Place in DEC Archives

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December 7, 1989

Mr. Winston R. Hindle, Jr.
Senior Vice President - Corporate Operations
Digital Equipment Corporation
146 Main Street, ML012-1/A53
Maynard, MA 01754-2571

Dear Win:

The enclosed items were in Dorothy Rowe's apartment. She would want them in the Digital Equipment Corporation's confidential archives.

Best regards.

Sincerely,

Richard J. Testa

2RJT7008/1.AB4
Encs: 1. ARD Report d. 7/10/57
2. Forrester Report d. 12/10/62

Box 4
DEC Personal 1

CONFIDENTIAL

July 10, 1957

DIGITAL COMPUTER CORPORATION

Boston, Massachusetts

I. PROPOSAL

It is proposed that American Research and Development Corporation finance the organization of a new company tentatively named Digital Computer Corporation which initially will manufacture and sell transistorized digital building block units used by manufacturers and operators of digital computing equipment in developing and testing digital circuitry and components. At a later date, it is anticipated that Digital Computer Corporation will expand its activities to include the manufacture and sale of related accessory items such as precision low voltage power supplies and specialized computer terminal equipment. Eventually the company should be in a position to develop and produce speccialized digital systems.

Management for this proposed endeavor initially will be provided primarily by Mr. Kenneth H. Olsen and Mr. Harlan E. Anderson, two young technologists currently associated with the M.I.T. Lincoln Laboratory. In the near future, however, it is anticipated that a third management member will be brought into the proposed new company to help manage its business affairs. Messrs. Olsen and Anderson are outstanding scientists in this rapidly growing new technological field but they have never before been responsible for a business operation.

A significant but quantitatively undefined market exists for the products of the proposed new company. There is little direct competition at the present time but the rapid development of digital technology suggests that keen competition can be expected in the near future.

It is recommended that $250,000 be made available by ARD to the proposed new company with $100,000 of this amount to be invested at this time, $70,000 in 70,000 shares of $1 par value common stock representing 70% of the equity and $30,000 in a 6% 10-year subordinated note. When and if needed and approved by American Research, the additional $150,000 would be made available to Digital Computer Corporation in units of $25,000 in the form of 6% subordinated notes with no additional equity consideration. 20,000 shares of $1 par value common stock representing 20% of the equity would be given Messrs. Olsen and Anderson in recognition of their technological contributions to the new company and 10,000 shares representing 10% of the equity would be authorized but retained by the company treasury to attract future management talent.

It is recommended that the American Research Board of Directors authorize the organization and financing of Digital Computers Corporation as outlined above, subject to further detailed investigation and consideration by its Executive Committee.

II. DESCRIPTION OF PROPOSED NEW COMPANY

Digital Computer Corporation will be organized to commercialize certain new digital techniques which have been developed primarily at the M.I.T. Lincoln Laboratory. These techniques are based upon the utilization of transistorized circuits and magnetic core circuits which have been perfected and tested at a cost of several hundred thousand dollars in Government research funds. Initially the company will exploit these techniques by manufacturing and selling digital building block units. These units are small "electronic black boxes" which generate test signals that are fed into components and circuits of digital computing systems to test the behavior and reliability of these systems. Similar digital building block units are utilized to receive test signals from such equipment to permit interpretation of its behavior and reliability. By plugging together various combinations of digital building block units, simplified special purpose digital computing systems can be rapidly constructed which are useful to engineers and scientists in developing improved systems of logic for large general purpose computers. Most computer engineers utilize these units in their development work and most computer manufacturers routinely purchase them in quantities of five to twenty units per creative engineer.

About eight years ago a line of vacuum tube digital building block units was developed at M.I.T. Lincoln Laboratory and subsequently was exploited commercially by the Burroughs Corporation. These units have been widely used and have played a significant role in many developments in the general purpose computer field during subsequent years. However, the uses of this vacuum tube equipment generally have been limited to small special purpose systems because of its large size, large power requirements, inherent limited scope of performance, large heat output, and comparative unreliability of vacuum tube circuits.

With the development of transistorized circuitry for general purpose computers at M.I.T. Lincoln Laboratory in recent years, a line of transistorized digital building block units has been developed to complement the Burroughs vacuum tube units and eventually to replace them. These new transistorized units have many advantages including greater reliability, higher speed, increased versatility, smaller size, lower cost, lower power requirements, and a substantial reduction in air conditioning requirements to dissipate the heat produced by vacuum tubes. These units currently are in the final stages of design at M.I.T. Lincoln Laboratory and are believed to be superior to any competitive products now commercially available.

After its program is under way on digital building block units, Digital Computer Corporation plans to introduce certain specialized items of computer terminal equipment and a line of precision low voltage power supplies used to provide the electrical power needed to operate the digital building block units. These items are reasonable accessory products in view of the fundamentally interdependence of the units. Subsequently, Digital Computer Corporation also plans to broaden its activities to include the development, manufacture and sale of special digital systems. The prospects for the company in this latter field cannot be clearly foreseen at this time but this

area appears to offer great promise after Digital Computer Corporation has established its "bread and butter" line of business.

It is proposed that Digital Computer Corporation be organized in September, 1957 after the technical leaders of the company, Messrs. Olsen and Anderson, resign their present positions at M.I.T. Lincoln Laboratory. The company will initially operate our of American Research's office but very shortly thereafter will set itself up in small manufacturing facilities somewhere in the greater Boston area. About three months will be required to procure essential components and construct prototype models of the new digital building block units and obtain initial orders, and perhaps an additional three months will be required to secure significant market acceptance. Thereafter, manufacturing operations will be expanded as necessary to meet market demand.

Sales will be carried out through manufacturers representatives who will be retained throughout the United States. At first, however, most of the direct sales effort will come from the founders of the company who already know where sales can be made.

III. MANAGEMENT PERSONNEL

In addition to the fact that the field of digital computers is a rapidly growing area of technical activity, American Research is encouraged to propose the organization of Digital Computer Corporation because of its regard for the two scientific founders of the company. Both are competent young men who appear to possess the personal characteristics required to successfully undertake the difficult task of organizing a new technological company in a competitive field.

The founders, Kenneth H. Olsen and Harlan E. Anderson, occupy resonsible positions at M.I.T. Lincoln Laboratory developing modern digital techniques. They have had direct personal responsibility for the spending of several hundred thousand dollars of Government funds in the development of new digital technology and have administered moderately large technical groups in this endeavor. Both are eminently qualified on the basis of their education and technical experience although neither has yet had the opportunity of participating significantly in matters of general business administration.

These men have worked together at M.I.T. Lincoln Laboratory for over five years and, in addition to technological development work, have done cost estimating, manpower estimating, and internal scheduling for projects at M.I.T. Lincoln Laboratory and for a large prime contract held by IBM. Their experience includes the application of digital techniques (including computer programming) to many types of military problems. They have participated in studies of the economic feasibility of various applications of digital computers and have performed liaison work (i.e. selling) on behalf of M.I.T. Lincoln Laboratory with several military organizations and major aircraft companies.

Kenneth H. Olsen is 31 years old, married, and the father of two children. He holds BS and MS degrees in Electrical Engineering from M.I.T. During the War he attended the U.S. Navy radar school and served approximately one year

on active duty in the fleet. Before that he studied machine shop practice and worked in a tool shop.

Since graduating from M.I.T., Mr. Olsen has worked exclusively at M.I.T. Lincoln Laboratory and its predecessor, the M.I.T. Digital Computer Laboratory. His MS thesis, which was done at the M.I.T. Digital Computer Laboratory, played a key part in the initial practical demonstration of magnetic core memory. The circuits and techniques which he developed at that time now are commonly used in many large general purpose computers.

In 1952 Mr. Olsen was assigned full responsibility for designing and building the Lincoln Memory Test Computer. With a group of eight engineers and ten technicians, this 3500 vacuum tube computer was completed in 11 months-- an amazingly short period of time. This computer currently is operated 24 hours per day and is believed to be the fastest computer in routine operation.

During 1954 Mr. Olsen was in residence at the manufacturing plant of IBM as the M.I.T. Lincoln Laboratory representative and the U. S. Air Force quality control engineer during the manufacture of the first SAGE computer. He returned to M.I.T. Lincoln Laboratory in 1955 where he organized a group of technologists to initiate the development and construction of a new computer using transistors rather than vacuum tubes. This work resulted in the development of the techniques and technology which Mr. Olsen now proposes to commercialize in Digital Computer Corporation.

Harlan E. Anderson is 27 years old, married, and the father of two children. He was born and raised in the Mid-West where he attended the University of Illinois, receiving a BS degree in Engineering Physics in 1951 and an MS degree in Physics in 1952. He then joined the staff of the M.I.T. Digital Computer Laboratory which subsequently became part of M.I.T. Lincoln Laboratory.

Initially Mr. Anderson worked under the direction of Mr. Olsen on the logical design of a high speed digital computer used to test the new magnetic core memory subsequently adopted for the SAGE system. After completion of this task he performed circuit development work associated with the utilization of high speed electronic switches in conjunction with magnetic drums.

In 1955 Mr. Anderson became a member of the M.I.T. Lincoln Laboratory systems office which was responsible for the specifications used by IBM in manufacturing the SAGE computer. During this period he had administrative supervision of eight engineers, most of whom were older than he, and his responsibilities included technical design and justification studies, cost estimating for contract changes, and industrial liaison.

During the last year and a half Mr. Anderson has been active in planning new systems to be associated with the SAGE system. This responsibility has broadened his contact with the U. S. Airforce at many levels and has brought him into close working contact with such organizations as the Rand Corporation and the Boeing Aircraft Company. His work involves advising the U. S. Air Defense Command how to use electronic computers effectively and requires extensive travelling on behalf of M.I.T. Lincoln Laboratory to attend technical meetings related to the SAGE system.

Messrs. Olsen and Anderson recognize that their lack of business experience is a handicap in organizing and administering a new business venture. They agree with American Research's requirement that a third management member be brought into Digital Computer Corporation within the next few months to assume primary responsibility of the business operations of the company. Several candidates for this position are under consideration by American Research staff but no definite selection has yet been made. Until this position is filled to American Research's satisfaction, one or more members of the American Research staff will work closely with Messrs. Olsen and Anderson to help supervise the business management of the company and to approve the expenditure of all funds.

IV. COMPETITION

At the time of its formation, Digital Computer Corporation will have only two known direct competitors, both of which are small companies offering products of limited technological interest. One is an organization named Navigation Equipment Company which produces a limited line of digital building block units with specialized characteristics and the other is a company named Digitronics, Inc. which is attempting to become a manufacturer of similar units. Neither of these organizations appears to possess the technological skills attributed to Digital Computer Corporation.

However, the field of digital computing is an exceedingly active one at the present time and there can be little doubt that substantial competition will develop in the future. The Burroughs Corporation may choose to up-date its outmoded line of vacuum tube digital building block units and thereby make itself a worthy competitor. More likely, however, other competent small companies may enter the business in a manner similar to Digital Computer Corporation. Successful survival will depend upon outstanding creative technological competence, an aggressive sales effort, high quality precision manufacturing, and adequate financial support. These prerequisites are well within the capabilities of Digital Computer Corporation.

V. PROJECTED FINANCIAL PERFORMANCE AND REQUIREMENTS

Management forecast of sales by the proposed new company during its first five years by product catagories is presented in Table I. This forecast anticipates a sales volume of $196,000 the first year, approximately 60% of which will consist of digital building block units. Thereafter, sales are expected to increase to $580,000 the second year, $1,050,000 the third year and $4,050,000 the fifth year. Although continued growth is projected for all product categories, major expansion is expected to occur in special digital systems. Because the likelihood of achieving success in this particular product category cannot be reliably forecasted at this time, the significance of the overall sales forecast necessarily diminishes substantially for each subsequent year.

Estimated profit and loss statement of Digital Computer Corporation, based upon the sales forecast discussed above, is presented in Table II. This estimate indicates that the proposed new company should break even during its first year of existence but that it should be earning approximately 10% after taxes on net sales by the end of the third year.

The capital required to initiate operation of the proposed company is estimated to be $134,000 as shown in Table III. However, American Research's historical experience indicates that more capital usually is required to organize a new company than is initially forecasted by its founders and hence American Research recommends that $250,000 of capital be made available to Digital Computer Corporation. $100,000 would be provided the new company initially and the remaining $150,000 would be provided as needed in the future, subject to the approval of the American Research Executive Committee, if the initial success of the new company indicated that further capital investment was merited.

In order to help supervise the utilization of these capital funds, American Research will nominate the majority of the members of the board of directors of Digital Computer Corporation and also will nominate the treasurer of the company. Furthermore, Digital Computer Corporation will retain the firm of Lybrand, Ross Bros. & Montgomery as its auditor and will utilize the services of the Shawmut National Bank as its commercial bank. Messrs. Olsen and Anderson will be paid salaries of $14,100 per year and $12,300 per year, respectively, which represent increases of $1500 per year for each man above their present remuneration at M.I.T. Lincoln Laboratory. Although American Research will be exceedingly active in the management affairs of the proposed new company during its formative period, no consulting service fee will be charged through December 31, 1957. After that date, however, ARD reserves the right to request a consulting service fee.

Other considerations which will be covered by contractural arrangements between the principal parties include a stock repurchase agreement whereby any equity owner must offer his equity interest in the company to other stockholders before offering it to an outside potential purchaser should he desire to liquidate his interest in the company. Messrs. Olsen and Anderson also will sign a contract with Digital Computer Corporation agreeing not to compete for a period of three years should they voluntarily withdraw from the company at any time. Should they be released by the company, however, no restriction would be placed on their future employment activities.

VI. FIELD INVESTIGATION

In order to better inform itself on the potentialities of Digital Computer Corporation and the competence of its technical founders, American Research has discussed the proposed venture carefully with several independent experts to benefit from their appraisals. With one exception, the general reaction has been favorable and the opinion has been expressed that Digital Computer Corporation could be a profitable enterprise. Of course, all expressions of opinion have been hedged by statements that the ultimate success of the undertaking will depend as much upon the overall manner in which it is carried out as upon the basic worth of the idea.

ARD personnel have interviewed the three immediate line supervisors of Messrs. Olsen and Anderson at the M.I.T. Lincoln Laboratory. These gentlemen are Mr. Robert R. Everett, Head of the Digital Computer Division; Mr. Norman H. Taylor, Associate Head of the Digital Computer Division, and Mr. William N. Papian, Leader of the Advanced Development Group of the Digital Computer

Division. These men have known and worked with Messrs. Olsen and Anderson for several years and hold them in high esteem as scientists and as individuals. It was the opinion of these gentlemen that the technology which Digital Computer Corporation proposes to commercialize is definitely ahead of competition, that a potential market exists for transistorized digital building block units, and that Messrs. Olsen and Anderson should make a splendid technological team for developing the potentialities of this product line. No adverse comment of any kind was expressed although none of these gentlemen claimed sufficient business experience to appraise the merit of the proposal from a business viewpoint.

American Research likewise interviewed Mr. J. A. Haddad, General Manager of the Special Engineering Products Division of International Business Machines Corporation in New York. Mr. Haddad, knows Mr. Olsen professionally and has a favorable opinion of him. He stated that the proposed activities of Digital Computer Corporation sounded interesting to him but warned that the capital, personnel, and time required to develop the company from a manufacturer of specialized test equipment into a manufacturer of specialized digital systems might be substantially greater than anticipated. Even without broadening its activities as widely as presently anticipated, however, Mr. Haddad believed that the venture could be meritorious. He specifically stated that IBM itself would not engage in the manufacture of digital building block units since these items did not directly encourage the increased sale of standard IBM products. He stated, however, that IBM might become a customer of Digital Computer Corporation if the products of the proposed company performed as projected.

An interview with Mr. Holton E. Harris, Sales Manager of Reeves Instrument Company in New York sustained earlier opinions that the digital equipment field is expanding rapidly and offers attractive business opportunities in many areas. Mr. Harris foresaw no reason why Digital Computers Corporation should not operate satisfactorily.

The lone dissenting viewpoint was expressed by Mr. John Dyer, Vice President of Airborne Instruments Laboratory, Inc. in New York. Mr. Dyer doubts that a successful new company can be developed in this field with inexperienced management and limited capital funds. He stated that the capital required to become established in the digital equipment business is great and possibly may be beyond the available resources of American Research. He pointed out that Airborne Instruments Laboratory, Inc. itself has been attempting to become established in the digital equipment business but that its efforts thus far have been expensive and disappointing.

American Research also discussed Digital Computer Corporation with Mr. James McDonough, President of Concord Controls, Inc. in Cambridge. This two-year-old company is an offspring of the M.I.T. Servomechanisms Laboratory in much the same manner that Digital Computer Corporation proposes to become an offspring of M.I.T. Lincoln Laboratory. Mr. McDonough believes that Digital Computer Corporation represents a potentially attractive business opportunity and has expressed preliminary interest in the possibility that the activities of his corporation and Digital Computer Corporation might be consolidated into a single entity at some future date. The technological

skills and product interests of both companies are closely allied so that a combination appears worthy of careful consideration. This possibility has no bearing upon the immediate proposal regarding the formation of Digital Computer Corporation but it suggests one expansion route which the company might follow in the future.

VII. CONCLUSION

The formation of Digital Computer Corporation is speculative and daring but sound reasons exist for believing that the undertaking can be successful. Hence, it is recommended that the American Research Board of Directors authorize its Executive Committee, subject to additional consideration and investigation, to invest as much as $250,000 in Digital Computer Corporation in accordance with the terms discussed in this memorandum.

DIGITAL COMPUTER CORPORATION

TABLE I

SALES FORECAST FOR FIRST FIVE YEARS

	1st Year	2nd Year	3rd Year	4th Year	5th Year
Digital Building Blocks	$115,000	$200,000	$ 300,000	$ 400,000	$ 400,000
Precision Low Voltage Power Supplies	35,000	50,000	100,000	100,000	100,000
Computer Terminal Equipment	10,000	80,000	200,000	500,000	500,000
Special Digital Systems	30,000	200,000	400,000	1,000,000	3,000,000
Miscellaneous	6,000	50,000	50,000	50,000	50,000

SALES FORECAST FOR FIRST FIVE YEARS

	1st Year	2nd Year	3rd Year	4th Year	5th Year
Digital Building Blocks	$115,000	$200,000	$ 300,000	$ 400,000	$ 400,000
Precision Low Voltage Power Supplies	35,000	50,000	100,000	100,000	100,000
Computer Terminal Equipment	10,000	80,000	200,000	500,000	500,000
Special Digital Systems	30,000	200,000	400,000	1,000,000	3,000,000
Miscellaneous	6,000	50,000	50,000	50,000	50,000
Total	$196,000	$580,000	$1,050,000	$2,050,000	$4,050,000
	1958 (10 mos.)	1959	1960	1961	1962
Actual:	$ 94,029	$ 775,570	$ 1,399,799	$ 2,648,100	$ 6,466,752

DIGITAL COMPUTER CORPORATION

TABLE II

NET PROFIT FORECAST FOR FIRST FIVE YEARS

	1st Year	2nd Year	3rd Year	4th Year	5th Year
Net Sales	$196,000	$580,000	$1,050,000	$2,050,000	$4,050,000
Manufacturing Cost					
Materials	76,000	300,000	480,000	900,000	1,800,000
Labor	91,000	170,000	300,000	650,000	1,200,000
Overhead	48,500	85,000	135,000	150,000	200,000
Change in Inventory	22,000	40,000	75,000	25,000	50,000
Total	193,500	515,000	840,000	1,675,000	3,150,000
Net Profit Before Taxes	2,500	65,000	210,000	375,000	900,000
Income Taxes	700	26,250	102,000	194,000	468,000
Net Profit After Taxes	$ 1,800	$ 38,750	$ 108,000	$ 181,000	$ 432,000

NET PROFIT FORECAST FOR FIRST FIVE YEARS

	1st Year	2nd Year	3rd Year	4th Year	5th Year
Net Sales	$196,000	$580,000	$1,050,000	$2,050,000	$4,050,000
Manufacturing Cost					
Materials	76,000	300,000	480,000	900,000	1,800,000
Labor	91,000	170,000	300,000	650,000	1,200,000
Overhead	48,500	85,000	135,000	150,000	200,000
Change in Inventory	22,000	40,000	75,000	25,000	50,000
Total	193,500	515,000	840,000	1,675,000	3,150,000
Net Profit Before Taxes	2,500	65,000	210,000	375,000	900,000
Income Taxes	700	26,250	102,000	194,000	468,000
Net Profit After Taxes	$ 1,800	$ 38,750	$ 108,000	$ 181,000	$ 432,000

	1958 (10 mos.)	1959	1960	1961	1962
Actual:	$ (11,999)	112,000	125,000	343,000	807,000

DIGITAL COMPUTER CORPORATION

TABLE III

CAPITAL REQUIREMENT FORECAST FOR FIRST SIX MONTHS

Initial Charges		
Legal fees	$500	
Filing fee and organization tax	200	
Painting and partitioning	500	
Library	200	
Office Supply Stock	300	
Miscellaneous	300	
Total		$2,000
Capital Equipment		
Machines	3,800	
Special tools	1,200	
Small tools	500	
Test equipment	2,100	
Office machines	2,300	
Furniture(leased with option to buy)		
Miscellaneous	1,100	
Total		11,000
Manufacturing Parts		
Transistors	5,000	
Electronic parts	4,500	
Mechanical parts	2,500	
Miscellaneous	3,000	
Total		15,000
Monthly Operating Cost		
Salaries and wages	7,500/mo.	
Accountant service	200/mo.	
Legal fees	100/mo.	
Rent, insurance, utilities, and miscellaneous overhead	500/mo.	
Travel	1,000/mo.	
Advertising	1,000/mo.	
Office supplies	50/mo.	
Furniture rent	130/mo.	
Miscellaneous	520/mo.	
Total	11,000/mo.	
Three months @ $11,000/month		33,000
1st Quarter Cash Required		61,000
2nd Quarter Cash Required		13,000
Reserve for Contingencies		60,000
Total Cash Required		$134,000

THE FORRESTER REPORT

Duplicated at
Testa, Hurwitz & Thibeault

February 2, 1988

TESTA, HURWITZ & THIBEAULT

THE FORRESTER REPORT

Duplicated at
Testa, Hurwitz & Thibeault

February 2, 1988

SCHOOL OF INDUSTRIAL MANAGEMENT

ESTABLISHED UNDER A GRANT FROM
THE ALFRED P. SLOAN FOUNDATION, INC.

50 MEMORIAL DRIVE
CAMBRIDGE 39, MASSACHUSETTS

December 10, 1962

Gen. Georges F. Doriot, President
American Research and Development Corp.
John Hancock Building
Boston 16, Massachusetts

Dear General Doriot:

Enclosed are three copies of a memorandum giving my comments on DEC as you recently requested.

I showed a first draft of this material to Kenneth Olsen and Win Hindle at DEC (I believe Anderson was away at the time). Some of their comments seemed well founded and I made some corresponding modifications.

However, the memorandum in its present form does represent my views. Consequently, it is not a jointly approved document and does not imply the agreement of Ken Olsen with what is said in it. You will probably want to discuss with him his opinions on the points covered. I am sending him a copy of the memorandum.

Sincerely,

Jay W. Forrester
Professor of Industrial Management

JWF:mec

c.c. Kenneth Olsen

Enclosures: Memorandum on DEC
(Original and two copies)

Confidential
Dec 1962

Jay W. Forrester
Sales Plans Fac G 3
DIGITAL EQUIPMENT CORPORATION

Georges F. Doriot

GFD

MEMORANDUM

TO: General Georges F. Doriot

FROM: Jay W. Forrester

SUBJECT: Digital Equipment Corporation

DATE: December 1, 1962

On November 27 you requested by telephone that I give you my thoughts on the present status and future course of the Digital Equipment Corporation. As you know, I have followed the activities of DEC with intense interest, both because it is run by former associates for whom I have the highest respect and regard, and also because it provides a splendid case study in corporate growth dynamics, which is my greatest present professional concern.

The remainder of this memorandum is divided into the following sections:

A. A summary which gives the tone, high points, and principal conclusions of the memorandum.

B. A section which discusses the general nature of growth processes in new companies.

C. A summary of the DEC history to date.

D. A brief listing of what seem to me to be the major strengths and assets of the company at the present time.

E. A discussion of numerous detailed manifestations of present problems, nearly all of which derive from the very rapid growth of the corporation and its present rather over-extended situation.

F. Comments on goals toward which the corporation might strive.

G. Future expectations for the company.

H. A discussion of several typical things which I feel should be done before further expansion of the company in order that a sound foundation for future expansion can be laid.

I. Long term policies which I would suggest as the governing basis for future growth.

A. SUMMARY

In all following discussion of DEC, it is essential to bear in mind that the situation is not unique. The growth of new technically based corporations seems to fall into a small number of rather standard patterns. One of these patterns begins with substantial early success which is followed by rapid expansion and then by a proliferation of problems growing out of over expansion and over extension. The problems begin to look severe at the point where the corporation has grown large enough that it can no longer be controlled by the pure power of personal leadership. At this point control must become more institutionalized in the form of policies, traditions, and generally accepted attitudes if coordinated growth is to continue.

DEC has grown very rapidly and its success has been unusually high. Almost as an automatic corollary to this success, there follow many pressures for rapid expansion. The more rapid the growth the less opportunity there is for seasoning of the company management and the establishment of an effective team interplay between the board, the officers, and the key leaders of the internal activities.

The corporation has great strength in the technical skills and personal character represented by its people. If these strengths can be properly seasoned and drawn together into an effective team that subscribes to essentially the same goals and methods, I believe that the financial success of the organization can continue.

The present problems are numerous. It is my feeling that none should be considered unexpected in view of the growth history. However, the problems are severe and a cause for deep concern should they not be satisfactorily handled. Most of them are of the type that occur because of the control and leadership vacuum that occurs when an organization can no longer be personally directed in detail by one man and a suitable framework for an effective subdivision of authority and responsibility has not yet evolved.

One can not evaluate anything except against some standard of desired performance. Evaluation of the DEC present and future is clouded by the absence of any generally recognized goals for the organization. Goals are often conflicting in nature, and there needs to be a commonly accepted understanding of the priority order should compromises be necessary. Since no memorandum such as this one can be valid without an assumption about the goals against which performance is being compared, these assumed goals are set down in section F. They consist essentially of placing the greatest emphasis

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on the feeling of accomplishment and satisfaction of the people from whom the other successes derive. Because I feel that it need not conflict with other desirable goals, I place the continuance of high profitability near the top of the list. Stability of growth is given high priority in its own right because an unstable, crisis-ridden, and insecure organization is most unlikely to be able to achieve any of the other goals. Last on the list of goals I put the rate of growth. This is because I feel it can not long take precedence over any of the other goals or it itself will be defeated. Placing the other goals higher on the list in their own right is, I believe, the surest way to enhance solid growth. I am making the assumption that growth is desired as long as it is compatible with other goals. This does clearly involve a decision by the present management to orient and retrain themselves as required by the new phase into which the company is moving. If this choice is not consciously and freely made, then the proper goal should be complete suspension of growth so that the organization does not grow beyond the size which can be controlled by personal dictation and leadership.

It is my feeling that DEC stands at a most important crossroads. Successful and profitable growth can follow if the proper steps and preparation are taken. Alternatively, profitable operations could be continued at the present level of activity if that were the desired and agreed upon decision. Not thinking through the choices which present themselves at this crossroads can easily lead to a mixture of policies which are separately suited to various alternatives, but which together lead to stagnation at a low level of profitability or to financial disaster. I feel that all of the people involved, from financial backers through the board, management, and key personnel, are capable of arriving at a coordinated set of objectives and plans. This memo presumes that the future is to be in the direction of profitable, stable growth.

It is my feeling that the corporation is now greatly over-extended and is carrying on a volume of sales greater than that justified by its internal strength. ① Section H is not necessarily a complete list, but identifies numerous items which I think should be successfully accomplished before the company embarks upon a new growth phase.

The last section discusses a philosophy and a set of implementation policies which I believe will lead to profitable growth -- a growth that is controlled by the policies of the company rather than the ② vagaries of the outside world. Briefly, these involve three things. First is a limitation on the acceptance of new commitments to that rate for which the corporation has existing, demonstrated capability. Second is the carefully planned allocation of activity to all of the areas that determine superior quality and performance in order that

① to or ?

② eleven ?

the market will recognize the superior performance and sustain a demand in excess of that which the corporation can accept. Third is a planned growth program which is geared to the company's expansion capability and which is not motivated primarily by the pressures of over-commitment.

B. THE NEW-COMPANY GROWTH PROCESS

The newly-formed, technically-based company has been a conspicuous phenomenon of the last fifteen years. The upsurge in science and technology in the last two decades has created large numbers of new ideas which have become the foundations for new enterprises. Many of these are located in the Boston area as an outgrowth of activities at M.I.T. and Harvard.

These companies, in their evolution, seem to exhibit variations on a common underlying growth pattern.

Such a company is often started by a strong, courageous, and technically competent man whose background has been primarily in science or engineering. He is likely to be relatively young, having graduated from college since 1940. In beginning the organization, he gathers together associates whom he already knows. These people have experience with each other and a common background in the technology of the undertaking.

In the beginning they may be unique in their capability. There is very little competition compared to the demand. Because they start with high technical skill and a low or nonexistent level of business, they can devote a high concentration of ability to the initial products and the first customers. With this concentration of skill on a relatively low volume of business, performance is exceptionally high and rises rapidly.

During this beginning period the product is often underpriced. This happens because the technical men may feel that the prices set by older organizations are excessive. The "overhead" of new organizations is low, so that costs can be recovered at relatively low prices. Marketing effort is often neglected so that the high reputation and the low prices become the factors to attract business. Very often one sees a pride on the part of the founders in being able to price a product lower than established companies.

The combination of low price and rapidly increasing reputation leads to a growth of business beyond the capability of the organization. There is often a feeling of obligation to accept all available orders. Orders are accepted against anticipated increases in capacity to produce. Initially, the company is top-heavy in administrative and technical

They do not know how to price - They want to sell.
No R and D expense to prepare for the future.
No selling
No reserve for capital
always true at start - Originally capacity = 0

skills and expansion can be accomplished relatively rapidly by increasing production capacity in the form of shop and assembly space and workers. As the product becomes more visible through an increasing circle of customers and as the reputation continues to rise, growth can be rapid. A state of over-commitment continues to exist and becomes the motivation for expansion. The over-commitments are successfully discharged so long as the company must expand only those factors such as production rate which can be done in a relatively short time compared to the time interval that the customer is willing to wait for the product.

If the founders were sufficiently capable and the choice of product sufficiently fortuitous, this expansion can continue into the annual dollar volume range of $500,000 to $20 million per year. Somewhere in this range the technical and management capability of the company becomes insufficient to sustain the kind of performance which accounted for its earlier success. The average age of the products becomes older. This may be partly because pressures to deliver in the short term divert attention from new products. Even if former product activity continues at its original rate, the fraction of sales arising from these new products declines merely because the total sales volume in older products is increasing. A commitment of production capacity and sales effort to the older products is established and the company can fall victim to increasing competition and declining demand for those products.

At the transition point of a few million dollars per year the power of personal leadership which formerly held the organization together becomes insufficient. The key man or small leadership group is no longer in personal control of all aspects of development, sales, production planning, and inventories. Operating decisions drift into the hands of new, recently acquired people. These people do not know the traditions and practices which should be followed, and no framework exists for their guidance.

Even though the internal coordination and control is breaking down, the tradition of rapid growth and over-commitment continues. The solution to the over-commitment continues to take the same form as before, that is, production capacity is expanded. However, the situation is inherently different from previously. Production rate and short term selling effort are already excessive compared to management and technical capability. Further expansion of the short term processes within the company aggravates the situation. The reputation of the organization suffers as delivery promises are not met, as high quality technical salesmanship is replaced by order taking, as field service of equipment in the field declines, and as the average age of the products increases.

At this stage, inefficiencies become conspicuous. No traditions

or methods for the tight control of production costs and inventories have been required. Inventories can become excessive and production costs may creep upward. They need not - particularly if there is over commitment.

If the demand in the early growth phase has risen very rapidly, a large backlog of unfilled orders may build up, and to discharge this backlog the production rate may be forced upward even as the new demand is falling. Rising production and falling sales can lead abruptly to an acute crisis. This can lead to financial difficulties and to the necessity for cutting back production.

Recovery from a severe crisis can take several forms. The most desirable and perhaps the least frequent is a readjustment of the technical and managerial balance so that sound growth at a high performance level can be reinitiated. A much more common outcome is a form of stagnation where market demand falls off sufficiently to force the company to improve its product and performance. Under these circumstances there is no excess demand and no over-commitment, and as a result there is no expansion because the organization seems not to have enough business opportunities to justify expansion. Another possible outcome which is probably more frequent than great success is the conspicuous financial collapse and failure in the backwash of over-expansion. Another common outcome is the merger of the organization into some larger group, primarily as a means for that group to acquire the technical skills of the people in the company.

At the transition crisis point that occurs between the phase of personal leadership and the phase of control by policy, changes in the management inevitably take place. These changes may be in the form of growth, maturing, seasoning, and reorientation of the management group which started the company. Such is infrequent but clearly is possible. Another very common solution to the management transition is the replacement of the original management by men who have experience in and understanding of the new phase into which the company is growing. This is most apt to happen when the stockholder power lies in the hands of a financial group which is interested in quick success and has no loyalty to the management. A third approach to strengthening the management appears in mergers where the new parent company undertakes to provide the managerial guidance necessary for the expanding organization.

× Too much loyalty has hurt us. The two arguments need not go together.

The severity of the problems encountered in the management transition from a small to a medium sized organization will depend greatly on the rate of growth.⊗ If the organization has grown slowly, the problems can often be worked out without becoming conspicuous. ✻ Furthermore, the management is more able to change and mature because one of the essentials for management reorientation is sufficient time for the management to think through and absorb the new demands being

⊗ Depends on the men - who has control - who sees the problem who agrees. How do you find others How do you make the change.

✻ Not necessarily

slow growth often leads to no growth and
stabilization. After all, new Co. is supposed to be
something better for which there is a demand

placed on it. By contrast, very rapid growth brings with it greater dangers, more severe symptoms, and the need for greater effort in bridging the transition phase.

During the early rapid growth phase, almost everyone underestimates the length of time necessary to build a management organization. The founders may already have known each other and possess understanding of one another's strengths and weaknesses. They may already have come to a common understanding of the power balance so that they can accept one another without conflict. The rapidity of early growth which occurs in the production side of the business is misleading and gives the impression that rapid growth can be sustained. During the early growth period there is a tendency not to hire into the organization superior men of the inherent capabilities of the founders. There is a tendency to hire helpers rather than leaders. This may reflect a feeling that additional leadership is not required and may reflect a subconscious unwillingness to hire men who might threaten to be superior to the founders in some characteristics. When the time comes for expanding beyond the size which can be managed by the founder group, a strong management does not exist for taking on the new managerial demands which arise.

When the pressure for additional management capability is recognized there tends to be an assumption that the management ranks can be expanded as rapidly as were the production worker ranks. Competent men are slow to be found. When they arrive they are not immediately effective except in routine and fairly clearly defined tasks. To build them into a team of high esprit de corps and a team in which individual strengths and weaknesses are recognized, requires several years. During this period of management consolidation, growth in the more routine activities must be suspended or there is great danger of its growing out of the control of the management group.

The management control difficulties which arise at the transition from a small to a medium-sized organization bring with them financial pressure, lowering profitability, inventory control problems and such. If the difficulties are severe, short range solutions are often sought which may accentuate the difficulties in the long run. To rebuild sales, there may be pressures to reduce prices. To build up the sales activity, there may be a diversion of people from product design, market development, and long term managerial planning. A short term view of fixed versus variable costs may tend to encourage still greater sales to spread the already deficient management, product, and market costs over a larger sales volume. This tends to force the corporation out of its unique position and into a stance where it must struggle at a disadvantage to better entrenched competitors.

no money -
you need different men. If they are hired too soon
they may not be what is needed.

C. DEC BACKGROUND

The company is just over five years old. It has been created by Kenneth Olsen and Harlan Anderson and a key group of engineers almost all of whom have known each other and worked together before the founding of DEC.

It is easy to underestimate the value of those skills and acquaintanceships which existed before the founding of the company. In one manner of speaking, they are a capital investment created prior to the formantion of the company. This body of skill and group acquaintanceship has been a capital investment of far greater uniqueness and value than the financial investment in the company.

The products of the company have fitted into a particular dynamic relationship to science and the market. The stress has not been on new research which may have glamour but not much market demand. On the other hand, products have so far avoided that mature phase where numerous competitors can supply a fully comparable service to the customer. The intermediate region in which DEC has been operating is not as competitive as some other sectors of the economy. It therefore represents a better opportunity for profit. One of the challenges is to maintain a position in that particular part of the market. The lack of glamour tends to repel those men who are interested in science for the sake of new discovery and for the papers which can be published. The lack of a mass market tends to keep out those managers who are primarily interested in mass production and a large organized and standardized sales procedure.

Several product and market conditions are advantageous to an organization which attempts to operate in the intermediate zone. Products should be such that the organization can develop them with high skill intensity in a time period shorter than that required by other organizations to develop the comparable skills. The particular sector of the market which is solicited should be one which can learn to use the product rather quickly after its availability. There should be an appreciable sector of the market which values high reliability, knowledgeable salesmen, dependable deliveries, and superior follow-up service all aimed at making a sale successful in the mind of the customer. With such customers, ultimate satisfaction is the primary objective rather than low initial price. DEC has been operating under such conditions.

The company has grown rapidly and successfully because of the above combination of skills and circumstances. The table on the following page shows how rapid this growth has been.

The table shows the remarkable financial success to date as well as showing the very rapid annual growth which leads to the

Year Ending June 30	Sales (Thousands of dollars)	Net Profit after Taxes (Thousands of dollars)	Net Profit on Sales (per cent)	Stockholder Equity (Thousands of dollars)	Net Return on Equity (per cent)	Loans (Thousands of dollars)	Net Return on Equity plus Loans (per cent)	Annual Increase in Sales (per cent)
1958	94.	(12.)	(12.8)	58.	(20.6)	30.	(13.6)	-----
1959	776.	90.	11.8	172.	52.3	51.	40.4	720.
1960	1300.	125.	9.6	300.	41.7	126.	29.3	68.
1961	2657.	343.	12.9	643.	53.1	119.	45.5	104.
1962	6535.	807.	12.3	1492.	54.0	1203.	29.9	146.

present over-extension of the organization. The figures are average sales for the year, which means that the actual sales rate at the end of each year was substantially higher. Sales during the first four months of the 1962-63 fiscal year have been $5,057,000. In this amount is included some deferred billing from June of the last fiscal year, so that the production capability of the company in the first third of the year was probably at a rate of about $12 million per year. Even if the capability of the company during the first quarter of the fiscal year were to be held constant, annual sales for the present fiscal year would again be almost double the previous year. (This does not take into account reduction in production capability which may have occurred during the last few weeks as a result of declining order backlogs.)

One sees, from the table and the extension of it to the present fiscal year, that sales have doubled annually for three consecutive years after reaching the $1 million per year level. So far as I know, we have not a single precedent of a company being able to grow this rapidly and to sustain such a growth rate on into the region where the character of the management control process changes from direct to indirect control.

The early symptoms of problems do not show up in the financial statements which, as in the table, seem to be without a hint of problems. (Although the multiplication by a factor of 10 of the debt load in one year could be taken as a sudden change of serious portent.) One sees the early symptoms of difficulty in the operating activities of the company. These appear only if one examines the activities lying behind the financial statements. Once the results of growing problems have made their appearance on the balance sheet, the difficulties may sometimes have become irreversible.

D. DEC STRENGTHS

A principal asset of the company is in the capability of the management and key group. They are of high technical competence and intelligence. They are of strong moral character. They are capable of learning.

The other people in the company are young, vigorous, and able. Technical ability is high in all personnel groups of the company.

One should note particularly the courage of those who have developed the company to the present point. They are willing to venture into areas unknown to them. They are willing to take risks which are essential to conspicuous success.

The integrity of the organization is high, and this is especially important if the company is to provide a superior product and service. In the average level of technical ability the company is probably unsurpassed for one of its size or larger. There is ability to produce quickly and efficiently a superior product.

The financial position of the company is basically sound and its record of earnings is outstanding.

The company has a good reputation in the marketplace. It is above average, although possibly not as high as may be appropriate to the company objectives. There is at the present time a tremendous momentum of activity to carry forward into future progress.

The board of directors is sympathetic and able, and represents a diversity of background and viewpoint. It should be one which can assist in guiding the company through its present period of transition.

The majority stockholder is understanding of the problems of growth companies. Unlike many financial groups, there is a sincere interest in developing the founding management to grow with the growth and evolution of the company.

With these strengths, it should be possible to take the forthcoming hurdles without faltering.

E. PRESENT WEAKNESSES

DEC is in that part of the typical new company growth pattern where it has developed very rapidly. The growth rate, the profitability, and the general high caliber of products could easily be taken to indicate that no problems, present or potential, exist. However, part of the danger from the rapidly rising early section of the growth curve comes from the over confidence which it can generate. If we are to take seriously the lessons to be learned from other companies, we must look behind the financial data at those activities which are setting the stage for future conditions. If it is possible to find and correct undesirable trends before they create serious results, the crises observed in other similar companies may be avoided.

If there were no evidences of disturbing conditions, there would be little basis for arguing for changes in present practices. Consequently, I shall list here some of the conditions that cause me concern. They are not intended to imply a negative picture, but are listed to balance the undue confidence that might result from sections C and D above.

Lack of clear goals. At this phase in the growth of a company, control must be shifted from the individual leader to a body of policy, practice, and tradition. Before any consistent policy structure can be created, the goals and objectives of the organization must be understood. Otherwise, the practices arise from happenstance and the goals are known only by what is implied in the practices. These will usually not be the goals which would be chosen in advance. At the present time the course of the company is being set by the perpetuation of past practices and by the pressures arising from these practices. There is no agreed upon statement of company goals which is consistent throughout the management, employees and board. Without such a set of goals it is not possible to judge present performance or to plan for the future.

Absence of guiding policy. Thus far the company has been controlled by the detailed decisions of the president. Where his wishes have been unclear or have not been formulated, there has been a tendency for the company to drift. This has become rapidly more obvious in the recent stages of company growth because the company is now at that size where one person can no longer have sufficiently detailed and coordinated information to make all of the important decisions. The record clearly demonstrates that such control has been financially successful in the past. There are strong tendencies to extrapolate this same kind of management into the future, even though the basis of intimate knowledge on which it was founded is well on the way to disappearing.

Over-extension. The most conspicuous characteristic of the company during the last year has been the great pressure on the management and technical people. A very noticeable change has occurred in the last year. People have less time to think about and talk about their future plans. There is an atmosphere of having no time for anything but the present crisis. Under these circumstances the company is exploiting, but is not renewing, the technical and managerial skills which were brought into the company from the outside. The people are repeating their past practices and approaches to problems without time to contemplate how the situation is changing and what new approaches may be required. This amounts to a liquidation of an existing capital asset. The great initial skills representing a large capital investment by others (in this case government sponsored research and development) are becoming obsolete and are not being rebuilt for the future.

Top management isolation. As an organization grows, the top management becomes more and more isolated from the true state of what is happening in the company and the market. The information

which the management receives becomes heavily filtered in a manner which represents the nature of the relationships between the parties. I feel that the upward flowing information in the organization is more and more presenting a favorable picture and surpressing difficulties and problems. This seems true between the lower levels of the company and the management and also between the management and the board. Such a tendency to put the best foot forward and to surpress bad news may occur where the bearer of bad tidings is personally criticized. Management may be doing this to subordinates and the board doing the same to the management.

Management experience. The management of the company is highly skilled technically but has had no prior experience in the kind of management now required. This lack of management seasoning is a serious matter. I feel it is essential that the growth rate of the corporation be delayed temporarily until the management has had time to mature and to shift its attention from present decision making to the creation of organizational structure and policy. At the present time each of the small crises which comes along seems to be viewed as an unfortunate exception. There is not enough effort to generalize from the specific situations to an understanding of the underlying causes from which the particular problems arise.

How? Danger

Management team. There is another kind of management immaturity that appears when considering the management group as a whole. It is now becoming necessary to build company expansion on new men who have had no prior common associations before coming to DEC. They do not share the team knowledge gained through past associations. Their strengths and weaknesses are not known to one another. Even if one had a group of individuals all of whom had prior but separate experiences in the present types of management problems of DEC, several years would still be required before they were welded together into a fully effective group. One must bear in mind that as the present management gaps are filled, this new form of lack of seasoning will emerge and a period of time will be required for the men to adjust to working with one another.

Training. Definition of Tasks. Coordination

Insecurity. There seems at the present time to be a rather defensive attitude on the part of management. This I feel arises from understandable causes, and is a reflection of the pressure under which they operate and the insecurity which they feel in their command of the present situation. The insecurity is probably a new sensation since most of those now in the company have previously been in technical activities where they were acknowledged experts and rather sure of success in what they were doing. Many

? x

x Lack of knowledge - experience? anything else?
The board of directors should help.

managements seem to show these signs of insecurity even in older men and much more mature companies. Probably the best help here will be more sympathy and encouragement and the sharing of difficulties and responsibilities by the principal stockholder group and the board members.

Sensitivity to problem symptoms. The management still must learn that one of its principal duties is to look deeply for future troubles whose forerunners are just beginning to be visible. Many company managements, and this one in particular, are not sufficiently receptive to symptoms while problems are still minor. There is a strong desire to observe what one wishes to see and to avoid the discomfort of looking objectively and critically for weaknesses. Most of the difficulties can be solved much more easily in the formative stage than after they become full grown.

Management control. A corporation comes to the present size of DEC with the officers ruling with complete control. The president of DEC is especially strong and forceful. He feels that he delegates authority to subordinates and he takes pride in this. However, I observe a considerable mismatch between his feeling and that of others in the company. The problem takes two forms -- too much restriction in small matters and not enough guidance in large matters. Even while detailed control in some matters exists, the opposite extreme can also exist. Tasks may be assigned to those who are not prepared to carry them out. Guidance in how to succeed is not available, and the follow-up to check on progress is inadequate. As a result, unguided freedom can lead the unprepared person into an unsuccessful result. Then, when the failure comes to light, the man is severely criticized to the detriment of his self-confidence and his career.

Management-board relationships. Relationships between the management and the board of directors are rather distant. The board, in its efforts to be helpful, has apparently created an impression that it does not trust the management. There is not the proper atmosphere of sharing problems and informally exchanging ideas. It appears that the management tends to withhold possible troubles from the board until their disclosure becomes unavoidable. Some of the board members, myself included, have given management the impression that problems and difficulties are being sought and imagined where none in fact exist. Free and easy communication and informal discussion does not exist to a sufficient degree. Several of the board members have had the experience of making suggestions to the management without receiving a response and thereupon assuming that there was agreement. Later it has frequently developed that such agreement never in fact existed. The management has not yet learned

how to make the best use of the varied experiences represented in the board. The vice president infrequently, and the president almost never, takes problems informally to board members between meetings. The agenda of board meetings is ordinarily filled by routine and minor matters while questions of much greater importance are acted on by management without reference to the board. Part of this may no doubt arise from the severe overloading of the management and the lack of time for planning how to best use the possible contributions of board members. Because of the distance which has developed between the board and the management, the outside board members tend to exchange views informally between themselves. This no doubt is contributing to an increase in the distance between the management and the remainder of the board members. This means that the management is not the focal point through which the views of the board members are exchanged.

Management-staff relationships. The expansion of the company has been so rapid that the management has not had time to integrate its top team of people and to lead them in their new kinds of duties as the situation evolves. As a result, the comments and attitudes of the senior people in the company exhibit considerable frustration. This is relatively new, having begun to be apparent only during the last year. This frustration seems to arise from several causes. There is often lack of authority to really discharge the responsibilities assigned. Jobs are often given which the man is not yet prepared to do. Responsibilities and authorities are not clear. The situation is new to the management as well as the man so that no guidance can be given in how to behave in newly developing managerial responsibilities.

Balance of responsibility, authority, and reward. The company has a cost center system which charges the expenses of various activities against their own particular accounts. Two or three years ago there were discussions of how authority and responsibility centers could be set up so that individuals had clear tasks which they were free to discharge in accordance with their skill and ability. It is my recollection that the present cost centers were initially undertaken as a step toward this definition of authority and responsibility. As it turns out, the cost centers seem to be more in the form of half of a budgeting system. They measure the cost which might appear in a previously approved budget. The budgeting system itself is being developed but is not yet in operation. A budget and cost center system does not necessarily clarify responsibility and authority in a meaningful way. The men in the company seem generally to be uncertain as to their responsibilities and authorities. It is quite clear that the present cost center system does not provide a measure of successful performance with the possible exception of perhaps three or four people.

Profit vulnerability. The profit percentages even up through the report for October continue to look good. However, I feel the profit basis is fundamentally vulnerable. Adding the "overhead" necessary for correcting the deficiencies discussed in section H will increase expenses enough to cut heavily into the present profit margins. The danger here is that profits may slip downward and begin to exert still greater pressures against taking the actions which will be necessary for long term strengthening of the situation. At the present time, performance may not justify a higher price. The necessary steps would seem to be to increase performance sufficiently to permit a price increase that would more than cover the additional costs. It is my feeling that the corporation is deficient in a number of items -- field service on equipment, collection of information about how customers feel, sales follow-up after equipment delivery, correction of equipment defects, taking responsibility to see that the ultimate user will be satisfied before accepting his order, quality control, and the opening of new market areas.

Insufficient diversification. The company has a dangerous lack of product diversification. The majority of the sales are concentrated in two product lines -- modules and the PDP-1 computer. Furthermore, there is a tendency to accept too much business from one customer. The conspicuous example of this has been the sales to I.T.T., which represent too large a single block of equipment for a company of this size. The dangers are illustrated by the recent cutback in orders from I.T.T.

Product age. The average age of the products is rapidly increasing. This occurs if sales are expanded by pressing for new orders in established products rather than by increasing sales with primary emphasis on new products. There are already signs of the kind of competition that comes with product maturity. The company could easily slip over from one dealing with highly profitable new products into one selling highly competitive products on a very narrow profit margin. Under these latter circumstances, the game will be won by the organization having the highest efficiency in production and the lowest costs everywhere. This would be a very different character of operation from what DEC has practiced thus far. Its present people would be unsuited by temperament and training for such a business.

Lack of expansion policy. There is no agreed upon policy regarding expansion plans. Sound expansion involves building certain skills and capabilities over a period of three or four years. If expansion is to be sound, it can not be turned on and off with short notice. The lack of a clear policy is illustrated by various recent discussions where a proposed sales increase for the 1963-64 fiscal

year have ranged all the way from zero to 80%.

Lack of control of company commitments. Thus far there has been very little control of the acceptance of new orders. These have been taken without sufficient regard for existing company capability. There seems to be an attitude that orders should be taken whenever available, followed by an attempt to expand capacity. It is generally true of other companies and it has been true of DEC that capacity expansion can not be made quickly enough to satisfy orders already in the house. The unfavorable results of over commitment are numerous. Orders are not delivered when promised. The pressures to meet deliveries divert company attention from its longer term important activities.

Insufficient concern for efficiency. During the past period of high profitability and rapidly increasing sales, there has been a rather outspoken lack of interest in efficiency. This has been particularly noticeable in the lack of interest in inventory control. The expressed view has been that inventory is a cheap way of avoiding production shutdowns for lack of material. A "maximum inventory" type of system has tended to evolve. This occurs when material is ordered and allocated as soon as a forthcoming need is known irrespective of how far in the future that need may be. Such seems to have been the practice and in a rapidly rising sales picture it was perhaps not serious. However, when the situation tightens up, many months are required to change the prevailing attitudes and to develop satisfactory control methods.

F. GOALS

The future course of the company can not be discussed without an underlying assumption about its goals and objectives. I will very briefly state the assumptions which I am making. If they are not the ones which the management and the board want to follow, it will call for some revision in parts of this memorandum.

1. Personal satisfaction

At the top of the list of goals, one should strive for an organization in which the participants can have pride and a feeling of satisfaction. This means that the performance of the organization should reflect their own ideals and standards of performance. This must hold true not only for the management but for all employees.

2. Growth of people

If morale is to be high and if long term performance is to be superior, the organization must be outstanding in the rate at which its people can grow and develop.

Re. F-1-2 Cannot disagree. but 1. 2 are desirable necessary characteristics, environment in which what I would call "goals" must fit so as to be attainable. 1 and 2 are not what I would call "goals" as such

3. Profitability

Profitability both in terms of sales and in terms of return on investment should be maintained at a conspicuously high level. This is in keeping with the first two goals above. If the organization is meeting its challenge it will command a favored place in the market.

4. "Carriage trade" market sector

I feel the company can best meet its other goals by aiming at the section of the market which prizes high performance, quality, and integrity and is willing to pay for these. This market should be more fun. It should challenge and interest the skilled people. A unique and fairly non-competitive hole in the American economy exists at this point. It means that the company will sell customer satisfaction rather than product glamour or low product price.

5. Stability

A necessary complement to the preceding goals will be stability of operations and of growth. There must be continuity in performance and capability. Reputations are hard to build and can be torn down relatively more quickly. If performance is consistently high, success should follow consistently.

6. Growth

Growth is one of the goals of the company but it is purposely placed last in this priority list. It should occur only to the extent that the previous goals can be met first. If the other goals are met, growth will easily follow. If growth is put first, the other goals may not be met, and when they fail so will the ability to grow.

I feel that growth should be strictly limited to something less than 30% per year. Such may not be possible for it would be a very high rate for a company above the present size of DEC. As will be suggested in section H, no growth should be anticipated in the near future until a number of preparatory steps have been taken.

G. FUTURE EXPECTATIONS

The Digital Equipment Corporation is now facing the most severe test that a growing organization is apt to encounter. If

it continues to grow, the changes which the management must make are probably the greatest which they will encounter in their entire careers. If this is recognized and if there is a serious attempt to bridge the step from the present size corporation to a larger one, I believe the attempt can be successful.

If facing this transition is not acceptable to the present management, then I feel it very important that the decision be made to hold the size of the organization at its present level. I believe the corporation could be successfully managed by the present one-man rule at the present size once the strains of recent growth have been relieved.

To go on to a larger organization with the existing management methods will, I feel, lead to loss of important capable people and to insufficient internal strength.

Assuming that the decision to attempt the transition to the policy level of management is made seriously and in good faith, one must then allow time for the transition to become effective.

I believe this transition is possible. If seriously undertaken, I feel that the chances of success are greater than are likely from any of the alternative methods of strengthening the management.

Alternatives are possible, but I feel that they are undesirable and should be viewed as last resource steps. One could bring in a general manager on a temporary or a permanent basis with clear authority to make needed preparations for the company's future. This might generate a very difficult relationship to the present management. Also there is the question of whether or not a suitable manager could be found.

Another frequent alternative is to bring in a new management that has had experience with a larger corporation. This would be unfair to the present management. The success to date in growth and profitability would make this seem unreasonable. Generally such a step is not taken until the organization is already in deep trouble. Such a move would be contrary to the principles on which the American Research and Development Corporation has traditionally operated. The particular niche which DEC is now filling is sufficiently unique that one would have great difficulty finding management which understands the policies and philosophies which would be necessary to continued success.

A review of the alternatives seems to me to clearly indicate that full weight should be thrown behind the solution of present problems, the closing of present divisions between management and board and management and staff, and the orderly reorientation of

present management to the new challenges which lie ahead.

Such a course is not without its risks and may not succeed. However, it looks like the most desirable course to follow.

If the organization is relieved of extreme pressure until the present management has time to consider its own problems and those of the corporation, I feel certain it can rise to the occasion. The management needs time to relax, to be at ease, and to casually and unhurriedly come to understand the viewpoints of its board and its professional staff. The board must help dispel the pressure which the management believes it is under from the board. I believe these things can be done and that attention can be focused on problems at the organizational and policy level. This will not come quickly because it involves a new way of thinking, and means that people will be addressing themselves to new kinds of tasks. The board and the principal owner should assist this process but take care that their actions do not take the form of pressure to bypass the present stage of reorientation and maturing.

H. RECOVERY FROM PRESENT OVER EXTENSION

As already discussed I feel that the company is now greatly over extended in the sense that sales are too high compared to the supporting activities of the company. This would best be corrected by holding sales at the present level until the deficiencies can be relieved.

I feel strongly that a suspension of growth should continue until the solutions to the problems that follow have been demonstrated in operation. This may take two or three years.

On most of the following items a proper procedure would be the preparation of a written plan for action, the availability of this plan to the board followed later by discussion and approval, and implementation of the plan to the level consistent with the existing sales volume.

During the implementation of these preliminary steps, profitability should be recovered to and sustained at the target values given in the last section. Before this can be done it may be necessary to take some of the corrective steps as prerequisites to justifying a readjustment in prices.

The following is a partial list of those things which I feel need strengthening to achieve a proper balance with the present sales volume.

1. Inventory and production control

Inventories and production control are intimately interrelated. At the present time authority for this situation is not clear and means for its proper management are not available. A proper system should be designed and implemented and the appropriate parts of it should be computer mechanized.

2. Product development

Long term plans for product development should be made in terms of the magnitude of effort required to sustain the proper ratio of product newness. If a constant product newness for the average of all products is to be maintained, some heavy responsibilities fall on new product development. New products must continually push out old ones even before the market for the old ones subsides. The company can not completely exploit its old designs under some circumstances without running the risk of slipping into dependence on obsolete products.

3. Market development

There needs to be a clear definition of the DEC market objectives. At the present time customers and sales areas are being solicited which, when they succeed, will probably be too large for DEC to handle. Concepts of high DEC performance, product and market diversification, a continual stream of new products, and long term market development should be coordinated into a clear picture of DEC market strategy. At the present time some fraction of the market effort is wasted because it is devoted to areas lying outside of the proper interests of the company.

4. Clarification of authority and responsibility

The positions of various engineers and managers should be clarified so that they understand their responsibility and authority. These definitions should be on a clear and workable basis which gives individuals the freedom commensurate with their responsibility.

5. Written policy book

A loose-leaf written book of DEC goals, policies and practices should be prepared in such a form that it can be available to the professional staff.

6. Financial planning

A system of financial planning and cash forecasts should be developed that reflects actual company status and actual plans for the future and not merely an extrapolation of past financial performance.

7. Departmental relationships

The present division of responsibilities between company departments is not clear. For example, there is lack of understanding between sales and engineering on the development of new products. Likewise, sales and manufacturing share undefined responsibilities for inventories.

8. Internal data processing

Much of the data processing of the company should be put on a digital computer having a suitable compiler for the handling of business data processes. This might be a rented machine having available software or could be the creation of a suitable compiler for one of the DEC computers.

9. Control variables

There should be established a regular measuring and reporting system for observing the many variables necessary if one is to understand and control a growth business. The first step would be to list what these variables are and how they are to be defined. In addition to the obvious current variables, special emphasis should be given to those long-term activities that prepare for future success. Products under development, people under training for various future positions, the potential of markets being developed, the acquisition rate of new management talent, measures of market attitude toward company performance and product quality, would be included in the pertinent variables.

10. Personnel development

A plan should be made, approved, and inaugurated for the development of all company personnel. This would be aimed at preparing the men for increasing future responsibilities and opportunities. The plan must insure that time is set aside for such purposes.

11. Pricing policy

There needs to be a clarification and statement of pricing

policy. What is its basis? How is it related to profitability, delivery delay, and company performance? What are the underlying assumptions about the relationships of price to those other factors which matter to the customer?

12. Renegotiable business

There needs to be a policy statement with a method for its implementation regarding the management of renegotiable business.

13. Management-board cooperation

Relationships between management and board need to be developed on a more informal basis which can draw the board and the management closer together. The formal board meetings should be the secondary, rather than primary, contact between board and management.

14. Software

The company needs a clear statement of policy toward "software" (computer programs and compilers). The attitude has apparently varied but may at all times have been on the side of too little service to the customer. A clear plan needs to be stated which is coordinated with the definition of desired markets and the kind of company which is to be created.

15. Measuring company performance

There is presently inadequate information available at the various management levels regarding how well the company is satisfying its customers. Performance should be measured separately for use by some three different levels of management. First, the operating departments should be in close contact with the market and have channels for making effective use of what is learned in the guidance of normal operations. Second, the company management should have a frequent market sampling operation equivalent perhaps to one full time person to measure whether or not the operating departments are living up to the wishes of the management. Third, there should be a less frequent but sufficient sampling of market opinion directly by or for the board in order that the board can determine that the goals of the company are being sustained.

Routine and sure-fire procedures need to be established for the use of this information about market satisfaction so that it can not be ignored and fall into disuse.

16. Defective equipment

A policy and procedures need to be put into operation to guide the replacement of products which have been sold and are later found to be troublesome or defective. At the present time this seems to be too much of a happenstance situation.

17. Profit center responsibility

The whole set of concepts which presumably underly the present profit centers need to be reviewed so that they do indeed serve the purpose for which they were established. A proper balance of freedom, authority, responsibility, and reward needs to be established at each point. These should be suited to different types of personalities so that men with differing inclinations toward technical and administrative work can be satisfied.

18. Management team

Further expansion should be delayed until it is clear that a management team exists which can freely and effectively work together. This means that new men must be developed, and I feel that it means that present officers should be willing to share the management authority rather than to dictate.

It is never clear until they try. How shall we know if DEC stops growing?

19. Management-staff relationship

With respect to the management-staff relationship, some way needs to be found whereby the president can listen with more sympathy and understanding to the views of his subordinates. The problem here is one of rather deep-seated personal attitudes toward people. These attitudes can be changed but it will take great effort and willingness on the part of the present management to do so. Some formal arrangement giving specific powers to certain individuals and advisory groups of senior staff might help to create the change in the management relationship to subordinates.

The present officers need to realize that personal prestige can better come from the ability to lead rather than from the right to command. (The book The Human Side of Enterprise, by Douglas McGregor, McGraw-Hill, 1960, is pertinent here. The present management attitudes are there described as "Theory X". The move needs to be in the direction of "Theory Y".)

20. Quality control

Formal methods need to be established for policing the standards of equipment design and reliability. The general nature

of the standards should be clearly stated and a board of review should be established to pass on new products before their release.

21. Field failures

A formal system for finding and reporting field failures needs to be established. It should communicate information directly to the points where corrective action can be taken but should also communicate to the various management levels responsible for maintenance of company performance.

22. Reduced management load

The management responsibilities need to be redefined and new management added until there is sufficient spare time on the part of individuals so that they can give necessary attention to long term matters and to personal development.

23. Accounting system

The accounting and cost system should be reviewed to make sure that it properly reflects the cost and profitability of the various company products. There is some indication that modules are continuing to subsidize computers and systems in the sense that the latter are not earning a return commensurate with the management and technical time which they are absorbing. Such a review of cost and profitability should be extended to individual products as well as broad lines to make sure that each product carries a fair share of company success.

I. OPERATING POLICIES

Success for a company catering to that part of the market which appreciates high quality and high company capability requires adherence to practices substantially different from those of the average company. The normal pressures from the market and from the social stresses within the company tend to push the organization out of such a high performance spot.

It seems to me that high performance is to be achieved primarily by insuring that the company possesses unusually high average capability and that this capability not be overloaded to the point where it fails to deliver superior performance.

Under these circumstances the motivation for growth comes not

from over commitment and from having accepted more business than one can handle. Instead, it comes from first building those parts of the organization that take the longest to expand, then progressively increasing the capability of company activities which require less time to develop, and finally, accepting new business in proportion to the capability of a balanced organization.

I feel that this kind of high performance, with successful and profitable growth, can be achieved by consistently following the policies listed below along with secondary ones that are implied by these.

1. Degree of commitment

One of the most difficult practices to pursue will be the limitation of proferred business to that which the company has demonstrated it can handle. Orders should be accepted and promises made only to the extent that they can be fitted into the existing company capability. Existing capability, as used here, is to be based on demonstrated capacity taken as the average actual production of the last four months. Even this figure is to be used only if the recent sales rate is not in excess of company strength in the long term areas such as product and market development and internal managerial control capability. Such a policy means that fewer orders will be accepted than the probable capability if the company is growing. However, the difference will not be large. The excess capability can be used to correct for misjudgments as to the size of the commitments being undertaken. If indeed the capability is above the commitment, it means that jobs will be finished ten or fifteen per cent earlier than originally planned. When such has happened new orders can be fitted into the backlog as the openings occur.

This limitation on commitment is aimed primarily at maintaining company quality and performance by avoiding the pressures that would cause diversion of company effort from long term to short term activities.

2. Diversification

The company should strictly maintain diversification of products and of markets. Orders should be accepted only within approved rules for diversification, class of business, size of order, and fraction of business to one customer. The following might be typical of the policies which should be set down in writing and implemented by procedures that will assure compliance.

a. Renegotiable sales

At least 50% of each class of business should be

non-renegotiable. In other words, a generous safety margin should be maintained in favor of commercial rather than governmental business. This is important because the renegotiable government business tends to be the more aggressive as a result of the legal requirements for soliciting bids. On the other hand, the commercial business tends to be negotiated with those organizations of known high reputation and proven performance. If one responds too freely to the easy business available from the government, all available time can be spent in soliciting government business. The company can be rapidly drawn into a high fraction of renegotiable business even though a large untapped commercial market exists. The policies on renegotiable business should be such that none of the company business is subject to renegotiation, at least during the next major growth phase.

b. Rental business

For at least the next two or three years I would suggest a firm policy of no rental of equipment to customers. Much management time has been devoted to discussing the pros and cons of equipment rental. This time might better have been spent developing new company products and markets. Rental business, like renegotiable business is relatively easier to solicit. However, it is my feeling that those customers interested primarily in rental equipment are those who can also be satisfied by competitive equipment. DEC therefore presents no great advantage to them. DEC should strive for uniqueness in small, specialized markets to which other companies can not cater. No plan for equipment rental has looked financially as favorable as equipment sale. The financial strain presented by the rental business is one distraction which should be avoided until other company problems have been brought under control.

c. Class of customer

The amount of business to any one class of customer should be strictly controlled as part of the diversification plan. A class of customer might be defined as those customers whose own business depends essentially on the same economic factors. This definition will need further development. I feel that no more than twenty per cent of the company's business should be permitted to go to any one class of customer.

d. Single customer

Likewise for diversification and to limit the company vulnerability to the misjudgments of particular customers, the total sales to any one customer should be controlled. A reasonable number would seem to be to limit sales to any one customer at not more than ten per cent of the DEC sales in any one year. This policy will im-

mediately determine the wisdom of soliciting business from certain kinds of customers and markets. DEC has in the past and is at present trying to develop business in areas which if they come through will greatly exceed this policy. Expenditure of time on types of business which would be unsafely concentrated is inefficient and could usually be avoided if the sales policy were clearly understood.

e. Single customer, single use

To further limit exposure, I feel that sales to a single customer should be further reduced if they are for a single purpose. I would consider the sales of the ADX system to I.T.T. as one use by one customer. I would suggest that such sales be limited to five per cent of the DEC annual volume. This may at first sound very severe but the diversification is most important. It puts a smaller fraction of the company's welfare in any one basket. With reduced exposure, it becomes possible to give new and relatively inexperienced managers greater authority without the risk for the entire company becoming so high. DEC can hold a more unique position in the specialized small markets than it can in the larger markets which will attract the more powerful competitors.

f. New products

A minimum sales level should be set for new products in any year. A new product will need definition -- perhaps one which did not exist two years previously. Perhaps a minimum of 30% of the company sales should be in such new products. This is controlled partly by developing new products and new markets and partly by limiting the commitment to older products to a level less than their full exploitation. Full exploitation of old products will move the company into a vulnerable competitive position by increasing the average age of products being sold.

Definitions need clarification

3. Inventories

DEC is a company engaged in new technical products with growing sales. The purpose of inventories in such a situation is quite different from their purpose in a company handling a mature product with reasonably stable annual sales. Since the company can not and does not expect to meet all possible demands on it, inventories are not primarily for the purpose of absorbing fluctuations in market demand. Instead, inventories are to be maintained for the following purposes:

a. To absorb fluctuations in and miscalculations of

production capability. In new technology enterprises there is uncertainty in the estimation of time and effort required to meet promises to customers. Furthermore, the production processes are often not sufficiently under control to avoid periods when production falls below expectation. One of the purposes of inventories is then to provide a buffer against these uncertainties so that the company can meet its promises.

b. To permit out-of-inventory sales to a carefully controlled subclass of orders that are to receive expedited delivery. DEC has certain kinds of business to which it has a special commitment for rapid delivery. These are the customers who already have bought installations of DEC equipment and need small additions to this equipment to meet new situations that arise. A customer that buys DEC modules is "frozen in" and has a right to depend on the company to help him maintain his installation in a living and growing form. This is part of the superior company service already referred to.

Replacement of inventory for the above purposes should take precedence over the acceptance of new business. This means that inventory replacement should go into the production schedule, thereby filling openings that might otherwise be used for new orders. Otherwise, inventory will disappear and its purposes can not be served. Production and inventory policies need to protect the production for inventory. How this is done requires further development since it can affect system stability and the delivery dependability to customers.

4. Market demand

If the preceding policies are to be realistic and tenable, steps must be taken to keep the potential market demand above the company capability. Excess demand is created by superior performance and adequate market development effort. The presence of excess demand is shown by the length of time that customers are willing to wait for product delivery. The delivery delay criteria for various company products needs to be established and continuously reviewed. Maintenance of excess demand can be achieved by adequate allocation of effort to product quality, product newness, field service, new market development, and sales effort. Lost orders, delivery delay quotation, and delivery delay performance need to be continuously reported and interpreted to indicate the extent to which potential demand exceeds company capability.

5. Product newness

A measure of average "product newness" needs to be established. Effective protection against gradually increasing product average age needs to be established. Otherwise, the company will gradually slip into dependence on old products.

6. Dynamic product nature

The dynamic nature of desired products needs to be defined. This involves the general characteristics that distinguish the proper products for DEC from products that might be suitable to other types of companies. For example, one such characteristic is that the market should be able to learn to use the product in a length of time short compared to the length of time it takes competitors to provide the same product and service. In general, DEC should concentrate on products which can be developed quickly compared to their probable market life. A number of other product characterizations are possible which would be practical guides in the selection of successful developments.

7. Profitability

Company profitability should be sustained on a continuous basis. If profitability seems to be jeopardized, growth should be suspended until the problems can be identified and corrective action taken. A great danger here is to attempt alleviation of lower profits by seeking greater short term sales. This spreads fixed costs over greater sales and will improve profits in the short run. Basically, this is what has been happening to DEC over the last two years. Such a course ultimately lowers quality of performance and reduces the price which the company can command. At that time profitability can no longer be sustained even in the short run and the long term position has been substantially damaged. Any decline in profitability should be corrected by improving quality, performance, price, and efficiency of operations, but without reducing the investment in long term strength.

There is a great tendency in many organizations for profit margins to gradually decline since recent past performance is taken as the standard of excellence and current pressures cause performance to fall below that standard. As the performance is lowered, the standard itself declines.

I would suggest that a net profit standard of 15% on sales and 40% return on total investment (paid in, plus retained earnings, plus all borrowing) be maintained unless a full management and board investigation determines that the standards can not be met. When

the standards seem to be in jeopardy, the first recourse should be to examine all company activities, product quality, company performance, and pricing policies to see where the problem lies. It is clear that these target values are possible since they are maintained by a number of very large companies as well as small ones. It may be that further consideration will indicate that these profit targets could be further increased.

8. Growth

If company commitments are controlled to the company capability, there will be no over-commitment to act as a motivation for growth. Growth must therefore be a separately motivated and planned process. It should be gradual and regular.

There should be established the desirable ratios of people in various categories of skill and experience. Those which are most difficult and which will take the longest time to fill should be expanded first.

Easy positions such as production and clerical tasks and junior technical positions should be filled last and only up to their proper proportions in relationship to the higher skills.

This means that the top management positions, the research and development functions, long term market development, and quality control come first in the expansion sequence.

A growth rate of about 30% per year (2% per month) is probably about the limit that can be safely maintained if balanced company strength is to be sustained. This would lead to almost $50 million in sales after 5 years of such a slow steady growth.

J. CONCLUSION

I have suggested some courses of action in this memo. They are based on certain stated assumptions about company goals. Whether or not these are acceptable in their present form is less important than that some clear, agreed upon, and consistent set of goals and policies be adopted. In addition, it is of the greatest importance that these goals and policies be compatible with the rate at which the people in the company can grow. The present management has recently emerged from purely technical work. They are moving into the management of corporate growth, which is the most difficult undertaking in the field of management. They need to accept this as a challenge even greater than the development of technical capability, and they need to have the time to develop the required abilities.

DIGITAL EQUIPMENT CORPORATION

SALES PLAN

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Digital Equipment Corporation
Sales Plan

I. Introduction

The purpose of this Sales Plan is to document the policies, principles, and philosophy of the DEC marketing strategy. Out of necessity, this plan is based on assumptions about DEC's non-marketing activities and on overall company principles. Many of the points that are made in this plan are merely a written recognition of attitudes that have been in existence for some time. It is hoped that this formal documentation of principles and attitudes will be useful as the company grows.

DEC is participating in a very large industry and temptations occur daily to move in widely diverging paths, particularly in pursuing different segments of the computer market each having its own specialized requirements. The aim of this plan is to adopt formally those sales policies which encourage concentrated attention on particular parts of the market, and that as a result DEC will do a better job in establishing itself more strongly in these markets.

II. Assumptions about DEC Principles

The ideas in this Sales Plan are based on the following assumptions concerning DEC principles.

1. Sound Growth - It is assumed that DEC will continue to grow at rates in the vicinity of 30% per year. It is important to realize that the rate of growth is not a goal in itself but is a recognition of what is likely to happen. More important than the rate of growth is that growth takes place on a sound basis; this principally involves diversity of customers, products, and markets. The advantages of diversity have been illustrated clearly in the case of DEC during the past several years when one of the three major lines of business has temporarily carried the

expenses of one of the other lines of businesses, (e.g., modules supporting computers). Sound growth at DEC is most likely limited by the rate at which new people can be integrated into the organization.

2. Self-Financing - As long as DEC is able to maintain sizeable profits, growth is not likely to be limited by financial resources. This has proved to be true in the past at times when our growth was very rapid. However, in the future self-financing implies non-explosive growth.

3. Products - It is assumed that new products will be developed principally using in-house capability of DEC engineers. Furthermore, we plan to manufacture major portions of the products that we market. In contrast, some organizations enter totally new market areas by acquiring or merging a company or by remarketing the products of some other company. This principle of in-house development implies that products which are significantly different from what we are now doing will occur at a rather slow rate which is comensurate with our increasing technical capabilities for the area.

4. Early Profit - It is expected that all new ventures will aim at returning an early profit on the investment in development. Another way of stating this is that we are not likely to go into new endeavors which will require large investments before any possible payoff can occur. The word, "large", of course, means relative to the total size of DEC. There are several important reasons for this principle. The first is that DEC is not yet large enough to take significant investment risks in a highly dynamic industry. Those companies that have entered the computer industry assuming they would lose money for three to five years have almost always done just that and furthermore have usually found that the industry has changed sufficiently during the time period so that they have continued to lose money beyond the three to five year period.

5. Commerical Products - It is assumed that DEC will continue to emphasize and sell commercial products which lend themselves to catalog type descriptions and standard prices. However, it is important to recognize that one of our most important assets in the computer business has been our willingness and capability to do special engineering jobs for our customers. It is important to use our engineering capability for special equipment in commercial business wherever possible. We should further screen the use of this capability so as to assure it will be used for those projects which have a high probability of yielding new commercial products.

6. Government Business - Eventual low profit levels, governmental controls, and excessive customer dependence are major problems in doing business with the government supported activities. These comments are directed principally at defense procurement and the Renegotiation Act. Nevertheless, it is important to realize that the government is probably the largest customer for electronic equipment before embarking on a policy aimed at restricting government business. Also government business is normally easy to obtain compared to co mmerical business. The low profit levels of government business could very easily limit our ability to self-finance future growth and development of new products. The safe course of action which DEC should follow dictates selling only standard products to the government or its prime contractors and being very careful that all products developed have a commercial market available.

7. Uniqueness - DEC will continue to emphasize unique products, technical capabilities, and application know-how. Only by doing this will we be able to continue to command a high profit level on our business. Most of our past uniqueness has been in the product performance area. An equally important area of uniqueness is in the ability to show the customer how to use our products in new areas of application. This is particularly true of computers where until recently we have not had

programmers and application specialists.

8. Market Profitability - We will try to select market areas for our products which will be unusually profitable. This is in many cases equivalent to saying we will go into new applications and new products rather than products where price is a paramount customer consideration, such as in an old, established business. It is very important to recognize the difference between merely lowering the price on a product and developing a new way to satisfy a customer requirement at a lower price to him, as the latter course leads to profit to DEC.

9. Customer Loyalty - In all of its relationships with customers, DEC will emphasize the long term relationship. This means that we may frequently recognize moral obligations above and beyond legal contractual obligations to the customer.

10. Application of DEC Products - DEC will endeavor to be a critical user of its own products. This has happened very effectively in the case of modules and they are much improved products because of self criticism. It is particularly important that we develop first-hand knowledge of the use of our computers. This can be achieved in two ways. First, we can use them for internal purposes. We are now starting plans to use PDP computers in our own business data processing, automatic testing of modules, and software preparation. In addition to these experiences, we should be willing on a limited basis to do programming for complete systems for our customers. One normally can be reimbursed for this but it is probably worthwhile even without .eimbursement.

11. Current Techniques - DEC new products will continue to emphasize use of available techniques rather than depend heavily on radically new but unproven methods. This means that only a minimum effort should be invested in such fields as microminiaturization until they are available in a more advanced stage of development.

III. Markets

DEC has sold its products to government laboratories, universities, industrial organizations, and private research laboratories. Almost all users of DEC's products have engineering background and experience. In serving these customers we have concentrated principally on excellent hardware quality but have gradually been increasing the services that we provide along with the hardware. An important reason why customers have bought DEC products has been our flexibility and willingness to design special products or variations on standard products to meet their requirements. Our size has made this easy to do and it has been a major asset. Examples of this are very conspicuous in our memory testing business, and in our computer business to a slightly less degree. We have been quite successful in avoiding one-of-a-kind-type designs but still offering special features when required. Products for which true mass production is required are normally sold in markets which are so large as to be attractive to many organizations and thus quite competitive. On the other hand, work which is 100% special for each customer, no matter what price you charge, cannot be very profitable and frequently represents an uneconomical buy for the customer. For the foreseeable future it will be necessary to strike a balance between these two conflicting requirements.

1. Present DEC Markets

The areas of application listed below are the principal ones for which DEC products have been sold.

a. Scientific and Laboratory Use-This area of application is typified by our sales to Bolt, Beranek, and Newman, Itek, U.S. Air Force at Bedford, Systems Research Laboratory and others. These people have frequently used the computer as a real time device where they are studying man-machine relationships, automatic teaching machines, medical analysis, radar data analysis, library research, information retrieval techniques, etc. At the time these people made their decision to buy DEC, they did so for two principal reasons; first, they were getting computer speeds in the range of the IBM 709 and 7090 at a fraction of the price; second, they wanted to buy special options and features with the equipment initially and be able to add other options later. Both of their

objectives were basically satisfied by DEC.

b. Communications - DEC entered this business exclusively through the sale of computers to the International Telephone and Telegraph Corporation. The initiative for the application was clearly taken by ITT and we played the role of a hardware supplier. The sales peak to them has passed, but DEC gained in several very important ways through this affiliation. First, we started producing computers in significant quantities and established the manufacturing organization and techniques to accomplish this. Second, we acquired some experience in how computers can be applied in the field of communications. Third, the company acquired a reputation beyond what we otherwise would have received merely by association with ITT in the eyes of their customers. We also gained some recognition by ITT affiliates in Europe. Although the major sales to ITT are probably completed, we now have developed transmitters and receivers for doing communications work. We also have potential sales to Bell Telephone Laboratories, RCA Communications, and Standard Telephone and Cables, Ltd. This general area of computer application was described recently by IBM as one of the two which are still limitless.

c. Process Control - Our entrance into this market has been similar to the communications market except that it is on a smaller scale and in an earlier stage. Our initial affiliation is with the Foxboro Company and is progressing quite satisfactorily. We are playing a more active role in the marketing with them by conducting tours of our facilities for their customers. For the most part these are customers who have never heard of DEC prior to their visit here. In addition to selling computers to Foxboro, we are free and willing to sell computers to other systems manufacturers for process control, such as Leeds and Northrup. On occasion, we will also make special purpose systems which we sell directly to customers in this field of application. This business is almost totally non-renegotiable and holds great appeal for DEC.

d. Data Collection - The sale of computers to Jet Propulsion Laboratory and Beckman Systems have typified this area of application. It is almost 100% renegotiable business using the computer as a special purpose device for doing such things as receiving teletype relayed reports from a satellite and recording the information on magnetic tape for later analysis. There is much business available in this area, particularly if one is willing to take complete system responsibilities including programming, system operation, hardware design, etc.

e. Hybrid Analog Digital Simulation - This area of application is typified by our sale to Minneapolis-Honeywell. They bought from us principally because of hybrid research work conducted by MIT with the TX-0. However, these applications are likely to be military, and we should attempt to sell standard commercial products for them, which means selling to the prime systems contractor. The obvious candidate for this is Electronic Associates, Inc., the largest analog computer company, which is presently evaluating five digital computers and will presumably standardize on one for incorporation in hybrid work. DEC has also sold one PDP-1 in this area of application to United Aircraft, and direct sales to the end user instead of to a company like EAI appear to be possible.

f. Physics - Here we have sold computers to MIT for use in analyzing bubble chamber photographs. Our oscilloscope and light pen have been key factors in this application, and we have also designed a special purpose digital system known as PEPR to be used as an accessory with the PDP-1. In addition to these two parts, MIT has designed special optics equipment to go with this system. Each of the three parts are about equal in size and are all required to implement the MIT technique. We have also sold modules to several European atomic energy installations which have been used by the customer to build

special purpose digital devices known as the Hough-Powell System for reading bubble chamber photographs. Several duplicate installations are possible for both of these techniques for analyzing bubble chamber photographs. As a second physics application, we have now sold a computer for controlling an accelerator at the Atomic Energy Commission of Canada. There are several similar installations possible at places like Yale, University of Minnesota, University of Rochester, etc. The third physics area of application is control of nuclear reactors, and we are currently preparing a proposal for this application to the AEC of Canada. All three applications appear quite general and also appear to offer international opportunities. We should go much further in understanding the application of our products in these areas so that we can anticipate the needs of the field and strengthen our position. This necessitates assigning one or more full-time people to the applications of our products in the field of physics.

g. Test Equipment - This market is best represented by the memory testing systems that we have been building so successfully. The size of this market is ideal for DEC. It is large enough to be profitable and to offer repeat sales opportunities, but it is small enough so that it is not attractive to enough people to make it highly competitive. In addition to memory testers, we have sold many of our module products for use in special test systems, such as, the system that IBM made for the Mercury program.

h. Special Systems - Most of our modules nave been sold to customers who make special systems out of them. There are several reasons why people buy our modules for this work. First, the modules are easily available. Second, they have a reputation for working and for being easy to use.

Third, many module customers could not afford to have as large a design effort supporting their own production of modules as DEC provides. Fourth, many module users are government, educational, or research oriented and try to avoid producing things that they can buy from reliable sources. Some users, such as IBM, Bell Labs., RCA, etc., who obviously are large enough and, indeed, do produce modules for use in their own products, frequently find it easier, less expensive, and quicker to buy modules from DEC.

i. Education – Since modules are the building blocks of computers, an excellent way to teach computer design technology is by laboratory use of modules. This has represented a sizeable module market, principally in military schools. There is definitely a commercial market to schools and universities for the same type of instruction, but the market will probably be slower to develop.

j. General – In addition to the above market areas, DEC products have been sold in unique situations that do not fit a particular definition. Some of these customers are University of California at Livermore, Geotechnical Corporation, and United Gas Corporation. It is important that some part of our marketing capability be reserved for general customers who do not now fit into system categories. Out of this group may emerge eventually new categories that are in the embryo stage of market development.

2. New DEC Markets - The market areas listed in this section are those which are new to DEC but for which some commitment has already been made. In general, we have not yet made any significant sales in these areas.

a. Medical Research - Here we have loaned on a one-year basis a computer to Massachusetts General Hospital for use in their research laboratories. They are now teaching in-house courses in programming at the hospital and also at Harvard Medical School. In addition, we have started

renting time on our PDP-4 in Maynard to Yale University for use in brain wave averaging. We are now preparing a proposal to Bolt, Beranek, and Newman for a PDP-1 equipped with teletype facilities and a very large memory for use in patient record keeping at Mass. General Hospital.

b. Computer Aided Design - This is an MIT research project aimed at developing computer programs and hardware to do automatically more of the design; it is intended to be compatible with the concepts of the APT program. The SKETCH-PAD program is also included in this development. Our commitment in this area involves the development program for a line drawing and circle drawing oscilloscope. A good description of the objectives of this research is contained in the MIT Reports on Research, January 1963 issue.

c. Analog-to-Digital Conversion - DEC has incorporated analog-to-digital conversion equipment into systems and has sold modules for analog-to-digital conversion purposes. We have a continuing development effort in this area and it represents a significant potential market.

3. Markets to be Evaluated - The following general market areas appear to be somewhat compatible with our product capabilities and should be evaluated as potential areas of interest for DEC.

a. Drug Research
b. Automatic Control
c. Printing Business
d. Oceanography
e. Geosciences
f. Hotel and Department Store
g. High Schools
h. Engineering (Small computer for small company concept)
i. Teaching Machine Use
j. Business Applications - (Secondary use perhaps)
k. Materials Testing - (Instron Machines)

4. Market Evaluation Techniques - Before expending time, effort, and money on a new market for our products, DEC must evaluate that market based on the following criteria:

a. Market Characteristics - What is the most realistic estimate of the total number of units that can be sold in this market? Over how many years will the sales last? How many organizations are likely to buy? What kind of products will be needed in the market?

b. Market Saturation - How many units have already been sold and how many companies have already committed themselves to a portion of the market? If the competition has already committed itself to cover the market and DEC has nothing unique to contribute, the company should not concentrate its efforts here.

c. Saturation by DEC - Is this a market which DEC can potentially saturate? If not, what percent of the market could DEC realistically obtain?

d. Financial Support of the Market - Is this market supported by government or private industry funds? What is the prospect that this financial support will be increased, and how far into the future is support guaranteed? If the financial support is quite shaky, the risk to DEC of investing time and money in selling to this market is considerably higher.

e. Stage of Development of Market - If DEC can enter a market in the early stage of its development, and participate in this development, we are more likely to be in a position to contribute something unique, thus insuring a solid base for future sales. If the market has already reached its peak of development and present activity is confined to refining techniques, it is likely that DEC's influence on the market will be inconsequential and we should not enter the field.

f. Investment Required - In order to investigate and make a contribution to the market, how much money and time would have to be invested by DEC? How many people would have to be committed to the development of the market (or new people hired)?

g. Unique Contribution by DEC - In a market where DEC has especially useful equipment or techniques, the prospect for sales is much higher. Consequently, DEC's effort should be directed primarily to markets where a unique contribution is present or can be developed.

h. DEC Volume - How many units could DEC expect to sell to the market in relation to the amount of time, money and effort exerted in developing the products and training people? How many different customers could we expect? If the market were confined to a few large users, DEC would have to be careful not to become dependent on one customer.

i. Present Staff Interest - Is there anyone now at DEC who is enthusiastic about working on the new market? Would we have to hire a new man to work on this market, and if so, how long would it take us to find such a man? In line with developing our own people's potential along the lines of their interest, the company would be more likely to succeed ir markets where a man is now available to provide leadership.

j. Profitability - Could we expect the products sold in the market to be as profitable as our present products? If the market appears to be geared to a lower rate of profit, it may not be suitable for us to spend time and effort.

k. Type of Customer - Are the customers likely to be military and thus renegotiable? If so, DEC must be assured that the sales to this market can be balanced by non-renegotiable sales of similar products in other markets.

Original Equipment Manufacture

5. OEM Market - A number of advantages can accrue from having a portion of DEC's business in the OEM market:

a. The customer's sales force is an extension of the company's sales force and does active selling of DEC products.

b. The equipment sold to an OEM customer is repetitive business, thereby making our production and checkout problems simpler.

c. Customer service is concentrated in one location (in the long run such service may have to be expanded to the ultimate customer, thus removing this as a decided advantage).

d. The ultimate customer is, in most cases, aware of DEC and in some instances will deal with us directly in future purchases.

At the same time the OEM market has inherent disadvantages that cannot be overlooked:

a. DEC has less control over the uses and servicing of its products.

b. The business can evaporate rapidly and cause extreme fluctuations in DEC sales.

c. DEC can come to depend too heavily on one customer.

d. The customer may decide to make his own product after several years of buying from DEC.

Taken on balance, however, the OEM market has enough advantages so that DEC should consider this method of entering a market in each of the new market areas investigated.

Even if the OEM sales to one customer last for only a few years, the advantage of multiple sales outweighs the risk of losing the customer. At the same time, the amount of OEM business with one customer ought to be limited to approximately 10% of DEC's annual sales so as to limit the repercussions of cancellations. More important than the exact percentage is the degree to which this interferes with DEC's ability to meet its production, engineering support and service obligations to its regular customers. Thus, before entering an OEM relationship with a customer, DEC ought to assure itself that the total business with this customer will not exceed 10% of annual sales.

6. Foreign Markets - Almost all the areas of application described above also exist in the areas outside the United States. We should develop these for two principal reasons. First, sales in these areas will help to offset government sales of the same products in this country. Second, we may amortize our engineering investment over a larger number of production units. Other technical companies, such as High Voltage Engineering, Electronic Associates, and Foxboro, have significant portions of their sales outside the U.S. (e.g. 25 to 50 percent of their total sales.)

IV. New Product Development

The importance of new product development in the overall growth of DEC cannot be over-emphasized. Today DEC is still selling almost all of the original products that have been developed. Very few have been obsoleted or superceded. If one looks at the sales growth of any particular model, it is most likely to be less than the overall growth of the company. In addition to these observations, we must continually realize that we are in a very dynamic industry where changes occur rapidly. We must continue to aim for short development times to meet market requirements. One of our greatest strengths in the past has been our size and flexibility to make new products on time scales that large companies could not meet.

Our development effort should be regarded as a precious commodity to be used where it does the most good. We are continually tempted to develop one-of-a-kind products requested by specific customers. We should examine all new product ideas including circuits and systems to see if there is any potential for repeat sales. This is a principle which must be administered with considerable care since a major asset we have available for our customers is flexibility to do special things. For example, development of one special module type which permits large sales of our standard modules might very well be worthwhile.

Most of the new DEC products in the past have been developed in response to customer needs and requirements. This is basically very desirable but has one potential pitfall. Those potential customers who are more aggressive and articulate in describing their needs and selling us on meeting their needs may dominate our development capacity. These same customers are not necessarily the most profitable nor representative of an ideal market for DEC. Because of this, we should have a broad application of our new products in mind when we set about developing them. The Sales Department must play an important role in uncovering customer requirements when they are still in a nebulous state. Filtering these requirements and bringing them to the attention of the Engineering Department is a key task.

Specific areas of product development which are underway or need to be started are the following:

1. Modules

a. VHF Modules - These are needed principally to broaden the line and to extend the applications for which our modules can be used. The initial area of application will probably be in the field of physics for time interval measurements. The sale of these particular modules is not likely to be great in itself but their existence will continue to spur the sale of our standard, less expensive modules for use in systems having both requirements. The technical problems are sufficiently challenging that success will be a technical achievement as well as a market opener. The time involved in this development has considerably exceeded the original expectation and every effort should be expended at completing it in the near future.

b. Silicon Modules - Recent developments in silicon transistors seem to indicate that they will be significantly less expensive than the germanium types we are now using. Hopefully, they will have other advantages, including better reliability and tolerance to elevated temperature environments. If a new line of modules could be developed using these transistors, thus achieving lower selling prices and the other advantages while preserving DEC normal profit margins, then we should begin an aggressive development program. This is a very serious decision, due to the fact these new modules would not be directly compatible with our existing signal conventions. This program might serve as an ideal vehicle for making other changes to bring our module line up to date. They might also serve as the basis of a new computer design.

c. Educational Modules - The silicon modules listed above may also serve the educational market. The requirements are principally for lower cost techniques which can be used in engineering departments at universities, and perhaps high schools, to demonstrate logical techniques. This could

be a totally different technical approach if it met the other requirements of low cost and simplicity.

In general, DEC modules have proven highly satisfactory in use. One of the reasons for this is that DEC is a high volume user of these modules. Our own engineers are quite critical of the design and performance of the modules and represent a convenient and forceful feedback from a typical user. No major new improvement has been made in DEC Modules in the last several years and we should be cautious to avoid falling behind in this important bread and butter area.

2. Computer Developments

The market for DEC computers represents the most general and largest of all the future expansion of DEC. Therefore, it should take a significant portion of our new product development work. The three areas discussed below represent major opportunities for improving our product.

a. Central Processor - One key goal here is to achieve a more capable central processor which can be sold at lower prices without sacrificing profit. Fruitful areas of cost reduction appear to be larger memories, different packaging technique including more functions on a card, lower cost circuits and components, computers which require a lower percentage of sales cost for marketing, etc. We should be very careful to have in mind specific computer applications when we develop new computer systems. The ability to address directly a larger memory certainly should be emphasized in any new design.

b. Peripheral Equipment - One of the most important new development areas for the computer market is the peripheral equipment. The opportunity for uniqueness lies principally in this area. Central processors will probably tend to look more and more alike in the future, but the peripheral equipment will make the difference. Specific areas that DEC is now active in are enumerated below.

i. DEC Magnetic Tapes - These are the low cost, high reliability, simplified tape units that were originally developed at Lincoln Lab. They feature fully redundant recording and a drive mechanism involving no capstans or pinch rollers. They may become an effective replacement for punched paper tape in many applications. They also will feature replaceable blocks of information on the tape.

ii. High Density Magnetic Tape - This type of IBM compatible magnetic tape features 556 or 800 bits to the inch and is rapidly becoming the standard or normal tape memory technique. This is important because it offers high transfer rates of information and offers continued compatibility with IBM installations, a feature which has been important in the past. Initial plans call for use of IBM transport units. Later we will undoubtedly want to have our own electronics in conjunction with a high density tape transport such as Potter, Ampex, Burroughs, etc., in an effort to lower the cost of high density tape for the PDP-1 and PDP-4 Computers.

iii. Mass Memory - Many new exciting applications of computers are dependent on the existence of large amounts of rather fast access memory. The only current activity at DEC on this is aimed at integration of a Randex Drum into a PDP-1 for Bolt, Beranek and Newman. We should continue to investigate other mass memory devices such as large discs, removeable discs, (such as the IBM 1311), and other techniques of low cost, large volume memories.

iv. CRT Displays - The area where we have the most significant head start from any other computer manufacturer is in CRT displays. We currently have developments underway for doing the following: automatic line drawing, automatic curve drawing, and incremental operation. These are potentially useful in computer-aided design and hopefully will reduce the amount of computer time required to keep the scope picture flicker free.

In addition, we are beginning experiments in projection systems in order to create a large display on a flat surface. Many of these new developments will require programming support in order to investigate their usefulness. Perhaps some of this can be done jointly with other research organizations like M.I.T.

Another unique area of CRT work is film reading. We should expand the completeness of the system that we can offer in this area to include camera, eyeball, and program sub-routines.

v. Electro-Mechanical Equipment - In order to offer a complete line of units, we should continue to improve our card reading and punching, low cost line printer, paper tape reader, and typewriters. None of these represent requirements of tremendous importance. However, a continuing development effort in these areas is vital.

vi. Communication Terminals - We should continue to develop equipment in this area that will work with dataphone, teletype lines, and other communication methods. One major market area could depend on the existence of these techniques. In other applications the availability of good communications equipment may be a requirement of the system.

vii. Analog-Digital Hybrid Operation - Analog-Digital converters have played a major role in many of our computer systems. We should continue to develop our knowledge of these converters and our hardware capability to build them, due to their importance in our systems. This should include both higher performance units and lower cost techniques, and perhaps even include shaft encoders. Particular needs exist at DEC for analog multiplexers, sample and hold circuits, generally higher precision elements, operational amplifiers, and level shifting techniques.

c. Software - We must increase the emphasis that we place on computer software developments. Conventional software such as FORTRAN, and perhaps some simple business oriented software, may indeed help our customers justify a multiple use for our computers. In addition to this, we must develop software which makes the CRT display, DEC tapes, and all other parts of our system easy to use. Software aimed at unique areas of application should be considered an important part of developing new markets. Development schedules, specifications, acceptance tests, etc., should accompany software engineering just as it does hardware engineering.

3. Special Systems

We should continually examine our development work on special systems to see if it can be applied to other customers. Our memory testers were at one time a one-shot job. We should also recognize the need for key components which will allow us to go into special systems like memory testers. The transistorized current driver is a prime example of how a key component spurred the development of other equipment.

Some areas that might develop this way are thin film memory testers, PEPR systems for bubble chamber film reading, spark chamber encoding devices, accelerator controlled devices, non-computer process control systems, materials testing electronics (Instrom testing machine), etc.

V. Marketing Policies

1. Long-term Customer Loyalty

The major portion of DEC sales has been to established customers. Therefore, marketing activites should be directed toward these customers in order to generate a long term customer loyalty. In essence, this policy means giving former customers priority over new customers. One way to implement the policy is to give preferential delivery treatment to old customers, another procedure is to build special hardware for old customers but not for new customers. Both of these approaches have been utilized with reasonable success.

By maintaining a ratio of one new customer to three old customers, DEC can establish the balance we are seeking. The new customers should not be selected on a random basis. Rather, they should be companies who appreciate high quality in a product and are willing to pay a premium price for it. One way of achieving this kind of selection is by working with the customers in the early phases of the development of his own new products or service. At this time, special hardware or programming help and other technical support will help insure his success and will consequently insure his loyalty to DEC.

2. Applications Capabilities

In fields which obviously are dominated by quality customers, we should start to develop an applications capability. An example of such a field is physics. where the customers are quite sophisticated. During the whole process of working with the customer, including selling and servicing, DEC sales engineers should be especially sensitive to the special requirements of each customer. Having applications specialists will increase the company's ability to work effectively with customers and make suggestions which fit his needs.

3. Customer Training

DEC will provide computer customer training in both programming and maintenance. In addition, we will provide on-site technical support for all customers. This support should continue until the customer is capable of operating the computer, special system, or modules by himself; the length of time that this training entails should not be fixed but should depend on that customer's capability.

4. New Markets and Products

Rather than dissipate efforts attempting to sell to all markets, marketing efforts should concentrate in selected fields which should be selected as outlined in Section III-D. In general, though, it may be said that these fields are those in which DEC has some unique competitive advantage.

After a product has been in the field for several years and met wide acceptance, competitive companies will generally build a similar unit. DEC has experienced this in the case of our PDP-1 computer and our system modules. At this point two approaches can be taken. One would be to lower the price to meet the competition, and the other would be to find new applications for the older products. The latter approach is, of course, most desirable and should be the DEC approach.

Our technical capability in the areas of new product development must remain flexible so as to meet our customers' changing needs effectively. This flexibility has been one strong reason why our customers have remained loyal in the past, and will, of course, be a major factor in attracting new customers.

5. Pricing Policy

The pricing policy is straightforward, it is the price which is high enough to permit a quality job to be done and still earn a significant return on our

investment. DEC prices are always fixed prices and not variable or subject to negotiation.

To insure that our pricing meets these requirements, a cost center accounting system is being established. This system should allow marketing expense information to be readily available and broken down by:

a. Product Line
b. Major Customer
c. Warranty
d. Selling Function (i.e., shows, sales literature, customer service, customer training)
e. Branch Office

Control of many hidden costs in the selling process, or at least an awareness of these costs, can be of significant value in planning a sales campaign and in evaluating marketing techniques.

6. Information Flow

There are two types of information flow to be considered here: the first is between the customer and DEC; the second is between the Sales Department and the other parts of the Company.

There should be a frequent sampling of customer satisfaction by the officers and senior managers of DEC. This type of sampling should be done separately from a sales trip and should have customer attitudes about DEC as the sole purpose of the visit. Recent trips of this type have been quite rewarding and revealing.

Within our Customer Service Department, a maintenance reporting system has been set up which will, to a large extent, record on a regular basis any customer dissatisfactions.

The Sales Department has a very important obligation to inform the Engineering Department and other senior managers of quality and customer attitudes. New ideas areoften generated by customers and these should be quickly passed along to Engineering.

VI. Sales Department - Organization and Staff

1. Organization - Four Major Divisions (Chart 1)

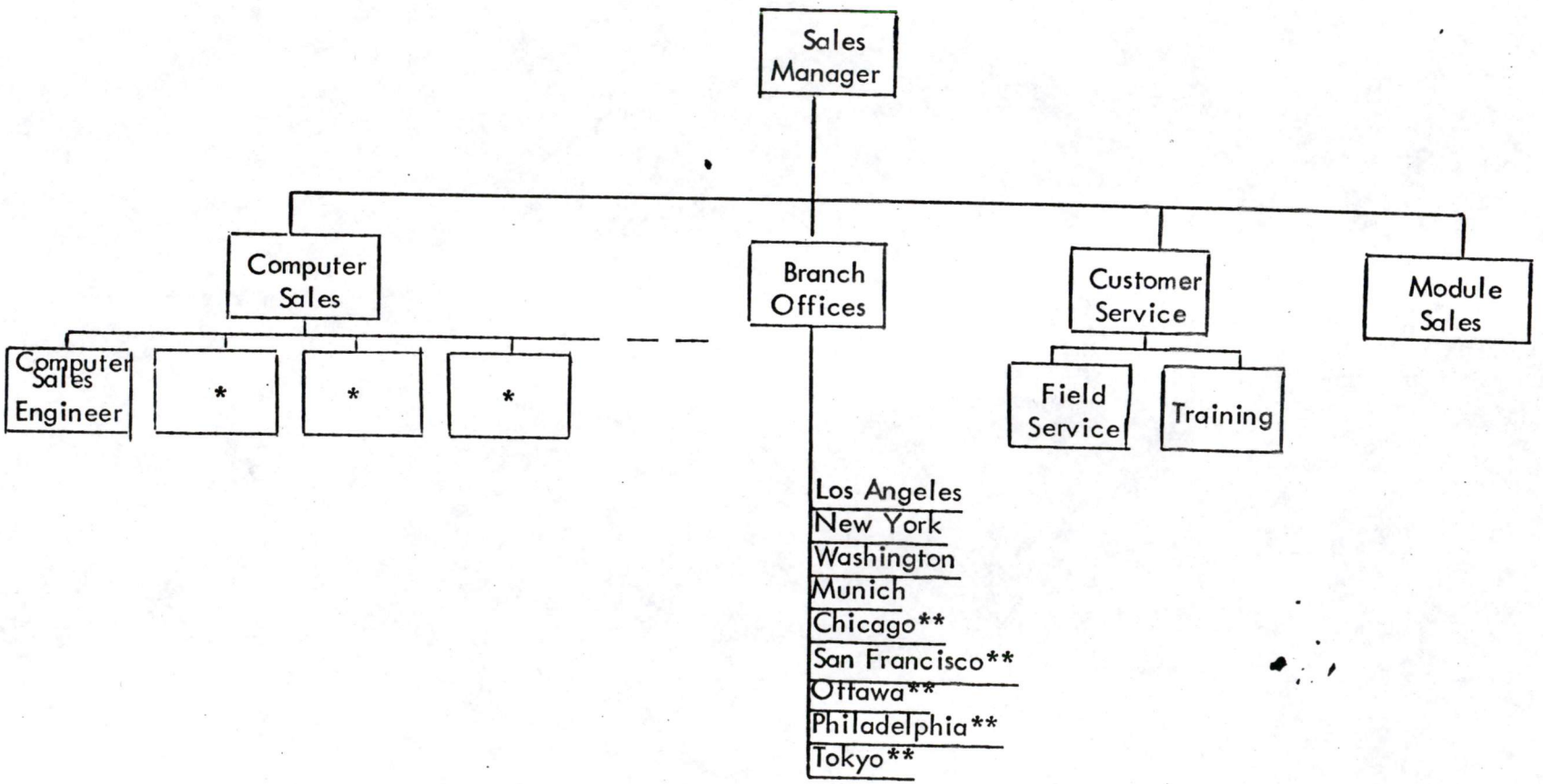
a. The Computer Sales Group is subdivided into a general sales group and into a number of small applications groups, each responsible for developing a specific market area, such as medical and biological research, physics, communications, etc. Each applications group will be responsible for keeping in close touch with its field of specialty by attending conferences related to the field, by visiting specialists regularly and working with them in developing computer applications, and by generally identifying themselves with the field. These applications groups should develop as fields are studied and seen to be especially suitable for DEC.

b. The Module Sales Group is oriented to applications engineering. In this Group, as in the Computer Sales Group, specific markets may be allocated to individuals. However, the expectation is that Module Applications Engineers will each be flexible enough to cover a number of areas.

c. All Branch Offices will sell all DEC products. It is expected of course, that individual sales engineers will develop a specialty in particular products. Quite possibly, an engineer in a branch office will also be a member of one of the computer applications groups, especially if the market in that field is concentrated geographically about the branch. The continuity between a customer and a sales engineer is vitally important, and branch office personnel should concentrate on developing close relationships with particular customers. The sequence of establishing new branch offices should remain somewhat flexible so that it can depend on the availability of sales engineers for the branch and on the urgency of serving specific customers in the area.

Chart 1

Basic Sales Organization of DEC



* Application Groups for Specific Markets (i.e., Physics, Medical)

** New Offices to be Established.

d. Customer Service has the responsibility for field installation and maintenance of computers in addition to providing maintenance and programming courses. It must be kept in mind that the number of field service personnel needed by this group grows cumulatively with the number of computers intalled.

2. Sales Engineers

a. All sales engineers should have an engineering background and training in order to deal effectively with DEC's technically oriented customers. They should be familiar with all of the company's products before having customer contact, though each individual will tend to develop greater interest and ability in a specific product line.

b. The training of new sales engineers is critically important to the continued success of DEC. Typically, a new employee will be assigned first to an engineering project, or projects, for a period of 3 to 6 months, depending on his background. This type of training period offers the most direct and effective way to have a newcomer learn the engineering and managerial practices and philosophy of the company. In addition to project engineering, a new sales engineer will participate in the training courses offered to customers.

3. Communications

a. It is vital to have the branch office personnel in constant touch with the home office and plant so that they are intimately aware of new developments and company attitudes. Just as important is the awareness of the home office of field sales information and customer attitudes. Frequent telephone calls, the Bi-weekly Report, Sales Literature, On-Line, and regular memoranda are all useful in providing this communications link. However, personal contact is essential and regular trips must be made by branch office sales engineers to the home office and vice versa.

b. Monthly sales meetings will be held in Maynard, generally lasting one day. There should be at least one representative from each branch office (except foreign offices) present at each of these meetings. In addition, representatives from distant offices (e.g., California) should plan to remain in Maynard at least one week since their visits to the plant are less frequent.

VII. Plan of Action for the Next 12 Months

1. Personnel Additions (Refer to Chart 2)

a. Computer Applications Engineers (CAE)

Four applications engineers will be hired by 1 May 1963.

b. Module Applications Engineers (MAE)

One new module application engineer will be hired by 1 July 1963.

c. Branch Office Men (BOM)

Two present DEC sales engineers will be moved to branch office locations and will be replaced by new applications engineers.

d. Field Service Technicians (FST)

Four new field service technicians will be hired by 1 June 1963, and net increase of two because we expect that two present technicians will move to engineering.

e. One new technically trained man will be hired for training.

f. One man for applications and promotion of the CRT displays will be hired.

g. One man will be hired or transferred to applications training and promotion for laboratory modules (LMM). If a man is selected from the inside he will be replaced by recruiting from the outside.

2. Establishment of Branch Offices

a. In January the Munich office will be opened with Guenter Huewe taking an active part by May 1st.

b. A Chicago office will be opened by February 22, with a temporary sales engineer until we hire a permanent man.

c. By April, the Ottawa office will be opened with a local Canadian as manager.

d. By June the San Francisco office will be opened probably with Ken Larsen managing it.

3. New Markets

a. We will establish a formal plan for entry into new markets. Such a plan drawn up by market specialists.

b. We will establish a rental plan to be used where we wish to encourage a customer in a new market.

c. Certain areas, such as physics, we will treat as new markets and will organize them in the same manner by having a specialist and a definite plan. The physics group should be started by 1 March 1963.

4. Communications, Information and Training

a. We will install a formal field office maintenance recording system to minimize the communications problem with the customer.

b. We will control delivery commitments on computer systems by careful quotations, particularly when large engineering content is involved.

c. We will initiate a job cost system for the sales department for 1963.

d. We will initiate a plan for one representative of the California office to visit DEC each month.

e. We will formalize our management review of quality of products and service by planning visits to particular customers at least once every three months.

f. We will establish a system to allow branch offices to report more information to Maynard, specifically to the Computer Guidance Committee, on possible new products.

5. Specific Hardware Action

a. The Sales Department will provide the Engineering Department with desired characteristics from a marketing standpoint of the next computer by 1 April 1963.

b. We will include the Multiply and Divide option in the basic PDP-1 system price.

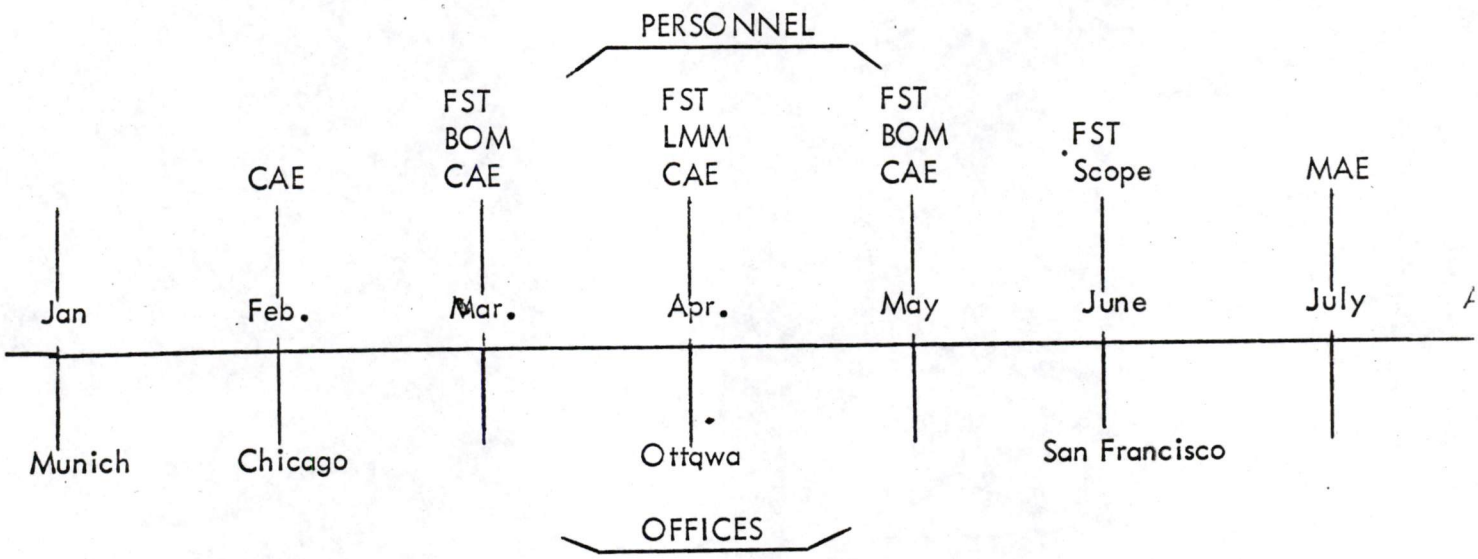
c. We will settle on the performance specifications for the new high density magnetic tape system by 1 March 1963.

d. We will settle price, performance, and promotional literature for DEC tape by 1 March 1963.

e. Action will be initiated to insure that DECAL is completed and documented by 1 April 1963.

Chart 2

Schedule for New Personnel and Branch Offices



APPENDIX

A. Sales Staff Expansion

Chart 3 is a projection of the number of people required in the various divisions of the Sales Department to assure DEC's growth at the desired rate for the next five years.

B. Financial Aspects

The sales costs, excluding technical publications and advertising, are projected for five years in Chart 3. The projected annual costs are based on maintaining the same ratio of technical sales staff to costs as in 1963. The projection points up the fact that sales costs as a percentage of annual sales will rise for several years before leveling off.

APPENDIX

Chart 3

Total Technical Sales Staff at the End of Each Fiscal Year

	1962	1963	1964	1965	1966	1967
Module Sales	2	3	4	5	6	7
Branch Offices	4	9	14	17	20	23
Computer Sales –						
General	2	3	4	5	6	7
Physics		2	3	4	4	4
Medical		1	2	2	2	2
Process Control	1	2	2	2	2	2
Communications		1	2	2	2	2
Scope Application		2	3	4	4	4
New Areas			2	4	8	12
Customer Service –						
Field Service	6	10	15	22	30	40
Training	2	3	4	6	8	10
Sales Management	2	3	4	4	5	5
Total Technical Sales Staff	19	39	59	77	97	118
Annual Sales Costs (Based on present ratio of technical sales staff to sales costs)		$ 700K	$ 1,180K	$1,640K	$2,100K	$2,610K
Annual Sales Volume Forecast		$10,800K	$14,000K	$18,200K	$23,600	$30,600K
Sales Costs as Percent of Annual Sales		6.5%	8.4%	9.0%	8.9%	8.5%

COMPANY CONFIDENTIAL

THE DIGITAL EQUIPMENT CORPORATION

Maynard, Mass.

TWELVE MONTH FINANCIAL FORECAST

February 1, 1963 thru January 31, 1964

With Sub Totals for Fiscal '63
(Ended June 30, 1963)

As of March 5, 1963

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

HIGHLIGHTS

The Financial results for Fiscal '63 are Forecast at:

Net Sales	$9,939K
Net Profit	$1,089K

The Financial Results for the Twelve Months ended January 31, 1963 are forecast at:

Net Sales	$9,868K
Net Profit	$ 712K

For the past six months the operations of the Company have been in a cash generating direction. Now we are about to enter into a cash depleting period as engineering costs rise in conjunction with the Development of new products including some deterioration of margins on existing products as they are phased out.

Our present strong cash position should be sufficient to carry us until June of '63 at which time the peaking of major disbursements for retirement of the AR&D note ($300K) and Quarterly payment of Federal Income Tax ($190K) necessitate borrowing approximately $200K. The Forecast calls for DEC returning to a cash generating position by January of '64 at which time billings of new products are on the rise.

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

INDEX

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast -- March 5, 1963

Exhibit A

($000's Omitted)

Balance Sheet

	2/28/'63	3/31/'63	4/30/'63	5/31/'63	6/30/'63	9/30/'63	12/31/'63	1/31/'64
Cash* -- Sched. 1	$1,511	$1,022	$ 932	$ 684	$ 154	$ 171	$ 161	$ 164
Receivables -- Sched. 2	760	880	850	1,100	1,600	1,800	1,900	2,000
Inventory -- Sched. 3	1,915	2,064	2,192	2,176	2,091	1,999	1,912	1,934
Other Current Assets	30	30	30	30	30	30	30	30
Total Current Assets	$4,216	$3,996	$4,004	$3,990	$3,875	$4,000	$4,003	$4,128
Accounts Payable	200	200	210	210	220	240	250	25[illegible]
Notes Payable	316	316	316	316	216	216	216	11[illegible]
Withholdings and Accruals	320	350	340	350	360	300	350	36[illegible]
Reserve for Taxes -- Sched. 4	1,268	1,044	1,048	1,084	977	939	674	78[illegible]
Total Current Liabilities	$2,104	$1,910	$1,914	$1,960	$1,773	$1,695	$1,490	$1,5[illegible]
Net Working Capital	2,112	2,086	2,090	2,030	2,102	2,305	2,513	2,61[illegible]
Net Leased Equipment -- Sched.5	163	156	149	232	221	275	317	298
Net Fixed Assets -- Sched. 6	276	279	282	285	288	288	288	28[illegible]
Leasehold Improvements -- Sched. 6	45	48	51	54	57	66	75	78
Excess of Assets over Cur.Liabilities	$2,596	$2,569	$2,572	$2,601	$2,668	$2,934	$3,193	$3,279
Less Long Term Debt	71	71	71	71	71	71	62	55
Net Worth - Sched. 7	$2,525	$2,498	$2,501	$2,530	$2,597	$2,863	$3,131	$3,224

*As used in this abbreviated presentation the term Cash is taken to include Marketable Securities.

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Exhibit B

($000's Omitted)

Statement of Profit and Loss

	Net Sales (per Sched.8)	Less Cost of Sales	Gross Profit (per Sched.8)	Less Operating Expense (per Sched.10)	Operating Profit	Less Other Expense	Pre-Tax Profit	Less State and Federal Income Tax	Net Profit
First Seven Months Actual	$6,936	$3,005	$3,931	$1,643	$2,288	$54	$2,234	$1,230	$1,004
February Estimate	528	238	290	261	29	1	28	15	13
March Estimate	366	156	210	270	(60)	1	(61)	(34)	(27)
April Estimate	500	211	289	281	8	1	7	4	3
May Estimate	651	293	358	292	66	1	65	36	29
June Estimate	958	429	529	378	151	1	150	83	67
Sub-Total, Fiscal '63	$9,939	$4,332	$5,607	$3,125	$2,482	$59	$2,423	$1,334	$1,089
1st Qtr.Fiscal '64 Estimate	2,856	1,283	1,573	960	613	23	590	324	266
2nd Qtr.Fiscal '64 Estimate	2,980	1,354	1,626	1,027	599	4	595	327	268
January '64 Estimate	1,029	472	557	349	208	2	206	113	93
Total, Next 12 Months	$9,868	$4,436	$5,432	$3,818	$1,614	$34	$1,580	$ 868	$ 712

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 1

($000's Omitted)

Cash Flow

	Beginning Balance	Add Receipts: Customers (per Sched. 2)	Add Receipts: Borrowings	Add Receipts: Total	Less Disbursements: Taxes (per Sched. 4)	Less Disbursements: Repayments	Less Disbursements: Other	Less Disbursements: Total	Ending Cash Balance (per Exhibit A)
February '63	$1,515	$ 548	$ -	$ 548	$ -	$ -	$ 552	$ 552	$1,511
March '63	1,511	246	-	246	190	-	545	735	1,022
April '63	1,022	530	-	530	-	-	620	620	932
May '63	932	401	-	401	-	-	649	649	684
June '63	684	458	200	658	190	300	698	1,188	154
1st Quarter Fiscal '64	154	2,656	-	2,656	362	-	2,277	2,639	171
2nd Quarter Fiscal '64	171	2,880	-	2,880	592	-	2,298	2,890	161
January '64	161	929	-	929	-	100	826	926	164

For purposes of this schedule Cash is taken to include Marketable Securities.

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 2

($000's Omitted)

Accounts Receivable Detail

	Beginning Balance	Add Sales (per Exhibit B)	Deduct Estimated Collections	Ending Balance (per Exhibit A)
February '63	$ 780	$ 528	$ 548	$ 760
March '63	760	366	246	880
April '63	880	500	530	850
May '63	850	651	401	1,100
June '63	1,100	958	458	1,600
1st Quarter Fiscal '64	1,600	2,856	2,656	1,800
2nd Quarter Fiscal '64	1,800	2,980	2,880	1,900
January '64	1,900	1,029	929	2,000

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast -- March 5, 1963

Schedule 3

($000's Omitted)

Inventory Detail

	Beginning Inventory	Add Input: Purchases	Add Input: Labor and Overhead	Less Relief: Cost of Sales (per Sched. 8)	Less Relief: Capitalization of Rentals (per Sched. 5)	Less Relief: Used Internally	Ending Inventory (per Exhibit A)
February '63	$2,018	$180	$148	$ 231	$140	$ 60	$1,915
March '63	1,915	200	158	149	-	60	2,064
April '63	2,064	225	167	204	-	60	2,192
May '63	2,192	250	170	282	94	60	2,176
June '63	2,176	275	158	418	-	100	2,091
1st Quarter Fiscal '64	2,091	900	525	1,243	94	180	1,999
2nd Quarter Fiscal '64	1,999	975	514	1,302	94	180	1,912
January '64	1,912	350	185	453	-	60	1,934

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 4

($000's Omitted)

Reserve for Taxes Detail

	Beginning Balance	Add Accrual (per Exhibit B)	Less Payments	Ending Balance (per Exhibit A)
February '63	$1,253	$ 15	$ -	$1,268
March '63	1,268	(34)	190	1,044
April '63	1,044	4	-	1,048
May '63	1,048	36	-	1,084
June '63	1,084	83	190	977
1st Quarter Fiscal '64	977	324	362	939
2nd Quarter Fiscal '64	939	327	592	674
January '64	674	113	-	787

Estimate of September and December '63 Tax Disbursement

	Total	Federal	State
Estimated Fiscal '63 Tax (per Exhibit B)	$1,334	$1,184	$150
Portion Payable by 9/15/'63	742	592	150
Less Prepayments Rendered	380	380	-
9/15/'63 Disbursement	362	212	150
Fiscal '63 Balance due 12/31/'63	592	592	-

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 5

($000's Omitted)

Net Leased Equipment Detail

	Beginning Gross Leased Equipment	Add Cost of Equipment Rented	Beginning Reserve for Depreciation	Add Provision (per Sched.8)	Ending Net Leased Equipment (per Exhibit A)
February '63	$ 78	$140	$ 48	$ 7	$163
March '63	218	-	55	7	156
April '63	218	-	62	7	149
May '63	218	94	69	11	232
June '63	312	-	80	11	221
1st Quarter Fiscal '64	312	94	91	40	275
2nd Quarter Fiscal '64	406	94	131	52	317
January '64	500	-	183	19	298

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 6

($000's Omitted)

Net Fixed Assets and Leasehold Improvement Detail

	Gross Fixed Assets	Less Reserve for Depreciation	Net Fixed Assets (per Exhibit A)	Leasehold Improvements (per Exhibit A)
2/28/'63	$386	$110	$276	$45
3/31/'63	396	117	279	48
4/30/'63	406	124	282	51
5/31/'63	416	131	285	54
6/30/'63	426	138	288	57
1st Quarter Fiscal '64	456	168	288	66
2nd Quarter Fiscal '64	486	198	288	75
January '64	496	208	288	78

Gross Fixed Assets forecast as being acquired at uniform rate of $10K per month and Leasehold Improvements at a net of $3K per month. At the moment, the Company does not have definitive plans for these expenditures but regards the amounts as probable upper limits of expansion toward capacity Volume.

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 7

($000's Omitted)

Shareholders Equity Detail

	Common Stock	Stock Premium	Reserve for Contingencies	Retained Earnings	Total (per Exhibit A)
2/28/'63	$51	$81	$10	$2,383	$2,525
3/31/'63	51	81	10	2,356	2,498
4/30/'63	51	81	10	2,359	2,501
5/31/'63	51	81	10	2,388	2,530
6/30/'63	51	81	10	2,455	2,597
1st Quarter Fiscal '64	51	81	10	2,721	2,863
2nd Quarter Fiscal '64	51	81	10	2,989	3,131
January '64	51	81	10	3,082	3,224

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 8
(Page 1 of 2)

($000's Omitted)

Gross Profit Detail

	Net Sales and Rental Income					Cost of Sales and Rentals					Gross Profit on Products & Services
	Total	Modules	Systems	Computer Sales	Computer Rentals	Total	Modules	Systems	Computer Sales	Computer Rentals	
First Seven Months Actual	$6,936	$2,283	$ 684	$3,939	$ 30	$3,005	$ 782	$428	$1,782	$ 13	$3,931
February '63 Estimate	528	170	87	258	13	238	60	54	117	7	290
March '63 Estimate	366	250	76	27	13	156	88	48	13	7	210
April '63 Estimate	500	300	85	102	13	211	105	53	46	7	289
May '63 Estimate	651	300	152	179	20	293	105	95	82	11	358
June '63 Estimate	958	300	116	522	20	429	105	73	240	11	529
Total, Fiscal '63	$9,939	$3,603	$1,200	$5,027	$109	$4,332	$1,245	$751	$2,280	$ 56	$5,607
1st Qtr. Fiscal '64 Est.	$2,856	$ 960	$ 322	$1,500	$ 74	$1,283	$ 336	$202	$ 705	$ 40	$1,573
2nd Qtr. Fiscal '64 Est.	2,980	1,030	345	1,510	95	1,354	361	216	725	52	1,626
January '64 Estimate	1,029	360	115	520	34	472	126	72	255	19	557
Total, Next 12 Mos.	$9,868	$3,670	$1,298	$4,618	$282	$4,436	$1,286	$813	$2,183	$154	$5,432

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 8
(Page 2 of 2)

($000's Omitted)

Detail of Computer and System Sales – Next Six Months

	February	March	April	May	June	July
Computers						
CRC	$ 30	$ 7	$ 44	$	$	$
MIT	18		34			
Raytheon	120					
AEC of Canada			7			
JPL - Rental	10	10	10	10	10	10
BBN - Rental	3	3	3	3	3	3
NSA					321	
Minneapolis-Honeywell				151		
Foxboro	90			28	101	
ITT		3				
BBN		17	6			
SRL			11			
Shipments of Orders Not Yet Booked					100	500
Rental of Orders Not Yet Booked				7	7	7
Total Computers	$271	$ 40	$115	$199	$542	$520
Systems						
Ferroxcube	$ 60	$	$	$	$	$
Bell Labs.	25					
Western Electric		25				
U. of Connecticut		22				
Signal Corps				92		
Navy (Dam Neck)	2					
NCR		29				
Harvard			30			
Siemens Halske					56	
Orders Not Yet Booked			55	60	60	107
Total Systems	$ 87	$ 76	$ 85	$152	$116	$107

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 9

($000's Omitted)

New Order Detail

	Total	Modules	Systems	Computer Sales	Computer Rentals
Unfilled Order Position at 1/31/'63	$ 1,241	$ 53	$ 284	$ 718	$186
February Estimate	$ 506	$ 180	$ 56	$ 270	$ -
March Estimate	930	400	60	470	-
April Estimate	1,016	350	116	470	80
May Estimate	977	400	107	470	-
June Estimate	922	310	107	505	-
1st Quarter Fiscal '64	2,935	1,000	340	1,515	80
2nd Quarter Fiscal '64	3,110	1,050	360	1,620	80
January '64	1,150	360	130	580	80
Forecast New Orders Next 12 Mos.	$11,546	$4,050	$1,276	$5,900	$320

The above New Order Forecast is presented as the minimum monthly Booking Schedule consistent with the Unfilled Order position at 1/31/'63, the Billings per Schedule 8, and Normal Lead times of 1 Month for Modules and 2 Months for Systems.

As regards computer orders, on 2/11/'63 the Sales Department issued a list of some $4,615K of computer prospects against each of which they ascribed probability and time factors. This list has been used as the basis for the Computer new order forecast for the balance of Fiscal '63. Computer New orders for Fiscal '64 are predicated on the 30% per year growth rate as described in the Sales Plan presented to the Board of Directors on 2/12/'63.

THE DIGITAL EQUIPMENT CORPORATION

Twelve Month Forecast – March 5, 1963

Schedule 10

($000's Omitted)

Operating Expense Detail

	Total (per Exhibit B)	Selling	Technical Publications	Administrative	Company Sponsored Engineering
First Seven Months Actual	$1,643	$413	$162	$462	$ 606
February '63 Estimate	261	60	26	60	115
March '63 Estimate	270	62	28	60	120
April '63 Estimate	281	66	30	60	125
May '63 Estimate	292	70	32	60	130
June '63 Estimate	378	74	84	60	160
Total, Fiscal '63	$3,125	$745	$362	$762	$1,256
1st Quarter Estimate	$ 960	$246	$114	$195	$ 405
2nd Quarter Estimate	1,027	282	130	195	420
January '64 Estimate	349	100	44	65	140
Total Next 12 Mos.	$3,818	$960	$488	$755	$1,615