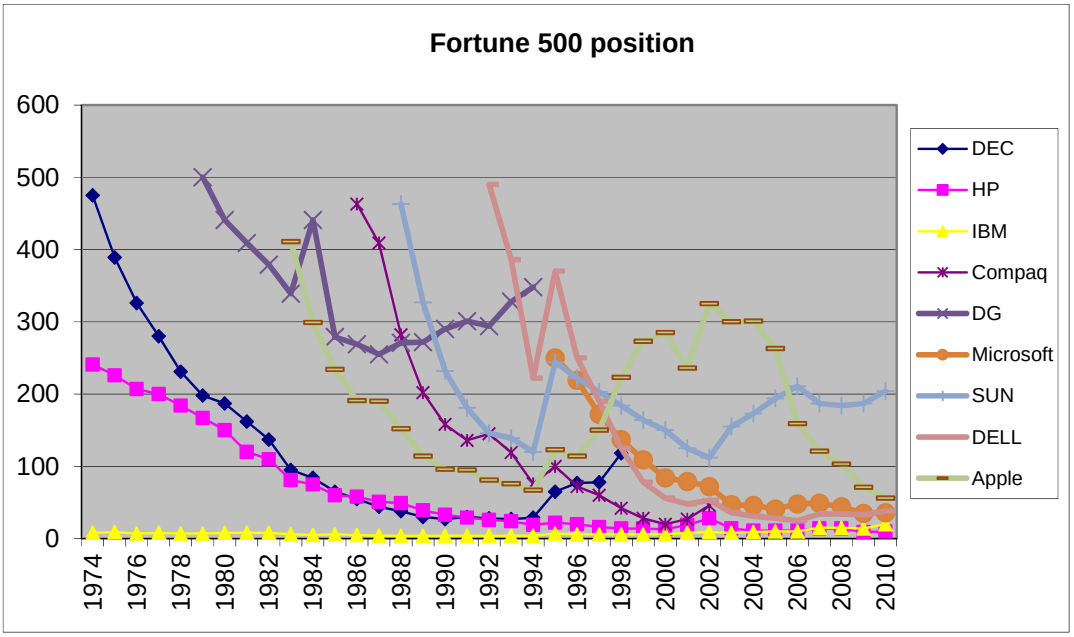


Figure 3: Fortune 500 position graphically by year.

[23] Donated to author by Kathy Hornbach of Corporate Strategy. Report untitled and undated but headed 'Corporate Strategy' and was presented to the strategy group in 1995.
[24] Data from http://money.cnn.com/magazines/fortune/fortune500 (accessed January 12, 2011).

Table 2: Fortune 500 position, by company by year.

Fortune 500

	DEC	HP	IBM	Compaq	DG	Microsoft	SUN	DELL	Apple
1974	475	241	8						
1975	389	226	9						
1976	326	207	7						
1977	280	200	8						
1978	231	184	7						
1979	198	167	7		500				
1980	187	150	8		441				
1981	162	120	8		409				
1982	137	110	8		379				
1983	95	81	6		339				411
1984	84	75	5		441				299
1985	65	60	6		279				234
1986	55	58	5	463	269				191
1987	44	51	4	409	255				190
1988	38	49	4	282	271		463		152
1989	30	39	4	202	272		327		114
1990	27	33	4	158	290		232		96
1991	30	29	4	136	301		181		95
1992	28	26	4	145	294		146	490	81
1993	27	24	4	119	328		139	386	76
1994	29	19	4	76	348		120	222	67
1995	65	22	7	100		250	244	370	123
1996	77	20	6	72		219	222	250	114
1997	78	16	6	60		172	203	190	150
1998	118	14	6	42		137	184	125	223
1999		14	6	28		109	164	78	273
2000		13	6	20		84	150	56	285
2001		19	8	27		79	125	48	236
2002		28	9	46		72	112	53	325
2003		14	8			47	155	36	300
2004		11	9			46	173	31	301
2005		11	10			41	194	28	263
2006		11	10			48	211	25	159
2007		14	15			49	187	34	121
2008		14	15			44	184	34	103
2009		9	14			35	187	33	71
2010		10	20			36	204	38	56

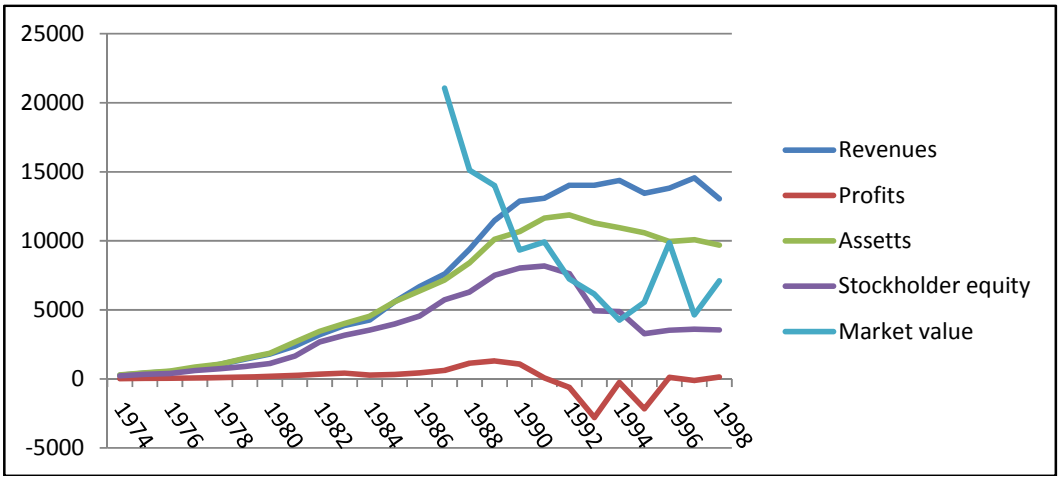


Figure 4: Fortune 500 data for DEC.

Table 3: Tabular format of Fortune 500 data for DEC.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Revenues	1058	1436	1804	2368	3198	3880	4271	5584	6686	7590	9389	11475	12866	13084	14024	14027	14371	13450	13813	14563	13046
Profits	108	142	178	250	343	417	283	328	446	617	1137	1306	1072	74	-617	-2795	-251	-2156	122	-112	141
Assetts	1070	1491	1863	2666	3456	4024	4541	5593	6368	7173	8407	10112	10667	11654	11874	11284	10950	10579	9947	10075	9692
Stockholder equity	735	904	1120	1651	2679	3164	3541	3979	4554	5727	6294	7510	8035	8181	7623	4930	4885	3279	3528	3606	3545
Market value										21056	15113	14002	9337	9916	7238	6149	4257	5555	9858	4641	7100
Employees	36000	39000	44000	5500	6300	6710	73000	85600	89000										61700	59100	54900
Earnings per share $	3.4	4.1	5.45	6.7	7.53	5	5.73	7.42	4.81	8.53	9.9	8.45	0.59	-5.08	-22.4	-1.93	-15.8	0.59	-0.97	0.68	
Return to investors %	15.9	28.4	37.9	-8.9	15	-27.6	53.8	19.6	58.1	28.9	-27	-16.6	-33	0.7	-38.9	1.5	-2.9	92.9	-43.5	2.4	

Table 4 and Figure 4 show that DEC's position as seen by shareholders was somewhat different to that reported in the SEC filings. They show that the company's market value dropped significantly from 1987, well before the profits tumbled, halving in four years and halving again over the next three. From 1990, the market value was below the asset value and, in December 1989, DEC adopted a stockholder rights plan as a 'poison pill' to ensure that no hostile takeover bid was attempted.[25] This was very important in 1995 where the market value was $3.279 billion and the asset value was $10.579 billion. The 'poison pill' clause was revoked at the 1997 stockholders' meeting, just before the Compaq takeover in

[25] Announced on DEC's internal VTX service on December 12, 1989, reproduced on Vogon News on December 29, 1989 and posted on Notesfile entry 980. Also reported in a *Los Angeles Times* article on December 12, 1989. The 'poison pill' was a mechanism of stock dilution to deter hostile takeovers. Invented in 1982, it lost favour in the early 2000s, as shareholders found it detrimental to their profits. DEC had a preferred stock plan.

1998.[26] Shareholder equity peaked in 1991 before dropping dramatically. After the four years of severe downsizing, profits began to recover slowly.

1.3 General Analysis of Company Data (1986 to 1996)

The Security and Exchange Commission filings submitted by the company and the company reports were studied and the data for the twelve years up to 1997 extracted (Tables 5 and 6). DEC's finances up to 1986 gave no real cause for concern to the board, as it was growing year on year and its products returned high margins. The market was however changing and so the senior management and the board should have been planning for this change. After 1986, DEC's financial position declined rapidly from one of high profit to negative income by 1991. DEC found it very difficult to track its costs due to its multiple interrelated product lines; costs were assigned to different groups and sales revenue was reported by more than one product line for the same sale. When Palmer introduced a commissioned sales force, the situation worsened due to lack of clarity in the commission scheme. DEC also introduced a SAP system for, amongst other things, order processing. This was a troublesome implementation in the early years, losing booked sales and sometimes shipping duplicate orders to customers.[27]

From Table 5 it is clear that DEC was in serious financial trouble by the early 1990s. Cost of sales had almost doubled in the five years from 1987. Selling and General Administration charges increased by almost three times in the same period. R&D costs increased by 75%, accounts receivable increased by 75%, the employee population increased almost 50% and working capital had halved. The balance between product sales and service revenue also altered in this period, with services becoming a much more important factor in the company's revenue stream. This was clearly a company lacking financial control. It is understandable that the board was concerned in 1992, but the problem had been building for a number of years and it could be said that its action was too late and hurried. This is considered an example of a board that was not in control of the company.

[26] The poison pill clause was revoked by the board without a vote and reported in the SEC filing of 1997. http://google.brand.edgar-online.com/EFX_dll/EDGARpro.dll?FetchFilingHTML1?ID=720756&SessionID=-2OuFv6dLSIv4p2 (accessed August 15, 2012).

[27] As reported in the Digital Notes file note number 3300,40. SAP was also blamed in part for a loss of product revenue immediately after the Compaq merger and was also an issue after HP and Compaq merged.[27]

Table **4: SEC filing data for the twelve-year period 1986 to 1997.**

TWELVE-YEAR FINANCIAL SUMMARY												
	1997	**1996**	**1995**	**1994**	**1993**	**1992**	**1991**	**1990**	**1989**	**1988**	**1987**	**1986**
(dollars in millions except per share data and stock prices)												
STATEMENTS OF OPERATIONS(1)												
Product sales	$7,197	$8,362	$7,616	$7,191	$7,588	$7,696	$8,299	$8,146	$8,190	$7,541	$6,254	$5,103
Service and other revenues	5,850	6,200	6,197	6,260	6,783	6,235	5,612	4,797	4,552	3,934	3,135	2,487
Total operating revenues	13,046	14,563	13,813	13,451	14,371	13,931	13,911	12,943	12,742	11,475	9,389	7,590
Cost of product sales, service and other revenues	8,725	9,756	9,392	8,912	8,631	8,132	7,278	6,795	6,242	5,468	4,514	4,282
Research and engineering expenses	1,014	1,062	1,040	1,301	1,530	1,754	1,649	1,614	1,525	1,306	1,010	814
Selling, general and administrative expenses(2)	3,177	3,788	3,273	5,234	4,447	6,181	5,572	4,521	3,639	3,066	2,253	1,665
Operating income/(loss)	130	-44	108	-1,996	-237	-2,136	-588	13	1,336	1,635	1,612	829
Net interest income/(expense)	-48	-24	-33	-24	13	57	68	111	85	106	77	28
Income/(loss) before income taxes and cumulative effect of changes in accounting principles	178	-68	76	-2,020	-224	-2,078	-520	124	1,421	1,741	1,689	857
Provision for income taxes	37	44	18	85	27	232	97	50	348	435	552	240
Net income/(loss)(3)	$141	$(112)	$122	$(2,156)	$(251)	$(2,796)	$(617)	$74	$1,073	$1,306	$1,137	$617
Net income/(loss) applicable per common share(3)	$.68	$(.97)	$.59	$(15.80)	$(1.93)	$(22.39)	$(5.08)	$.59	$8.45	$9.90	$8.53	$4.81
Weighted average shares outstanding (in millions)	155	152	146	137	130	125	122	125	127	132	133	131
FINANCIAL POSITION												
Inventories	$1503	$1,821	$2,054	$2,064	$1,755	$1,614	$1,595	$1,538	$1,638	$1,575	$1,453	$1,200
Accounts receivable, net of allowances	2,930	3,223	3,219	3,319	3,020	3,594	3,317	3,207	2,965	2,592	2,312	1,903
Working capital	3,035	3,188	3,026	1,832	2,964	2,015	3,777	4,332	4,501	4,516	4,377	4,223
Net property, plant and equipment	2,104	2,223	2,269	3,129	3,178	3,570	3,778	3,868	3,646	3,095	2,127	1,867
Total assets	9,693	10,075	9,947	10,580	10,950	11,284	11,875	11,655	10,668	10,112	8,407	7,173
Long-term debt	743	999	1,013	1,011	1,018	42	150	150	136	124	269	333
Stockholders' equity	3,545	3,606	3,528	3,280	4,885	4,931	7,624	8,182	8,036	7,510	6,294	5,728
Stockholders' equity per common share	21	20.62	20.89	20.24	36.19	38.58	61.18	66.76	66.12	59.47	49.87	44.54
RATIOS AND OTHER INFORMATION												
Current ratio	1.7:1	1.8:1	1.7:1	1.4:1	1.8:1	1.4:1	2.0:1	2.3:1	2.9:1	2.9:1	3.4:1	4.9:1
Quick ratio	1.3:1	1.2:1	1.1:1	.9:1	1.2:1	1.0:1	1.4:1	1.6:1	1.9:1	2.0:1	2.4:1	3.5:1
Debt/debt plus equity	22.10%	22.00%	22.50%	24.10%	17.50%	1.80%	2.20%	2.00%	2.00%	3.60%	4.20%	5.90%
Operating income/(loss) as a percentage of revenues	1.00%	-0.30%	0.80%	-14.80%	-1.70%	-15.30%	-4.20%	0.10%	10.50%	14.20%	17.20%	10.90%
Net income/(loss) as a percentage of revenues	1.10%	-0.80%	0.90%	-16.00%	-1.70%	-20.10%	-4.40%	0.60%	8.40%	11.40%	12.10%	8.10%
Return on equity	3.90%	-3.10%	3.60%	-52.80%	-5.10%	-44.50%	-7.80%	0.90%	13.80%	18.90%	18.90%	12.00%
Return on assets	1.40%	-1.10%	1.20%	-20.00%	-2.30%	-24.10%	-5.20%	0.70%	10.30%	14.10%	14.60%	9.10%
Non-U.S. revenues as a percentage of total revenues	67%	66%	65%	62%	64%	63%	60%	56%	55%	50%	47%	42%
Days sales outstanding	76	78	77	76	69	83	76	86	76	75	78	79
Number of employees at year-end	54,900	59,100	61,700	77,800	89,900	107,900	115,100	116,900	118,400	113,900	103,000	88,300
Number of shares outstanding at year-end (in millions)	151	156	150	142	135	130	130	130	130	130	130	129
Common stock yearly high and low sales prices	$ 47-25	$76-35	$49-18	$43-18	$49-30	$72-33	$87-45	$103-70	$122-86	$199-99	$174-82	$94-46

(1) Amounts may not be additive due to rounding.

(2) Includes restructuring charges of $492M in 1996, $1,206M in 1994, $1,5000M in 1992, $1,100M in 1991 and $550M in 1990. Includes reduction in carrying value of intangible assets of $310M in 1994.

(3) The cumulative effect of changes in accounting principles were: a one-time benefit of $65M, or $.44 per share, on net income and net income per share for fiscal 1995; a one-time charge of $71M, or $.51 per share, and a one-time benefit of $20M, or $.14 per share, on net loss and net loss per share for fiscal 1994; and $485M or $3.89 per share on net loss and net loss per share in fiscal 1992.

Source: SEC Info - www.secinfo.com - Fran Finnegan & Company - 950135-96-4030

Table **5: Summary of SEC filings for DEC.**

	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Product sales	5103	6254	7541	8190	8146	8299	7696	7588	7191	7616	8326
Service revenue	2487	3135	3934	4552	4797	5612	6235	6783	6260	6197	6200
Total Op Revenue	7590	9389	11475	12742	12943	13911	13931	14371	13451	13813	14563
Cost of sales	4282	4514	5468	6242	6795	7278	8132	8631	8912	9392	9756
R&D	814	1010	1306	1525	1614	1649	1754	1530	1301	1040	1062
Selling and gen admin	1665	2253	3066	3639	4521	5572	6181	4447	5234	3273	3788
Operating income	829	1612	1635	1336	13	-588	-2136	-237	-1996	108	-44
Restructuring costs					550	1100	1500		1206		492
Inventory	1200	1453	1575	1638	1538	1595	1614	1755	2064	2054	1821
Accounts receivable	1903	2312	2592	2965	3207	3317	3594	3020	3319	3219	3223
Working capital	4223	4377	4516	4501	4332	3777	2015	2964	1832	3026	3188
Property	1867	2127	3095	3646	3868	3778	3570	3178	3129	2269	2223
Total Assets	7173	8407	10112	10668	11655	11875	11284	10950	10580	9947	10075
	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Long term debt	333	269	124	136	150	150	42	1018	1011	1013	999
Employees	88300	103000	113900	118400	116900	115100	107900	89900	77800	61700	59100
Revenue per employee	85.95	91.15	100.74	107.61	110.71	120.86	129.11	159.85	172.89	223.87	246.41
Salary bill (estimated)	3127.49	3648.15	4034.21	4280.96	4226.73	4246.58	4062.18	3524.08	3112	2369.28	2955

All financial figures are $million, apart from revenue per employee, which is $thousand.

DEC had always invested heavily in R&D, but in the 1980s this level of investment became unsustainable, as DEC implemented a number of technologies that proved to be both costly and problematic. DEC's first product involving a large investment in product development was the RA90, a thin film technology disk drive and one that is often quoted by Christensen when he discusses innovation. The company then followed this up with the VAX 9000 which, according to those involved, cost between $2 billion and $4 billion to develop and took seven years.[28] Finally the Alpha chip required a great deal of investment in plant for manufacturing. All of these cost the company many billions of dollars at a time when its margins were being eroded. It took Palmer some time to gain control of the financial situation, although he did not pursue growth during this period. The R&D investment dropped significantly from 12.5% of revenue in 1992 to 7% in 1996. However, inventory peaked in 1994 due to the back filling of the channels, mainly in the PC area by Bernhard Auer, DEC's Personal Computer Business Unit VP; this strategy was to prove costly as PC sales were low. Every quarter, DEC was putting 30 to 50 per cent more PCs into the

[28] Greg Scott, Scott Consulting MBMG708 spring semester paper, 'Digital Equipment Corporation: R.I.P. or Future Lean and Mean Competitor?', 1994. ftp://ftp.infrasupport.com/demise.pdf (accessed July 4, 2012), 9; Also mentioned in an email to author from Supnik, subject: DEC history, March 9, 2008.

distributers' inventory than were being sold.[29] This was identified by Claflin, after he was recruited from IBM to replace Auer in 1995. Auer himself had been promoted by Palmer to replace Pesatori in 1994. DEC's long-term debt policy altered as soon as Palmer took over, and debt increased from $42 million to $1 billion in his first year. The effect of selling manufacturing plants can clearly be seen in the property assets, peaking at around $3.8 billion under Olsen and reducing to $2.2 billion after the cutbacks by Palmer.

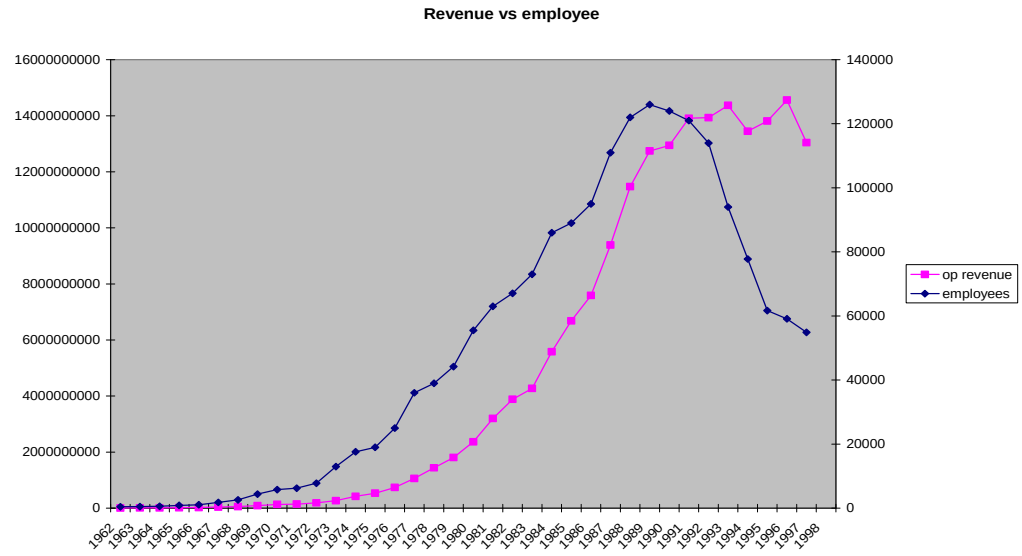
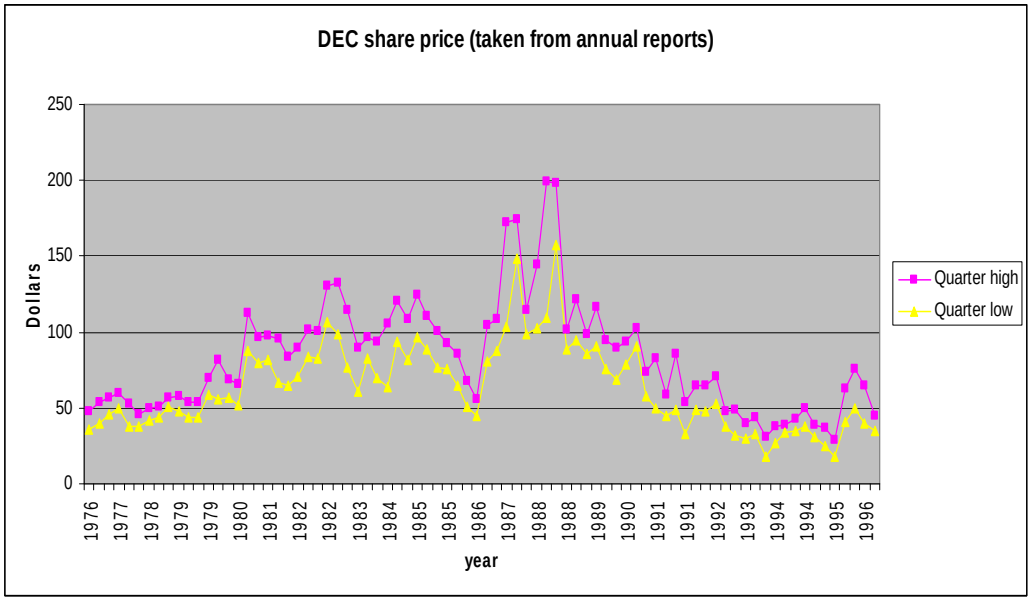


Figure 5: Revenue vs employee.



[29] Laurence Zuckerman, "For Digital's Chief, A Last Grab for Glory," *The New York Times*, May 25, 1997 (business section).

Figure 6: DEC share price by quarter.

DEC's share price dropped back to 1977 levels and revenue per employee doubled by 1997 (Figures 5 and 6).

1.4 Financial Analysis of the 1990s from the Company Reports

The following analysis is based on data from DEC's annual reports and from comments in the SEC filings.

By the 1990s, DEC had moved from a position where over 60% of its revenue was from the US to one where 66% was from overseas, bringing with it issues concerning foreign exchange fluctuations. On the technology side, it was necessary to address issues with voltage and frequency differences. Service revenue had grown during the 1980s from $2.4 billion in 1985 to around $5 billion by 1990. During the 1990s, this income was stable at around $6 billion, reflecting the move towards commodity computing and IBM's entry into the services market. Product sales dipped in the first half of the 1990s, but were increasing by 1996, bringing almost $8.5 billion to the company.

The following paragraphs are summaries of the annual company reports for the years 1990 to 1997.

In his 1990 company report, Olsen stated that 3,000 jobs were eliminated by voluntary separation, the costs of which were absorbed by the company.[30] He focused on mainframe computing and fault tolerant systems as the future. He reported on DEC's commitment to client server computing, emphasising DEC's commitment to RISC-based workstations. DEC sold over 560,000 terminals during the year and Olsen commented on DECWORLD in Boston, which included the liner Queen Elizabeth 2 as a floating hotel.[31] This, although a very costly business extravaganza, brought in sufficient business to warrant the cost. Product sales were flat due to a weakness in the US market and to customers waiting for the new high

[30] DEC company reports are available at Gordon College in the Ken Olsen archives. Many are also available at the Computer History Museum.

[31] DECWORLD was DEC's worldwide trade show, held annually in Boston. In 1990, the company hired the QE2 and based it in Boston harbour as a floating hotel for guests at the show.

end VAX 9000 that had been preannounced. Service revenue also slowed during 1990. R&D was now 12.5% of revenue, since Olsen believed that such investment was needed to maintain the company position as a leader in its field. The company tax rate was 40%. This had increased from 25% because the lack of profitability in the US made it impossible to utilise all of the foreign tax credits.

In the 1991 company report, Olsen is much less optimistic. He comments on the challenging times for the computer industry, improvements in technology and the dramatic increase in productivity. He laments the need to downsize, but comments that it is a result of the technology that DEC worked hard to develop. The company reported a loss of $617 million, mainly due to a downsizing charge of $1.1 billion. During the year, he reports that DEC shipped 330 VAX 9000 systems. In his memos, Olsen suggests that departments had been slow to downsize and had not, in many cases, delivered the numbers to which they had committed.[32]

In the 1992 company report, DEC reported a loss of $2.1 billion. This seemed disastrous for such a stable company, disturbed Wall Street and depressed the share price. However, when this is analysed, there was a $500 million charge for implementation of a new accounting standard for postretirement benefits, $1.5 billion for restructuring charges and a tax bill of almost $250 million due to profitable foreign operations, leaving what would have been a small operating profit on revenues. Also in 1992, 3,700 employees took the very generous early retirement package. DEC was losing some very valuable skills, and even though the headcount was reduced by 23,000, some poor acquisitions in Europe added a further 11,000 employees and cost the company about $500 million. These were the acquisition of the Philips and Kienzle operations, followed by the purchase of a stake in Olivetti, which was to cost $287 million in FY93. Moreover, investment in the Hudson semiconductor plant, which Palmer promoted, was to cost DEC $425 million over four years. Investment in R&D increased to 12.6% of revenue. This was Olsen's last report; he announced that Alpha was being delivered to customers and that DEC was the fastest growing personal computer company in the industry. He also talked of modular computing enabling processor and

[32] Also in internal memos held at the Ken Olsen archives. For example, Memo: June 17, 1991 From: Ken Olsen: Subject: Incompetent marketing; Memo: June 28, 1991, From: Ken Olsen, Subject: Saving Digital and Memo: August 26, 1991, From: Ken Olsen, Subject: What happened to the 1992 budget.

storage additions, when needed, which was an initiative that he began at DEC and urged Palmer to continue. Palmer subsequently discontinued modular computing research at DEC.

In the 1993 report, Palmer's first full year, it stated that SG&A expense was affected by the Philips/Kienzle acquisitions, but the tax bill was reduced to $27 million. Service margin was running at around 40%, cash reserves had increased to $1.6 billion, from $1.3 billion in the previous year, but debt was now $1.04 billion, from $42 million in 1992. Operating income showed another loss of $237 million and the company's assets totalled almost $11 billion. Palmer eliminated around 20,000 jobs in his first year, taking the employee population down to 94,000, and he reduced R&D to the equivalent competitor's investment and eliminated 3.3 million square feet of manufacturing space. He also talked of attracting professional, experienced talent to manage sales and marketing, as well as the consulting and new business divisions. Many of these personnel were ex-IBM and they were to prove problematic for the company in terms of compensation and performance.

By the 1994 report, margins were down 6% to 34%, European revenue was down, partly because of issues with the Kienzle business. In 1994, Palmer reported another restructuring charge of $1.2 billon: $679 million for separations and $527 million for plant closures. This resulted in another $2 billion loss for the company. He reported that during 1990, 1991 and 1992, DEC eliminated approximately $2.5 billion in operating expense. He also reported that the 1994 restructuring, when complete (20,000 people), should eliminate a further $1.5 billion. During the year, DEC also wrote off $194 million for Kienzle and sold Olivetti stock for $148 million ($150 million loss). Long-term debt was stable at $1 billion and cash reserves had reduced to $1.18 billion. In the 1994 company report, Palmer talked of a year of progress and frustration, removing 12,000 personnel and 5.2 million square feet of manufacturing space, eliminating DEC's inefficient matrix management system and shipping over $1 billion of Alpha systems since 1992.[33] He spoke of the move to indirect channels, and refining product and service costs, but DEC was still not in profit. In the question and answer session, there were questions about divestment and employee morale for the first time.

In his 1995 report, Palmer stated that Alpha based sales had increased to 22% of product sales, up from 13% in 1994 and 3% in 1993. Intel based sales were 26%, up from 19% in

[33] Schein talks of DEC's complex matrix management structure: Schein, *DEC Is Dead, Long Live DEC: The Lasting Legacy of Digital Equipment Corporation*. 127.

1994 and 9% in 1993. VAX revenues were 10%, down from 19% in 1994 and 34% in 1993. Margin had reduced to 32% and cash reserves were up to $1.6 billion. During the year, the Queensferry semiconductor manufacturing plant (with 530 employees) was sold for $128 million, contract manufacturing (with 700 employees) was sold for $75 million, the disk business (with 3,100 employees) was sold for $360 million, and DEC's relational database product RdB (with 250 employees) was sold for $107 million. In Palmer's letter as president in the company report, he is more optimistic after three consecutive quarters of profit. DEC's market value increased by $3 billion in 1995 and he reported that DEC was one of the few multinational companies to maintain revenue whilst downsizing. DEC eliminated a further 16,000 positions in 1995. Even though signs were appearing that DEC had turned the corner in terms of performance, Palmer continued to downsize and sell off profitable products.[34] Many DEC employees questioned whether Palmer was trying to take DEC back to a hardware company.[35]

By the 1996 report, cash reserves had increased to $1.8 billion, software development costs were running at about $100 million per year and long-term debt was still around $1 billion. Alpha-based system sales had increased to 29% of product sales, Intel sales were at 26% and VAX had reduced to 5%. Research and development costs were down to $1.1 billion from a high of $1.75 billion in 1992. Margin had stabilised at 33%, although this included a drop in services margin of 4% and an increase in product margin of 5%, representing a reduction in service income, moving towards lower-margin multivendor service offerings and increased product reliability. Learning services (with 600 employees) were sold for $80 million, although course development was kept in house. DEC still managed to post a loss of $112 million on operating revenues of $14 billion, even though employees numbered 59,000 meaning that, employee costs had halved since 1991, and margin had reduced by 15%. This was attributable to yet another restructuring charge of $500 million to cover more redundancies and plant closures. Also in 1996, AltaVista filed a registration statement with the Securities and Exchange Commission for the registration of shares in its Class A common stock in an initial public offering, the significance of which will be covered in a later chapter.

[34] Alpha sales were growing, revenue per employee was at or above industry norms, market value had increased and the company was profitable.

[35] As discerned from many Digital Notesfile entries. For example, Note 4558.x Subject: software? Not at Digital; Note 4663.x Subject: No mention of OpenVMS; and Note 4752.x Subject: Where are you leading us Bob?

In 1996 the adjusted revenue was the highest in the company's history, even after the sale of 8% of its business.

In the 1997 report, DEC once again made an operating profit but revenue was down 10%, mainly due to reduced product sales. This was due to the discontinuance of the PC consumer range and anticipated reduction in inventory as a result. Alpha sales were at 33% but this was a decrease of 4% in revenue. Intel-based sales were up to 28% due to an increase in server sales. Other products accounted for 40%, down from 52% in 1995, because of the divestment of various product lines. 1997 also saw the filing of a lawsuit against Intel alleging infringement of DEC's intellectual property in its microprocessors. This was an action that many, internally and in the media, suggested was primarily aimed at inducing Intel to purchase DEC's semiconductor manufacturing facilities.

Table 6: DEC's final SEC filing for FY98 from Edgar online.

	Three-month Period ended March 28 1998	Nine-month Period ended March 28 1998	
	---	---	
Product sales	$1,681,618	$5,080,232	Note (1): In the third quarter of fiscal 1998, Other (income)/expense, net
Service revenues	1,509,392	4,395,566	includes $26 million of interest income, $17 million of interest expense and
Total operating revenues	3,191,010	9,475,798	$237 million of net gains on divestments. In the third quarter of fiscal 1998,
Cost of product sales	1,073,646	3,226,158	approximately $223 million related to the sale of network assets were included
Service expense	1,022,201	3,002,895	in net gains on divestments. In the third quarter of fiscal 1997, Other
Research and engineering expenses	261,274	798,760	(income)/expense, net includes $30 million of interest income, $21 million of
Selling, general and administrative expenses	738,400	2,262,562	interest expense and $2 million of net gains on divestments. In the first nine
Operating income/(loss)	95,489	185,423	months of fiscal 1998, Other (income)/expense, net includes $85 million of
Other (income)/expense, net (1)	-244,791	-271,691	interest income, $69 million of interest expense and $246 million of net gains
Income/(loss) before income taxes	340,280	457,114	on divestments. In the first nine months of fiscal 1997, Other (income)/expense,
Provision for income taxes	33,457	50,400	net includes $82 million of interest income, $64 million of interest expense and
Net income/(loss)	306,823	406,714	$9 million of net gains on divestments.
Dividends on preferred stock	8,875	26,625	
Net income/(loss) applicable to common share	$297,948	$380,089	
Basic earnings/(loss) per share (2)	$2.03	$2.58	
Diluted earnings/(loss) per share (2)	$1.99	$2.54	
Weighted average common shares outstanding (2):			
Basic	146,929	147,574	
Diluted	149,398	149,617	

1998 was DEC's final year and so only 9 months of data are available. In its final SEC filing (Table 7), DEC talks of the strong US dollar having an adverse influence on revenue growth, but it was still showing a profit. In this period, DEC sold its network product business to Cabletron for $233 million and it announced a deal with Sequent to establish Digital UNIX as the leading IA-64 computing architecture. It also granted Samsung Electronics Co. Ltd. an Alpha architectural license, strengthening their existing agreement. Margin had increased to 34.3% and revenue in the US was up 8%. Windows NT server growth was 43% and UNIX AlphaServer revenue was up 11%. DEC's lawsuit against Intel had been finalised, but was not included in the filing. DEC's merger with Compaq had been announced, but had not been completed.

1.5 Financial Summary

As can be seen, DEC's financial position, although difficult, was far from critical throughout the 1990s, although Palmer had to sell assets to maintain its cash reserves. The financial markets did not agree, moving DEC's credit rating from AAA to CCC in the mid-1990s. All through the 1990s, the company had a very healthy cash balance, considerable assets and very little debt. This suggests that redundancy costs had been almost completely covered by operating profits, plant closures and divestments, without affecting DEC's overall financial position. Palmer concentrated on DEC's finances, particularly cash on hand, rather than trying to invest for growth. In spite of this lack of investment, by 1997 DEC's sales were increasing, headcount had reduced dramatically (possibly too far) and it was the leader in Microsoft technology services. This appears in contrast to the impression on Wall Street that DEC was near collapse in 1992 and Ceruzzi's statement that DEC in 1992 'was heading towards bankruptcy', although matters were approaching critical at the time.[36] Customers viewing the financial reports were reluctant to buy DEC products in the 1990s, because of concerns about DEC's position and press reports about the company. These factors, plus concerns over redundancy policy and product strategy, had led the board to consider Olsen carefully and as a result, it asked him to relinquish his position to Palmer. By 1993, DEC's SG&A percentage was running at 30.94 and cost of product sales had reached a peak of 58.83% because of the lower margins available. Revenue per employee had increased to $153,000 in 1993 (from the 1991 figure of $100,000), closing the gap on its competitors.[37]

1.6 Poor investments

DEC had always maintained a policy of holding back from investing in other companies. However, it did invest in a number from 1980 onwards and most were poor transactions, where the company lost a significant amount of money (as already indicated). Although these deals did not affect the core business, they absorbed resources and increased staff at a time when the company was in trouble. There were a number of investments that DEC could have made that would have benefitted the company, but there appeared to be a lack of corporate control. The purchase of Kienzle and Philips increased the number of employees at a time when DEC was seeking to reduce it. There were five main deals in the period that cost DEC time and money, and they were:

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[36] Ceruzzi, *A History of Modern Computing*, 306.

[37] Greg Scott, Scott Consulting MBMG708 spring semester paper, 'Digital Equipment Corporation: R.I.P. or Future Lean and Mean Competitor?', 1994. ftp://ftp.infrasupport.com/demise.pdf. (accessed July 4, 2012), 33.

1.6.1 Trilogy

In 1980 DEC had invested, as advised by Bell, in Gene Amdahl's Trilogy Company, which later became known as one of the largest failures in Silicon Valley. The company was set up to build low-cost IBM compatible mainframes. As a result of numerous failures in the technology, the firm became a technology provider, with DEC as its only customer. DEC spent another $10 million on the rights to Trilogy's interconnect and cooling technologies for use in the VAX 9000. As recorded earlier, the use of Trilogy's technology also delayed the VAX 9000. DEC lost many millions due to its involvement in Trilogy and, in 1986, the whole Trilogy design team joined DEC.

1.6.2 Olivetti

DEC tried to break into the desktop PC market in Europe by buying into Olivetti in a deal brokered by the Europe, Middle East and Africa (EMEA) management. DEC did not fully merge Olivetti PCs and DEC PCs, and had many logistical issues. It eventually cancelled the deal. The deal also included a commitment by Olivetti to sell Alpha based systems but the promised sales did not materialise. This transaction was not visible at corporate level and was executed primarily by DEC in Geneva. As mentioned in the previous chapter, this cost the company at least $150 million.

1.6.3 Philips and Kienzle

DEC bought Philips and Kienzle to gain market share in EMEA, but the plan was not well thought out and integration proved to be a problem for the company. DEC bought Kienzle to break into the legal market, which was not core to DEC's operation, and Philips was a failing operation at the time. These were EMEA management deals and money was wasted at the wrong time for DEC. Furthermore, the deal was not passed via the management in corporate headquarters. Olsen questioned the agreement in internal memos.[38] Kienzle alone cost the company $148 million in cash, with even more being spent on the ensuing redundancies.

1.6.4 MIPS

DEC had invested in MIPS, but failed to capitalise when it opted for the technology in their workstations. DEC could have taken the MIPS technology and enhanced it to meet their

[38] Memo in the Ken Olsen archives, January 6, 1992 Subject: "Keinzle and Philips".

needs. Eventually it could have taken full control of the company. DEC had been influential in the design of the MIPS chip and so it was not in fact a case of ‘not invented here’.

These few investments cost DEC over a half a billion dollars, and probably more if the personnel reduction is taken into account, and they contributed very little positive benefit to the company. It is argued that the European management must be blamed for much of this loss in its unilateral approach to the business. These were very poor investments and had the management considered the integration issues that they posed they might not have been so keen to progress. This clearly shows a lack of corporate control over major decisions.

1.7 Conclusion

In this chapter, the proposal is that DEC's financial woes were compounded by the hiring of excess personnel in the late 1980s to take on IBM. The annual cost was about $1 billion and forced the company into an expensive redundancy program. Had the excess been dealt with earlier and the VAX 9000 cancelled, there would have been no need for the losses at DEC and the loss of confidence in Wall Street. Reducing margins could have been handled had it not been for this expense. This was the beginning of an era of shareholder activism, with Wall Street focussing on companies quarter by quarter, no matter what their business required. DEC had a headline-grabbing loss in 1992, but this was not analysed closely on Wall Street. Without the pension accounting charge and the money put aside for redundancies, there was a small profit. This, it is proposed, started the on-going analysis of DEC by Wall Street. As has been shown, DEC's financial position was not as critical as many have suggested. It had large cash reserves and little debt. By 1997 it had moved back into a profitable position and was poised for growth. DEC's costs were under control and their workforce had been reduced to be comparable with its competitors. Analysis of the SEC reports has proven that the company finances had been stabilised after the large losses in 1992 and 1993, and that Palmer maintained a cash balance instead of using it to develop the company.

Appendix for Edgar H. Schein "DEC is Dead, Long Live DEC"

Berett-Koehler Publishers, San Francisco, 2003.

What happened?

Every time I meet a DEC alum that I haven't seen for a decade or two, after the moment of silence, comes the inevitable question: What happened? This book gives a fine understanding based on Ed's perspective of corporate cultures, especially Digital's. His observations, together with the various memos and reference interviews, stimulated me to elaborate, yet state simply what *I believe* happened. Hopefully it will be a guide for other companies that will be tested and judged by these same laws that govern computing.

Although I left the company in 1983, I maintained communication with Digital, including reviewing its portfolio of all of its failing startup ventures. In 1986 while leading the government's effort to build what became the Internet, I encouraged Digital to compete to build it[1]. In 1991, as an Intel consultant, I attempted to create a merger of the Alpha and Intel architectures, but unfortunately *especially for everyone connected with Intel's Itanium aka Itanic,* HP took on the role. In 1995 while keynoting the first InternetWorld conference, I made and won a *never paid* $1000 bet with Tom Richardson, Marketing Director of the Digital's Internet Business Group, working for Rose Ann Giordano, an Officer and long-time Vice President. The bet was: "DEC would come in last behind Sun, HP, and IBM in Internet product sales" despite its research lead with Web tools, products, and services including AltaVista[2]. Internet products were perfect for DEC—they had all the pieces including: servers, software and networking. However, DEC didn't understand how to organize to engage in a new market.

Clayton Christensen invariably starts his talks about his 1997 book, **The Innovator's Dilemma**, with DEC as the example of his technology observation. DEC, *or more precisely its top leaders including its ineffective board,* were found guilty of violating Moore's Law and sentenced to Compaq in 1998, and HP in 2002. The extra ordinary

[1] IBM and the University of Michigan won the first contract.

[2] An attempt was made to create a spin-off from DEC in 1995. However the spinoff failed because AltaVista was a prized asset of a financially-troubled DEC, who was in talks with Compaq. Eventually Compaq purchased DEC for $4.5 billion in June 1998. In June 1999, Compaq sold AltaVista to CMGI for $2.3 billion in cash and stock. In February 2003, CMGI sold AltaVista to Overtune for $140 million.

price shift resulting from Moore's Law was clearly known in 1975, when VAX (figure 1), was planned; furthermore this is the law that creates a new paradigm in computing about every decade! A common belief for failure was it failed "to get the PC". These explanations fail. Otherwise SUN, being tried by the same law and events in 2003 on its 21st birthday[3], would have failed to get started. HP and IBM should have floundered and died.

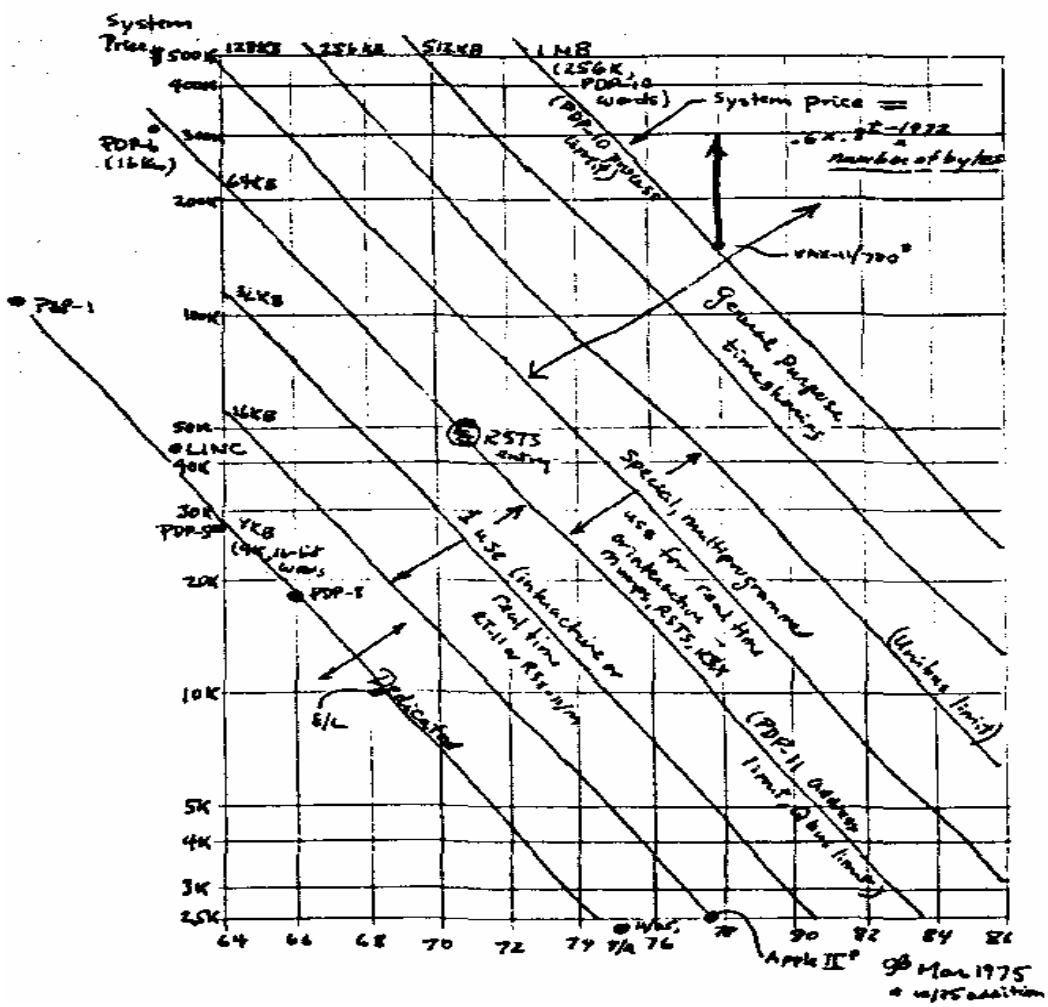


Figure 1. 1975 product planning graph showing the 1966-1986 decline of various priced computers in the VAX price and performance class.

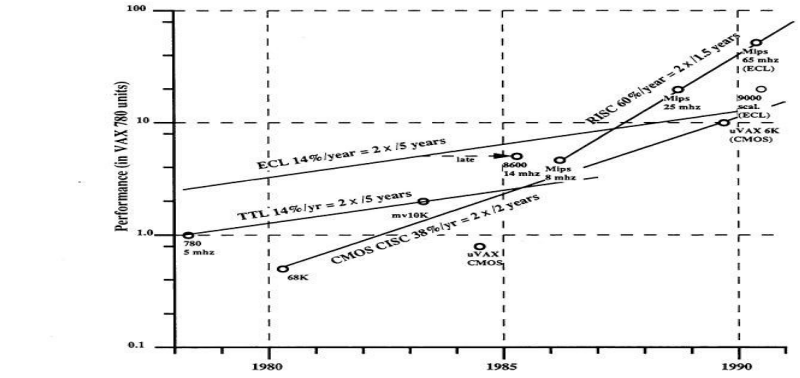
Failure was simply ignorance and incompetence on the part of DEC's top 3-5 leaders and to some degree, its ineffective board of directors that in removing Olsen made an even worse mistake in appointing Palmer. Given the DEC culture of openness, honesty, letting

[3]The reader is invited to substitute SUN, "all the wood behind one arrow", SPARC, Solaris, and the 2001 economy for DEC, VAX Strategy, VAX, VMS, and the early '90s economy to observe the outcome.

the data decide, and taking personal responsibility—this straight-forward explanation should suffice and hopefully over-ride other explanations. The data clearly supports the need to take individual responsibility for DEC's problems[4], rather than believing that it was the "events and the culture that made us do it". These leaders, lacked understanding of the nature of the computer industry in nearly every critical technology and product area:

- **Moore's Law.** In 1989 Ken demonstrated his lack of understanding that a $300 CMOS NVAX microprocessor would equal and shortly exceed the $300,000 ECL Aquarius performance. Figure 2 from 1981 shows that ECL would have a short life when I had proposed the purchase of a part of Trilogy (my 1982 optimism was a costly mistake that required killing the project). Not building an ECL computer was a clear and easy decision when the technology failed to materialize in a timely fashion. The market rejection confirmed the decision.

  As Ed shows in this book, Ken loved having many options, yet disliked killing projects implied with many options – he was too much an engineer[5]. Ken's unilateral decision to continue the project eroded the culture by going against the data and the technical community. In an earlier era, when Ken was a great CEO, data would have made such an important and costly decision—not Ken.



Notes:
Circuit Technologies
ECL = emitter coupled logic (bipolar semiconductor)
TTL = transistor-transistor logic (bipolar semiconductor)
CMOS = complementary metal oxide semiconductor (field effect)

Computer Architectures
CISC = complex (or complete) instructor-set computer
RISC = reduced instruction-set computer

Figure 2. Performance for semiconductor and processor architectures in the minicomputer class, c1981 showing the inevitability of CMOS to overtake TTL and ECL from High Tech Ventures, Bell and McNamara, Addison Wesley, 1991.

[4] When Lou Gerstner came to IBM, it was in the same relative position as when Ken Olsen resigned from Digital – demonstrating leaders are responsible for success or failures.

[5] I refuse to believe that DEC lacked the money gene! The second rule in the company beliefs after honesty, is profitability. I personally wrote a program that analyzed sensitivity to cost, price, schedule slips for all planned products that product managers ran.

- **The Hardware × Software platform, levels of integration that structure the computing industry, and the resulting costs.** Computers are built up in a layered fashion and include[6]: hardware components (e.g. microprocessor, disk), integrated hardware platform (e.g. MAC, PC, System \360), operating system (e.g. Palm O/S, Windows 2000, UNIX name/version), generic and vertical applications (e.g. Office XP, Acrobat, SAP), and finally user-specific customization, data, and content.

  Each hardware platform that hosts a specific operating system requires development, training, inventory, distribution, sales, support, customer knowledge, and *an implied commitment of eternal support*. Ken's predilection for many alternatives and to "let the customer decide" is clearly impossible to profitably support. In 1992 Digital's VAX, MIPS, PC, and Alpha hardware and various versions of UNIX amounted to 10 unique platforms. MIPS was adopted as an expensive, interim architecture, and delayed response to SUN. Cutler's Prism architecture, had been delayed two years by being reviewed to death. A subterranean version of Prism emerged from the semiconductor group as Alpha.

  By the mid 80's DEC had become a classic, well-run vertically integrated industry. By the mid-80's, the industry had become disintegrated and a completely horizontally structured industry. Digital did not need to manufacture its own disks, tapes, and especially semiconductors and microprocessors! Bob Palmer built up substantial semiconductor facilities. The make-buy policy that I posited to prevent inventing and building everything, was "Make what you sell, NOT what you buy". Alternatively, "if you make something it has to be competitive at that level of integration, otherwise buy it." DEC used its own components under a protective systems price umbrella –a classic management failure.

- **Customers buy software solutions to their problems, not hardware.** What computing customers actually buy are solutions to problems, or application tools supplied by an Independent Software Provider industry segmented by use e.g. small retailing, manufacturing. Few organizations build their tools, unless they sell them. Through a series of reorganizations, the industry marketing organization that focused on the acquisition of application software was eliminated, thereby eliminating exactly those products that customers buy. Who needs a computer that doesn't provide a solution to a problem?

- **Standards *interconnect the components of each level of integration*.** Because of the legacy and always increasing complexity of computing systems, standards are critical. Building all computing systems requires this understanding. As such, being able to invent a new standard or supply products that don't quite fit is perilous, and a culture that cannot be tolerated.

[6] Ignores the increased complexity when a database is added to a platform.

The policy I managed was: "Either make the standard, or follow the standard." If you fail to make the standard, you usually get to develop the product twice. Alpha is an expensive example. Ethernet, a DEC, Intel and Xerox-developed standard, allowed Sun to start-up and to distribute the workstation, typifies DEC's role as an industry standards setter.

While DEC is perpetually faulted for "missing" the PC, this was not the case. In 1982, when IBM, Intel, and Microsoft established the standard for the PC, DEC introduced three potential personal computers: a PDP-8 for word processing; a proprietary PDP-11 PRO (internal name, KO for knockout) unable to be cloned[7]; and an Intel 8088 that ran a version of DOS. It tried, but simply failed to establish the standard. Then it failed to follow the standards of the IBM PC once established by Intel and Microsoft, and the resulting PC industry. In 1987 Ken sent a DEC PC for me to test and use. If failed to run standard software, even though its cabling was simple and elegant. Even the cabling was "better", but incompatible. Was it arrogance or ignorance to believe that Digital could deviate from a well-established five-year old, standard?

Similar stories describe Digital's misunderstanding of exploiting its unique UNIX position.

- **Control based on comparable industry metrics.** Over time, every high-tech product protected by patents, know-how, or market position becomes a commodity. In this situation, cost structures are comparable across the industry. DEC's per employee revenue was twice as low as competitors in a horizontally integrated industry. Downsizing was long-overdue. It wasn't the economy that initially masked the lack of revenue. Where was the CFO et al?
- **Over-confidence and belief in an omnipotent and omniscient VAX Strategy.** The VAX strategy established a patent protected proprietary product and marketing plan. This worked well for a decade. However, DEC's leadership didn't update the VAX strategy to include the transition to 64-bits. Instead, they ignored the problem after Dave Cutler left[8].

  Just as bad, DEC ignored the computer industry's movement to UNIX. Ken called UNIX "snake oil," believing that the VAX operating system, VMS, was far superior technologically. Perhaps he was right—I think so, but so what. Again it failed to recognize customers wanted standards, albeit a faux and fragmented standard—not a technically superior system.

  Why did Ken and the other company leaders so love the VAX strategy even though it was counter to Ken's belief by putting all the eggs in one basket?

[7] PDP-11 microprocessors weren't available since architecture was considered to be a corporate jewel, albeit an obsolete one that needed to be exploited or face its inevitable extinction.

[8] Dave went to Microsoft and built NT. Computing is far better off because of his truly unique engineering ability.

The VAX strategy was simple and elegant because it allowed the whole company to focus in a single direction. The company didn't have to think about its direction! When proposed in 1979, it was one page, with six backup pages of tactics including those regarding IBM and Unix. The VAX strategy stated:

"Provide a set of homogeneous, distributed-computing-system products so that a user can interface, store information, and compute, without reprogramming or extra work from the following computer sizes and styles:

- via [a cluster of] large, central (mainframe) computers or networks;
- at local, shared departmental/group/team (mini) computers [and evolving to PC clusters];
- with interfaces to other manufacturers and industry standard information processing systems; and
- all interconnected via the local area Network Interconnect [Ethernet] in a single area, with the ability of interconnecting the Local Area Networks (LANs) to form Campus Area and Wide Area Networks."

Simple, elegant and it focused a multi-billion dollar company around a single architecture. DEC's leadership was hooked and it couldn't let go!

- **IBM Understanding.** In 2002, about 50% of IBM's revenue came from service. This gives IBM complete control of corporate computing environments because customers pay for IBM personnel, that lock customers into unique software and eternal support. A direct attack on this eco-system is doomed, especially based on hiring from the IBM sales organization that required an extensive and expensive infrastructure. DEC had been successful in various niche markets, e.g. R&D, manufacturing, communications as a low cost, technology platform supplier. After DEC, HP and SUN took over this role.

  In 1987, an IBM vice president told me that the VAX Strategy had really eroded their mid-range AS 400 business and was giving them heartburn in all fronts –just as we planned. Within five years while DEC hired IBM sales people who are generally unable to exist outside of the IBM environment, IBM built all the DEC marketing-sales channels, especially the third-party software providers. Unlike the "laissez-faire" era of DEC product lines, where every conceivable, often competing, channels of distribution were developed: OEMs, VARs, ISVs, System Integrators, stores, direct sales, and so forth were used. Jack Shields, who built DEC's service was in charge. Service requires absolute control and certainty. The new sales and distribution structure had to be under control and just one way.

- **Organizational complexity.** Ed Schein makes a strong point about the Digital organization. Prior to the PC, the Operations Committee had talked incessantly about divisionalizing the successful terminal business. No

consensus could be reached because the revenue of each product line contained revenue from terminals and no one was willing to give that up. In addition, Ken was fond of saying: "I don't trust anyone" *left alone without checks and balances*. Divisions implied making new, autonomous companies.

The push in engineering to simplify through autonomy was the opposite: get the organization outside of Maynard to avoid new committees and task forces that impeded progress, re-organization, new plans, and perpetual re-optimization. Disk engineering and manufacturing went to Colorado, terminals were engineered and manufactured in Taiwan, and Dave Cutler went to Redmond, Washington (as Ed discusses) in order to simplify, yet formalize communication. Overall, the Ed Schein points out the failure of the organization to scale, especially to interpret rules like "do the right thing". Rightness for: self, supervisor, colleagues, department, company, customer, or shareholders?

Failure to Act on Opportunities

Was Digital's inevitable death caused by top line failures or just errors that affected present and potential earnings?

Various analyses including this one, enumerate failures: the PC (DEC tried, but another standard was adopted and it took too long to embrace that standard. It never became a proficient supplier); having too many platforms that confused sales and customers; misallocation of resources to support a mainframe; destruction of a marketing organization and the plethora of channels of distribution; replacing one P & L responsibility dimension with three (products, market segments, and field sales); the fatal focus and direct attack on IBM; or a costly, un-sustainable semiconductor manufacturing organization[9], and so forth..

It is more positive to look at the missed opportunities that DEC's vast array of technology should have yielded to sustain and grow a technology company. DEC lead all computer companies in the transition from other technologies to custom CMOS microprocessors where the company maintained a lead (including with Intel) extending beyond 2003! In a similar vein, DEC's terminal business pre-PC included introducing one of the first laser printers—a business that HP ultimately claimed and that sustained their profits well into the early 2000s. With the introduction of the Ethernet, a communications products and

[9] Bob Palmer had been allowed to build a very large, captive facility. In spite of having not being involved in computing and never have run a successful company, his reward was becoming CEO during 1992-1998. He was successful at being acquired by Compaq and being provided with a plentiful severance package.

services division could have exploited Digital's lead in distributed computing. DEC could have exploited its position with UNIX as HP did in parallel with VMS, instead of being ambivalent and somewhat hostile.

The Long, Final Days, 1992-1998

In 1992, Ken resigned and the board appointed Bob Palmer, CEO. With no experience in computing or running a successful business, downsizing an out-of-control company was a no brainier for a semiconductor manufacturing person. Unfortunately, Bob provided no leadership[10] for the critical top line, missing the biggest computing market of all time – supplying tools to build the world-wide web (www). Palmer's severance from the acquisition by Compaq made him the first prize winner. The board came in second. Employees, customers, and stockholders all lost.

As Digital's leaders and board continued to make bad ill-informed decisions, it hired consultants and outsiders to advise and paralyze. Instead, they only needed to look inward. DEC's talented employee base did have the answers… but no one was upstairs or listening. Digital Equipment Corporation employed some of computing's brightest and motivated people who came to work to design, manufacture and market world-class products and services. Thus the greatest and fatal flaw was failing to draw on its intellectual capital.

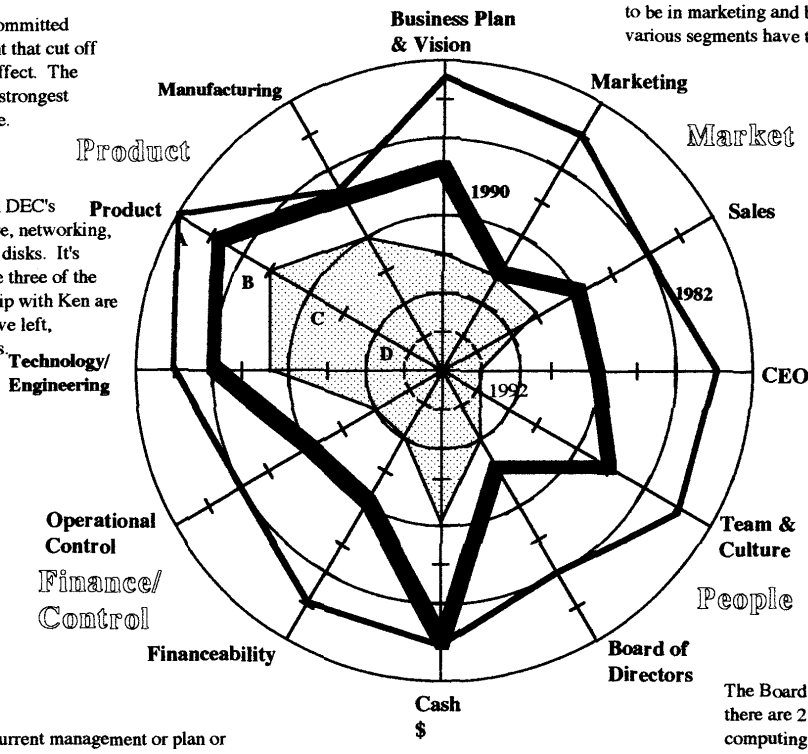
[10] A comment by a key Senior Consulting Engineer validates the board's final error: "Palmer would come to the engineering committee meetings all slicked up and sit against the wall. He never sat at the main table. He said nothing. Contributed zilch. Had no ideas. Had no vision. Had no strategy. Seemed to worry more about how he looked than what was going on. His participation was zero. Bob Palmer was no visionary charismatic leader that could have saved DEC."

Manufacturing capabilities are unclear.

What is the game plan? System integrator with networking? Bet it all on Alpha? Go back and sell MIPS too? etc. What can they really implement?

Marketing is the number two problem. They have industrial segmentation, but it's unclear where the P&L responsiblity lies. It has to be in marketing and broken up into customer segments. The various segments have to get the right applications.

Alpha is the perceived future. DEC committed suicide by its premature announcement that cut off VAX revenue to create the Osborne Effect. The UNIX and MIPS debacles have made strongest supporters very wary about their future.



Sales is nil. It needs revamping from the top. With Hughes' departure, does anyone their understand?

Engineering and technology have been DEC's past strengths, especially in architecture, networking, software, semiconductuctors and large disks. It's unclear what the situation is now, since three of the four top people who share the leadership with Ken are poor to awful. Many key engineers have left, especially in disks and semiconductors.

KHO has to go. He is probably certifiable.

Control is nil. The company is unable to do what it says it's going to do. Buying more companies has been insane when it can't manage what it has. For over a year the company operated without a CFO. The new appointment is a relatively weak DEC "old boy" that's been out of the financial organization.

The top level team is very weak and has deteriorated to only "yes" men. KHO only has people around him who know how to feed and exploit his ego. Anyone who challenges or potentially threatens him is eliminated. He has totally failed to have a successor internally.

There is no financability under the current management or plan or staff. The worst part of DEC is that it is OLD and people who could have been helpful in leading it out of the morass have either left or are completely exhausted from being part of the organization.

DEC is in dire straights as the balance sheet undoubtedly shows. The price of the stock is the best indicator of book value.

The Board is simply incompetent and should be sued. While there are 2 people that have an understanding of the computing industry, this has had no effect on their competence. The board should have acted to remove Ken and find an outside successor.

Bell-Mason Diagnostic Relational Graph With A Plot of Gordon Bell's Evaluatation of Digital Equipment Corp. 7/92

Manufacturing has never been DEC's strength as a high overhead, bureaucratic, slow-moving, conservative old boy network organization. It is slow to get products to the marketplace with a low degree of automation. Cost reduction consists of going overseas to low cost producers to buy out from Tandy. DEC will be unable to compete with Japanese producers in the future years. It had a strong Taiwan group.

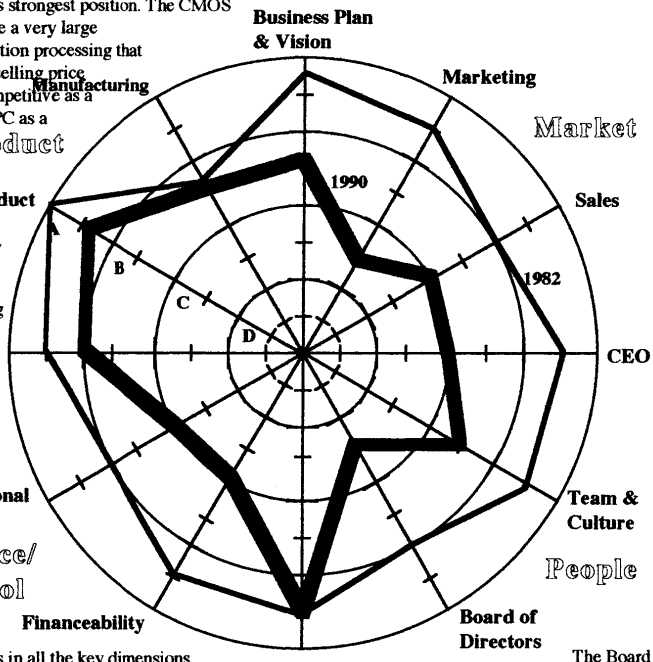
Products overall are not bad. Communication is DEC's strongest position. The CMOS VAX micros have saved DEC. DEC should have made a very large multiprocessor with 20-50 microprocessor for transaction processing that would have betat IBM, Tandem, etc. and kept higher selling price and margins. The ECL 9000 is not especially cost-competitive as a mainframe. Unlike HP, DEC failed to respond to the PC as a standard that sits on every desk.
The product flaw is there are TOO MANY!

Engineering and technology have been DEC's past strengths, especially in architecture, networking, software, semiconductuctors and large disks. The ECL 9000 took too many resources, robbing the company of potential gains elsewhere. DEC spends more on R&D than any other mfg. outside of IBM. Engineering failed to build a competitive workstation or PC, and hence is disproportionally higher than it should be. Strength in termals and low cost systems were not used to get competitive products in the PC and small server product space. DEC missed key products, technologies, and cost-reductions.

Control seems very poor... namely the company seems unable to do what it says it's going to do. The greatest source of poor control is in productivity, when it started buying more from outside and failed to downsize.

Every customer, employee, and stockholder is concerned witht DEC's strategy or Vision. Is it simply: we provide every possible platform, you choose and find the Application software?

Marketing is the number two problem. It has completely lost the communication between customer application segments (e.g. ECAD, insurance office, semiconductor manufacturer) and the product planning. As such it has no way to decide what to get for applications software or what platforms to recommend. The vast array of products with no market means the customer has to decide.



Sales is led by a non-salesman, such an organization is flawed Until DEC puts the field organization on a commission plan where the salesmen are really forced to produce, the sales folks will probably spend more time concerned about politics than customers and selling. Distribution of computing is moving from the 100K salesman. to the retail level.

KHO is clearly a legend. Recent performance is poor and he has no suitable successor. He now shares the CEO slot with someone with less stature. It is ironic that someone who failed in products and controlling manufactuing cost is COO. His failure is simply not being the CEO and seeing to it that he has a quality team and organization.

Is the top level team fundamentally weak without a representation of the marketing, sales, and a disconnect of the product builders? In the early 1980s, the Operations Committee was extremely strong. The problem then was that the team was not lead by KHO to resolve and find a product direction that would be successful in personal computing. The result, IBM walked away with it .... Compaq formed, etc. Similar stories can be told about worstations, minisupers, and RISC.

Financeability will not continue without improvements in all the key dimensions, together with a vision for the company of how it is to respond to the key exogeneous pressures: demand for commodity standards which put enormous pressure on the expense lines; lower cost systems that yield exceptional price per MIPS and do the work of yesteryear's systems that cost 10X the price.
DEC has to position itself so as to not look like a losing mini company such as DG, HP, WANG, Prime or a traditional mainframe company such as Unisys, CDC, Bull.

DEC missed 3 major market segments: PCs, Workstations, and minisupers, all of which ate into minis. It missed RISC as a technology. Betting on the company in the 1990s is unwise given the overall situartion in the market and in all other dimensions.

DEC has a healthy cash position, but this will evaporate quickly with loss.
The question is what is the true balance sheet of the company, given that an appreciable amount is in real estate and factory?

The Board is considerably weaker with the loss of General. Doriot who is probably the only person that Ken could talk with or listen to. Everett is the only board member who has an understanding of computers. Although the board members are ok,and have been connected, all are retired and are not in touch with the issues of the 1980s vis a vis computation. The average PC user (a few 10 millions of them) is in better touch with computing than the board, top level team, and the CEO.

Bell-Mason Diagnostic Relational Graph With A Plot of Gordon Bell's Evaluatation of Digital Equipment Corp. 11/90

What is the game plan? System integrator with networking? Bet it all on Alpha? Go back and sell

Manufacturing has never been DEC's strength as a high overhead, bureaucratic, slow-moving, conservative old boy network organization. It is slow to get products to the marketplace with a low degree of automation. Cost reduction consists of going overseas to low cost producers to buy out from Tandy. DEC will be unable to compete with Japanese producers in the future years. It had a strong Taiwan group.

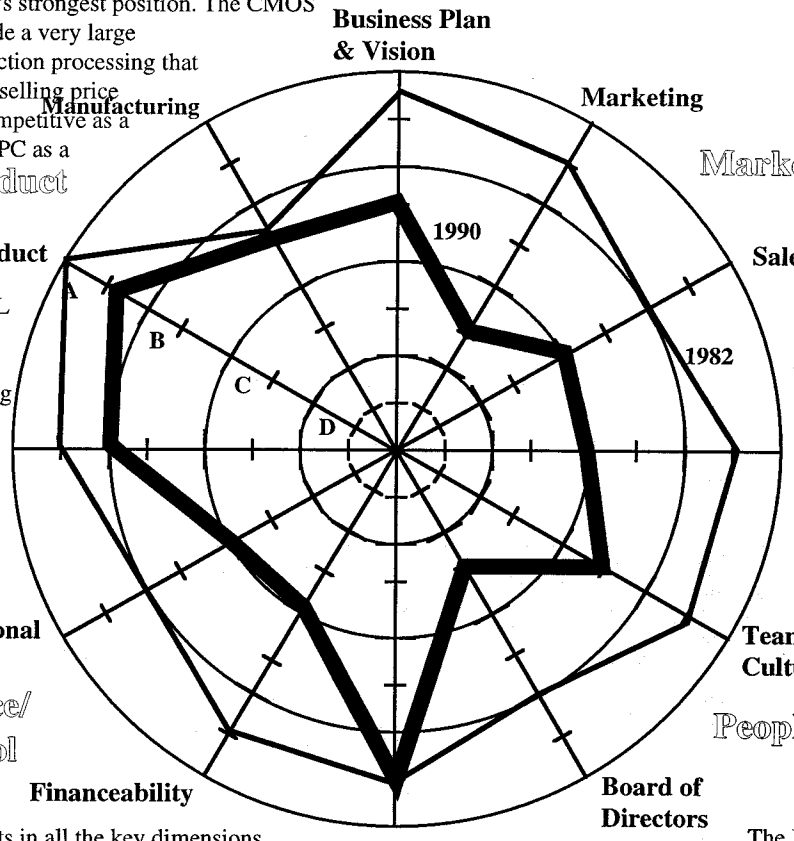
Products overall are not bad. Communication is DEC's strongest position. The CMOS VAX micros have saved DEC. DEC should have made a very large multiprocessor with 20-50 microprocessor for transaction processing that would have betat IBM, Tandem, etc. and kept higher selling price and margins. The ECL 9000 is not especially cost-competitive as a mainframe. Unlike HP, DEC failed to respond to the PC as a standard that sits on every desk.
The product flaw is there are TOO MANY!

Engineering and technology have been DEC's past strengths, especially in architecture, networking, software, semiconductuctors and large disks. The ECL 9000 took too many resources, robbing the company of potential gains elsewhere. DEC spends more on R&D than any other mfg. outside of IBM. Engineering failed to build a competitive workstation or PC, and hence is disproportionally higher than it should be. Strength in termals and low cost systems were not used to get competitive products in the PC and small server product space. DEC missed key products, technologies, and cost-reductions.

Control seems very poor... namely the company seems unable to do what it says it's going to do. The greatest source of poor control is in productivity, when it started buying more from outside and failed to downsize.

Every customer, employee, and stockholder is concerned witht DEC's strategy or Vision. Is it simply: we provide every possible platform, you choose and find the Application software?

Marketing is the number two problem. It has completely lost the communication between customer application segments (e.g. ECAD, insurance office, semiconductor manufacturer) and the product planning. As such it has no way to decide what to get for applications software or what platforms to recommend. The vast array of products with no market means the customer has to decide.



Sales is led by a non-salesman, such an organization is flawed Until DEC puts the field organization on a commission plan where the salesmen are really forced to produce, the sales folks will probably spend more time concerned about politics than customers and selling. Distribution of computing is moving from the 100K salesman. to the retail level.

KHO is clearly a legend. Recent performance is poor and he has no suitable successor. He now shares the CEO slot with someone with less stature. It is ironic that someone who failed in products and controlling manufactuing cost is COO. His failure is simply not being the CEO and seeing to it that he has a quality team and organization.

Is the top level team fundamentally weak without a representation of the marketing, sales, and a disconnect of the product builders? In the early 1980s, the Operations Committee was extremely strong. The problem then was that the team was not lead by KHO to resolve and find a product direction that would be successful in personal computing. The result, IBM walked away with it .... Compaq formed, etc. Similar stories can be told about worstations, minisupers, and RISC.

Financeability will not continue without improvements in all the key dimensions, together with a vision for the company of how it is to respond to the key exogeneous pressures: demand for commodity standards which put enormous pressure on the expense lines; lower cost systems that yield exceptional price per MIPS and do the work of yesteryear's systems that cost 10X the price.
DEC has to position itself so as to not look like a losing mini company such as DG, HP, WANG, Prime or a traditional mainframe company such as Unisys, CDC, Bull.

DEC missed 3 major market segments: PCs, Workstations, and minisupers, all of which ate into minis. It missed RISC as a technology. Betting on the company in the 1990s is unwise given the overall situartion in the market and in all other dimensions.

DEC has a healthy cash position, but this will evaporate quickly with loss.
The question is what is the true balance sheet of the company, given that an appreciable amount is in real estate and factory?

The Board is considerably weaker with the loss of General. Doriot who is probably the only person that Ken could talk with or listen to. Everett is the only board member who has an understanding of computers. Although the board members are ok,and have been connected, all are retired and are not in touch with the issues of the 1980s vis a vis computation. The average PC user (a few 10 millions of them) is in better touch with computing than the board, top level team, and the CEO.

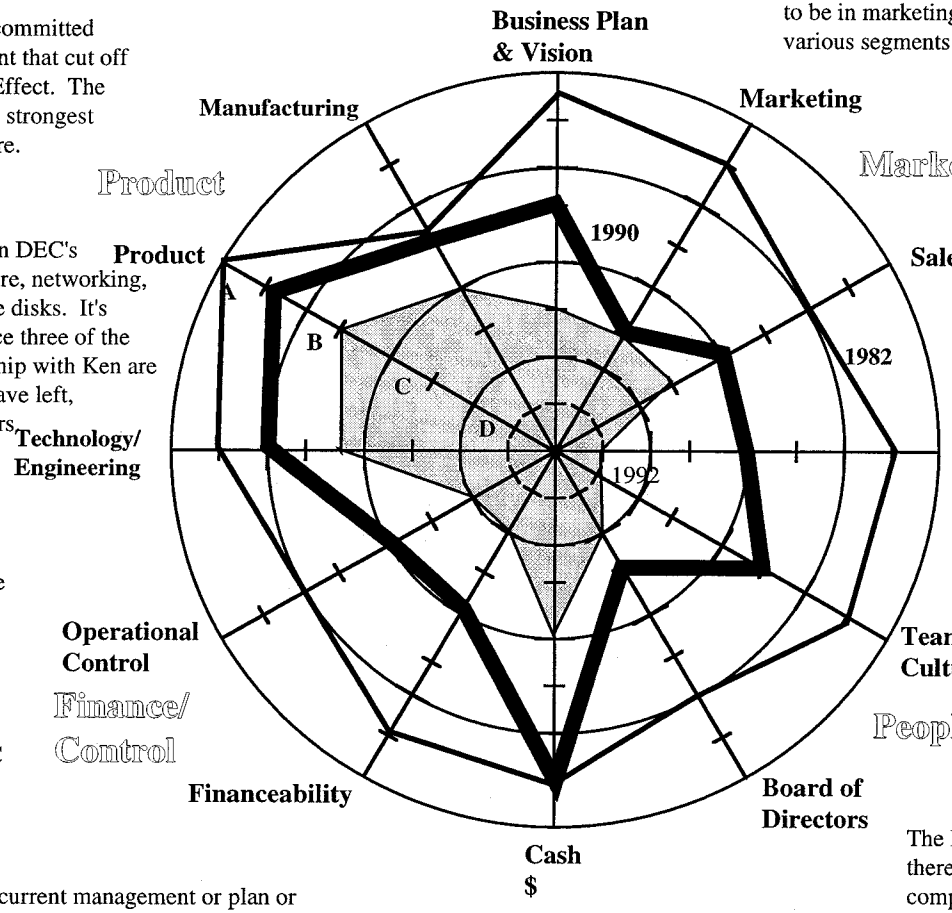
Bell-Mason Diagnostic Relational Graph With A Plot of Gordon Bell's Evaluatation of Digital Equipment Corp. 11/90

Manufacturing capabilities are unclear.

What is the game plan? System integrator with networking? Bet it all on Alpha? Go back and sell MIPS too? etc. What can they really implement?

Marketing is the number two problem. They have industrial segmentation, but it's unclear where the P&L responsiblity lies. It has to be in marketing and broken up into customer segments. The various segments have to get the right applications.

Alpha is the perceived future. DEC committed suicide by its premature announcement that cut off VAX revenue to create the Osborne Effect. The UNIX and MIPS debacles have made strongest supporters very wary about their future.



Sales is nil. It needs revamping from the top. With Hughes' departure, does anyone their understand?

Engineering and technology have been DEC's past strengths, especially in architecture, networking, software, semiconductuctors and large disks. It's unclear what the situation is now, since three of the four top people who share the leadership with Ken are poor to awful. Many key engineers have left, especially in disks and semiconductors.

KHO has to go. He is probably certifiable.

The top level team is very weak and has deteriorated to only "yes" men. KHO only has people around him who know how to feed and exploit his ego. Anyone who challenges or potentially threatens him is eliminated. He has totally failed to have a successor internally.

Control is nil. The company is unable to do what it says it's going to do. Buying more companies has been insane when it can't manage what it has. For over a year the company operated without a CFO. The new appointment is a relatively weak DEC "old boy" that's been out of the financial organization.

The Board is simply incompetent and should be sued. While there are 2 people that have an understanding of the computing industry, this has had no effect on their competence. The board should have acted to remove Ken and find an outside successor.

There is no financability under the current management or plan or staff. The worst part of DEC is that it is OLD and people who could have been helpful in leading it out of the morass have either left or are completely exhausted from being part of the organization.

DEC is in dire straights as the balance sheet undoubtedly shows. The price of the stock is the best indicator of book value.

Bell-Mason Diagnostic Relational Graph With A Plot of Gordon Bell's Evaluatation of Digital Equipment Corp. 7/92

What Does a Technology Company Look Like? (A look at Microsoft and Digital aka DEC)

Gordon Bell

Microsoft Bay Area Center Research

Three parts

- Observations on high tech organization cultures based on my experience at Digital aka DEC, Microsoft, and various high tech startups
  - Is it scalable?
  - Built productively on appropriate technology?
  - Increase your platform & Technology Balance Sheet?
- Where will technology e.g for *Telepresence* and Convergys be in a decade? (Recall 1993.)
- What can you do to exploit the options that technology provides to generate new business?

Microsoft Secrets

Cusumano and Selby

1. Organizing and managing the company
   - Find smart people who know technology & business Hiring pool, interviews, turn-over…
2. Managing creative people and technical skills
   - Small teams, overlapping functional specialists
3. Compete with products and standards *NOT brand Bodies!*
   - Pioneer and orchestrate mass markets… try many
4. Defining products and development processes
   - Focus creativity on evolution and fixing resources
5. Develop and ship products
   - Do it in parallel, synchronize and stabilize
6. Build a learning organization
   - Improve through continuous self-critiquing, feedback, and sharing
7. Attack the future… *be or be in, the mainstream*
8. *Be first, be lucky, grow rapidly, maintain high, motivational stock price*

Microsoft

- Product and process. Architecture for // development
- HBR Article: Architecture, interfaces, int/ext developers
  - Growing, increasingly valuable platform
- Small teams, interconnect with sync
- One development site w/ research. Large capital expenditures.
- Common language. Common development environment. …whole company tests (we eat our own dog food)
- No single point of developer failure
- Managers who create technology, make technical decisions
- Quick decision making re. business etc. issues
- Feedback from users…e.g. *Do you want to send this to MS?*
- Learn from the past…v3 is great
- *Try things, don't give up…* be prepared to fail vod, webtv, …
- *An understanding and appreciation for the individual… stock*
- Research!

DEC Cultural Beliefs (Ed Schein ms.) unconscious, shared, tacit assumptions

1. “Rational & Active Problem Solving”
2. Giving People Freedom Will Make Them Responsible
3. Responsibility means Being on Top of One’s Job, and owning one’s own Problems. (He who plans, does.)
4. “Truth through Conflict” and “Buy-In”
5. Internal Competition and “Let the Market Decide”
6. Management by Passion, but Work should be Fun and Enjoyable. Benign Manipulation or Controlled Chaos
7. Perpetual Learning
8. Loyalty and Life Time Employment
9. *Moral commitment to customers*

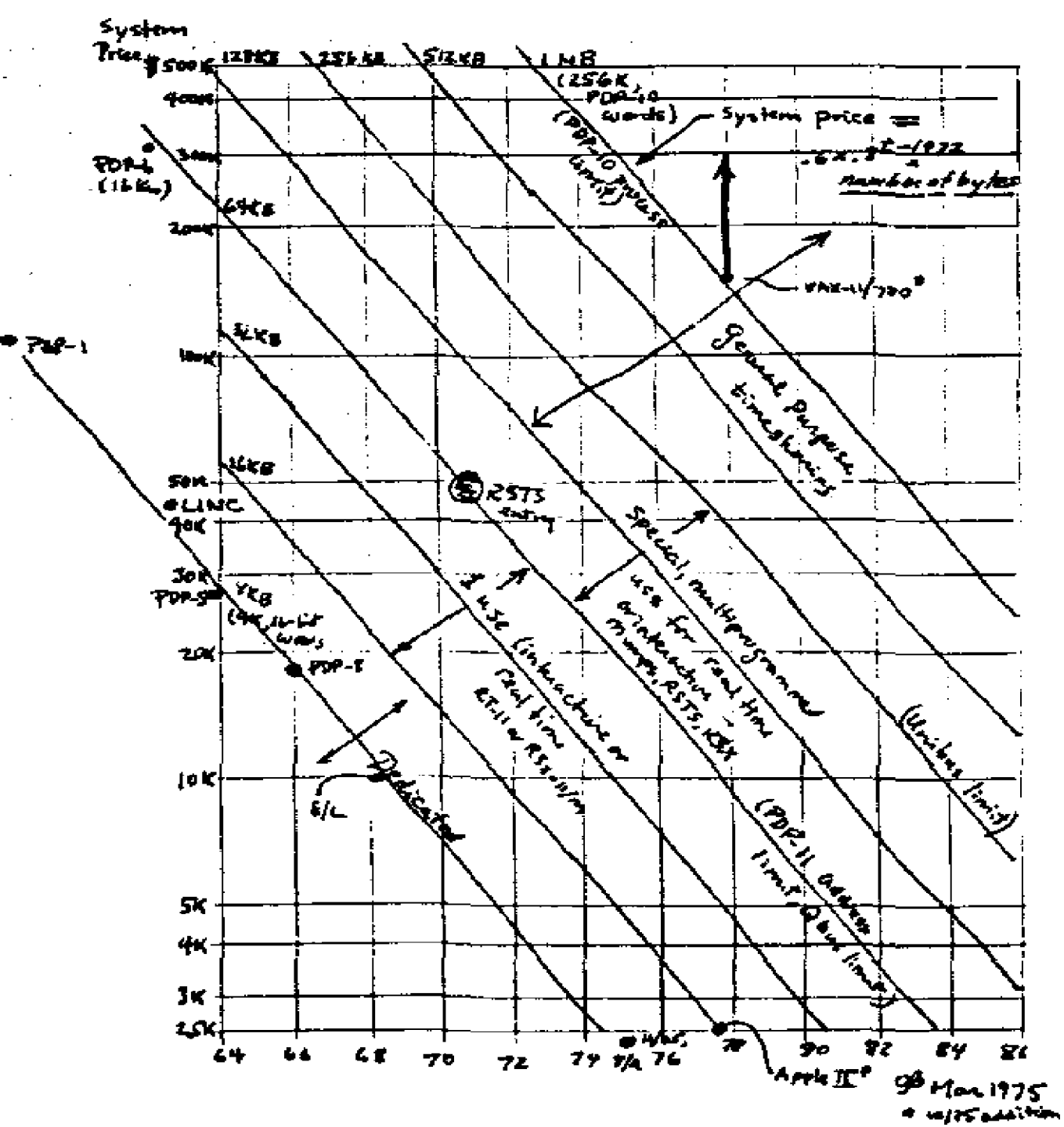
Digital-gb 1

- **Great responsibility, freedom, and trust in the individual.**
  - **“Do the right thing.” Open door-email. *Scalability is a problem.***
  - **Paternalistic organization.**
- **“He who proposes, does.” Very little was top-down**
  - **Product managers are part of the product (conflict at low level)**
  - **Small, responsible teams. Make their own schedules.**
  - **CDC: Cray left, machines obsolete, ETA had no legacy, Price (CE0) thought top decides, bottom executes**
- **Conflict is good. Came from starting from M.I.T. Data decides**
- **OK to have competing and overlapping technology/projects/products, *but know when to cut them! When DEC started down, it had almost 10 platforms***

Digital gb-2

- **Focus on Customer. Let them decide the strategy.**
- **Profit is essential …all products were measured**
- **“Either make the standard or follow it, if you fail to make the standard you get to do it twice.” IBM PC versus 3**
- **“Make what you can sell, not what you can buy.” Therefore: sell everything you make.” semi**
- **Wilkes: “Stay in the mainstream”… SOS, ECL**
- **Beware of complex structures. Buyer-seller relationships versus matrix**

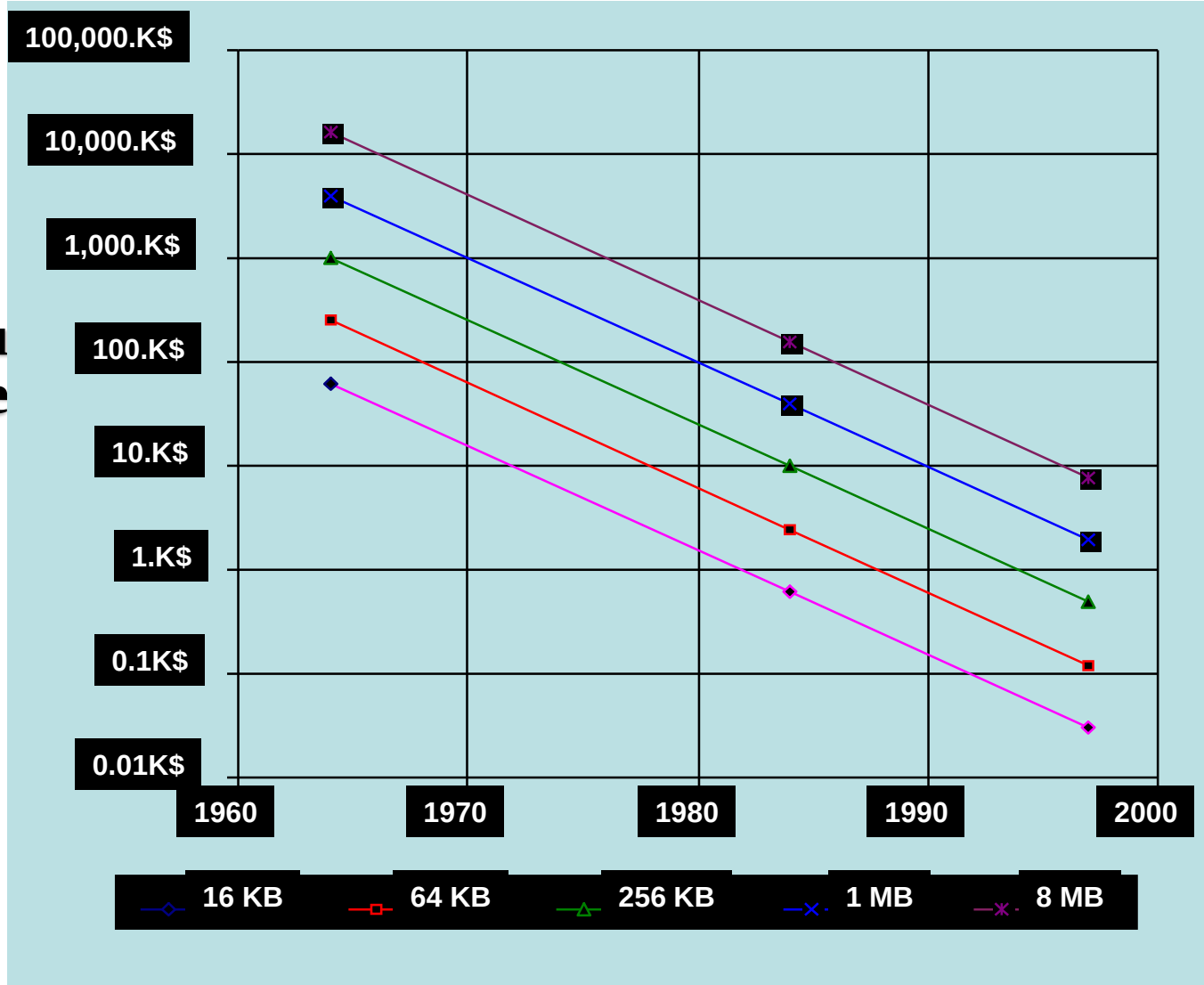
VAX Planning Model



Gordon Bell's 1975 VAX Planning Model... I Didn't Believe It!

System Price = 5 x 3 x .04 x memory size/ 1.26 $^{(t-1972)}$ K$

- **5x: Memory is 20% of cost**
  3x: DEC marku
  .04x: $ per byte
- **Didn't believe: the projection $500 machine**
- **Couldn't comprehend implications**



Why did Digital fail

- **The top 3-5 execs didn't understand computing**
  - Moore's Law, Standards and their effect
  - Platforms and their support
  - Levels of integration, make-buy, and ISVs
  - Competitor metrics: simply got "out of control"
- Destroyed their marketing organization, requiring a complex matrixed organization, but lacking ISVs
- Didn't exploit: printing (e.g. HP), networking (e.g. Cisco), the Web, and UNIX
- Did: ECL mainframe, non-compatible PC, too many platforms, semi-fabs…

(tradeoffs)

Problems in Decision-making

GB 9 May 72

We are significantly Market driven (via PSG's, MKters, etc.).
As we get larger, it is harder to Recover from poor MKT-based (Persons) ~~Dora~~ Recommendations vs. Tech. risk.

Examples:

→ Don't write-down Goals, etc. hence instability
→ Don't move out far enough (mP)
→ Don't understand new mkt. (LSI-11)
→ Don't understand systems we'll sell (eg. size on 11/70)
→ Don't understand changing mkt. (optimize R~R vs. Real Performance).
→ "MILL Around", No Clear decision/Test (CIS).
→ Overall the developers want to be heros ... i.e. building anything is OK. and avoids risk of Project Cancel. (eg. Unicorn)
→ Don't understand risk of a fully peopled company. Mfg. ... F/s. — hence minimum product cost, max. user (etc.) Cost.

Problems in decision making

****
* d i g i t a l *
****

TO: ENG STAFF:
JACK SMITH

DATE: MON 15 FEB 1982 6:55 AM EST
FROM: GORDON BELL
DEPT: ENG STAFF
EXT: 223-2236
LOC/MAIL STOP: ML12-1/A51

SUBJECT: TASK FORCES, COMMITTEES; NOD; C-I T/F; PRODUCTIVITY REV.

I just read the minutes of two meetings of a task force called Customer Installability. It is not a task force it is a sewing circle consisting of 21 people! If there weren't 3 people there who I know have real work to do and have done good work, I would ask that we simply dismiss the whole group.

The minutes contain no real information on the subject. We already have a spec on what CI is, and we have to do some work on products to get it. This is not the work of a committee.

My point, I would like you to come forward with a list of the various committees and task forces, etc that are working within your group during the productivity review. I don't want to look at them, but I expect you to have, and I want to know that you understand what's going on in your area.

I believe 1/2 of these people could be let go from DEC today and our productivity would take a sharp rise. If this is the case, I would like to have their names and since we have the reputation for never firing anyone we can put them in a new group I propose we start called NOD (No Output Division) where they won't take time from people who have real work to do.
PS
I'm quite serious about NOD. Since it is so difficult to get rid of people, I want to make us at least not have them mixed in with the workers and suck up good people's time.

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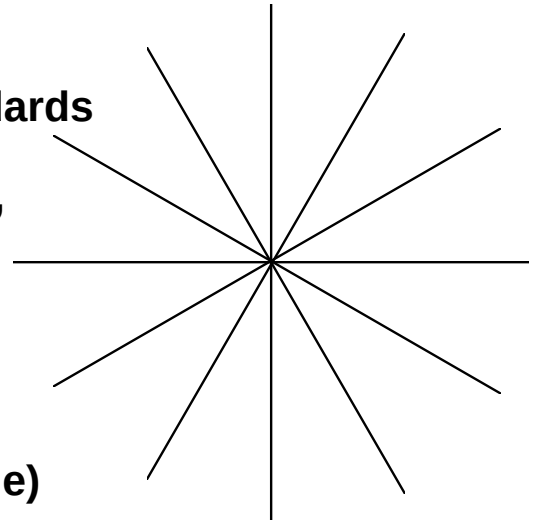
NOD: No Output Division

The Technology Balance Sheet



Plan with: Schedule of Milestones & Resources

Eng. Specs:
User view (e.g., data sheets, manuals) and Features, Functions, Benefit (FFB)
Eng. view (e.g., product structure, how to design)

Quality Design Methods/Processes

External (industry), internal, & other standards

Manufacturing Specs. (i.e. How to Produce Product)

Indigenous (i.e., skills,tools, & technical know how) & exogenous technology base (e.g., patents)

Chief Technical Officer (Eng. VP)

Operational Management (ability to fulfil plans-specs, resources, schedule)

Team, Product Architect, Engineering Culture

Technology Advisory Board

Technology Future -- Financeability

$s (Cash / Budget)

The End

F.C. Crawford. 10 Things I learned About Mgmt (Thompson → TRW)

Watch out!!

1. Always run your business lean and hungry. Benjamin Franklin said it best: There is no cure for affluence. Small businesses struggle, grow and become rich. Management then looks around and starts thinking, "We can get mahogany desks now. We can raise the ceiling on expense accounts now." It's human nature, but bad business. There's a saying: A businessman should always remember that someone, somewhere, is making a product that will make his product obsolete. Always assume that there's a disaster around the corner. Look askance at every fancy expense that doesn't contribute to your business. Seemingly invincible businesses do fail. Consider the list of the top twenty-five industrial corporations in 1900: only two on that list enjoy that status today. Business leaders must remember that corporations are expendable and that success is at best an impermanent phenomenon.

2. Never depend on luck in business; prepare to win, whatever happens. Most good business decisions result not from luck, but from getting the facts and having the foresight to plan well.

For example, at one point Thompson Products was very dependent on the aircraft-valve market. Aircraft designers began specifying a new kind of valve, a sleeve valve, that we didn't make. So it was clear we had to jump into the sleeve-valve business. We discovered that the technology for producing sleeve valves was very similar to the technology for truck cylinders. Aha—two markets for the price of one, we thought. So we began to make truck cylinders, partly to learn how to make sleeve valves. When World War II broke out, the sleeve-valve business virtually disappeared. But by then we had a thriving truck-cylinder business. No matter which way the situation went, we were covered. It's remarkable—the more attention you pay to details at work, the more luck you seem to have.

3. Education and intelligence are not synonymous with good judgment. You need common sense more than brilliance or college degrees to be a good manager. I believe in the Persian proverb: One pound of learning requires ten pounds of common sense to apply it.

4. Every company reflects the character and personality of its leader. If the CEO is an inventor, everybody in the company is inventing things. If the CEO is frugal, subordinates mind their budgets. If the CEO has integrity, the company has integrity. People take their cues from the top person; he or she explicitly and implicitly sets the tone for the organization.

5. People with ideas are the people who build a business. Cherish them. Remember that creative people are generally the most sensitive. When they offer ideas that you must reject, don't do it heavy-handedly. Creative people often leave companies because management is forever trampling on their ideas.

When our creative people would submit a proposal about which I wasn't enthusiastic, I took pains not to shoot it down immediately. I would think, "Well, maybe they've got something here. It's better to let them run with their idea; maybe they'll make a mistake, but let them run with it." Deming's message?

6. The gulf between management and labor is often unnecessarily wide. To bridge it, management must gain the trust of the worker. Management almost reflexively thinks that workers want higher pay and less work. But that's not so. Basically, workers have three concerns. The first concern is job security, especially in these tough times. Their second concern is to feel needed, to know they are members of a team. Employees' third concern is money, the desire to receive the best salaries available, consistent with the other two concerns.

So once you know these concerns, it makes sense to communicate in terms of these concerns. For example, talking to workers about productivity per se won't be effective, but talking to them about productivity in terms of their job security might. Put yourself in their places. It sounds oversimplified, but interest in people does solve problems. Chief executives should get the message out that every supervisor should take a genuine interest in his own people. In the end, the Golden Rule and communication are the keys to labor harmony.

7. Strive to produce new developments rather than commodities. There are only two types of products: new developments and commodities. A new development—something innovative that provides an exclusive benefit—is what makes a company highly profitable. A commodity is a product that has marketing features that can be applied equally to a competing product. Steel, for instance, is by and large a commodity now; a major domestic producer can't obtain a higher price for its steel than a Japanese producer can. Clearly, it pays to strike out on new paths rather than travel the traditional routes.

8. As a good management exercise, imagine that you've been fired and replaced by a new CEO. Imagine you go across the street, rent a second-story room and observe what the new CEO is doing. Upon observing, you'll find yourself saying, "I could have done that. The new guy isn't doing anything that I couldn't have done." Then, do it yourself. I don't know of a better way of assessing the state of your business.

9. Average Americans, teaming up under inspirational leadership, rise above the average. Management's chief job is to provide that inspirational leadership. I like to think I never gave an order in my life. I can't ever remember telling a manager, "Now, you do it this way." Instead, I might say, "If I were doing it, I would do it this way. But my way may not be the only way." Too many top-level executives lose sight of the fact that there isn't just one right way of doing something.

10. Cultivate a sense of urgency. Invariably, it's better to do something—even if it proves to be not the best possible thing—than to do nothing at all. Every action you take will have its trade-offs; perfection is for the gods of Olympus, not for CEOs. But do something. When you don't instill a sense of urgency, lethargy tends to spread in the organization.