* CONFIDENTIAL *

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INTEROFFICE MEMORANDUM

TO: Gordon Bell
John Leng

CC: Win Hindle
Bob Kleine
Ken Olsen ✓

DATE: December 14, 1976
FROM: Ulf Fagerquist/Ron Bingham
DEPT: LCDG
EXT: 6408
LOC/MAIL STOP: MR 1-2/E78

SUBJ: SMALL MACHINE R & D

The results on the R & D project are encouraging. The first phase will be completed within the next eight weeks when we power-on the hardware - that is four weeks late. We can still meet the April "Software Ready" date, at which time we should have a complete system (similar in performance to KA10) for 20% of current CPU costs.

The decision was made last Friday by the Management Committee to request approval to order parts for fifty pilots, for building if we so decide, when the evaluation of the bread-board is done.

The biggest risk (to manage) is over optimism; it is too early to get carried away in thinking we have a significant system innovation in front of us, but it is not too early to start pre-paring for it!

The word is getting out - after twelve months of hiding in the back room - and more people are getting involved; the control/ security issues are going to be most challenging. The best ap-proach now is probably to create a state of high level of con-fusion.

The innovation or the rediscovery that a few of the right people can engineer simple products in a small way seems to work for 36-bit computers also. The only place we tried something new - the multiwire process - has cost us four weeks delay; everything else has been proven by others.

We believe that the innovative concepts should not stop with the engineering phase. Just a few thoughts that we would like to make real.....

The traditional way of looking at the QDP CPU memory system is that we have created a lower cost "engine" that is capable of running the complete TOPS-20 (also it turns out the TOPS-10) Software System, all languages, COBOL, FORTRAN, ALGOL, APL... full capability DBMS database management, transaction processing in network and distributed processing applications and an engine for our "leadership" in T/S products!

In short, we could have a complete system we now sell for $300-500K for a portion of this price if we have to.

We think this way of thinking will give way very quickly considering the following concepts as a mental exercise:

The CPU and memory could be viewed as a very minor portion of the RK06 disk drive. This opens up the possibility of looking at TOPS-20 engines as options to DEC produced DISK Systems (intelligent controllers) that handle all DBMS administration of data as well as communication of data over DECNET; the same is true as part of tape systems and "word processing" KL-board in a letter perfect line printer.

The fact that these small systems have a very powerful software system with NETWORK CAPABILITY will allow customers to develop their own application systems at a very low cost. The TOPS-20/10 System is easy to program, maybe cheaper to program than a PDP-8. When the application is done, it can be attached to DECNET as part of the customer's distributed network.

These were product oriented thoughts, but there are just as many opportunities to explore in the process area:

- Manufacturing

  Our current estimate for man-hours necessary to assemble the QDP is twenty hours. Several improvements are possible; fewer boards, of course, but most important, design the machine for a "robot production process" 30 man-minutes/FA&T. What about using a "vertical production line" to save floor space. (= minimum number of DEC man-hours)

- Field Service

  Current KL20 has remote diagnostics capability; customer calls FS and a FS Engineer can call in to the computer and can remotely diagnose the whole machine, while another FS Engineer travels to the site to repair it, etc.

  QDP will have the ultimate of remote repair - it includes an 8080 - and full parity checking internally and can be programmed to run its own diagnosis, and in effect, "call the FS office" to tell it's sick and needs a module replaced. It also has LED indications that will make it easier to locate what module to replace. In essence, let the machine diagnose itself, the customer replace faulty parts and DEC produce and sell the spares. (= minimum number of DEC man-hours)

- Marketing

  The big success of this product can only come from a well disciplined/managed market plan. We have time now to do the right homework - MMT - Market Maturity Test project. This could be done by selling QDP internally to DEC "customers" and develop, monitor and perfect the whole "customer satisfaction", order processing, service, etc., processes before we sell it to real customers. In addition, we will save a lot on the capital investment side.

We have spent $100K to date on the project since we started in April and expect to spend another $80K through systems bread-board check-out.

Request:

We feel that the potential for a successful product exists and would like to have $1.5M of corporate funds allocated for use in continued QDP R & D activities - product and process oriented - during FY 78. Our intent is to continue to keep the project as small as possible, but expand the scope and breadth of the goals.

The funding will be spent only after acceptance of proposals on an ongoing basis -- no blank check.

In summation, this project will give us an excellent opportunity to reevaluate a lot of traditional concepts and find a way to break some bottlenecks in our current system.

UF/ap

8 of 10

SM-1Ø PROJECT PLAN

SECTION I - SUMMARY

1.1 Identifying Information

Project Name	SM1Ø	
Project Number	----	Revision Number Date - 5/18/76
Author	Ron Bingham	

1.2 This project is currently budgeted

1.3 Overview

People	R. Bingham	Project Manager
	B. Reid	Principle Designer
	S. Pomfret	Project Technician
	D. Lewine	Principle Software Designer Microcoder Logic Designer
	B. Bruckert	I/O Designer

The goals of this project are:

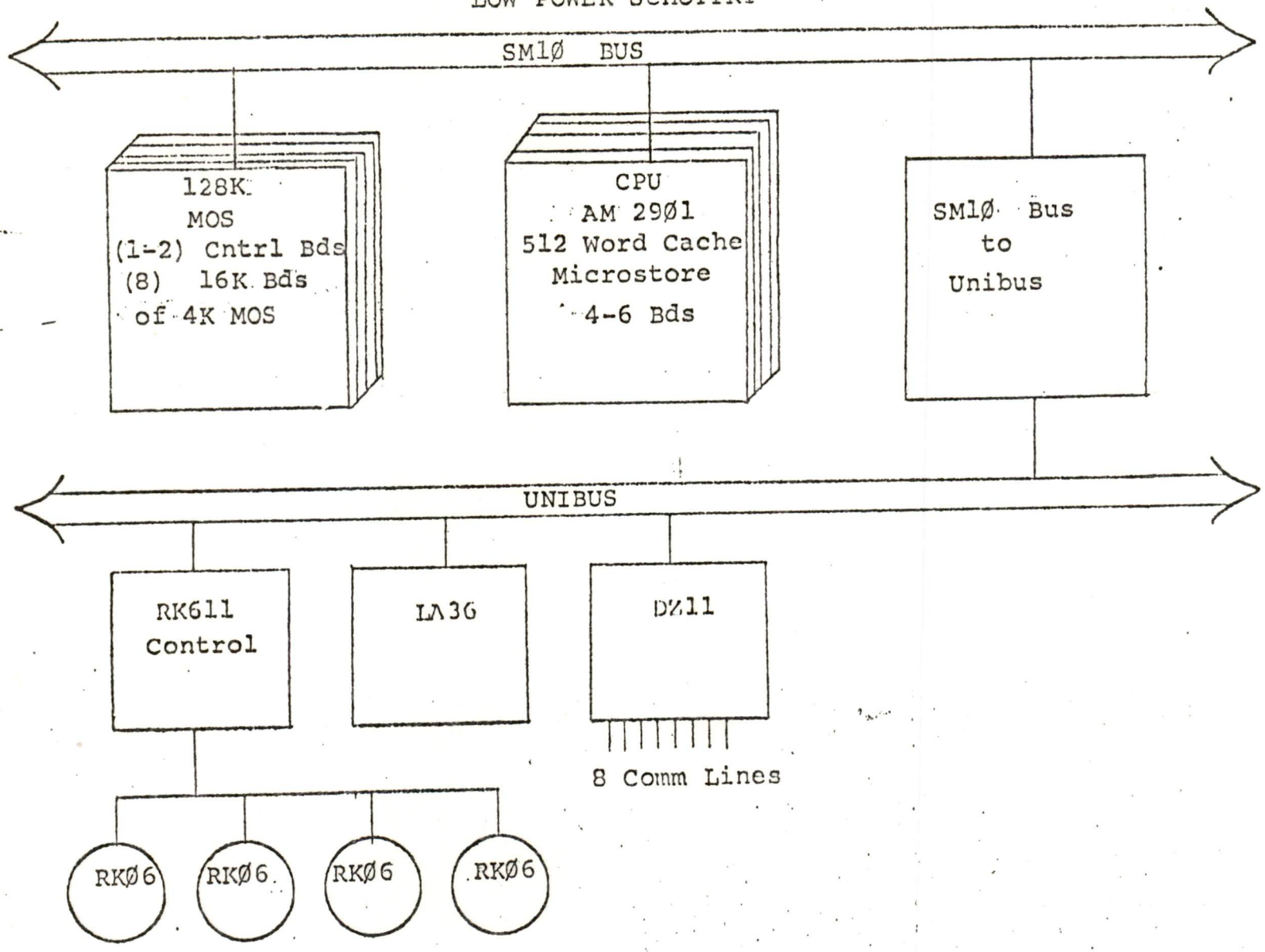
1. Prototype running monitor by 1 April 1977
2. Prototype cost of 15K for CPU, 64K MOS Memory, Console terminal, eight terminal controllers, and a 14 megabyte disk.
3. KA1Ø performance
4. Runs TOPS-2Ø
5. KL1Ø instruction set - less I/O and KA double precision floating point
6. Development cost of $35ØK to prototype running
7. An MTBF of 2ØØØ hours

Type of Product: New Product Feasibility Demonstration (proto only)

Product Description: A PDP-1Ø based computer system for personal use (see diagram)

LOW COST 1Ø

LOW POWER SCHOTTKY



1.4 Summary Schedule

Start Design	April 1976
Operate Prototype	Jan 1977
Monitor Running	April 1977
Planned Development Cost	$35ØK to prototype running
Planned Development Manpower	6 man years

1.5 Development Strategy

Our development strategy departs from previous approaches in which all phases of the product were addressed simultaneously. For example, manufacturing people were in from the beginning on KLlØ development and there was a lot of wasted motion as Manufacturing and Engineering tried to solve problems and answer production related questions based on very little stable information.

What we are proposing here is to rather than try to solve every problem simultaneously we stage the development into three over lapping phases. A breadboard build, a limited production/ manufacturability/supportability/marketability phase and finally a volume production phase.

1.5.1 Phase I

The goal of Phase I is to verify our initial design concepts, produce a running breadboard and build a data base for Phase II. In Phase I our task then is to take the shortest possible path to a running breadboard.

To implement Phase I we have put together a small but experienced group of designers with very few interfaces to other groups such as Mechanical Engineering, Circuit Analysis, Field Service, Drafting, Diagnostics, Power Supply Engineering and Production. Our belief is that by reducing the number of conflicting ideas and personalities the design will proceed rapidly, be cohesive and development cost will be held to a minimum. Since we have purposely limited our resources in Phase I we will force ourselves to take advantage of what already exists, will avoid technically risky approaches and won't be tempted to add unnecessary frills and features. This first phase has been affectionately referred to as "The Garage".

1.5.1 (Continued)

This phase will last from 4/76 until 4/77. Starting 1Ø/76 planning will begin for Phase II and in 1/77 a review will be held on progress in Phase I and plans for Phase II.

1.5.2 Phase II

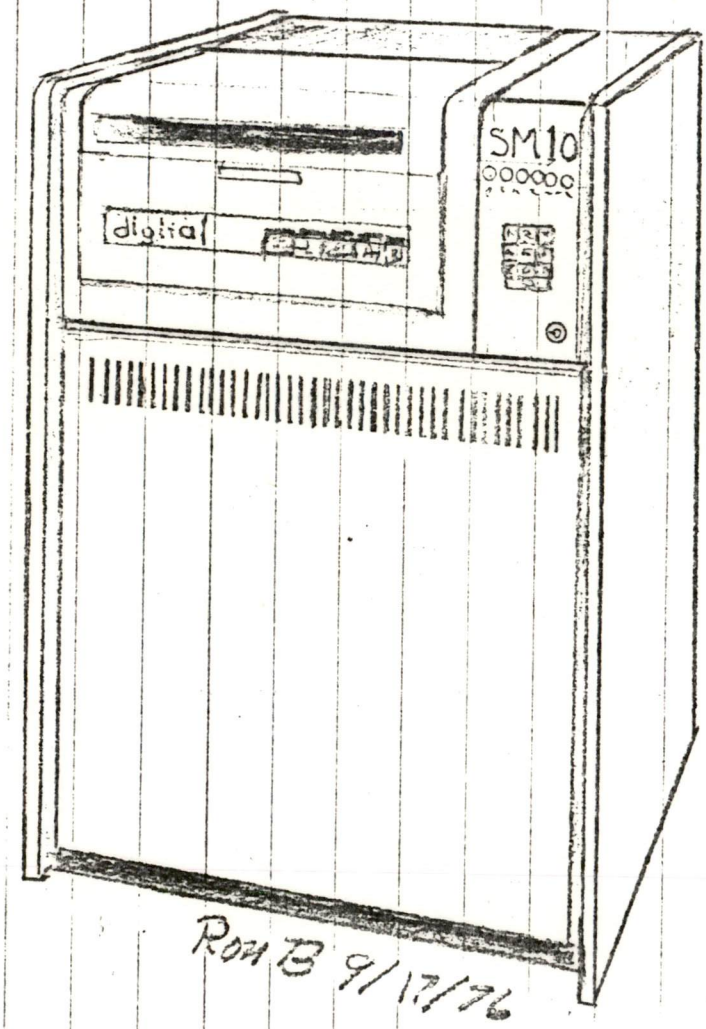
The goals of Phase II are to verify the manufacturability, field supportability and marketability of the design. This will be accomplished by manufacturing some quantity of units not to exceed 1ØØ for sale to our friends in the academic and research community. Their evaluation and feed back will constitute a field test of the hardware. It is anticipated that this phase would begin 1/77. The first hardware would be shipped 6/77 and the last unit shipped before 1/78.

1.5.3 Phase III

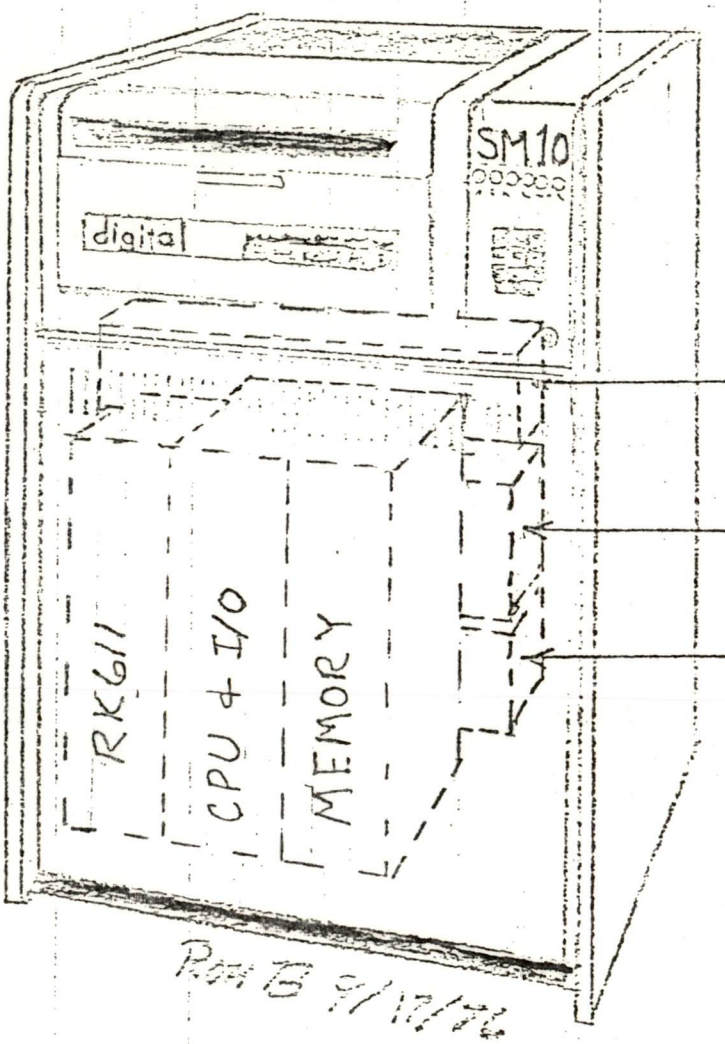
This would be the volume shipment phase. Preparations would probably begin 4/77 with the first ship starting 1/78.

1.6 Risks

This approach to development may be more time consuming. We may be faced with extensive redesign in Phase II.



ROM B 9/17/76


SM10
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H317 TTY PAN
POWER SUPP
POWER CONTR
RK611
CPU + I/O
MEMORY
RAB 9/12/72

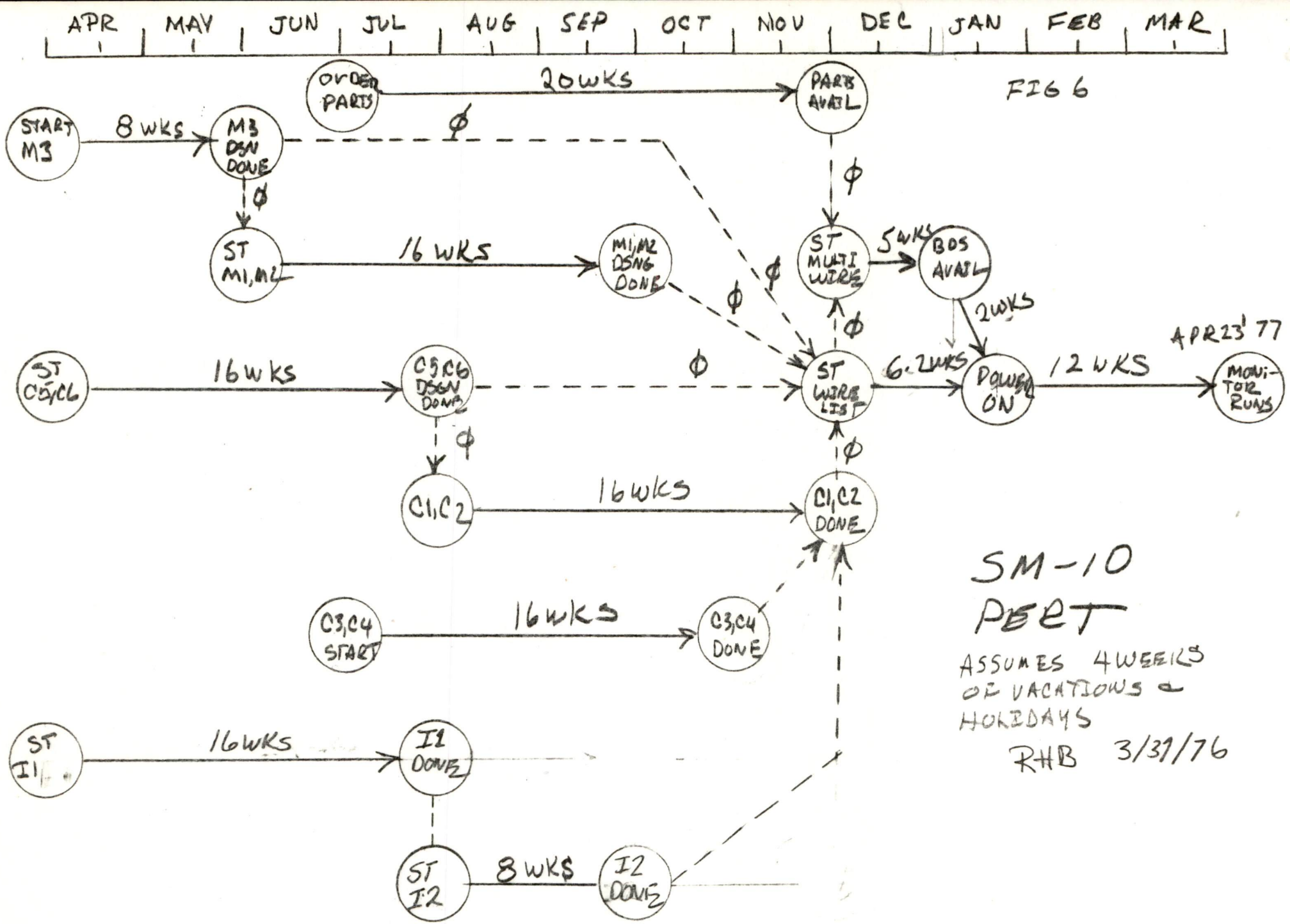


FIG 6

SM-10

PERT

ASSUMES 4 WEEKS OF VACATIONS & HOLIDAYS

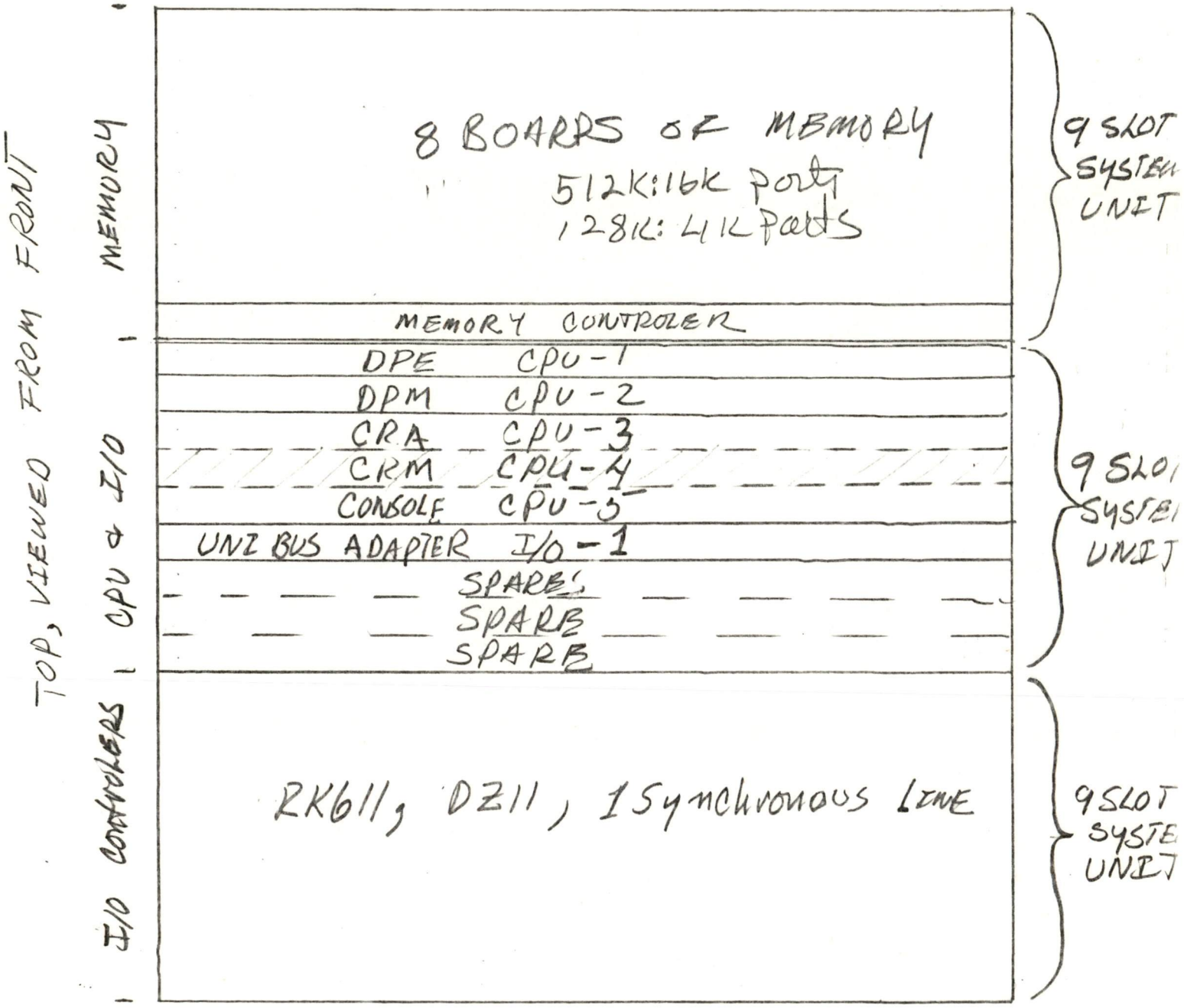
RHB 3/31/76

SM-10 MANPOWER LOADING

	Q4	Q1	Q2	Q3
TOTAL	3.58	5.75	6.75	7.25
CPU DESIGN	BOB REID LOGIC DESIGNER 1.5E	BOB REID LOGIC DESIGNER 2E	BOB REID LOGIC DESIGNER 2E	BOB REID LOGIC DESIGNER 2E
MEMORY DESIGN	STEVE POMFRET 1E	STEVE POMFRET 1E	STEVE POMFRET 1E	STEVE POMFRET 1E
I/O DESIGN	BILL BRUCKART 1/3 E	BILL BRUCKART(?) 1E	BILL BRUCKART(?) 1E	BILL BRUCKART(?) 1E
MICRO CODE	DON LEWINE .25E	SOFTWARE ENGR. 1E	SOFTWARE ENGR. 1E	SOFTWARE ENGR. 1E
MONITOR DEV	DON LEWINE .25E	DON LEWINE .5E	DON LEWINE .5E	DON LEWINE 1E
STANFORD SYS SPT.	STANFORD TECH .25T	STANFORD TECH .25T	STANFORD TECH .25T	STANFORD TECH .25T
PROTO BUILD			STEVE WESTON 1T	STEVE WESTON 1T

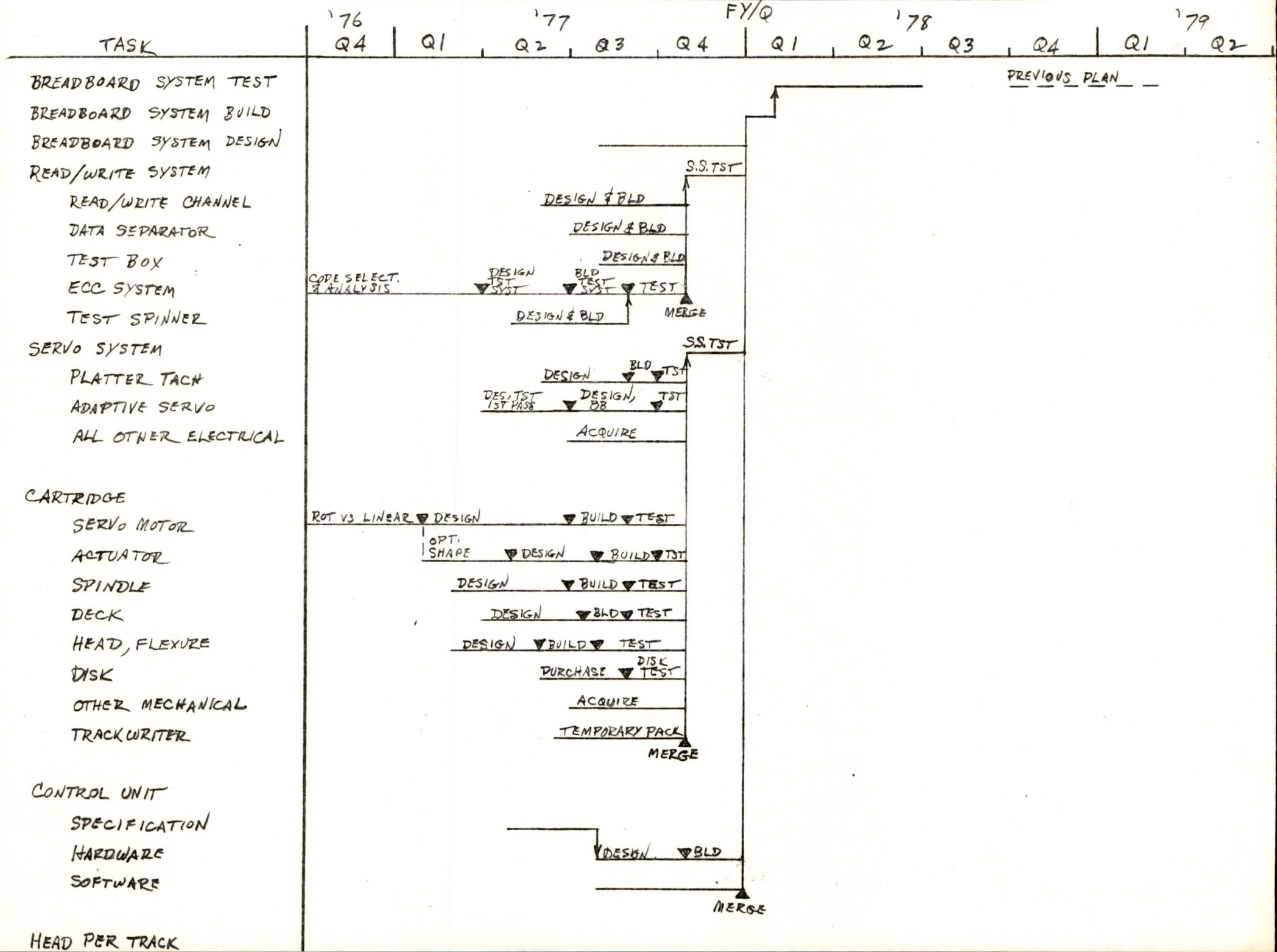
BACK PLANE ALLOCATION

12/3/76



CMK 11/30/76

SCHEDULE – MEDIUM CAPACITY, HIGH PERFORMANCE MODULE



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SEP 27 1976

INTEROFFICE MEMORANDUM

TO: Operations Committee

DATE: September 22, 1976
FROM: Peter Christy
DEPT: Software Development
EXT: 6110
LOC/MAIL STOP: ML12/A62

SUBJ: DECsystem-10 Competitive Analysis

Attached please find a set of notes resulting from my competitive study. These include some qualitative comparisons that were presented to Andy's study committee but not at your meeting. Obviously these represent my value judgements to some degree, although I have attempted to be quite fair.

attachment

COMPANY CONFIDENTIAL

DECSYSTEM-10 Competitive Analysis

The IBM 360

In April of 1964, IBM announced a revolutionary approach to computing, the System/360. This was a uniform family of computer featuring upward compatibility and a single massive all-purpose software system. The success of the/360 approach is self-evident from the success of IBM in the last decade. Nevertheless, the initial design of System/360 and OS/360 left a substantial technical hole into which the PDP-6, PDP-10 and DECsystem-10 fit nicely. This hole was due to the batch orientation of the System/360 which was characterized by a very cumbersome interrupt and I/O structure, non-relocatable memory and a batch software design. OS/360 software represented a tremendous amount of development and suffered from its immaturity. On balance System/360 provided only mediocre real-time and interactive performance. These weaknesses were the strengths of PDP-6, PDP-10 and DECsystem-10.

IBM Development Highlights

Since 1964 IBM has invested a large amount of money in continuing hardware system and software development. Some of the key aspects of these developments vis-a-vis the DECsystem-10 and -20 are noted below.

In April of 1965 IBM announced the System/360 model 67 and the time-sharing software system that went with it, TSS/67. These developments were apparently motivated by competitive pressure from the Multics System developed by MIT, Bell Laboratories and G.E. The model 67 was a poor "Chinese copy" of the Multics System, with several key technical features poorly implemented, resulting in inadequate system performance. The product never was a commercial success. Nevertheless, one can assume that IBM has learned from this experience, which is now almost a decade old. 1965 also saw the introduction of the System/360

IBM DEVELOPMENT HIGHLIGHTS

Era	Date		Product	Impact
batch	1965	April	360/67 TSS/67	Experience
			360/44	
	1968		IMS	Functionality
	1969		CICS	Functionality
			TSO	Functionality
interactive				
	1970		System/370	
		Sept	370/145 Semi. Mem RCS	Technology, Effectiveness
	1972	March	3705	Function., Effectiveness
		August	370VS /158 /168 VOS'	Functionality
	1973	Feb	/158 /168MP MPOS	Functionality
		March	3340 (Winchester)	Technology
		July	370/115 (ICA)	Effectiveness
		Dec	3790 Terminal Processor	Effectiveness
			3330 II	Technology
----------			370 Installed-base Exceeds 360	----------
	1974	Sept	3767 Matrix Printer	Effectiveness
			3770 Remote Batch Terminal	Function.
	1975	July	3350 Fixed-media Disk	Technology
	1976	Jan	VS/PC (Personal Computing)	Effective, Functionality
			3790+ (more term, RJE, local TP)	" , "
interconnected				
		Sept	Ink-jet Printing	Technology

- DISTRIBUTED INTELLIGENCE ARCHITECTURE
- VIRTUAL MEMORY
- INVESTMENT IN INTERACTIVE FUNCTIONALITY
- FUNDAMENTAL TECHNOLOGY

model 44, which was a lean, cost effective implementation of the System/360 for computational purposes. This machine was also not a competitive success, but presumably a rich learning experience in terms of cost effective implementation of the /360 architecture.

In 1968 IBM first released the IMS data base software system. Since that time IMS and the CICS transaction processing system, first released the next year, have been two of the most richly developed application software systems in IBM's portfolio. Data base management and transaction processing are key to interactive distributed processing. In IMS and CICS, IBM has two mature systems with extensive development, investment and implementation experience.

In 1969 IBM released the TSO time sharing option to OS/360. Initially both the performance and functionality of TSO were mediocre, but in its seven year life time, it has been enhanced and improved tremendously. The massive price reductions on central memory represented by the /138 and/148 announcement make time sharing on a System/370 much more attractive (see below).

In June of 1970 IBM announced the System/370, which at that time represented only a modest improvement over comparable System/360 processors. In September of that year the /370 announcement was expanded somewhat by the introduction of the /370 model 145, which featured semi-conductor memory and reloadable control store (RCS). The introduction of semi-conductor memory at that time was an indication of the fundamental technology leadership of IBM. We should note that the PDP-11/04, announced last year, was the first Digital processor to feature semi-conductor memory. Reloadable control store represents a significant architectural evolution toward system oriented products. The only Digital processor with a reloadable control store is the KL-10. (The STAR processor will also feature a reloadable section of the control store.)

In March 1972 IBM announced the 3705 communication processor, which represented a tremendous evolution from the 27xx series of the System/360. The 3705 is a fully programmable communication processor providing rich front end functionality and a substantial off-loading of the central processor for interactive or distributed applications. The first Digital product to fully compare to the 3705 in terms of programmability will be a DCOPS front end, which is still some time to come.

In August of 1972, IBM revealed the full power in the System/370 announcement by describing the virtual memory capabilities of the system for the first time, by announcing two new processors featuring virtual memory, the /158 and /168, and by announcing virtual memory operating systems, including DOS/VS, OS/VS1, OS/VS2 and VM/370. The significance of virtual memory in the System/360 and System/370 product line is that this technical enhancement eliminates one of the most glaring architectural faults in the original /360 vis-a-vis interactive and distributed processing: the absence of relocatable memory. Having virtual memory permits the physical memory to be allocated only to those computational activities instantaneously requiring it, which in turn permits a smaller amount of real memory for a given application.

Virtual memory is available on the DECsystem-10 in TOPS-10 Version 6.02 and is a fundamental part of the TOPS-20 design. Virtual memory is also fundamental to the VAX machine design and is well-supported in the STARLET system.

VM/370 goes beyond virtual memory and provides a complete virtual machine operating system, the functionality of which is not available in any Digital product currently implemented or planned. VM/370 serves as a basic operating system which provides virtual machine facilities to a number of secondary operating system, such as DOS or OS/VS1. VM/370, in conjunction with the Cambridge Monitor System (CMS) developed at the IBM Cambridge Research Center, provides a rich time sharing environment quite comparable to what we offer in TOPS-10 and TOPS-20.

In 1973, IBM announced multiprocessor versions of the /158 and /168 and the second release of OS/VS2 which supported the multiprocessing configurations. It should be noted that this is richer multiprocessing support than we offer in the TOPS-10 operating system and that neither the PDP-11 nor the DECsystem-20 offer any substantial multiprocessing facilities at this time. Multiprocessing is an important part of distributed processing applications which require high system availability.

In March of 1973, IBM announced the 3340 disk unit featuring "Winchester" technology. This product announcement is indicative of the fundamental leadership which IBM holds in the disk area. The first Digital-supplied disk (which will be purchased from an OEM disk manufacturer) which features the Winchester technology will be the RP07. This product is not due for several years.

In July 1973, IBM announced the 370/115. This announcement is of significance because the processor features multiple microprogrammed support processors including an integrated communications adapter (ICA) which provides line support for up to 8 on-line terminals. The announcement of the /115 is indicative of IBM's evolution toward smarter architectures which offload basic overheads (such as line management) from the central processing unit.

In December 1973, IBM announced the 3790 remote, shared-processor, data-entry system. This represents a further evolution in intelligent terminal distributed processing system design. The first set of Digital products which will provide a reasonable alternative to 3790 functionality, will be the combination of ATAM, DECNET, the VT62, DCOPS software, and a front-end or remote concentrator processor.

In December IBM also announced the 3330 model II disk which is the technology available in the Digital supplied RP06.

The final item of significance in 1973 was the growth of the System/370 installed based to a point where the total value of installed 370 equipment was greater than the total value of the

installed System/360 equipment. This is indicative of the use of the much more powerful systems. In September of 1974 IBM announced the 3767 family of serial matrix terminals. This represented a substantial increase in capability over the Selectric-based 2741 terminal. IBM also announced the 3770 remote batch terminal.

In July 1975 IBM announced the 3350 disk unit, which was a fixed storage unit based on Winchester technology and represented a new level of mass storage efficiency measured in the cost of a megabyte of storage.

In 1976 IBM announced VS/PC which was built as a person-computing, time-sharing option to OS/VS. The significant features of this announcement were a computer system with a simplified, human-engineered interface comparable to what we tout in RSTS, and a notable software evolution in shared code processors for FORTRAN and BASIC, and the first IBM implementation of a shared APL processor. The value of shared processors in interactive applications is the substantial decrease in the amount of real memory required to support the application.

Also in 1976, IBM announced substantial enhancements to the 3790 data entry subsystem, including a substantial increase in the number of terminals supported, RJE capabilities and local transaction processing capabilities.

In summary we see this decade of IBM developments as making substantial inroads into the technical weaknesses which the PDP-6 and PDP-10 exploited. These weaknesses included a cumbersome machine architecture for interrupt handling and I/O. Although the central processor design has not been redone, the CPU is now augmented by a number of intelligent support processors for functions like communications which eliminate the vulnerability of the cumbersome CPU design. Virtual memory has been added, which makes the system 370 processor much more useful for providing realtime and interactive functions. There has been a tremendous investment in interactive functionality, particularly in the IMS and CICS software systems. Finally, over this decase IBM has evolved as a clear leader in data processing technology, particularly semiconductor central memory and disk storage units. IBM has a substantial cost advantage in these technologies which comprise the majority of the cost of a computer system, giving IBM tremendous pricing leverage competitively.

The 370/138 and 370/148

In June of this year IBM shocked the data processing industry with the introduction of the 370 models 138 and 148. These products represented meaningful conservative advances in technology but a dramatic deviation from the traditional IBM pricing algorithm. The /138 and /148 are slightly higher in performance than their predecessors, the /135 and /145, due to the use of a faster 2K MOS memory chip and the expansion of the reloadable control store by a factor of 4 or 5 to a total capacity of 128K bytes. What is much more dramatic however, is the pricing of these products. Traditionally IBM would announce a new product with approximately twice the performance of a predecessor at a price increment of approximately 40%. The /138 and /148 represent perhaps a 40% performance improvement, but a price reduction of almost 50%, dominated by dramatic reductions in the cost of central memory. The attached pricing chart indicates the size of the price reductions. Whereas a 1/2 megabyte /135 processor had a purchase price of $659,000. The corresponding /138 processor, with improved performance, has a selling price of $350,000. A 1 megabyte /145 processor sold for $1,250,000, whereas the corresponding /148 processor with improved performance had a purchase price of $689,000. Similarly, a 2 megabyte /145 processor sold for $1,840,000, whereas the corresponding /148 model sells for $859,000. These prices are seen as all the more remarkable in comparison to the /158-3 prices of $2,020,000 for a 1 megabyte processor, and $2,280,000 for a 2 megabyte processor.

Viewing the pricing of incremental memory (memory in addition to the basic memory of the processor) also shows dramatic reduction. The price of incremental memory for a /135 processor was $500/KB; the incremental price for memory on the /138 processor was $162/KB. The incremental price for the /145 processor was $548, where it had been slashed to $166/KB for the /148 processor. 11/70 memory is priced incrementally at $110/KB (11/70 memory is one of the nighest marked-up Digital options). By comparison, incremental DECsystem-10 memory is currently priced at approximately $180/KB.

JUNE 1976 370/138 370/148

- CONSERVATIVE TECHNOLOGY

  2K MOS MEMORY CHIPS

  EXPANDED RCS

- DRAMATIC REPRICING

CPU AND MEMORY

	MB	/135	/138	/145	/148	/158-3	BURROUGHS
	1/2	659	350				495 (3830) 311 (6807)
(K$)	1		435	1,250	689	2,020	912 (4840) 648 (6811)
	2			1,840	859	2,280	

INCREMENTAL MEMORY

$/KB	500	162	548	166		462 (3830) 582 (4840)

11/70 is $110, DEC-10 $180

- KEY MARKETING ACTION

  DB/DC ENTRY MOVED DOWN,
  FULL VS2, CICS, IMS, SNA/SDLC
  PRICE/PERFORMANCE ATTACK
  BACKUP FOR BIG MACHINE
  REASONABLE T/S ADD-ON
  GREATER INTEGRATION OF PERIPHERALS, CPU, SOFTWARE

One can assume that this dramatic IBM price reduction which substantially impacts IBM's near-term profitability, as well as the profitability of competitors, has very sound reasoning behind it. One can see these system offerings, along with the enhancements of the full virtual memory operating system family to run on these processors, as IBM's aggressive lowering of the entry price for full data base, data communications systems. Previously, the 370/158 was the practical low-end processor for full systems support. The repricing is a direct price/performance attack on the mainframe competitors in this price range, and an indirect threat to many competitors. For example, it is now attractive to purchase a /138 or /148 as a backup machine for a large System/370. A customer with a new interactive or distributed application, may choose to purchase a /138 or /148 rather than purchasing a competitive product which would be of no backup use. Similarly, the reduction in the cost of central memory makes the addition of time-sharing to System/370 (adding the TSO option) much more attractive than it was previously. With the cost of incremental central memory for a System/370 now more in line with DECsystem-10 prices, it becomes attractive to consider the purchase of a larger central memory to support time-sharing as well as batch processing. Previously the exorbitant cost of IBM central memory made the purchase of a specialized time-sharing machine, such as a DECsystem-10, very attractive. Finally, these machines represent a continuing integration of peripherals, CPU and software. This represents both a threat to the IBM add-on vendors, and to other mainframe vendors since the cost efficacy of the product has gone up substantially. In the System/370 /138 and /148 the expanded reloadable control store is used to store microcode implementation of commonly used operating system facilities. This permits an improvement in performance above and beyond that which machine level recoding of functions can achieve, in particular the overhead of supporting the virtual machine operating system, BM/370, is said to have gone down by over 50%. The overhead of the more conventional operating systems, OS/VS1 and OS/VS2, have been improved by 10 - 20%.

Basic Performance Factors

Computer system architectures have evolved to a point where there is no longer a dramatic difference in the intrinsic performance between one modern architecture and another. For example, a recent Army/Navy study showed the intrinsic power in the PDP-11 and 360 architectures to be comparable, which might be surprising to one who thinks of the PDP-11 as a "minicomputer". Although the 360, PDP-11 and HP-3000 architectures all have substantial defects (paged memory management support in the hardware), the evolved systems, the 370 and VAX architectures, can be considered to have no intrinsic defects. What differs among the products is seen in other factors, including the implementation of the architecture, the software design, the software maturity, the system maturity, the basic technology.

The implementation of the architecture can be seen as a measure of how well the different parts of the computer system play together. The 360 with its relatively cumbersome processors and controllers represented a relatively inefficient implementation (by measure of cost/performance) of the architecture. In contrast, the 370 represents a mature and effective evolution of the comcepts of the architecture. The PDP-11 started as a relatively elegant but limited in performance implementation of the architecture, especially in the limited power of the device controllers and the limited thruput of the Unibus, but in the initial VAX implementation (STAR), most of the known problems have been overcome. The DECsystem-20 represents an elegant and powerful architecture with the most substantive implementation limitations lying in the relatively small engineering investment thus far. The HP-3000 also suffers from a relatively modest investment and a somewhat archiac fundamental architecture.

BASIC PERFORMANCE FACTORS

	1360	/370	PDP-11	VAX	-20	HP-3000
ARCHITECTURE	= -	=	= -	= +	= +	= -
IMPLEMENTATION	-	++	=	+	=	= -
SOFTWARE DESIGN	-	+	+	++	++	+
SOFTWARE MATURITY	N/A	++	+	- -	-	+
SYSTEM MATURITY	N/A	++	=	+	=	=
BASIC TECHNOLOGY	N/A	++	+	+	=	= +

The original System/360 software could be considered cumbersome at best; it suffered from tremendous size and performance problems. However, the 12 years since the introduction of the product line have seen enormous investments in software and system performance which result in the OS/370 software being generally as good or better than any in the industry. The PDP-11 software in general has been well-designed and well-implemented, but represents only a very small fraction of the total 370 software base. The VAX software represents perhaps the most powerful design with the most maturity in the design, but represents an immature and unfinished product which must be considered a substantial initial liability. The DECsystem-20 software is an elegant design for limited purposes and has seen only relatively modest investment. The HP-3000 software is relatively mature and represents an apparent effort on the part of HP to improve the performance.

System maturity is a measure of now much real experience with the system product has been factored into its redesign and evolution. The System/370 is the clear leader in this area. VAX is a very mature design, but its initial implementation problems have yet to be discovered. The DECsystem-20 is hindered by a relatively modest engineering investment and the HP-3000 by an inauspicious beginning.

The final factor in basic performance is the technology used. The 370 is the clear leader in fundamental technology and manufacturing ability, although the full power of IBM has never been applied to an ultimately cost-reduced product. Both the PDP-11 and VAX will benefit by the relatively high volumes. The DECsystem-20 is at a relative disadvantage due to its lower engineering expenses and relatively modest product volumes. The HP-3000 lies somewhere in between the PDP-11 and the DECsystem-20 in terms of volume.

Virtual Memory Performance

Virtual memory designs can be best viewed as an engineering exercise, the purpose of which is to keep an adequate stream of instructions and data available at the central processor for a minimized cost in the memory system. Memory hierarchies are comprised of a number of different memory technologies each of which has a distinct performance level and cost. If the cost per byte for all technologies were equal, all systems would be designed with a single level of memory consisting only of the fastest technology. Instead, however, we see a memory hierarchy consisting of the central processor registers with the fastest performance and highest intrinsic cost, a cache memory of lesser performance and lower cost, a large (currently semi-conductor) central memory, possibly a fixed head disk, and finally a moving head disk storage system. The performance design of the 370 family can be seen by the presence of all members in this memory hierarchy. Of particular note, IBM has developed a fixed-head option to their moving head disk products, permitting an installation with multiple on-line spindles to use part of those spindles as a swapping storage for virtual memory without an incremental investment in mechanical parts or electronics. The 2040, due to the absence of an economical fixed head disk and the removal of the cache for cost purposes, has only the CPU, central memory and moving head components of the memory hierarchy. The 11/70 has a cache but is usually sold without fixed-head disk. The STAR system currently is conceived without a fixed-head disk, although CCD and bubble alternatives have been explored to some degree. The HP-3000 is without both a cache and a particularly cost attractive fixed head disk, but there have been industry rumors that HP is strongly examining the use of bubble technology.

Both the PDP-11/70 and HP-3000 have relatively weak architectures for virtual memory support, lacking paging. The end effect in any weakness in a virtual memory design is relative cost-ineffectiveness. For example, the absence of a cache in the 2040 processor limits the effective thruput of the CPU and the absence of the cost-effective fixed-head disk option requires the use of more core memory than would be needed with a fixed-head disk.

SUMMARY

In summary, we can see the following attractions and limitations to each of the compared system products.

The PDP-11 - The value in the PDP-11 products centers around the relative maturity and high volume. The maturity of the product means that every major feature has gone thru at least one reimplementation and is relatively well understood. The volume of the product leads to good manufacturing volumes and basic cost attractiveness of volume parts. The volume of sales has also supported a large software investment, both within Digital and from our customers. This investment leads to a relatively large and well-evolved set of software systems for the PDP-11.

The negative aspects of the PDP-11 include the minicomputer history (which causes many people to conceive of its uses from a historical background and neglect the true power of a modern "minicomputer"), the address space limitations, and some aspects of the architecture, including the Unibus design (which limits the upward levels of performance available on a Unibus-based PDP-11 system).

The PDP-11/VAX - Being the most recent of any of the architectures compared, it is expectable that the PDP-11/VAX will have the most mature architecture representing the greatest amount of combined understanding in computer system design. This mature architecture will represent a fundamental attraction of the product. Because the VAX architecture is aimed for the PDP-11 marketplace, we can assume that the VAX machine will benefit from PDP-11 product volumes and achieve good basic cost efficiency of the manufactured parts. Finally the system design currently anticipated for VAX products represents a relatively mature view and should achieve a good balanced implementation based on experience. The liabilities of the VAX set of products include the fundamental immaturity of the product and the low software investment.

The DECsystem-20 - The attraction of the DECsystem-20 include the fundamental elegance of the design and the base of established PDP-10 software, which is available at an application and utility level. The disadvantages of the DECsystem-20 include the relatively low volume of the product, which limit the manufacturing efficiencies available, the relatively low volume in DECsystem-20-specific software (a problem which is exacerbated by the incompatibility between TOPS-20 and TOPS-10) and the relatively small number of DECsystem-20 peripherals that are currently available due to the low overall volume in the DECsystem-10 and -20 product lines.

System/370 - Attractions of the 370 include the maturity in the system design, the completeness of the software and system products available, the volume of the product, and the basic technology leadership which IBM has. The disadvantages of the System/370 derive primarily from its history, in particular the fact that the original System/360 operating system was relatively poorly designed and implemented.

HP-3000 Series II - The attraction to HP-3000 Series II compared to the VAX machine and DECsystem-20 machines, is the relative maturity of the product and the software system. Compared to the DECsystem-20 the HP-3000 probably has a small volume advantage. The disadvantages of the HP-3000 include the basic architecture, which represents detrimental compromise between a machine of tremendous generality and power and a minicomputer, relative lack of peripherals that are available for the HP-3000, the relatively primitive software technology which does not include a powerful paging mechanism, and the relatively small software investment that has been made in the product to date.

digital

INTEROFFICE MEMORANDUM

TO:	Andy Knowles	MR2-2/A52
	Larry Portner	ML12-3/A62
	Steve Coleman	PK3-2/M28
Cc:	Bill Thompson	
	John Leng	MR1-1/F35
	Larry Tashbook	PK3-1/M33

DATE: September 8, 1976
FROM: Ken Olsen
DEPT: Administration
EXT: 2300
LOC/MAIL STOP: ML12-1/A50

SUBJ: PDP-10 REVIEW COMMITTEE

We did not give you very much direction in the preparation of your study of the PDP-10 future alternatives. Maybe as you go into this, we will know what directions to give future committees who review other Product Lines.

Some of the questions I would like to see answered are:

1. What markets are we now in and what markets do we plan to go into?
2. How many machines do we have in each market and how many machines do we plan to have and how big a marketing group do we plan in each of these markets?
3. Which markets are we going into because we can do better than everybody else and which markets are we going into because we sold a machine there?

Also, I would like to see how our ratio of marketing and engineering costs in the 10/20 area compare with the rest of the Company and with other computer companies.

KO/ma

file - 2-4

digital INTEROFFICE MEMORANDUM

AUG 15 1975

TO: Product Line Managers
Operations Committee
Specific Managers of In-house DEC-10's

DATE: August 12, 1975

FROM: Bill Kiesewetter Bill dw

CC: Al Pilon
Les Strauss

DEPT: -10 Product Management

EXT: 6232 LOC: MR1-1 M55

SUBJ: PROJECTED DECSYSTEM-10 IN-HOUSE EQUIPMENT

It has been our practice to set aside a portion of DECsystem-10 production to fill orders from in-house computer installations. In the past the planning for this usage has been generally on an informal basis, and up to FY75 most of the equipment we produced was in fact consumed.

In FY75, probably due to tight capital budgets, a number of these informal "commitments" were not met. Consequently, we have a considerable inventory problem on our hands over and above our normal customer ships. As a result of this, we are taking steps to formalize all requests for equipment from the DECsystem-10 Product Line.

To ensure that your plans are not negatively impacted, I would appreciate a written commitment to us before the end of this month as to any DECsystem-10 options or systems you intend to request over the next four quarters (through Q1, FY77.) This information must be detailed in a memo to Hartley La Duke with specific management approval. We will publish this information and respond back with a delivery commitment. Any equipment required above and beyond what you commit to will be forecasted as part of our normal cycle, which in some cases could be 12 to 15 months lead time from Volume Manufacturing.

We will also be detailing our policy with respect to accepting older equipment back for refurbishment. Currently, our policy is to accept only equipment (DEC-10 options) that are either fully depreciated (i.e. on the books at zero value) or at the then-current refurb manufacturing standard for that option. Your cooperation in helping us coordinate this activity will be appreciated.

BK:DW

Ken Olsen
12-1/A50

digital INTEROFFICE MEMORANDUM

TO: Ken Olsen

DATE: 14 Aug 72

FROM:

DEPT: '1Ø Engineering

SUBJ: '1Ø Planning

I'm worried. Many other engineers in '1Ø land are uneasy.

We have built and are shipping KI1Ø's. We have abandoned the RS1Ø fast, large drum project after spending $25Øk more or less. Now we are abandoning the RF1Ø/RPØ4 project (large disk pack, 333Ø technology) after getting to the point of being ready to wire-wrap a prototype ($1ØØk more or less). The RS1Ø was to relieve the major performance bottleneck in '1Ø systems - after its abandonment, the RF1Ø was revised to control drums as well as disks. These projects have been abandoned in order to get personnel to work on the KL1Ø cheap processor which is now going to have an integrated disk control (actually a Gordon Bell bus control).

The first problem as I see it is that we are abandoning any further sales in our traditional markets (large university computer centers and computer research departments; multiple CPU in-house and commercial computer utilities; and banking, social science and industrial modeling. This action also cuts into our ability to sell in our more recent markets of typesetting, data management and inventory control systems, and data entry and processing. All of these markets require relatively large and growing amounts of data storage which the competition is now or soon will be providing at RPØ4 prices. We are abandoning these markets by providing no growth in disk pack systems storage capability or performance per dollar until the KL1Ø is available as a disk controller (2 to 3 years), by abandoning the use of the 22-bit memory address capability of the KI1Ø (as no controller will now use it), and by failing to provide larger,better transfer rate "drums".

The second problem is that we seem to be chasing after a "low price" market where the system price goal is $2ØØk and where we will supposedly sell 1ØØØ to 2ØØØ systems per year. However, after inquiries to John Leng, Bill Kiesewetter, and others in the '1Ø product planning and marketing groups, no answer seems forthcoming to the question "in what markets (applications) are we going to sell these machines?" I don't believe, on the basis of my view of the market, that this substantial market exists in any form which is capturable by low price alone. Every market of reasonable

size is going to require a direct hardware and software attack in order to penetrate it. No such attack is evident to me. All of these plans seem to be based on rather vague data on total projected EDP market size in (say) 1975 -- mostly purchased, industry wide forecasts which are already substantially in error and which seem to have little relevance to DEC.

The third problem is that in the interim before the KL1Ø is shippable with its integrated file system, RPØ4's, and new (small, efficient) software, the product line is stuck with the existing high cost, low performance equipment which is more and more poorly suited to our existing markets and too expensive for the "new" markets. This will lead to a sales and cash flow crisis in about one year in my opinion.

The forth problem is that the constant turning on and off of projects (RF1Ø, RS1Ø, MS1Ø, KL1Ø) for no apparent reason or for reasons which do not withstand scrutiny by the system wizards and which are seldom mentioned to the engineers involved is causing a serious morale problem with productivity going rapidly toward zero.

I suggest that the whole '1Ø marketing plan (if there is one) be subjected to a critical review both by the '1Ø system wizards as well as their managers and by people outside of the product line. Such a review should delve into the facts and assumptions on which the plan is based and verify the plausibility of the assumptions. If the people (hardware and software) doing the design don't know what applications they are trying to sell to, the resultant product will not be very salable.

AUG 1 8 1970

digital INTEROFFICE MEMORANDUM

SUBJECT: COMPUTER INSTEAD OF CONSOLE FOR PDP-1Ø

DATE: August 14, 197Ø

TO: Gordan Bell

FROM: Fred Wilhelm

cc: Ken Olsen
Win Hindle
Bob Savell
Alan Kotok

DEPARTMENT: PDP-1Ø Engineering

I read with great interest your recent memo. The computer idea has been around for some time, but has always been only an idea because of cost considerations. With the advent of the PDP-8E, this obstacle appears to evaporate. Some quick calculations show that the switches, switch buffer, lights, light drivers, flex cables, etc. cost about $7ØØ. Even if this rough number is doubled, the resulting $1.4k is about the same as the cost of a PDP-8E (I would guess).

You mentioned numerous advantages to which I would like to add the inherent capability of this approach to solve the console problem associated with multi-processors.

The main disadvantage appears to be the inability of Field Service or checkout to look at light patterns. This could be solved by adding a scope (at additional cost) to the small computer.

Let's discuss this the next time you are here. Until then, I will have to continue to disappoint you in the aspiration department by plodding ahead on trying to meet the present approved objectives for the new processor. By the way, I would like to see this "almost" solid plan to get a factor of 1Ø over the PDP-1Ø. Believe me Gordan, Schottky TTL and Cache memories aren't the panacea for that kind of undertaking. We could certainly build such a machine at a higher cost, but it doesn't fit in with our present marketing plan or time schedule. It does sound like the kind of thing

we plan to do on the next go around.

It also seems possible that with the right kind of additions to our team, we could also produce such a Super-1Ø in a year. You have a standing invitation to join us and head such an effort.

cap

digital INTEROFFICE MEMORANDUM

TO: John Fisher
Cc: Win Hindle
John Leng

DATE: April 23, 1974

FROM: Ken Olsen

DEPT: Administration

EXT: 2300 LOC: 12-1

SUBJ: FUTURE APPLICATIONS FOR PDP-10

For one of the future Operations Committee meetings coming soon will you schedule John Leng to present how many applications they now offer on the PDP-10, what applications they plan for the next year or two and how many of each they plan to sell.

I'm afraid the PDP-10 develops too many applications and never plan to sell very many of them. I'd much rather have fewer applications and get 90% of the world market. I don't want to discourage new applications, but just force a little review.

/ma

2-1

Ken Olsen

SUBJECT: Proposed PDP-10

FROM: R. Melanson
T. Keane

TO: Computer Strategy Committee

The PDP-6 system has deteriorated to a level no longer capable of maintaining status quo for the required production of drawings, wirelists, AWT tapes, numerical control tapes, Gardner-Denver info, and ECO wirelist data.

The PDP-6 hardware has not been 100% operational during the past year and for the last 5 months has operated with only 32K of core. Twenty percent of the time the system has been completely down. We now require a minimum of 80K of core to meet our present processing requirements. This hardware demand is currently being provided by System 40 at a minimum cost of $50K per year.

We require a reliable computer system necessary to maintain and improve all of the Automated Drafting Services, from which we will realize a 65% increase in proficiency as well as 30% faster turnaround per drawing. To do this, we recommend the purchase of a PDP-10 computer at a cost of $276K. Estimated annual savings under current operations will exceed $137K.

The ADS Operation has demonstrated its ability to consistantly produce 20 drawings a week over the last six months at a decrease from 24 to 14 hours per drawing. Improved techniques and the implementations of two digitizers have enabled the preparation phase of the operation to initiate a minimum of 30 new drawings a week. Plans call for the addition of several more digitizers increasing our capability to 70 drawings per week for an annual savings of $294K.

To our knowledge there is no apparent intention of maintaining monitor or software support for the PDP-6 within DEC. This is evidenced by the current problems of trying to build a monitor for the PDP-6 configuration and the difficulties encountered with TECO. As new monitors and software are developed for the PDP-10 there is little consideration to maintain compatability between the two systems.

Without a reliable and dedicated computer system to handle the current work load, we strongly recommend curtailment of all ADS operation with the exception of the wirelist service.

REQUIRED SYSTEM:

NO. OF UNITS	TITLE	UNIT COST	TOTAL COST
1	KA10 Processor	$ 50,000	$ 50,000
5	MA10-16K Memory Unit	20,000	100,000
1*	RP02 Disk Pack	17,000	17,000
1	TM10B MAGTape Control	13,000	13,000
2	TU30B MAGTape Trans.	9,000	18,000
1	TD10 DECTape Control	7,500	7,500
6**	TU55 DECTape Trans.	1,200	7,200
1	DC10 TTY Scanner	5,000	5,000
1	DC10B 8-Line Group Unit	2,000	2,000
8	KSR35 - Tele-Printer	1,600	12,800
1	CP10A Card Punch	17,000	17,000
1	CR10A Card Reader	8,000	8,000
1	LP10C Line Printer (600 Lines/Min)	19,000	19,000
1	BA10 Controller (For Punch, Reader & Printer)		
	TOTAL		$276,500

* Currently have one RP02 and related controller.

** Two Transports are included within cost of the KA10.

PRODUCT LINE DECsystem-10

DATE June 8, 1973

CHARTER

(This should be the current charter of your product line as agreed to by the Operations Committee, if available; if not, put down what you think the charter of your product line should be. In future quarters this will not have to be changed unless you are requesting a change to your charter, and the change should be clearly identified.)

In defining the Charter of the group, we have taken account of the areas we have traditionally had success in and projected these into the future. In addition, we have taken account of the business the Corporation is primarily involved in and have determined a complementary role for the product line.

Fundamentally we are:

1. In the large computer systems business.
2. Providing immediate response on-line data processing systems, and
3. Providing networks of hierarchical computing systems.

Our objectives are:

1. To make DECsystem-10 Sales, Field Services and Software Support operations a profitable, long-term business.
2. To develop growth markets for the DECsystem-10 to take us to more than $100M per annum.
3. To develop new products to maintain and enhance our market shares.
4. Wherever possible, to perform the above with a view to complementing our corporate minicomputer business and, thus, to enhance it.

Note: * means change from last input.

PRODUCT LINE DECsystem-10
DATE June 8, 1973

OBJECTIVES:
(Concisely list what you consider to be the key objectives of your product line for the next two years.)

1. Get us back to greater than 30% contribution.
2. Completion of KL10 program for first shipment in September, 1974.
3. Establish KA10 and KI10 traditional products as a profitable upgrade and refurbishment business.
4. Complete software unbundling and establish as identifiable and profitable business.
5. Establish strong and profitable systems capability particularly for the network business.
6. Complete development of Typeset-10 and make money at business.
7. Establish "10" as an OEM product.

*8. Better return on assets controlled. (Not yet quantified).

*9. Establish clear market leadership as number 1 in timesharing.

CONCERNS:
(List concisely any major concerns you have, for either internal or external, which may limit the achievement of your objectives.)

1. Space problems--very critical!
   - Engineering Space
   - Advanced Systems Manufacturing
   - Refurbishing Group.
   - KL10 Manufacturing
2. Introduction of KL10 and phase out of older products could seriously affect shipments and profits for six months.
3. Will typeset ever work? Can we sell such complex systems to inexperienced computer users?
4. Problems with managing software effort: product late, wrong, conflicts with product line.
5. Management weakness in systems and some marketing areas.
6. 10 sales effort being diluted
   - Management now has to manage 11/45's.
   - 10 salesmen have budgets for 11/45 bookings.
   - Haven't yet learned to manage what they have.
7. Rental program--essential for government funded business outside of scientific area.

*8. Potential low-end competition from DG, Interdata, etc.

*9. Potential recession.

*1. Still a major problem

*2-7. Progress being made although concerns remain.

MARKET PLAN

(The objective of this plan is to communicate your market strategies to be used over the next 2 years which would be given to sales and advertising departments as a as a guide of your objectives.)

COMPETITION:

(Who is your competition, and what do you expect them to do over the next two years?)

Xerox is now probably our toughest competition again. Their product now works very well. It is better in some areas. They are using a wider sales force and are becoming very aggressive again including pricing. IBM is everywhere. Expect that they may get better at networks and typesetting. This will affect our competitiveness. CDC and Burroughs are hard to replace; otherwise, we can cope with this competition on the low price end, and with T/S. Honeywell Univac CDC NCR Burroughs *Additional potential problem on low end from DG, Interdata, etc.

PRICING:

(What changes in pricing are you planning?)

In FY75 KL10 will cause major price changes downwards for existing products.

Software will be identified even more and will constitute a bigger percentage of the customers' dollars to us--up to 20% in some cases.

*Now expect that price reductions will be needed in Q3 and Q4. Have budgeted a 4% reduction for those quarters. Necessity will depend on economy and competition at that time.

SELLING:

(What are your general objectives in using the sales force? Are you expecting increased yields? fewer salesmen? or any other brief description of what direction you expect to give to the sales force.)

Growing sales force to 100 specialists by KL10 introduction, nearly 70 now... was 45 at end of last year.

11/45 sales effort being mixed in. Hope to take advantage of this in 1½ yrs.

Emphasizing lower price systems $400K to $600K.

Selling tools, not total solutions.

*Have planned reduced yields in order to ensure adequate funds for sales force growth. Recession could make these yields seem high.

ADVERTISING:

(How do you expect to use advertising to help your market strategies over the coming years? Will you be concentrating on direct mail, general ads, trade shows, etc.?)

Some brochures, just a few ads. Most of money being saved for Q4/74 introduction at NCC. Heavy advertising in the following year.

*Strategy change in advertizing likely. Have budgeted less money. Intent is to keep KI10 business going for 18 months.

PRODUCT PLAN

(This page will be used to communicate what products you will need over the next time period in order to be successful in your business.)

ASSUMPTIONS:

(Identify what hardware and soft ware products you are expecting the general hardware groups developing for you and when you expect to get them. In addition, identify products that you would like to be developed that are not currently scheduled to be done.)

Bob Puffer is producing:

RS04 Swapping Disc	Q1 74
TU16 1600 bpi tape	Q1 74
RP04 Mass File	Q4 74

Brad Vachon is producing:

TU43 200 ips, 1600 bpi tape system

*Same as before. However, likely to use Special Systems TU43 as a 150 ips, 1600 bpi standard system.

HARDWARE:

(What significant hardware developments are you planning to compliment those assumed above, and when do you expect them to be available?)

We are providing:

RH10	Mass Bus Controller for the KA10 and KI10	Q2 74
DC76	Asynchronous Communications	Q1 74
DC72	Remote Batch terminal and concentrator	Q1 74
DA28	Inter computer communications unit	Q1 74

plus, of course, the new KL10 processor and associated memory and controllers

We Need:	150 ips, 1600 bpi low cost transport with 6,250 bpi later	Q3 74
	new 300 lpm low cost printer	Q3 74
	32K sense memory	Q3 74
	RP05 disc **See below	Q3 74

SOFTWARE:

(What significant software developments are you planning to compliment those assumed above, and when do you expect them to be available?)

Software Under Development:

5.07 Monitor for KA10
6.01 virtual memory monitor for KI10
VIROS for KL10
Message Control System
Data Base Management
FORTRAN-10
New Multiprogrammed Batch
Typeset-10

ORDERS: *No change although more emphasis being placed on TOPS-10 for KL10.

(Identify any product you are currently accepting orders for that has not been released to production.)

MCS, DBMS, Typeset-10, FORTRAN-10

*No change.

**No change although in-house manufacture of RP04 could alleviate need for RP05. Lower costs will allow lower price or alternatively a half capacity RP04 would fill the RP05 bill.

DATE June 8, 1973

THE SERVICE PLAN

HARDWARE:

(Briefly explain your strategy in the hardware service area identifying what types of service you will be offering with your product and how it may be changing over time.)

Installation
8, 12, 16, and 24 hour maintenance contracts, resident and on-call.
5 and 7 days per week
Schedule PM service.
Special hardware training--no regular courses.
The P/L ships spares to be used on-site with each system. These are included in warranty.
No charge for field add-ons is made nor for ECO's if customer is under contract
Special acceptance tests giving guaranteed uptime and crash rates are performed when negotiated.
Penalty charges are offered on a special basis.
We are beginning to perform more diagnostic and error detection capability on-line. This is now done for discs and tapes will shortly be included. With the advent of the KL10 we will do more of this and will likely have communications links to all of our systems for immediate analysis before F.S. departure to the site.
**See below

SOFTWARE:

(Briefly explain your strategy in the software service area identifying what types of service you will be offering with your product and how it may be changing over time.)

We have taken the move towards unbundling services and are linking bundled support to installation and SPR warranty. Additional software help is being sold as needed for each account.
Major updates of monitors will be charged for and will include a one year SPR warranty.
SPR service is now being performed by a separate maintenance group in the software support organization. This will provide a fast response bug fixing service.
Other unbundled services such as training, program conversions and operations management are now being offered and these enhance our attractiveness to many customers.

*No significant change. However, it is unlikely that maintenance services will do better than break even. Unbundling of products has a much better chance of making money.

**Need for more attention here. Increasing competitive pressures on the one hand, plus lack of profits on the other. Business is too big to give up, but we must make it profitable. Need a new approach with the KL10.

MANUFACTURING PLAN

(The objective of this page is to communicate your ideas on how you will be controlling your inventory and the cost structure necessary to run a successful business.)

INVENTORY:

(What level of inventory do you expect to operate at and how will you be controlling to achieve your goal?)

We have modified our finished goods inventories down 6.0M in Q4 74, in keeping with our phase out ideas of older products in FY75.

The P/L feels responsible for every inventory item. The manpower and computer time dedicated to this is helping us to identify every piece together with its scheduled use.

*The increased shipments budget has improved both the backlog and inventory pieces of the plan.

COST:

(What cost structure do you need to achieve over time to be successful in your business? The obvious answer is decreasing costs. The desired answer is what will you be doing to achieve the cost levels that you need, better ordering of materials, new designs, cost reduction of FA & T?)

The cost structure for profitability varies by item depending on whether it is bought out or of in-house manufacture. Obviously, competition helps set this.

The P/L has traditionally spent a great deal pf time with purchasing and vendors to achieve the desired levels. A major part of our engineering effort is aimed at cost reductions.

The KL10 will allow us to move towards 5X markups on many in-house electronic items.

*The cost accounting efforts to more clearly identify product line costs will be very welcome. Standards are essential, the quicker we move to these the better.

PRODUCT LINE DECsystem-10

DATE June 8, 1973

AREA PLAN

EUROPE:

(What do you expect from Europe and how will you go about helping them to attain your goals. Are you expecting a more rapid growth than the total product line in this area? Changing cost patterns? or any other thoughts that will help communicate your expectations.)

This operation is growing and is hiring well in spite of the usual difficulties. The profitability is superb; I'm not certain they'll be able to maintain it.

*No change

GENERAL INTERNATIONAL:

(Again the key point is communicating your expectations and desires from this area and how you will attain this over time.)

This has been a growth area in FY73. Ron Smart is very optimistic about FY74 opportunities. It could use some dedicated management at Maynard to ensure that we plan and support this business properly.

*No change

NORTH AMERICA

The biggest push is to build up the 10 Computation sales force to 100 specialists worldwide by the beginning of FY 75. North America obviously represents the major piece of this and is now recovering from a very slow start in FY 73.

*North America

Since Canada operates as a subsidiary with local pricing, we should expect some uplift there.

The USA should see greater growth this year due to ease of hiring.

Page 8 (to be attached to the Changes to the JUNE QUARTERLY REVIEW PRODUCT LINE PLAN. Submission to be reviewed September 10, 11, 12).

The Operations Committee would like you to lead them in a discussion on various segments of your business and your alternate strategies to improve each segment. The segments could be defined in terms of markets, hardware, type of customer, or in any manner meaningful to you.

I

Segments	(History) FY 73					(use estimated numbers) FY 74					FY 75				
	NOR	GM	GM%	PLC	PLC%	NOR	GM	GM%	PLC	PLC%	NOR	GM	GM%	PLC	PLC%
1. KA10/KI10	31.7	14.7	46.4	8.39	26.5	45.8	25.4	55.5	17.0	37.1	27.3	14.6	53.5	8.6	31.5
2. Advanced Systems	1.4	0.88	63.0	0.60	42.9	2.0	1.2	60.0	0.8	40.0	3.0	1.8	60.0	1.2	41.0
3. Software	1.8	1.6	89.9	(0.16)	(8.9)	2.0	1.8	90.0	(0.46)	(23.0)	3.0	2.7	90.0	0	0
4. KL10	----	-	-	(1.03)	N.M.	--	--	--	(3.05)	N.M.	25.0	13.7	55.0	7.0	28.0
5.															
Total (Equal Plan)	34.9	17.2	49.3	8.0	22.9	49.8	28.4	57.0	14.3	28.6	58.3	32.8	56.3	16.8	28.8

II Discussion on Alternatives

digital INTEROFFICE MEMORANDUM

file

TO: Ken Olsen

CC: Win Hindle
John Leng
Allan Titcomb

DATE: June 7, 1973

FROM: Dick Dobbie

DEPT: -10 Marketing

EXT : 2185

JUN 8 1973

SUBJ: TOTAL

I have reviewed the history of our involvement with CINCOM Systems on TOTAL and find that:

1. It is indeed a very good package which is quite widely used on competitive systems (primarily IBM--Honeywell uses it on their 2000 series equipment, not on the 6000 series, where they have the G. E.-developed IDS.)

2. We did very seriously consider TOTAL when we made our decision on DBMS-10. We decided on the Rapidata implementation because it was more extensive than TOTAL, was more nearly compatible on a functional basis with IBM's IMS and Honeywell's IDS, conformed to the CODASYL committee recommendations, and could be obtained in return for equipment credits from Rapidata, thus not requiring an actual cash outlay.

3. We clearly informed our salesmen (see attached TWX's) that we were not providing TOTAL at the same time we told Richley of our decision to take another course of action. This was about a year ago, and we have had no dealings with CINCOM since.

4. Alcan uses TOTAL on their three IBM systems, and would apparently prefer to stay with one DBM system. There is no technical reason why they could not use DBMS-10, as TOTAL is essentially a subset of that system (First Church was using TOTAL on their RCA system and is converting to DBMS-10.) It would obviously be an advantage to Alcan if they did not have to worry about conversion and running two different DBM systems.

5. Bruce Weames assures me that we never promised to provide TOTAL to Alcan, but feels that CINCOM has implied to Alcan that they have renewed negotiations with DEC for putting TOTAL on the DECsystem-10. Bruce spoke to Tom Richley three weeks ago, at which time Tom indicated that they were going to make an independent decision regarding conversion of TOTAL to the 10 based on the apparent demand from users/prospects.

6. I would be very happy to see CINCOM offer TOTAL on the 10, as it would be attractive to prospects like Alcan, who are using TOTAL on IBM systems, and prospects who would like an easy-to-use subset of a full-blown DBM system. DEC can certainly not afford to either fund conversion of TOTAL or support the sale of two DBM systems, however.

I am sure that Tom is understandably disappointed that his efforts with DEC have not been successful, feels that there may still be a market for TOTAL on the 10, and is making one last attempt to interest DEC in participating in the conversion. Win will call Tom to reaffirm our position regarding TOTAL, and we will closely monitor the Alcan situation to ensure that everything remains under control.

DD:DW
Attachments

DEC WLTHM A

DEC SYS 10

MSG NO. 116 MAY 15, 1972

URGENT URGENT URGENT

TO: DENNY MAHER - NORTHEAST REGIONAL OFFICE
LEO SHPIZ - CAMBRIDGE
WALTER CROWELL - NEW YORK
MIKE MARSHALL - PHILADELPHIA
JOEL SCHWARTZ - WASHINGTON, D.C.
JIM CURRY - KNOXVILLE
GALE MORGAN - CHICAGO
HARVEY WEISS - PITTSBURGH
DON LARSON - ALBUQUERQUE
DICK HILL - DENVER
BOB CARMICHAEL - ANAHEIM
LES TAYLOR - SUNNYVALE
JACK RICHARDSON - TORONTO
MIKE ELLIS - VANCOUVER
ALEX LAYMAN - DALLAS
JOHN LENG - MAYNARD
BILL KIESEWETTER - MAYNARD
DICK DOBBIE - MAYNARD
ED ARNOS - MAYNARD

FROM: BILL FERGUSON - MAYNARD

I WAS CONTACTED TODAY BY TOM RICHLEY, EXEC V.P. OF CINCOM SYSTEMS TO GET OUR CURRENT POSITION ON DATA BASE MANAGEMENT. HE INFORMED ME THAT HIS COMPANY HAD LOST A SALE RECENTLY BECAUSE A 10 SALESMAN HAD INDICATED WE (DEC) WERE GOING TO PROVIDE "TOTAL" FOR NO CHARGE.

THIS IS NOT THE CASE.

PLEASE REFRAIN FROM REFERENCING "TOTAL" IN DBMS DISCUSSIONS.

OUR POLICY STATEMENT IS THAT WE ARE IN A DECISION CYCLE WITH REGARD TO DBMS, AND ANY SYSTEM IMPLEMENTED WILL BE BASED AROUND THE CODASYL SPECIFICATIONS AS A MINIMUM WORKING SPECIFICATION.

A FORMAL POSITION WILL BE ANNOUNCED SHORTLY. IN THE INTERIM PLEASE BE PATIENT, POSITIVE, AND DO NOT COMMIT US TO ANY NON-DEC PRODUCT.

CR

NNNN

Also published in the July 16 Buy Line to all 10 salesmen.

T W X JUNE 21, 1972

TO: DENNY MAHER - NORTHEAST REGIONAL OFFICE - WALTHAM
LEO SHPIZ - CAMBRIDGE
WALTER CROWELL - NEW YORK
MIKE MARSHALL - PHILADELPHIA
JOEL SCHWARTZ - WASHINGTON, D.C.
JIM CURRY - KNOXVILLE
GALE MORGAN - CHICAGO
HARVEY WEISS - PITTSBURGH
DON LARSON - ALBUQUERQUE
DICK HILL - DENVER
BOB CARMICHAEL - ANAHEIM
LES TAYLOR - SUNNYVALE
JACK RICHARDSON - TORONTO
MIKE ELLIS - CANCOUVER
ALEX LAYMAN - DALLAS
JOHN LENG - MAYNARD
BILL KIESEWETTER - MAYNARD
DICK DOBBIE - MAYNARD
BILL FERGUSON - MAYNARD

FROM: ED ARNOS - MAYNARD - DECSYSTEM-10 PRODCUT PLANNING

DATA BASE MANAGEMENT SYSTEM

CINCOM SYSTEMS - TOTAL

WE WILL NOT BE PURCHASING TOTAL FROM CINCOM SYSTEMS. THIS DECISION WAS MADE BECAUSE THEIR PRICE WAS CASH ONLY AND WE WERE UNABLE TO PAY IT.
I HAVE DONE AN EVALUATION OF THEIR PRODUCT AND SURVEYED SOME OF THEIR CUSTOMERS. TOTAL MEETS OUR REQUIREMENTS, IS EASY TO USE, AND INCLUDES IMPRESSIVE APPLICATION ORIENTED TRAINING BY THE CINCOM SYSTEMS PEOPLE. I INTEND FOR OUR DBMS TO EQUAL OR BETTER THESE HIGH STANDARDS. HOWEVER IF YOU HAVE A CUSTOMER WHO WANTS A -10 BUT INSISTS ON TOTAL AS THE DBMS, PLEASE CONTACT ME DIRECTLY. THE CUSTOMERS WOULD HAVE TO PAY APPROXIMATELY EQUAL TO $50K (AS OPPOSED TO $33K FOR TOTAL ON IBM EQUIPMENT) AND THE PROPOSED SYSTEM PRICE MUST EXCEED $800K.

PLEASE DO NOT CALL DIRECTLY ON CINCOM SALES PEOPLE AS THEY WILL BE FORCED TO PUSH NON-DECK EQUIPMENT IN ORDER TO SELL THEIR PRODUCT.

NNNN

digital INTEROFFICE MEMORANDUM

TO: Win Hindle
John Leng

DATE: June 6, 1973

FROM: Ken Olsen

DEPT: Administration

EXT : 2300

SUBJ:

I had a call today from Tom Richley, Vice President and Director of Venture Projects of Simcon Systems of Cincinnati, Toronto and other places. They are the ones who developed the data base system called TOTAL. He says they have 300 of Fortune's top 500 companies. They have a franchise with Honeywell which means Honeywell pays them for every system Honeywell delivers and they also sell TOTAL directly to customers of Univac and IBM and, I think he said, Burroughs.

They worked hard to get us to franchise TOTAL for the PDP-10 and after months of work and, they thought, a good proposal, we said no at the last minute because we could get one cheaper from a customer of ours.

Our literature at times, however, said that we were going to offer TOTAL and they have been receiving many calls as to when TOTAL will be available. When I was at Alcan two weeks ago, this was a very important question they asked us because apparently they felt we had promised TOTAL.

He has a telegram from Alcan asking when TOTAL will be delivered and he said that he will not answer the telegram until he hears from us.

I promised I would get back to them in a couple of days and tell them what our plans are. His telephone number is (513) 961-4110.

/d

DECsystem-10 PROCESSOR/PERIPHERAL UPGRADE POLICY

The Product Line is initiating a new policy for upgrading DECsystem-10 Processors and Peripheral options which will allow customers to receive a trade in credit on certain options toward the purchase price of a high performance DEC device. In general we have not included devices which would continue to be useful, since the potential trade in allowance generally does not justify the loss of capabilities (such items are memories, RP02 Disks, RD10 Disks, etc.). The following upgrade guidelines, which are subject to future changes as the value of the traded equipment changes, have been set:

	Upgrade Option	Nef Price
KI10U	Processor Upgrade (provides KI10 processor, requires trade in of 1 KA10)	280,000
KA10U	Processor Upgrade (Provides KA10 processor, requires trade in of 1 PDP-6)	100,000
RP10U	Disk System Upgrade (provides controller to run RP02 or RP03 drives - requires trade in of RP10)	20,000
TM10U	MAGtape System Upgrade (provides controller and data channel required to run TU40 drives - requires trade in of TM10A)	20,000
TU40U	MAGtape Drive Upgrade (provides 1 TU40 drive - requires trade in of one TU30 drive)	20,000
TU40V	MAGtape Drive Upgrade (provides 1 TU40 drive - requires trade in of one TU20 drive)	22,000
DC75U	Synchronous Communications Upgrade (provides DC75 - requires trade in of DS10)	45,000
DC75V	Synchronous Communications Upgrade (provides DC75 - requires trade in of 2 DS10)	40,000
CR10U	Card Reader Upgrade (provides CR10E - requires trade in of CR10A)	14,000

These guidelines assume that the traded equipment is in generally good condition (i.e., DEC Field Service maintained). If it is not, an additional refurbishing charge may be necessary. The net prices shown above are discountable under the terms of the standard DECsystem-10 discount agreement.

bwf

UPGRADE PROFITABILITY

KI10U	280,000	
Mfg. Cost (KI10)	33,000	
Gross Margin	247,000	(88.5%)
KA10U	100,000	
Mfg. Cost (KA10)	25,000	
Gross Margin	75,000	(75%)
RP10U	20,000	
Mfg. Cost (RP10C)	6,500	
Gross Margin	13,500	+ RP10 (67.5%)
TM10U	20,000	
Mfg. Cost (DF10, TM10B)	10,000	
Gross Margin	10,000	+ TM10A (50%)
TU40V	22,000	
Mfg. Cost (TU40)	9,500	
Gross Margin	12,500	(57%)
TU40U	20,000	
M Mfg. Cost (TU40)	9,500	
Gross Margin	10,500	(52.5%)
DC75U	45,000	
Mfg. Cost (DC75)	16,000	
Gross Margin	29,000	(64%)
CR10U	14,000	
Mfg. Cost (CR10E)	6,500	
Gross Margin	7,500	(54%)

DECsystem-10

Competitive Price Comparison

Section I - Individual Options

The individual options which seem to be most price sensitive are the Disk Pack Drives, MAGtape Drives, and with certain types of customers memories. It was felt that the memory prices could not be made really competitive for the relatively small portion of the customer base which would consider buying foreign memory without creating an extremely adverse effect on system profitability. In many cases these customers are within the educational, non-profit organization community and steps can be taken on an individual basis to provide more competitive memory pricing. In the Disk Pack and MAGtape areas, a comparison was drawn with IBM's pricing for similar units:

Disk Storage Pricing
(all prices in K$)

Million Words (36 bit)	10	15	20	25	30	40	50	60	70	80
#RP02 (2314) Drives	2	3	4	5	6	8	10	12	14	16
#RP03 Drives	1		2		3	4	5	6	7	8
#3330 Drives						2				4
RP02 (Old Pricing)	93	119	145	171	197	249	328	380	432	484
RP02 (new Pricing)	77	95	113	131	149	185	248	284	320	356
RP03	-	-	-	-	-	150	175	200	225	250
IBM 2319	-	68	92	110	-	-	-	-	-	-
IBM 3330	-	-	-	-	-	174	-	-	-	235

MAGtape Pricing

	# of Drives on System			
	2	3	4	Incremental Drive Price
TU10 System (36KC)	38	46	54	8
IBM 2415 (30 KB, 800 BPI)	35	-	55	-
IBM 2401 (30 KB, 800 BPI)	61	76	91	15
TU40 System (120 KC)	90	115	140	25
IBM 2401 (120 KB, 1600 BPI)	86	110	134	24

There will, of course, continue to be competitive pressures in these areas from the independent peripheral manufacturers whose prices tend to be lower than IBM. Our policy of only selling Disk and Tape systems in minimum configurations which include 2 drives should help reduce this since they will have to buy two of our drives and the lower savings potential combined with the maintenance problems with mixed equipment will serve to discourage most.

Section II - Systems

(Note: All DEC monthly lease and rental rates in this section are based on a 2.1%/month lease multiplier and a 2.5%/month rental multiplier and include an estimate of the 8 hour F/S charge.)

Since IBM sets the pricing standards for most of the large computer manufacturers, the IBM system prices were used as the basis for our competitive study. These were also crosschecked against Burroughs and XDS.

A. IBM 370/155. IBM cannot do a reasonable job of timesharing on a machine smaller than a 370/155. In doing the competitive comparisons, we therefore compared small and large 1040 systems with equivalent 370/135 and 370/145 systems. In each case the DECsystem-10 is capable of providing timesharing as well as batch:

	(all prices in K$)		
	Purchase	Monthly Lease	Montly Rent
IBM 370/135	595	-	12.5
DEC 1040 (64K ME)	512	12.2	14.2
IBM 370/145	896	-	18.5
DEC 1040 (64K)	608	15.2	17.6

Since the major distinguishing characteristics of the 1050 system is the swapping drum and increased timesharing capabilities, and IBM does not stress fixed head storage or timesharing on a system smaller than a 370/155, a relevant comparison could not be drawn. The 1070 system was compared to the 370/155 with and without the fixed head storage device:

	(all prices in K$)		
	Purchase	Monthly Lease	Monthly Rent
IBM 370/155 (w/out Fixed Head)	1,955	-	41.6
IBM 370/155 (w. Fixed head)	2,255	-	48.0
DEC 1070 (160K & 2 RM10B)	1,542	37.1	43.2

B. XDS Comparisons were drawn between the 1040, 1050, and 1070 and the XDS Sigma 5, 8 and 9. The monthly rental rates were estimated for some portions of the systems, since they were not all available, and may not be exact:

	(all prices in K$) Purchase	Monthly Lease	Monthly Rental
Sigma 8	640	-	17.7
Sigma 5	565	-	15.5
DEC 1040 (48K)	489	11.7	13.7
Sigma 8	837	-	22.6
DEC1050 (80K)	760	18.3	21.3
Sigma 9	1505	-	40.7
DEC 1070 (128K)	1320	31.7	36.9

C. Burroughs Comparisons were drawn with machines of equivalent capabilities in the B3500, B5700, and B6700 series. The purchase prices were generally much higher, although their lower rental multiplier (a la IBM) made their rental prices much more competitive:

	(all prices in K$) Purchase	Monthly Lease	Monthly Rental
B3500	720	-	14.7
DEC1040 (48K)	510	12.3	14.3
B5700	1050	-	21.0
DEC 1050 (64K)	665	16.0	18.7
B6700	1495	-	31.0
DEC1050 (128K)	965	23.2	27.0
B6700 (Dual Proc)	1860	-	38.6
DEC1055 (128K)	1175	28.2	32.9
B6700 *	2370	-	47.1
DEC1070	1740	41.8	48.8
B6700 (Dual Proc)*	2835	-	56.8
DEC 1077 (160K)	2220	53.3	62.3

*These systems include the more powerful processor option in the 6700 series.

DECsystem-10 PRICING SUMMARY (Effective Sept. 8, 1971)

	Purchase	Approximate Monthly Lease**	Maintenance 8 Hour	Maintenance 12 Hour
DECsystem-1040				
consisting of:	400,000	8,400	1300 (1600 with after hours PM)	1700
PDP-10 Central Processor				
2 ME10 Core Memories (32K)				
RP02G Disk System (2 RP02)				
TM10G 36KC MAGtape System (2 drives)				
DK10 Real Time Clock				
8 lines DC10 (DC10A, DC10B)				
DECsystem-1050	660,000	13,860	NR	2700
consisting of:				
PDP-10 Central Processor				
4 ME10 Core Memories (64K)				
RM10G Drum System (1 RM10B)				
RP02G Disk System (2 RP02)				
TM10G 36 KC MAGtape System (2 drives)				
DK10 Real Time Clock				
CR10D Card Reader (1000 CPM)				
LP10C Line Printer (1000 LPM)				
32 lines* (DC10 system or DC68A system)				
DECsystem-1055	1,015,000	21,315	NR	3930
consisting of:				
2 PDP-10 Central Processors				
5 ME10 Core Memories (80K)				
RM10G Drum System (1 RM10B)				
RP03G Disk System (4 RP03)				
TU40G 120KC MAGtape System (2 TU40)				
DK10 Real Time Clock				
CR10 Card Reader (1000 CPM)				
LP10C Line Printer (1000 LPM)				
32 lines* (DC68 system or DC10 system)				
DECsystem-1070				
consisting of:	1,180,000	24,780	NR	4230
PDP-10/1 Central Processor				
6 ME10 Core Memories (96K)				
RM10G Drum System (1 RM10B)				
RM10B Additional Drum				
RP03G Disk System (4 RP03)				
TU40G 120KC MAGtape System(2 TU40)				
TU 40 Additional Drive				
CR10E Card Reader (1200 CPM)				
DK10 Real Time Clock				
LP10C Line Printer (1000 LPM)				
32 lines* (DC10 System orDC68A system)				
DECsystem-1077	1,680,000	35,280	NR	5300
consisting of:				
2 PDP-10/1 Central Processors				
8 ME10 Core Memories (128K)				
RM10G Drum System				
RM10B Additional Drum				
RP03G Disk System (4 RP03)				
TU40G 120KC MAGtape System				
2 TU40 Additional Drive				
DK10 Real Time Clock				
CR10E Card Reader (1200 CPM)				
LP10C Line Printer (1000 LPM)				
32 lines* (DC10 system or DC68A system)				

SYSTEM RECONFIGURATION OPTIONS ***	Purchase	Approx. M.L.	8 hour	12 hour
TU40R TU40G system in place of TM10G (1040 or 1050)	52,000	1,092	155	201
RP03R RP03G system in place of RP02G (1040 or 1050)	73,000	1,533	350	490
MD10R 64K MD10G in place of 32K ME10 (on 1040)	40,000	840	160	183
CR10R CR10E in place of CR10D (on 1050 or 1055)	4,000	84	90	104
SYSTEM EXPANSION EQUIPMENT				
PDP-10 Central Processor (for upgrade of 1050 to 1055)	180,000	3,780	370	426
PDP-10/1 Central Processor (for upgrade of 1070-1077)	380,000	7,980	500	575
ME10 (incl. ports as required for DEC supplied options)	50,000	1,050	150	172
MD10G Mass Memory System (64K-MD10A or B, MD10E incl. cables as required for DEC supplied options)	140,000	2,940	460	517
MD10E Additional 32K Module for MD10 System	50,000	1,050	120	138
MD10H Mass Memory System (128K-MD10A or B, 3 MD10E incl. cables as req. for DEC supplied options)	220,000	4,620	700	843
MX10 Memory Multiplexor	4,500	95		
RM10G Drum System (DF10, RC10, RM10B)	86,000	1,806	235	286
RM10B Additional Drum Unit	50,000	1,050	145	182
RP02G Disk System (DF10, RP10, 2 RP02)	77,000	1,617	380	515
RP02 Additional Disk Drive	18,000	378	125	175
RP03G Disk System(DF10, RP10C, 4 RP03)	150,000	3,150	830	990
RP03 Additional Disk Drive	25,000	525	150	210
TM10G 36 KC MAGtape System (TM10A, 2 TU20 or 2 TU10)	38,000	798	173	234
TU10 Additional Drive	8,000	168	70	98
TU40G 120KC MAGtape System (DF10, TM10B, 2 TU40)	90,000	1,890	378	505
TU40 Additional Drive	25,000	525	140	196
TD10G DECtape System (TD10, TU56)	20,000	420	65	75
TU56 Additional Drive	4,700	99	30	42
Input/Output Devices				
CR10F Card Reader (300 CPM)	8,000	168	60	72
CR10D Card Reader (1000 CPM)	14,000	294	80	112
CR10E Card Reader (1200 CPM console)	18,000	378	90	126
CP10A Card Punch	35,000	735	100	115
LP10A Line Printer (300 LPM)	28,000	588	108	125
LP10C Line Printer (1000 LPM)	44,000	924	158	182
XY10 Plotter Control	3,000	63	10	12
XY10A Calcomp Plotter Model 565 with control	9,000	189	30	35
XY10B Calcomp Plotter Model 563 with control	13,400	281	35	41
Communications Equipment				
DC10A Data Line Scanner Control	10,000	210		
DC10B 8 line group unit	5,500	116		
DC10E Expanded Dataset Control	5,500	116		
DC10C 8 line Telegraph Relay Assembly	3,000	63		
DC10D Telegraph Power Supply	500	11		
DC10F Expander Cabinet	2,000	42		
Teletypes and Terminals for Local DC10 Use				
LT33A Teleprinter 33 TS machine (KSR-33)	1,200	25		
LT33B Teleprinter 33TY machine (ASR 33 w/XON/XOFF)	1,800	38		
LT35A Teleprinter VSL312HF machine (KSR-35)	3,000	63		
Data Communications System Type (DC68A)				
DC68A Basic Communications System (incl. DA10)	31,000	651		
M750 Serial Line Adapter	100	2		
DC08B Local Line Panel	1,000	21		
DC08F Modem Interface and Control Mux.	3,400	74		
DC08G Dual Modem Control Unit	300	6		

Teletypes and Terminals for Local 680/i Use	Purchase	Approx. M.L.	8 hour	12 hour
LT33C Teleprinter 33TS machine (KSR-33)	1,200	25		
LT33H Teleprinter 33TY machine (ASR-33)	1,800	38		
LT35C Teleprinter VSL312HF machine (KSR-35)	3,000	63		
CRT Displays				
VT06 Alphanumeric Terminal	3,950	83	35	49
VT05	2,795	59	35	49
Remote Batch Stations				
DC71A Station includes processor, operators console, line printer. 132 columns 350 lpm 64 characters Card reader 300 cpm	41,000	861		
DC71B Station includes, processor, operators console line printer. 132 columns 250 lpm 96 characters Card reader 300 CPM	42,500	893		
DC71D Teletype Concentration Package for DC71 including 8 lines	11,500	242		
DC71E Second 8 lines on DC71D	5,500	116		
DS10 Synchronous Line Interface	12,000	252		
DC75 Synchronous Communications System (DL10, DS11, PDP-11, 8 lines)	50,000	1,050		
DC75D Expander Option for multiple DS11 (DS11, PDP-11, additional port on DL10)	30,000	630		
DC75E Incremental 8 Line Group on DS11	10,000	210		

* 32 Line Options Consist of a choice of

DC10 System	or	DC68A System
DC10A		DC68A
4 DC10B		DC08B
		16 M750

** All lease prices are based on a five year lease-purchase contract and can vary slightly with any major shift in prime rates. End of term options on the lease-purchase contracts are:
a. Purchase the equipment for the then fair market value.
b. Continue to lease the equipment for 1/10 the normal monthly lease rate.
Lease prices do not include maintenance which must be quoted in addition to the prices shown.
Lease rates for non-domestic U.S. sales must be determined on an individual basis.
*** SYSTEM RECONFIGURATION OPTIONS are provided strictly as a pricing aid in configuring DECsystems which have other than the standard set of peripheral options. There is a separate policy which governs the upgrading of peripheral devices which have been installed in the field.

PDP-10 OPTION MIX FORECAST FOR FY72

8/23/71

OPTION	COST	PRICE	% MARGIN	FORECAST				
XY10	0.2	3	93.3	1	1	1	1	4
IM10A	3.5	24	85.4	11	1	1	1	14
CR10	4.6	16	71.3	8	2	0	0	10
CP10A	15.3	35	56.3	3	3	3	3	12
KA10	29.6	160	81.5	14	0	0	0	14
DF10	4	14	71.4	19	1	6	8	34
RC10	4.6	22	79.1	6	1	1	1	9
RM10B	26.6	50	46.8	6	1	4	3	14
RP02	9	26	65.4	68	0	0	0	68
TU55	0.9	2.35	61.7	12	12	8	8	40
TU56	1.3	4.7	72.3	19	22	22	22	85
IM10B	6	26	76.9	1	2	5	5	13
TU20A	8	13	38.5	5	0	0	0	5
TU20B	7.6	12	36.7	6	0	0	0	6
TU30A	10.6	22	51.8	11	6	0	0	17
TU30B	10.4	21	50.5	5	3	0	0	8
LP10A	12.3	28	56.1	2	3	3	3	11
LP10C	22.5	44	48.9	8	4	3	2	17
DC10A	2.9	10	71	11	1	1	1	14
DC10B	1	5.5	81.8	23	6	6	6	41
DC10E	1.1	5.5	80	8	9	9	9	35
DK10	0.8	4.5	82.2	4	2	1	1	8
VT05	1	2.9	65.5	0	0	18	18	36
VT06	3	4.9	38.8	12	12	0	0	24
DC71A	20	41	51.2	3	3	3	3	12
DC71B	20	42.5	52.9	2	2	2	2	8
*ME10	14	50	72	59	13	12	19	103
DS10	3	12	75	5	5	3	3	16
MA10	18.6	53	64.9	10	6	0	0	16
XY10A	3.7	9	58.9	1	1	1	1	4
XY10B	5.6	13.4	58.2	1	1	1	1	4
RP03	11	25	56	0	0	16	42	58
TU40	9.5	25	62	0	0	22	18	40
KA101	24.6	180	86.3	0	0	2	2	4
KA10U	24.6	80	69.3	1	2	1	0	4
KI10	33	380	91.3	0	0	0	1	1
*S1040	105	400	73.8	0	11	9	9	29
*S1050	197.2	660	70.1	0	5	5	5	15
*S1070	313.5	1180	73.4	0	0	0	2	2
RP021	9	18	50	0	18	12	6	36
MD10	42.5	140	69.6	2	6	7	7	22
MD10E	12.5	50	75	2	3	5	5	15
TU10	3	8	62.5	0	0	4	4	8
RP10C	6.5	36	81.9	0	0	4	10	14
CR10F	3	8	62.5	0	1	3	3	7
CR10D	4.5	14	67.9	0	1	1	1	3
CR10E	6.5	18	63.9	0	2	5	3	10
DC75	16	50	68	0	0	1	3	4
RP10	6.2	27	77	16	2	1	1	20

TOTAL COST = 15133.
TOTAL SALES = 50508.1
COST/SALES (%) = 29.9

* Includes 5K System integration cost

** Includes average of 2 extra MC10's

digital INTEROFFICE MEMORANDUM

TO: The Operations Committee
cc/John Leng
Larry Portner
Dick Clayton
Computer Strategy Committee

DATE: September 20, 1971

FROM: David Stone

DEPT:

SUBJ:

On behalf of the Computer Strategy Committee, I have put together the attached proposal for your consideration. It is a suggestion of a way to go, rather than a detailed implementation plan. Comments on the validity of the proposal as well as the propriety of our making it are requested.

attachment

Proposal to build a low cost hardware system capable of running current DEC System-10 software

- The target is $200K to $500K systems inside the computational market; this system fills the gap under the DEC system 1040.

- We should build this system to exploit the 100 man-years of perfected, heavily used PDP-10 software now in existence. DEC system 10 software is ideally suited to both batch and time-sharing computational users and we are adding to it at a rate of 25 man-years per year. We should broaden the market for the software we have already got--it's a superior product.

- We should plan to start soon and be able to deliver a system by January, 1974. It is important to know now what we are going to do, because the PDP-10 plans in this area affect the 11/45 marketing plans. [The alternative plan of capturing this market with 11/45 based software would be more costly and take longer.]

System Prices

The system we need to capture this market is:

	1040 (now)		Low Cost	11/45 (now)		[in $(000)
	MFG	SALE	MFG	MFG	SALE	=
CPU	33		8	5		
48 K core (36 bits)	60		24	30		
RPO2 DISK	32		22	23		
Card Reader	6		5	2		
Line Printer	23		10	10		
8 Local Teletypes	8		8	9		
Totals:	162	487	77	79	192	

We can reasonably expect to manufacture the low-cost DEC System 10 for under $80 K, allowing us to sell it for $250 K and up.

The only part of the system not now under way in the PDP-10 product line is the low-cost cpu.

What We Are Selling

We are selling a proven product - DEC System 10 software. We would not expect to sell the hardware by itself. For this reason, the speed of the hardware is not critical. We are offering this market its first chance to get at all the DEC System 10 software facilities; it is not so much the speed with which they execute, but rather that they are available at all for this price that will sell the system. Cobol is an excellent case in point.

In addition to the software, we have an excellent set of documentation, a competent and trained field support staff and a set of training courses already available.

11/45 Implications

If we decide to implement this proposal, the 11/45 systems should be aimed to complement the low cost DEC System 10. In addition to upgraded support of the 11/20 systems (DOS, RSTS, RSX, COMTEX) we should emphasize the real time systems aspect of the 11/45 hardware and software - for the real time is the PDP-10's weakest point. Other complementary strategies include remote batch station use, communication front ends and computational systems up to $250 K. I believe it is important to decide on this market strategy before the 11/45 announcement is made and hence feel that we must make the PDP-10 system decision soon.

digital INTEROFFICE MEMORANDUM

TO: Attendees

DATE: November 4, 1971 NOV 5 1971

FROM: David Stone

DEPT:

David.

SUBJ: Minutes of the Low-Cost PDP-10 Meeting

The low cost 10 meeting was held in response to a memo from me dated 9/20/71. That memo proposed that DEC build a low cost hardware system capable of running current DECsystem-10 software. In particular, it suggested that by January, 1974, we could build such a system for less that $80K (48K core, one RP02, CR, LPT, 8 TTY's). The 11/45 implications were suggested to be:

. emphasize real time systems

. attack the computational market only up to $250K.

The primary emphasis was on meshing low cost 10 plans with 11/45 plans.

At the meeting, John Leng said that the 10 product line planned to market a 10 system similar to the one suggested with a manufacturing cost less that $40K; time frame to be two years. Ron Bingham presented details which included the possibility of expanding the project scope to require substantial new software--many pertinent questions were raised in his proposal and a reasonably large planning investment is to be started soon to answer those questions.

Dick Clayton outlined his 11/45 plans with emphasis on expansion of current 11/20 products (RSTS, DOS, COMTEX, RSX) and an excellent real-time capability. A "multi-function" operating system was also stressed. The top range of this system would meet the bottom of the low cost 10, thus providing a complete covering of the computational market.

The primary controversy centered around potential conflict and duplication between the lowest cost 10 systems (hardware and software) and the larger 11/45 systems. For example, should COBOL be available on the 11/45? The 11 group concensus was that most current 10 software would eventually have functional equivalents on the 11.

Conclusions

My conclusions from the meeting were:

1. It is critically important that a two year plan of both 11/45 and KL-10 projects be created and compared to ensure maximum development value and market penetration.

2. The KL-10 project should concentrate on lowering cost without major software changes--we should support only one basic DECsystem-10 operating system and the KL-10 should be able to use all 10 software (an example might be to use PDP-8 based line printer and cardreader for which the DECsystem-10 operating system already has working code, rather than 11 based peripherals).

3. The 11/45 based system should continue on its current track and avoid heavy EDP oriented expenditures until good real-time and special purpose multi-user systems are complete (RSTS, DOS).

4. The transportability of user source code (FORTRAN, BLISS) from 11/45 to 10 and vice-versa should be explicitly addressed in future plans.

Attendees

A. Bertocchi
R. Bingham
R. Clayton
U. Fagerquist
W. Hindle
A. Knowles
J. Leng
N. Mazzarese
K. Olsen
S. Olsen
H. Spencer
D. Stone

vp

digital INTEROFFICE MEMORANDUM

TO: John Leng

Cc: Win Hindle
Al Ryder

DATE: December 13, 1972

FROM: Ken Olsen

DEPT: Administration

SUBJ: SYSTEMS-10 ADVERTISING

I called Al Ryder today and gave him a hard time about the PDP-10 group copping out and not giving your message to the world. You did a good job in getting the Systems-10 started, but then you gave up and blamed your lack of enthusiasm on the fact that you are part of a minicomputer company. I think you are copping out.

Xerox hasn't had a product and they are part of a copier company, but they at least show enthusiasm in their computer message.

I would like to have you and anyone else from your group come to the Operations Committee for 15 minutes on January 2 and tell us your pitch for the Systems-10, or maybe your pitches for the various markets you are in, and how you are going to get this across to the world.

The pitch has to be simple; you never get a chance to get two paragraphs to the world. It has to be a phrase, or at most, one or two sentences.

One pitch that sure would attract attention and would look great in a full-page ad in the Wall Street Journal would be to call the Systems-10 the world's largest minicomputer. If you get that message across, you might even be able to raise the price of the 10 and people would think they were getting a bargain. They would at least read your ad because everyone knows the importance of minicomputers nowadays.

Some people feel that Exxon wasted an enormous amount of money just to change their name. I feel that it was a beautiful piece of advertising. One oil company has nothing unique from any other oil company, and all they can do is advertise their name. They found an excuse for advertising and did a masterful job of it.

We do have things unique from all other computer manufacturers, but we can't put them across in a simple advertising pitch. We just sound like all the other manufacturers.

/d

DECsystem-10

WOODS MEETING NOTES

March 28 & 29, 1972

We have prepared a selection of data designed to help us with our forthcoming Woods Meeting. This covers the business history of the product line, the marketing plans for the short term and the ideas for the future, and the hardware and software development plans. These will be presented briefly by John Leng, Ward MacKenzie, Ulf Fagerquist and Al Ryder respectively.

DECsystem-10, WHERE DID IT COME FROM AND WHERE IS IT GOING?

We are now in the 10th year of the product line, from fiscal year 1963 when we started development of the PDP-6, to five years later when we introduced the PDP-10 and five years more to the present with the introduction of the KI10 and the renamed DECsystem-10 family.

Some 23 PDP-6's were built, PDP-10 serial numbers are now over 260 and the third KI10 and first production model has been installed in-house with the fourth going to a customer next month. Total customer installations are now at about 230 processors, with a total installed systems value of about $110M as shown in the enclosed 10 year record. Based on the number of processors installed, number of communications lines, estimated number of terminals calling these lines and the estimated number of people taking advantage of these and other access means to the 10, we estimate that there are some 100,000 10-users in total. That is probably as many as have used all of our small computers.

The PDP-6 in the prime years of its existence lost $700K. However since its discontinuance, add-on sales, although not documented, have surely taken it into a profitable position. The PDP-6 was a difficult machine to build and maintain and proved a considerable burden on the Corporation during the years when sales grew in total from $10M to 20M. In the year following its discontinuance from the market place it contributed $1.1M of profits and this together with the enthusiastic acceptance of it in the market place encouraged DEC to proceed with the PDP-10.

Unfortunately at that time when the market place was looking for the capabilities of our product a years gap in our marketing effort enabled SDS to get a foothold with their Sigma Series. In addition it seemed that the DEC sales force were asking for one product and the 10 development group were intent on producing another.

The guidelines established for the product called for a basic selling price of $100,000, something that must be saleable by DEC's sales force in DEC's traditional markets and must be price-performance competitive in the then present and foreseeable future. The study group responded with a recommendation that the basic price would be 85K and that the average price would be $150K. That the product would provide extreme ease of interfacing customer devices and would use conventional non-time-shared software.

The product we have ended up is a very fine one with many of the objectives achieved. However it is interesting to note that the average price has worked out at about $500K and the minimum price was never much below $300K and now sits at $400K. Presumably the lack of conventional software and the tremendous emphasis on time-sharing capability has been responsible for this. We started off selling 16K core systems but the only software sufficient to do a reasonable job required 32K. Now the minimum system barely suffices with 48K and 64K memories have become the standard minimum.

Unfortunately we weren't able to take advantage of such a product. The sales force were not in tune with the market place that this product was able to do a good job and in our traditional markets we were wiped out by SDS with the Sigma 5 and to a lesser extent SEL, IBM and Honeywell. SDS have sold some 300 Sigma 5's to date but is now coming under increasing pressure from the 1145 below and from the 1040 above as we are introducing more cost effective hardware.

The KI10 has continued the tradition of the KA10 systems by moving the price and performance even higher. Naturally without that desired strength in our field marketing, we will not achieve the potential of this product either.

This background therefore has had a considerable affect on our product-marketing strategies developed during the last year. We now have a two-part plan which first calls for building a field-force to take advantage of what we have product wise and second to develop very cost competitive hardware under our existing software, likely to appeal to a much broader market base and able to be sold by the majority of the DEC sales force.

Hopefully this will make sense as part of the overall medium and large computer strategy being developed this week.

Based on this strategy we believe the following figures for the next five years are a reasonable objective. These only include that expected from the present 10 Marketing organization. Considerable additional business is expected to develop through the efforts of LDP, Industrial and Hospital products marketing.

	FY63	FY64	FY65	FY66	FY67	FY68	FY69	FY70	FY71	FY72
NET BOOKINGS	-	?	?	?	?	16,331	23,200	28,200	21,200	27,000
NET BACKLOG	-	?	?	?	?	11,000	11,000	6,000	4,000	8,000
NOR	-	-	2,841	2,768	3,651	5,333	21,328	33,187	23,221	23,000
COST OF GOODS	-	-	1,559	1,970	2,661	2,549	9,469	17,599	12,199	11,700
MARGIN	-	-	1,272	798	1,598	2,784	11,859	15,588	11,022	11,300
MARKETING	-	?	563	350	389	838	2,068	3,481	4,405	4,400
ENGINEERING	37	?	781	949	914	1,352	1,624	2,765	2,863	3,300
CONTRIBUTION	-	-	(72)	(501)	295	594	8,167	9,342	3,754	3,600
% NOR	-	-	-	-	-	11	38	28	16	16
PROFIT BEFORE TAX	(37)	(661)	(268)	(839)	(60)	17	6,277	3,055	1,517	1,300
KEY MILESTONES	6 ENG. STARTED	6 MKTG. STARTED	6 SHIP-MENTS STARTED	6 MKTG STOPPED 10 PRO-POSAL MADE	PEAK OF 6 SHIP-MENTS 10 ENG. & MKTG STARTED	10 SHIP MENTS STARTED	KI10 STUDY	KI10 ENGRG. RP02 SHIP-MENTS STARTED 4-SERIES SWAPPING MONITOR INTRO-DUCED	KI10 PROTYPE COMPLETED 5-SERIES INTRO-DUCED	DECsystem-10 ANNOUNCED KI10 SHIPMENTS STARTED

	FY72	FY73	FY74	FY75	FY76	FY77
NET BOOKINGS	27,000	36,000	48,000	60,000	75,000	90,000
NET BACKLOG	8,000	14,000	24,000	28,000	38,000	43,000
NOR	23,000	30,000	38,000	50,000	65,000	85,000
COST OF GOODS	11,700	13,500	17,000	22,500	29,250	38,250
MARGIN	11,300	16,500	21,000	27,500	35,750	46,750
MARKETING	4,400	6,000	7,250	9,000	11,000	13,000
ENGINEERING	3,300	4,000	4,500	5,000	5,500	6,000
CONTRIBUTION	3,600	6,500	9,250	13,500	18,250	27,750
% NOR	16	22	24	27	30	32
PROFIT BEFORE TAX	1,300	3,500	5,450	8,500	11,750	19,250
KEY MILESTONES	DEDICATED SALES FORCE SET UP FOR DECsystem-10 NEW COMMUNICATION & REMOTE BATCH EQUIP.ANNOUNCED	KL10 ENGINEERING STARTED NEW FORTRAN DATA MGMT. PACKAGE 3330 & 1600BPI ANNOUNCED	KL10,RP05 MASS CORE VIRTUAL MEMORY SOFTWARE ANNOUNCED BROADER PRODUCT MKTG.IN DEC LDP, HOSPITAL, IND.	KL10 SHIPMENTS KS10 SUPERPERFORMER ENG. STARTED	KS10 ANNOUNCED	KS10 SHIPMENTS STARTED

CONFIDENTIAL

FISCAL 1973
DECSYSTEM-10 SALES PLAN

I. PROGRESS TO DATE

By the end of Fiscal 1972, there will be approximately 230 DECsystem-10 computers installed at customer locations. A major milestone will be achieved in Quarter 4 with the initial customer deliveries of 1070 System several months ahead of schedule. The long-awaited DC75 Communications Front End will also begin initial deliveries in Q4. By the beginning of Q1 of FY73, all major items currently announced for sale will be deliverable with the exception of the 1077 System which is scheduled for delivery beginning in Q3 of FY73.

Several major milestones in market penetration will be achieved during FY72. In the Commercial market, it is anticipated that we will close at least two major newspaper accounts based upon our joint development with the Typesetting Group. The first DECsystem-10 installation in a County Government EDP application is proceeding smoothly. In the Industrial market, the TRW system for the Bonneville Power Authority will place DEC as a highly-qualified vendor for large power network control systems throughout the world. The 1070 order from Rapidata will strengthen our market share position in the Data Services market as the primary vendor to this profitable and rapidly-growing Data Service company. In the Education market, a penetration has been accomplished in the Junior College market with four system orders expected during FY72. The first 1070 in an educational institution is anticipated to be installed in Q4 of FY72 at the University of Pittsburgh, one of the top 50 universities in the United States, which will lend additional credibility to our efforts in selling to medium and large University Computing Centers.

II. PRODUCT

A number of key product capabilities are anticipated to become available during FY73. The new FORTRAN project is staffed and the compiler is expected to be released in Q3 of FY73. The new FORTRAN will significantly enhance our benchmark competitive position. WATFOR, a fast FORTRAN compiler for student-type jobs, will also be available around Q3 of FY73. WATFOR will be a powerful sales tool in selling to University Computing Centers.

A Data Management System based upon a superset of the Honeywell IDS system is anticipated to become available as a DEC-supported product during the latter half of FY73. The system will permit the creation, maintenance and accessing of data base information with a simple command structure. The system will be designed to take advantage of the interactive facilities of the DECsystem-10 rather than being batch-oriented as were earlier data management systems available from IBM and other vendors. The availability of data management software will be an important product capability in all of our market areas.

Our position on a Product Line supported APL is not clear at this time. A version of APL is available through DECUS, although core requirements limit its use to systems with greater than 64K words of core. A smaller and more efficient version of APL is available for a fee from APL Systems Inc. Until an alternative approach is developed, APL requirements must be met with one of the above-mentioned versions.

In the hardware area, it is anticipated that we will announce an LP08 type printer as a replacement for the LP10A by Q1 FY73. It is also anticipated that a high-quality line printer of the chain or train type will be announced in Q2 or Q3 of FY73. This printer will probably constitute a replacement for the LP10C. An interim solution to phase encoded 1600 bpi magnetic tape facility is anticipated to be announced as a Product Line supported device by Q3 of FY73.

Average system costs are anticipated to be as follows:

System	K Dollars
1040	500
1050	600
1055	850
1070	1200
1077	1600

In the area of support, it is recommended that a Field Service contract be sold with a system whenever possible. Depending on the specific account, coverage should be 12 hours or greater. In view of the long leadtime to train a DECsystem-10 Field Service Engineer, support planning is essential beginning in the early stages of the sale between Sales and Field Service management at the local level.

Software Support is increasing in importance as we penetrate the Industrial and Commercial markets. A large number of such accounts require from 6 months to 2 years of heavy Software Support coverage. However, most such accounts are willing to pay for this service if support planning for the account has been accomplished with the prospect early enough in the sales cycle. One major sales pitfall uncovered this year has been the appearance of a weak support image in accounts where support planning has not been covered adequately. In the pre-sales Software Support area, it is important that our hiring and training programs tend toward enabling our Software Specialists to act more as system analysts consulting with prospects on their system requirements. This will be particularly important in districts targeted for concentrated Commercial selling emphasis as noted below in the Market section. Software Specialists in these targeted districts should be familiar with processing techniques in the EDP (COBOL) environment.

The major thrust of our competition will come from IBM. Honeywell and Univac, with second-order competitive pressures from XDS, Burroughs, CDC and ICL. IBM is our most consistent competitor competing heavily in all of our markets and meeting us in the majority of our sales situations. The 1070 System is price and performance competitive with the 370/155 and our 1040 and 1050 Systems are very competitive with the 370/135 and 370/145. IBM continues to be weak in interactive-based applications with TSO being their closest functional equivalent to the DECsystem-10 Timesharing System. There is limited information available on the 370/135 but rumors indicate that it may have operating software designed to compete directly with our class of interactive applications. IBM strengths rest in its size, corporate image, field support strength and vastly greater experience in EDP type applications. IBM's competitive strategy involves very limited discounts to specific markets like Education and, in general, a policy of price stability.

Honeywell competes directly with the DECsystem-10 with the 6000 Series systems. This product is a multifunctional system with a strong interactive facility under GECOS. Honeywell is primarily targeting Commercial-type accounts and are seldom encountered as a strong competitor in the Education, Scientific or Industrial control type markets.

Univac has become a significant DECsystem-10 competitor over the last year. The EXEC8 Executive System is beginning to operate reasonably. Primary competition from Univac has been encountered in the Commercial, Industrial and University

Computing Center markets with the 100 Series systems. Univac's strategies have involved large discounts (up to 60%) and large amounts of free software support.

XDS has been struggling during the last year. Their software (UTS) is beginning to work but they seem to have developed a credibility problem as a result of their past product problems. XDS is building a strong sales organization and could return as a strong competitor in FY73. Currently, XDS is limiting its sales efforts to University Computing Centers, Medical and Hospital applications and its more traditional Scientific and OEM markets. Burroughs has been encountered in the University market with the B3500 and the B6700 where they have offered large educational discounts. We have also encountered the B3500 in small Commercial applications. CDC has become very aggressive with their Cyber Series (6400) and are giving large discounts to move systems in the Education market. ICL is a very strong competitor for all government funded markets in the U.K. due to political pressures.

The DECsystem-10 advertising program has not been set at this time for Fiscal 1973. It is anticipated that there will be a compaign developed with a consistent theme but with individual ads tailored to specific markets. The ads will run in publications appropriate for specific markets, such as Commercial ads in the Wall Street Journal or FORTUNE, Scientific ads in Science and Scientific American, etc. A media schedule will be sent to the field as soon as it is finalized. It is anticipated that our advertising program will run from August 1972 through June 1973. A continuing flow of product and market promotional materials are anticipated to continue during FY73.

III. MARKETS

A. Education - The DECsystem-10 has achieved significant penetration into Educational Computing Center applications. A key to our penetration has been the facility of the system to simultaneously meet the academic and administrative needs under both batch and timesharing. Product announcements which will positively affect this market include WATFOR, a 1401 Simulator, a Data Management System, and APL through APL Systems Inc.

Approximate market share figures are as follows:

	# Students	# of Institutions	-10 Class Decisions	Orders 1972
Junior College	-	1000	60	4
Small College	3000	2000	280	3
Medium College	3000-10000	600	120	4
Large College	Over 10000	200	40	1
				12

Market Share = 2.5%

Direct Federal funding (NSF) of University Computing Centers has evaporated in the United States but continues to be the major source of funds in Europe and Australia. State funding and Federal research grants are very strong influences. The major area to avoid is a Computing Center application with administrative but no academic computing requirements. Care should be employed in selling to the large University applications where Univac and CDC have recently been giving very large educational discounts.

B. Commercial - In the Commercial market, the large newspapers and newspaper chains are targeted with the applications software which is under development by the Typesetting Group. In the non-publishing portion of the Commercial market, we plan to concentrate on firms generally with sales volumes of 120 million dollars or more with interactive or transaction based applications and a competent applications programming staff of 10 or more. Business should be highly qualified by Field and Marketing personnel. During Fiscal 1973, a major concentration of Field and Marketing resources is planned in four high-potential districts. The targeted districts are New York City, Philadelphia, Boston and Los Angeles. The market size of DECsystem-10 class systems is approximately 1 billion dollars and the Product Line would anticipate acquiring a 1% market share in FY73. As the economy picks up in the United States, this market should be well funded.

C. Industrial - Our major Marketing thrust in FY73 will be to penetrate system houses and large companies with internal systems capability. Closed loop process control systems will not be considered a market for DECsystem-10 in FY73.

Applications include power distribution control (TRW), pipeline transmission (IPL), large-scale data acquisition (Plessey), traffic control and warehousing. We anticipate achieving a market share of between 5 and 10% in a market that approximates 100 million dollars for DECsystem-10 class equipment. Customers should be avoided who are looking for complex "turnkey" applications from the manufacturer or that do not possess adequate programming resources to develop the required applications software.

D. Scientific - The Scientific market is a well-established market for the DECsystem-10. This market encompasses all forms of scientific research. Common applications involve physics research, chemistry, computer design research, biomedical research and front-ending large scale scientific computers such as the CDC 6600 and 7600 systems. Funding for large-scale Scientific computer applications appears to be growing at a moderate rate. Primary prospects will primarily be found in government research organizations, the Scientific Departments of major universities and the central research laboratories of large Industrial firms. The market for DECsystem-10 class computers in this market is estimated to be 200 million dollars and our market share is approximately 5%.

E. Data Services - The Data Services market is a very well-defined market. Our Marketing thrust is to the on-line segment of the market which includes timesharing and remote batch. The batch service bureau market is not targeted for development in Fiscal 1973. Our strategy involves selling aggressively to the profitable and successful firms who are upgrading from older generation systems such as the XDS 940 and the Honeywell 400 systems. Very few new firms are expected to enter this market in the United States who are not already established, although formations of new firms may occur outside the United States and particularly in Europe. The annual volume in the on-line segment of this market is approximately 200 systems and our market share with 35 systems is approximately 17%.

IV. SALES

The product will primarily be sold by Sales Specialists with large system sales experience. A yield per Sales Specialist of approximately 800 to 900 thousand dollars is anticipated. Software Support and Sales management should approximately

match our Sales Specialist manpower producing a corporate yield of approximately 450 thousand dollars per man.

The training program for new Sales Specialists has been extended from 2 to 3 weeks to account for the broader scope of our product offering. In addition, the course will incorporate more information on system analysis and account support planning. Training will also be coordinated with the Software Support organization to insure better understanding of our Marketing objectives by our field Support personnel.

A three-day retraining program for specialists in the field will begin in Fiscal 1973 to ensure that all specialists are equipped with the latest product and marketing information. In addition, an International Sales Meeting is tentatively scheduled for the last week of July to review our FY72 progress and to establish our market strategy for FY73.

Submitted by
Ward MacKenzie
Marketing Manager
DECsystem-10

March 16, 1972

Rod Belden
March 21, 1972
John Long

NOTES FROM AMA SYSTEMS MANAGEMENT CONFERENCE

"The Generation of the Users"

The following summarizes my notes from the key speakers at this 2½ day conference.

Conference Attendance: Approximately 900 registered.

20%	Presidents or Board Chairmen
30%	Directors of divisions or departments
40%	Managers
10%	Other - specialists

Frank Cary, President IBM

EDP industry is not at all saturated. There's a growing stock of technology. Increasing labor costs provide the economic incentive to apply this technology to new applications, particularly to get improved productivity from the company. Example: in medical insurance a terminal network reduces the time to turn around claims from six weeks to one week. IBM studies indicate that only 12% of the overall data processing budget is spent on designing and implementing new EDP applications. Therefore, customers are looking for guidance in planning and implementing new applications from the computer vendors. What are IBM's plans to help the users?

1. Put more functions into OS. Offer interactive programming to allow the end user to do his own program development.

2. Broaden the availability of applications packages.

3. Joint effort to develop new applications with end users.

4. Increased customer education.

5. Train IBM people for broader applications of data processing, relating to the main stream of a company's business.

William Quirk, Director of Data Communications AT&T
All digital data network will start in 1974, eliminating need for data sets and giving a 5-1 improvement in band width. Competition is forcing AT&T to adopt new pricing policies, away from point to point average pricing towards a new route pricing.

John Odeneal, FMC Corp., Manager of Systems, International Division
International group uses a timesharing system (service) for their data and reports. Why? To get immediate performance feedback for self-motivation of managers. Attitude is for immediacy and relevance of information. Why timesharing?

- Immediacy
- Real-time response to adjustments and errors
- Minute-to-minute update of data
- Direct user access to the computer

Managers, however, are reluctant to interact with the data base from a terminal. Therefore, brief reports are printed and distributed.

LT./GEN. F. C. Gideon, Vice Commander Air Force Logistics Command
A properly designed MIS should give the facts to the man responsible for resources. The resource manager is the key user (foreman, purchasing agents, department managers). If these men do the optimum, the overall plan will be reached. The Air Force Logistics Command system is an on-line real-time system with 22 billion character data base, 2,600 remote terminals linked to all states, supported by 1500 people in the Air Force doing program development. Why? Today's military airplane is best described as approximately 200,000 spare parts flying in close formation.

Data Communications Sub-Session
Number of terminals in use 1970 equals 200,285
" " " " " 1975 " 822,000
AT&T estimated their 1980 revenues in 1970 as $2 billion. A year later in 1971, they revised the estimate upwards to $5 billion because of the forecast explosion in data communications. Remote batch terminals represent the largest dollar portion and growth of the remote terminal market. During the next five years, terminal prices will drop two-thirds with the use of LSI. Shared data-base systems is the key incentive for remote terminals. Remote intelligent terminals, mini-computer based, will have rapid growth because of their stand-alone capabilities.

John Diebold, President of The Diebold Group

It is becoming increasingly difficult to realize savings from cost reductions in EDP hardware. Each cost/performance improvement of new hardware has less impact. Attention is being turned to personnel for economics and for more efficiency from applications. Look for less justification of increases in total EDP dollars and more emphasis on where to spend the same dollars more effectively. Average large, profitable company today spends between 1-3/4% and .75% of sales dollars on EDP. Trend in costs:

1950 - Hardware equals 5 times personnel costs.

1960 - Hardware equals personnel costs.

1970 - Personnel equals 1.5 times hardware costs.

Why? Users are taking over the EDP development load; users are doing source data entry; favorable cost/performance of hardware. Only 60% of data processing programming effort is on production work - the rest is on new developments and conversion. Most profitable companies are investing heavily in large-scale applications for future payoffs. The most profitable companies are making the most extensive use of data communications and are implementing the most exotic applications.

Q&A Notes

Medical and hospital services will be a large employer in the 70's, but only 10% are automated. Why? Today, medicine is not in a competitive stance, which motivates it towards improved productivity.

What will the task of the corporate EDP professional staff become as users do their applications? It should be to concentrate on standardization and business system design.

How do you measure performance of the EDP group? We know how to measure performance of sales and manufacturing, but there is no answer to the EDP question yet.

Union Carbide and Pillsbury Company - Comments on Operations

Only with central information flow can you have decentralized management, so that the top management knows how each division stands. Pillsbury uses GE 635. Why? Because of IDS data management system. However, they spent a total of 6 years of effort to get the operating system, IDS, and recovery and restart on the 635 working to their satisfaction. Now, 25% of their resources are on remote activities and timesharing. Future predicts 75% of resources on remote batch and remote timesharing. Key to success is taking pains to train the end users in how to use the system and get their applications working. Centraliza-

tion is a battle of the struggle between economics and emotion (users unwilling to let a central group handle their precious information). Mini-computer trend = minis doing plant data acquisition, control, information communication to central site file system.

Don Kircher, President, The Singer Company
Users will become partners with technicians in the design of new EDP systems and equipment. Trend: from an age of "faith" to an age of "skepticism." "Tell us exactly what computers can do for us that justifies their cost." Innovation is needed to bring computer power to the uninitiated user. Singer did this with their new point of sale terminal. The terminal brings the power of the computer to the point where it performs socially and economically useful tasks.

Managing DP Operation Notes
A DP development project is similar to a capital equipment procurement; the development project represents a capital investment, it represents maintenance costs, incurs operating costs, and has a limited lifetime. Therefore, use some of the same justifications as used for capital procurement. Where possible, give users fixed costs for doing their jobs. In a multiprogramming environment, use standard costing, reviewed every six months against systems statistics. Key to program efficiency is the operational review of the project just as soon as the program does its first clean compile. Tighten it up at this time and then again at time of the first installation.

Dr. William Dill, Dean, Graduate School of Business Administration-NY
The new breed of computer user emerging from today's school will, in increasing measure, have had early hands-on computer experience. Their formal education will have included concepts, language and tools that are central to the emerging fields of information processing. This new generation is most likely to be the skeptic - raised in college where costs were rarely a factor and where there were always promises of new equipment and software to cure any ills. They will concentrate heavily on performance evaluation, and benchmarks will be used to protect themselves against over-optimistic vendors. Dill also commented that at one time he worked with IBM on a sales training technique which got the salesmen to play the role of the customer - evaluating proposals, living with problems and sorting out vendors' promises.

SOURCE MATERIAL FOR DEC LARGE COMPUTER MEETING

DEC LARGE COMPUTER BUSINESS

- Historical
- Projected
- Market Split

LARGE COMPUTER INDUSTRY

- Forecast Gross Shipments
- USA and International - $, #
- Market Split - By Industry
- Worldwide Installations - By Country
- Migration Patterns - By System Size
- Migration Patterns - By 360 Model
- Supplementary Industry Notes

PROJECT NOAH

- Market Summary
- System Model - 1975 Industry Forecast
- Market Share
- LDP Markets
- Questions and Answers from Computer Strategy Meeting

Rod Belden
March 24, 1972

DEC LARGE COMPUTER BUSINESS

HISTORICAL SUMMARY

SYSTEM	BOOKINGS TOTAL $M	# SYSTEMS	# YEARS
PDP-6	6	23	3
PDP-15 est total	65	520	4
PDP-10 to date	100	200	5
PDP-11/45 projected	225	1500	4
PDP-10 total projected KA10, KI10 to end 1975	240	390	8
NOAH '74-'78	300*	960**	4-5

* INCLUDES A PROJECTED 20% IN ADD-ONS

** AVERAGE SYSTEM SOLD @ 250K, BEFORE INCLUDING ADD-ONS

RB 3-8-72

DEC LARGE SYSTEMS BUSINESS (> $200K)

A. BY MARKETS ($ million)

	'72	'73	'74	'75	'76	'77
EDUCATION	8	10	13	18	24	30
COMMERCIAL + DATA SERV.	8	12	16	22	31	40
SCIENTIFIC	8	10	13	12	12	12
INDUSTRIAL	3	4	6	8	8	8
TOTAL -10 P/L	27	36	48	60	75	90
OTHER DEC MARKETS - LDP, HOSPITAL, INDUSTRIAL	—	—	—	15	25	35
TOTAL ALL	27	36	48	75	100	125

B. BY SYSTEMS ($ million)

KA10, KL10	22	26	33	55	75	100
KI10	5	10	15	20	25	25

C. BY SALESMEN* (# dedicated man-years)

-10 SALESMEN	25-48	48-64	64-80	80-100	100-120
OTHER DEC SALESMEN	—	—	0-20	20-34	34-47
TOTAL	25-48	48-64	64-100	100-134	134-167

* Assumes yield = $750K per salesman-year = { 1 KI10 or 3 KL10

RB 3-23-72

DECsystem-10 MARKETS 1975

%		
(25)	EDUCATION :	UNIVERSITIES COLLEGES 4-YR JR COLLEGES 2-YR
(25)	COMMERCIAL :	FINANCIAL & INSURANCE STATE & LOCAL GOVT WHOLESALE (INV. + DISTRIBUTION MGT.) PRINTING & PUBLISHING CORPORATE DATA CENTER OTHER
(15)	SCIENTIFIC :	GOVT RESEARCH PROJECTS + LABS COMPUTER SCIENCE NETWORK SYSTEMS (ARPA & MINIS)
(5)	DATA SERVICE	TIME SHARE UTILITIES PROGRAM PRODUCTS (DIGITEK, ADR)
(15)	LDP	* INSTRUMENT DATA COLLECTION & CONTROL * DATA STORAGE & DATA REDUCTION
(10)	INDUSTRIAL	OEM - SYSTEM HOUSES * PLANT INFORMATION SYSTEM
(5)	HOSPITAL	* ADMINISTRATIVE & LAB

* JOINT PRODUCT LINE SALES

RB 3-23-72

FORECAST GROSS SHIPMENTS - USA

$ MILLION VALUE IF SOLD

YEAR	SYSTEM RENTAL VALUE* $K/MONTH			
	2-4.9 (11/45)	5-9.9 (K110)	10-19.9 (KL10 KA10)	20-39.9 (KI10)
1972	$663	$1315	$1779	$1969
1973	731	1377	1849	2107
1974	821	1470	1962	2299
1975	931	1580	2100	2530
1976	1075	1736	2297	2839

NOTE:

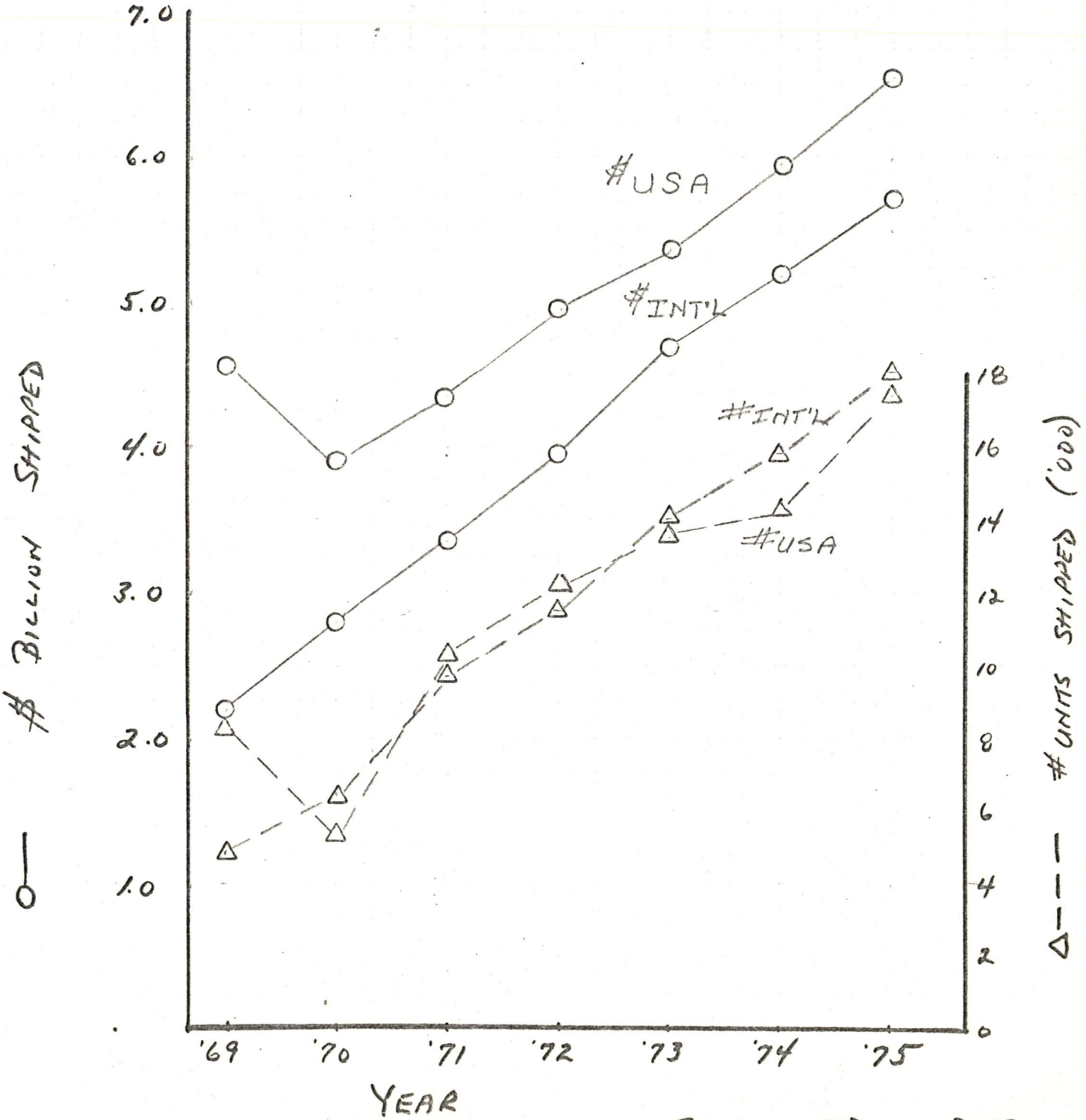
INDUSTRY RENTAL VALUE APPROXIMATES DEC 5-YEAR LEASE PURCHASE VALUE INCLUDING SERVICE. ONLY 4 OUT OF 7 RENTAL CLAISES SHOWN.

SOURCE: HIS MARKET DATA BOOK JUNE 1971

USA and INTERNATIONAL SHIPMENTS

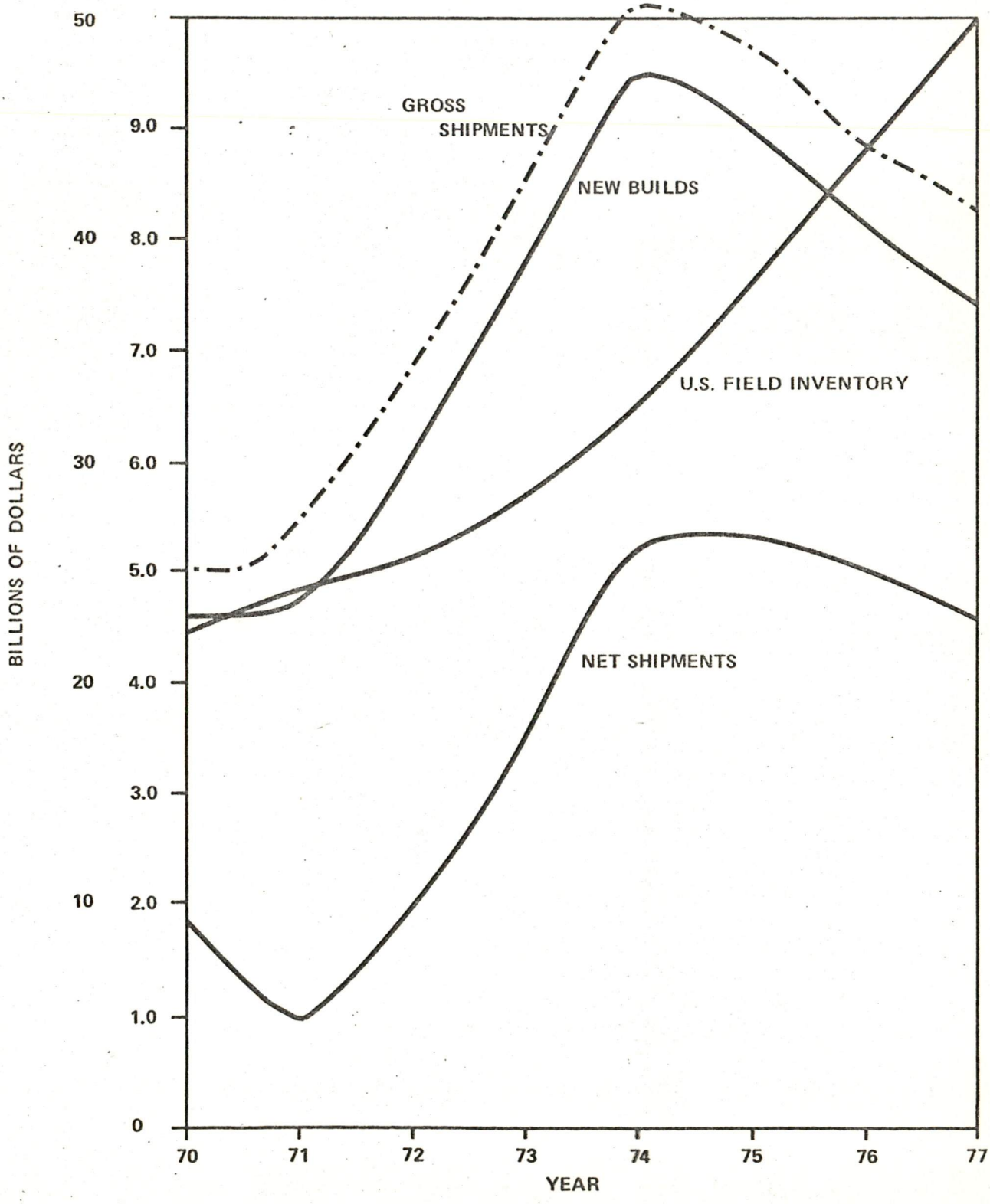
and # (USA-BASED MANUFACTURERS ONLY)

GROUP A (NON-MINIS)



SOURCE: IDC 3-12-71

U.S. COMPUTER MARKET SHIPMENTS/INVENTORY



Quantum Science Corporation

3-72

SHARE INSTALLED BASE BY SYSTEM CLASS WITHIN INDUSTRY – USA ONLY

1970 INSTALLED BASE
(PURCHASE VALUE - $MILLIONS)

	≤2	2-10	10-20	20-40	40-80	80	TOTAL	
PETROLEUM/CHEMICAL	1.0	14.3	19.8	31.1	29.1	4.7	100	1225.8
PROCESS MANUFACTURING	1.9	28.1 ✓	28.3	29.9	10.1	1.7	100	1508.7
DISCRETE MANUFACTURING	1.1	18.9	20.5	23.5	27.8	8.2	100	5280.3
RAILROAD	0.2	6.2	13.2	45.2	35.2	-	100	212.2
AIRLINES	0.3	4.9	8.9	14.7	69.5	1.7	100	235.7
TRANSPORTATION	0.8	27.8 ✓	26.2	29.9	15.3	-	100	259.3
COMMUNICATIONS	0.2	9.6	23.5	25.2	33.3	8.2	100	707.2
UTILITIES	0.3	13.1	16.3	34.3	27.6	8.4	100	495.0
WHOLESALE/RETAIL	1.3	33.0 ✓	30.0	26.8	8.9	-	100	1225.8
BANKING	0.2	27.1	27.5	29.8	13.6	1.8	100	1744.4
FINANCE	0.6	19.8	22.6	32.6	19.2	5.2	100	636.5
INSURANCE	0.2	14.6	21.1	37.5	25.3	1.3	100	1650.1
✓ SERVICES	0.9	17.5	23.6	25.4	23.4	9.2	100	2899.4
✓ MEDICAL	2.1	37.3 ✓	20.7	33.4	5.1	1.4	100	306.5
✓ EDUCATION	1.5	19.0	11.4	23.1	26.5	18.5	100	1603.0
FEDERAL GOVERNMENT	0.5	13.5	14.8	19.2	34.9	17.1	100	2357.3
STATE & LOCAL GOVERNMENT	0.8	20.6	15.3	47.5	15.3	0.5	100	1037.2
OTHER	4.2	32.9	20.2	16.4	12.5	13.8	100	188.6
TOTAL	0.9	19.5	20.9	27.5	23.9	7.3		23573.0

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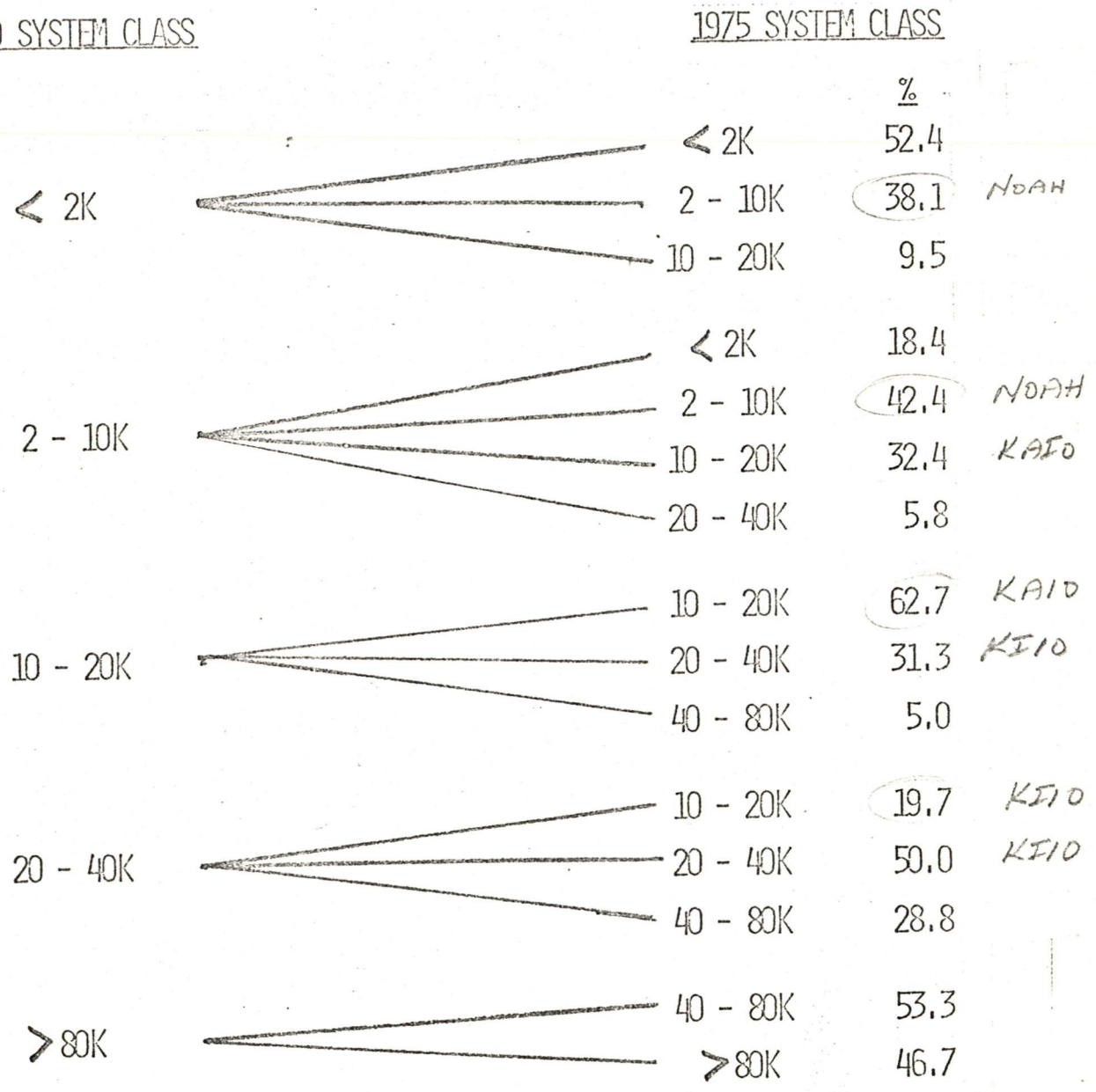
ESTIMATED WORLDWIDE INSTALLATIONS OF GENERAL-PURPOSE AND DEDICATED-APPLICATION COMPUTERS AT YEAREND 1971: COMPARISON OF COMPUTERS IN USE TO GNP AND POPULATION OF 20 TOP NATIONS

Country	No. CPU	% Total	$M Value	% Total	Cum. % By $M	$B GNP (1969)	%-EDP/ GNP	$K GNP/ Capita	Population (1969-Mil.)	No. CPU/ M People
USA	84,600	59.4	28,900	60.8	60.8	932	3.08	4.61	202	417
W. Germany	7,800	5.5	2,890	6.1	66.9	165	1.75	2.69	61.2	128
Japan	8,680	6.1	2,860	6.0	72.9	174	1.64	1.66	105	83
UK	7,600	5.3	2,475	5.2	78.1	93	2.63	1.68	55.5	137
France	6,700	4.7	2,150	4.5	82.6	130	1.65	2.55	51.0	131
USSR	5,500	3.9	1,460	3.1	85.7	260	0.56	1.08	241	23
Canada	3,800	2.7	1,295	2.7	88.4	79	1.65	3.65	21.5	177
Italy	3,300	2.3	1,040	2.2	90.6	82	1.26	1.55	53.1	62
Netherlands	1,680	1.2	530	1.1	91.7	29	1.85	2.21	12.9	130
Australia	1,340	0.9	415	0.9	92.6	30	1.40	2.37	12.5	107
Sweden	800	0.6	405	0.9	93.5	28	1.43	3.53	8.0	100
Belgium	1,050	0.7	355	0.7	94.2	23	1.56	2.36	9.7	108
Switzerland	755	0.5	345	0.7	94.9	19	1.83	3.03	6.2	125
Spain	720	0.5	255	0.5	95.4	29	0.87	0.85	34.1	21
Brazil	730	0.5	250	0.5	95.9	23	1.07	0.25	92.3	8
Denmark	390	0.3	175	0.4	96.3	14	1.22	2.94	4.9	80
S. Africa	480	0.4	145	0.3	96.6	7	2.06	0.36	19.6	24
Mexico	360	0.3	130	0.3	96.6	8	1.44	0.18	48.9	7
Finland	255	0.2	105	0.2	97.1	9	1.12	1.95	4.7	54
Norway	270	0.2	100	0.2	97.3	11	0.93	2.77	3.9	69
Subtotal	136,830		46,280			2145	2.15	2.05	1048	130
Others	5,570	3.8	1,220	2.7	100.0	438	.34	0.17	2492	2
TOTAL	142,400		47,500			2583	1.85	0.73	3540	40

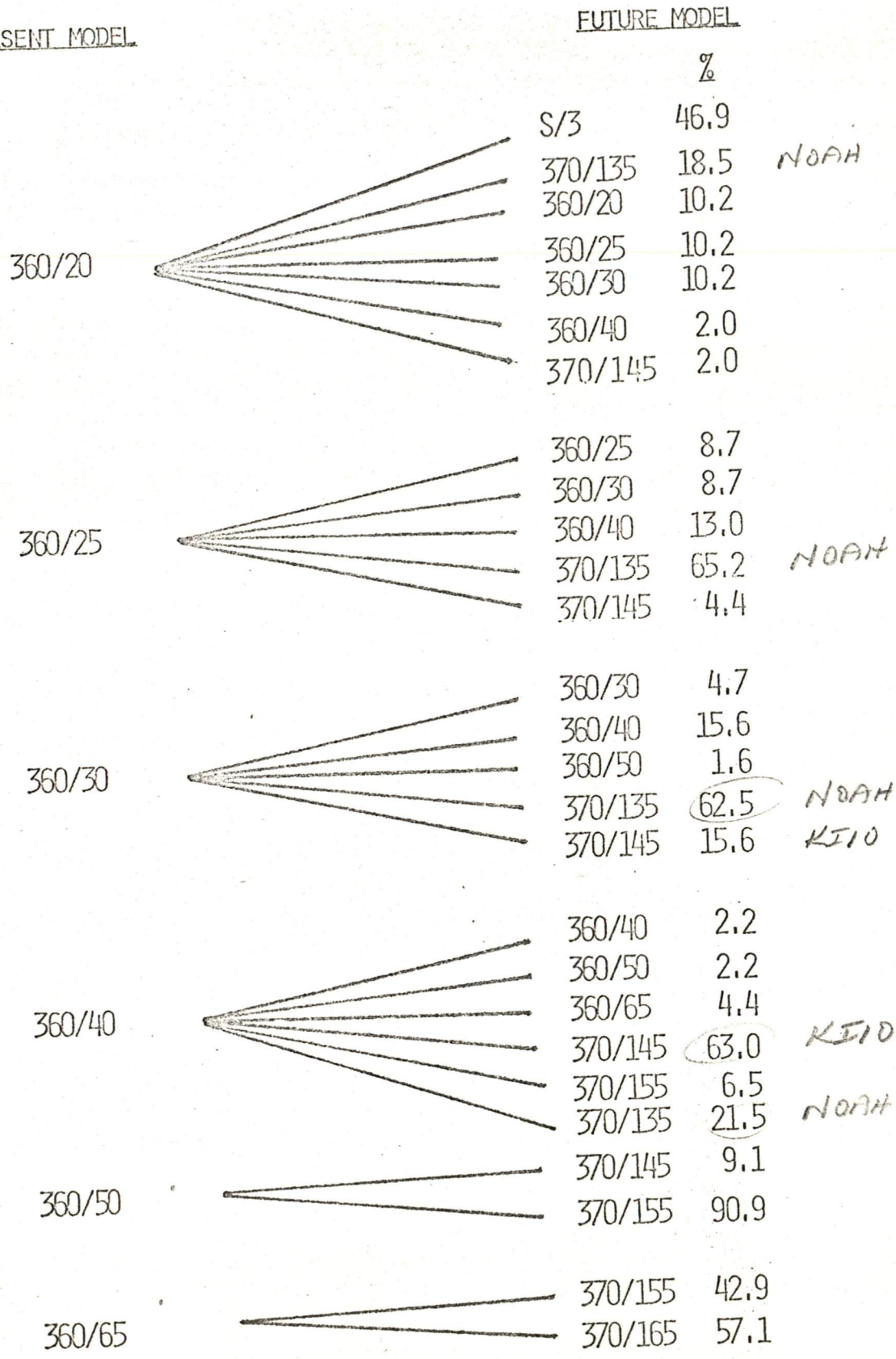
MAJOR MIGRATION PATTERNS BY SYSTEM CLASS

95% CONFIDENCE LEVEL



MIGRATION PATTERNS BY IBM 360 MODEL

1971 - 1976



SUPPLEMENTARY INDUSTRY NOTES - LARGE COMPUTERS

- ADL study forecasts a high level of new shippments, but lower additions to the manufacturer's revenue bases until 1974-75. DEC will benefit from increased new shipments if we can make it easy for the user to convert from his present system

- ADL projects a brighter outlook for large computers, priced $750,000 to $1.5 million and indicates a recovery of moderate activity for medium-scale systems, priced $200K to $750K.

- Market characteristics will trend towards:
  - remote computing
  - more sophisticated applications
  - price/performance
  - reliability

- Remote batch terminals are projected to be the fastest growing segment of the computer communication market. Up to $1.8 billion in intelligent batch terminals are forecast for shippment (in total) by 1976.

RB 3-23-72

Rod Belden
March 10, 1972

MARKET SUMMARY FOR NOAH

Market Definition - The market universe within which NOAH sells includes (non-military) computer systems which today offer the computing power of the IBM 370/135, 145 and competitive systems; the price of the IBM 370/125, 135 (5K dollars to 20K dollars per month, or 200K dollars to 800K dollars purchase price). Within this universe:

NET USA CUMULATIVE INSTALLATIONS (UNITS)

	$5-10K	$10-20K	$20-30K
1971	13,879	10,112	5,028
1974	16,863	12,794	7,156
1976	19,404	14,966	8,849

Market Characteristics - By 1974 in the NOAH market the user, not the computer specialist, will provide the dominant justification for computer acquisition. Users want compatibility with or ease of transition from their previous system, high system reliability, and will look for methods of coupling data entry and data output directly to the data source. Communications-based systems are the fastest growing segment in the market and, within communications, remote batch applications lead the list.

NOAH Market Strategy - Build on our existing PDP-10, DECsystem-10 base and bridge into new, related market areas. Sales through replacement and expansion of existing computer installations assume that the NOAH price/performance and capabilities will attract between 2% and 3% of the 1974 installation base of 29,500 systems (USA, monthly rental $5K to $20K). The migration patterns of IBM 360 model owners indicate that 65% of 360/25 owners and 62% of 360/30 owners will switch to the 370/135. Also, 21% of 360/40 owners will switch to the 370/135. In general, these users will be well accustomed to third generation computers and will possess a degree of sophistication in their applications to qualify them for NOAH. Sales for new applications, including new DEC penetration in the LDP, Hospital and Industrial markets, are enhanced by the existing well-developed NOAH operating system and high level languages. Additional new applications will be based on the ease of interfacing NOAH to our large mini-computer market base (target of $500 per mini interface).

DEC Marketing and Sales Capability - Assuming that the NOAH product is acceptable to the marketplace, the speed with which we can build up sales power will be a major limiting factor in NOAH growth. Our plans assume two-thirds of the sales effort will come from -10 Specialists and one-third of the sales effort from the LDP, Hospital, Industrial and other DEC sales teams. Yield per trained NOAH Sales Specialist should be at least $750K per year (3 systems per man per year). Bundled pre- and post-sales software support should account for one software specialist for every two salesmen to give a net yield per field man including software specialist of $500K per man per year.

Related Revenues - NOAH will bring in substantial related revenues to DEC which should be counted as part of the market plan. Field service, software support (unbundled), contract programming, special systems, network mini-computer, and terminal sales should account for between ___ and ___ million dollars over the five-year product cycle. This is budgeted at a level of ___ % of expected NOAH system sales.

Market Message

NOAH is a low-cost extension of the DECsystem-1040 and 1050, making use of the valuable existing operating system and higher level languages and user software. NOAH offers capabilities found in larger machines such as the IBM 370/155 (multiprogramming, multi-processing, ease of data communications, shared file system, inter-active timesharing, remote batch); the computing power of systems equivalent to the IBM 370/145; at a price of systems in the range of the IBM 370/135; and offers the ease of expansion and interfacing of the DEC PDP-11 family.

SYSTEM MODELS

1975 PROJECTION

≈ NOAH SIZE

BUSINESS PROCESSOR - MEDIUM (MODEL #2)

GENERAL DESCRIPTION

Major use in medium sized businesses ($20-$50 million annual revenue) to service total EDP requirements. Frequently a second or third computer in larger companies where it is dedicated to specific applications.

PROJECTED PRICES (MONTHLY RENTAL - $ THOUSANDS)

	1970	1975
Range	7-14	8-16
Average	10.0	10.0

TYPICAL MANUFACTURER MODELS

IBM 360/30, 370/135
Burroughs B2500, 3500
CDC 3100
GE 405

Honeywell 125, 1200, 200
NCR Century 200
RCA 2, Spectra 70/25, 35
Univac 9400

MEMORY CHARACTERISTICS

	1970	1975
• Internal		
Size Range (Bytes)	8-96K	16-24K 248K
Average Size (Bytes)	64K	128K
Width of Memory Path (Bits)	8-32	8-32
• External		
*Tape Systems		
Avg. # Drives (Range)	2.2 (0-6)	2 (0-4)
Transfer Rate	60 kHz	60 kHz
*Removable Disc Pack Systems		
Avg. # Spindles (Range)	2.5 (1-3)	4 (1-6)
Capacity (Bytes)	5.4-29M	29-180M

1 RP03 = 60M CHAR.

* Some disc or tape only machines

SOURCE: QUANTUM SCIENCE

MODEL #2 (CONT.)

	1970	1975
• Other Memory Features		
Organization (Internal)	Direct Access	Direct Access, Cache, Virtual

CPU CHARACTERISTICS	1970	1975
Channel Capacity	3	5-6
Communication Lines	0-20	0-50
Memory Cycle Time	1.5 μs	.5-.75 μs *

* 370/135 SPEED = 2 byte access read 0.77 μs
2 byte write 0.935 μs

PERIPHERALS AND TERMINALS

Peripherals: Card reader/punch, printer, tape, paper tape, modems

Terminals: 20-25% will have terminals.

PROGRAMMING SYSTEMS

Operating Systems: DOS, RAX (remote access), TOS, tape operating system with basic data access method

Programming Languages: Assembler, Cobol, Fortran (IV), PL/1

DEC NOAH KEY IS 1 OPERATING SYSTEM, ALL FUNCTIONS, LOCAL & REMOTE

NOAH MARKET SHARE - 1975

NOAH MARKET POTENTIAL INCLUDES ALL COMPETITORS SYSTEMS IN PRICE RANGE $ 5K - 20K / MONTH BECAUSE OF FAVORABLE NOAH PRICE / PERFORMANCE.

GROSS SHIPMENTS 1975 ($ 5K - 20K / MO.)

#	3,680 M	USA
	3,120 M	INT'L (est at 85% USA)
#	6,800 M	WORLDWIDE

DEC NOAH PENETRATION 1975

$$\frac{55\ M}{6,800\ M} = 0.8\%$$

NOAH IN THE LDP MARKETS

(Notes from meetings with Loren Gale & Ed Kraemer)

WHY NOAH FOR LDP?

1. NOAH is center of multi-mini computer, and multi-instrument system
2. Mass file storage from/to instruments and terminals
3. Computing power
4. Ease of program preparation from multiple terminals - specially in FORTRAN.
5. Ease of major system expansion to a larger 10 based product
6. Minimum system (cost to DEC of #31K) is very attractive as a starter system

WHY NOT 11/45?

1. The 11/45 will have LDP applications, but more for specific hardware needs than for a complete system
2. People will buy <u>future</u> - want the ease of expansion to larger systems under the same software

Booking estimate for systems > #200K

'73	'74	'75	'76	'77
# 2M	# 3M	# 6M	# 7M	# 8M

Questions - Answers from Computer Strategy Meeting

1. Why not use the present KA10 product?
   Our plan is evolutionary and is based on the current -10 product. To keep us competitive for the next 3 years we need to do some cost reducing and repackaging: We will continue to use the same software system, with improvements.

2. Why isn't the -10 selling today?
   The -10 is selling in markets which are very economically depressed - where our competition is doing worse, as a % of target sales, than we are. Also we have never received our budgeted amount of sales effort in any quarter; however sales staffing has improved during FY'72.

3. Is the product high performance or low cost?
   Both. The performance equivalent to a 370/145 at price of the 370/135 & /125 gives us our price/performance edge.

4. What does the -10 sales force want?
   Make the present product more user oriented - improve our data communication, file manipulation, mag tape handling, etc. capabilities. Reduce the price & the space.

5. Why did we build the KI10?
   To give expansion room to our installed and new customer base.
   To meet an anticipated scientific and data service market need.

RB 3-24-72

PERIPHERAL EQUIPMENT PLAN

The main objectives of the plan for future peripherals are to satisfy the requirements for:

1. Capability - widely accepted in the industry (i.e. 3330 disk)

2. Lowest possible system cost.

3. Improved system performance (speed, through-put).

The following list includes possible product alternatives - and possible vendors for the products.

1. DISK/DRUMS

1.1 Head Per Track Devices

Current Products:

RM10B - 350,000 words capacity, 3600 rpm, 4 us/word transfer rate.
Cost: $25,000/unit
Vendor: Bryant

Future Products

Main requirements:

- reduce the cost

- improve the speed

FY73

- Drum for the RS10 System:

Capacity: 1,000,000 (2,000,000) words/unit
Cost: $20,000 ($35,000) /unit
Transfer Rate: (1), 2,4 us/word
Rotation Speed: 36000 rpm
Possible Vendor: DDC

- RM10B Replacement - we need more drums at lower cost.

Capacity: 250-300,000 words/unit
Cost: $10,000/unit
Transfer Rate: 4 us/word
Rotation Speed: 3600 rpm
Possible Vendor: DDC

FY74

- Low Cost High Speed Disk (RS03 type)

Capacity: 125,000 (or larger) word/unit
Cost: $2,000/unit
Transfer Rate: 4 us/word
Rotation Speed: 3600 rpm
Vendor: DEC

- Faster drum for the RS10 System

Capacity: 500,000 words/unit
Cost: $30,000 / unit
Transfer Rate: 1 or 2 us/word
Rotation Speed: 6000 or 7200 rpm
Possible Vendor: DDC

1.2 Moving Head Devices

Current Products

RP02 Disk - 5.2 M words, 2400 rpm, average latency 30 ms, 15 us/word transfer rate, cost $7000/unit

RP03 Disk - 10.2 M words, 2400 rpm, average latency 30 ms, 15 us/word transfer rate, cost $8,500/unit

Future Products

Requirements:

- Industry standard
- Lower cost
- Higher speed

FY73

RP04 Disk Unit (corresponds to IBM 3330) for the RF10 disk system.

Capacity:	20M words
Rotation Speed:	3600 rpm
Average Latency:	30 ms
Transfer Rate:	5 us/words
Cost per Unit:	$9,000
Possible Vendors:	CDS, ISS, CDC

FY74

RP05 (or RP07) disk unit

Capacity:	7 - 9 M words
Rotational Speed:	1500 - 2400 rpm
Average Latency:	25 - 35 ms
Transfer RAte:	5.5 - 15 us/word
Cost per unit:	$2500-3500
Possible vendors:	DEC or CDC, ISS, CDS

FY75

RP08 disk unit for the RF10 disk system.
Same speed as RP04 but capacity doubled: 40 M words/unit
Cost: $10,000/unit
Possible Vendors: CDS, ISS, CDC

2. MAGNETIC TAPE UNITS

Current Products

- TU10; 7/9 channel, 200/556/800 bpi NRZI, 45 ips, up to 36 KC transfer rate.
  Cost: $3000/unit
  Vendor: DEC

- TU40/41; 7/9 channel, 200/556/800 bpi NRZI, 150 ips, up to 120 KC transfer rate.
  Cost: $8500/unit
  Vendor: Bucode

Future Products

Key requirements.
Improved performance
; better transfer rate (higher density
; preferred to higher tape speed)
; dual recording mode NRZI/PE
; automatic threading/loading
; read reverse operation
; low cost

FY73

- Low cost 1600 bpi, 45 ips TU10

Transfer rate: 72KC
Cost: $3000
Vendor: DEC

- Medium cost 100 ips, dual desnity 800 bpi NRZI/1600 bpi PE drive with automatic threading/loading read reverse.
Transfer rate: up to 160 KC
Cost per unit: $5000
Possible Vendor: Bucode (later DEC)

- High performance 200 ips, dual density 800 bpi NRZI/1600 bpi PE drive with automatic threading/loading, and read reverse operation.
Transfer Rate: Up to 320 KC
Cost per unit: $9000
Possible Vendor: Bucode

FY1975

- Medium cost 100 ips, 800/1600/6400 bpi, automatic threading/loading, read reverse.
Transfer Rate: Up to 640 KC
Cost per unit: $5000
Possible Vendor: DEC or Bucode

3. MASS MEMORY

Current Product: NONE

Future Product:

FY74-75

Main features:

- Large size in the range of 10^8 to 10^{11} words on line

Cost Objectives: $100 per million words or less
Possible Vendors: PI, Ampex, IVC

4. LINE PRINTERS

Current Products

LP08/F	132 column, 64 character, 350 lpm
Cost:	$8500
Vendor:	Data Products
LP10A	132 column, 64 character, 300 lpm
Cost:	$12,500
Vendor:	MDS
LP10C	132 column, 64 character, 1000 lpm
Cost:	$22,500
Vendor:	MDS

Future Products

Main requirements

- Reduce the cost on medium performance printer
- Get a high print quality printer
- Reading replaceable character set

FY72

LP10F	132 column, 64 character, 350 lpm
Cost:	$8500
Vendor:	Data Product (via CSS)

FY73

- Low cost printer for remote batch

	132 column, 64 character, 100 lpm
Cost:	$2000
Vendor:	Centronix

- Medium performance line printer

	132 column, 64/96 character, 1200 lpm, replaceable drum
Cost:	$12,000
Vendor:	Data Product (2740)

- High performance line printer

	132 columns, 64/96/128/characters, 1200 lpm, replaceable train
Cost:	$25,000
Vendor:	CDC (possible in CSS)

FY74

- Low cost 132 column, 64/96 character, 300 lpm

Cost Objectives:	$5,000
Vendors:	Data Printer, Data Products, CDC

5. CARD EQUIPMENT

5.1 CARD READERS

Current Products

CR10D;	1000 cpm, hopper/stacker capacity 1000 cards
Cost:	$4,500
Vendor:	Documation
CR10E;	1200 cpm, hopper/stacker 2250 cards.
Cost:	$6500
Vendor:	Documation
CR10F;	300 cpm, hopper/stacker 600 cards
Cost:	$3000
Vendor:	Documation

Future Products

It is expected that current products will satisfy the needs through FY1975.

5.2 CARD PUNCH

Current Product

CP10	200 cpm, hopper/stacker size 1000 cards
Cost:	$15,300
Vendor:	MDS

Future Products

Objectives

- Reduce cost

- Improve reliability

FY73

Card Punch	100-200 cpm, hopper/stacker size 1000 cards
Cost:	$10,000
Vendor:	Data Product - SP120 (possibly via CSS)

6. COMMUNICATIONS TERMINALS

6.1 Hard Copy

Current Products:

Teletypes type LT33 and LT35

Future Products

Objectives

- Lower cost

- Upper/lower case

- Higher speed

FY73

- LA30 300 cps, 64 characters

Cost:
Vendor: DEC

FY74

- LA30 300 cps, 96 characters
Cost:
Vendor: DEC

6.2 CRT Terminals

Current Products

VT05 64 character set, 300 cps
Cost: $1000
Vendor: DEC

Future Products

- Lower Case

- Upper/lower case

- Higher speed

FY73

- VT05 64 character set, up to 2400 cps
Cost: $1000
Vendor: DEC

FY74

- VT05 96 character set, up to 2400 cps
Cost: $1000
Vendor: DEC

HARDWARE PLANS

The following is a summary of major projects currently in progress and projects for the future. Projects are not in priority order.

1. CURRENT PROJECTS

1.a KI10 Processor

Discrete Project No:	63-07450
Cost to Complete:	$50,000
First Ship:	April 1972
Main markets:	Fundamental to all

1.b RP10C/RP03 Disk System

Discrete Project:	63-06369
Cost to complete:	$2,000
First shipped:	February 1972
Main markets:	All

1.c TM10B - TU40

Discrete Project No:	63-06166
Cost to complete:	$5,000 (this part)
First shipped:	February 1972
Main markets:	Commercial

1.d TM10A/B - TU10

Discrete Project No:	63-06166
Cost to complete:	$5,000 (this part)
First ship:	March 1972
Main markets:	Educational

1.e TM10A/B - TU20/TU30 Compatibility

Discrete Project No:	63-06166
Description:	Make the existing TU20 and TU30 drives operate with the modified TM10A or TM10B bus.
Cost to complete:	$17,000
First installation:	June 1972
Main markets:	All (add-on)

1f DC75 Synchronous Front End

Discrete Project No:	63-07551/-06711/-06713/-6710
Description:	PDP-11 based synchronous front end to PDP-10 Phase I to satisfy initial configurations for Copley and Pittsburgh (1 line @9600 baud + 3 lines @ 4800 baud Phase II to provide capability to handle 8 lines @ 9600 baud (include more than on PDP-11).
Cost to complete:	Phase I $20,000 Phase II $30,000
First shipment:	Phase I April 30, 1972 Phase II August 1972
Main markets:	Commercial, Education, Data Services

1.g RF10/RP04 Disk System

Discrete Project No:	63-06700
Description:	Provide an IBM 3330 disk system capability (20 M words/drive). The RF10 controller will have a dual I/O bus (system) option. Each RP04 will have a dual controller access option.
Cost to complete:	$350,000
First ship:	December 1973
Main Markets:	All

1.h High/Medium Performance Line Printer

Discrete Project No:	63-0699
Description:	Provide an IBM 1401 quality line printer with readily changeable character set.
Cost to complete:	$50,000
First ship:	October 1972
Main Markets:	All

2. FUTURE PROJECTS

2.a NOAH SYSTEM

Discrete Project No: 63-06705/-0774
Description: DECsystem-10 compatible system at lowest possible cost
The main parts of the NOAH systems are:

- KL10 processor
- ML10 Internal Memory
- RP05 Disk System
- PDP-11 subsystem including
  - line printer
  - MAGtape system
  - card reader
  - communication front end
  - real-time front end

Cost to complete: $2,200,000
First ship: Full system 24 months after start
Main Markets: All

2.b MS10 MEMORY SYSTEM

Discrete Project No: 63-06701/-6163
Description: Lower cost, higher density and higher bandwidth. 128K word per cabinet. Main memory could be core or mos. Initially 16K sense core stacks will be used. Internal memory bus will be 4 word wide. A cache option is considered.
Cost to complete: $400,000
First ship: 24 months after start
Main Markets: All (medium, large systems).

2.c 128K-ME10 MEMORY SYSTEM

Discrete Project No: NONE
Project identification No: 9941
Description: Use ME10 memory interface with 16K sense core stacks. Use outside vendor supplied stacks until DEC stacks are available.
Result - lower cost, higher density (128K per cabinet).
Cost objective 25% of current cost for 128K words.
Cost to complete: $200,000
First ship: 12 months from start
Main Markets: All

2.d MAGtape SYSTEM 800 bpi NRZI/1600 bpi PE

Discrete Project No: NONE
Proj. identification No: 9925
Description: Provide 1600 bpi PE capability.
Convert CSS developed system into a standard special system. Will handle dual density (NRZI/PE), automatic threading/loading, 150-200 ips (up to 320 KC transfer rate) drives.
Cost to complete: $55,000

First ship; 20 months after start
Main Markets: All

2.f RS10 DRUM SYSTEM

Discrete Project No: 63-07372
Description: Main objectives: lower cost controller, larger drums, faster operation. Provide a high speed paging drum system. The controller will allow dual system operation. Each drum (500,000 - 2,000,000 words capacity) can access one controller. Word transfer times are 1,2 or 4 us/word.
Cost to complete: $190,000
First ship: 12 months after restart
Main Markets: Scientific

2.g ASYNCHRONOUS COMMUNICATION FRONT END

Discrete Project No: NONE
Proj. identification No: 6709, 9976
Description: Increase capability to handle up to about 500 asynchronous lines. The system is based on PDP-11 communication equipment.
Software development includes modification to the monitor to handle more than 120 jobs and a communication package.
Cost to complete: $110,000
First ship: 6 months after start (<120 jobs)
12 months after start (> 120 jobs)
Main Market: Data Services, Commercial

2.h DC71 NEW PACKAGE

Discrete Project No: NONE
Proj. identification No: 9101, 9953
Description: Reduce cost of DC71 by using PDP-8/E processor and peripherals.
Cost to complete: $35,000
First ship: 4 months after start
Main Markets: Commercial, Educational

2.i NEW REMOTE STATION

Discrete Project No: NONE
Proj. identification No:
Description: Develop PDP-11 based remote station support
Cost to complete: $50,000
First ship: 12 months after start
Main markets: Commercial, Educational

digital INTEROFFICE MEMORANDUM

TO: John Leng

DATE: March 25, 1972

FROM: Al Ryder

DEPT: DECsystem-10 Software Development, 3-5

SUBJ: Notes on the Future of DECsystem-10 Software.

Overall, we have the best designed system (both hardware and software) in the large computer marketplace. This inheritance together with our corporate lead in minicomputers provides the DECsystem-10 with a potential for profitable growth and marketplace expansion. To convert this potential to reality, we must improve our software. This note is an overview of what we must do about the software, the way in which we produce and support it, and the way in which it is used.

SOFTWARE NEEDS

For the purpose of this memorandum, I view the software needs in four areas:

1. editors and utilities,
2. monitors and the BATCH sub-system,
3. languages, and
4. application packages.

We have urgent and long-term need in all four areas, but of the four I believe that the bulk of our investments during the next three to four years will be in languages and application packages.

One of our more immediate needs is a strongly competitive editor. Although the "computer nuts" who formed our traditional market loved TECO, it is not a healthy basis to sell to an EDP manager in the face of ATS and other more friendly appearing competition. The two principal editors available on the 10 today, TECO and the STOPGAP family (e.g., EDITS and SOS), are both crusty with age --- they have been modified, patched, extended, and improved to the point of being somewhat incoherent, delicate to maintain, and certainly not a basis for long-term competition.

Conversion aids to help our salesmen bump competing equipment out of existing installations should be high in priority. Our repertoire should include comparison tables, sifting programs, data file reformatters, and similar utilities.

The concept of a data management facility needs clarification in jargon-free language as a prelude to eminient development activity.

We have three concerns in the monitor area:

1. longevity,

2. problems associated with supporting more than one monitor, and

3. provisions for increasing capability and competitiveness.

Because we know we can support the KL10 in whatever form it assumes, we are only worried that the KL10 support itself might break reliability or create a splinter monitor.

The longevity of the monitor, its ability to serve as a reliable basis for our products year after year after year, is seriously imperiled by our current management practice. As we add a feature here and add a feature there, we constantly increase the complexity of its inter-connections and introduce opportunities for unreliable performance. The apparent contradiction implied by our current reliability threatens to lull us into a smug postponement of precautions, but our current market response to make every sale "special" by adding new features is exactly the worst course of action for us to take if our monitor is to be reliable two years from now. We should continue incremental development only if we pause occasionally to reset our basis, clean-up accumulated messes, and try to establish a pattern for what is to follow. Accordingly, we see three approaches to ensure longevity:

1. a total redesign,

2. a strenuous overhaul and clean-up, and

3. an absolute freeze on configuration.

A total redesign is not without some contradiction and risk in that our current reliability is the result of years of maturity with careful bug elimination after every change. These three approaches have serious impact on the competitive capability aspect of longevity, and we recommend a funded study of these three alternatives.

We foresee a need for several new monitor capabilities: full support of virtual memory, ability to interlock files at the block and record level, full support of displays, ability to optionally swap parts of the monitor, increased throughput and expansion to accommodate hundreds of concurrent users. Before starting any of this, we should firm our long-term plans.

Whatever course we follow to fully support the KI10 and KL10, we must not blithely assume that we can support more than one monitor. (Our experience with 4S72 should serve as a lesson.)

In part this is true for technical reasons (unless we use something ourselves, it will not continue to work) and in part for management reasons --- our resources always seem to be too sparse to apply anywhere but on the burning issues of the day. We should either plan to have essentially one monitor as today or to drastically redesign it and thereby improve its throughput.

In addition to our needs for new languages (PL/1 for the European market, APL, and WATFOR) and continued development of our COBOL, FORTRAN, and BASIC, we need a new emphasis on problems that are common to almost all of our languages. We need to take a lead in high level debugging techniques to capitalize on the competitive edge inherent in interactive usage (DDT is not the answer). We should permit subroutine calls amongst user subroutines written in different languages. All standard file formats should be acceptable to all languages as appropriate. To enable file and subroutine compatibility, to increase the cost effectiveness of the system by reducing the load on user core, and to reduce the cost of maintenance, we should have a common run-time system to serve all of the programming languages.

The domain of application packages needs the discipline of a programming manager although much of the work will probably be done outside of DEC. Well over half of the effort in a software product starts at the point at which we typically acquire application software. The package must be harmonious with the rest of the system in all of the system environments as well as that within which it was developed. If it is to appear to be part of the product, the documentation must be integrated as well. Testing of application packages can be a very serious problem if the package involves a technology outside of our available skills. Finally, the word "product" implies a maintenance commitment both to repair flaws and to ensure continued compatibility with the rest of our software.

PRODUCTION AND SUPPORT

We need to spend much more effort on competitive awareness and analysis both at product initiation time and later during maintenance. We started this eighteen months ago in planning the new features for BASIC version 16 and onwards, but it is not sufficient to look about once and then rest quietly. We now have ANSI representation on both BASIC and FORTRAN; we should extend that to equivalent participation on PL/1 and COBOL. We should involve the key developers in occasional sales contacts and insist that they use competitive equipments frequently to plagiarize what the competition does well and inform our sales people whenever we have an advantage.

We must sharpen our tools for writing software. All new software should be written in BLISS for reasons documented elsewhere. Accordingly, BLISS is a tool, and we should worry about how well any tool performs and weigh every possibility for increased productivity (for example, debugging aids). In part to reduce the burden on our in-house computers and in part to facilitate field maintenance of our software, we recommend that we fund a rewrite of the BLISS compiler starting this summer.

In the area of testing and quality assurance, we should continue the significant advance we started with the COBOL project three years ago. Concurrent test development should be a part of every software project both to provide software diagnostics and to serve as a basis of an automated quality assurance test system. (Although S.O.P. for hardware projects, this is new in software engineering.)

Our documentation is beginning to show the change in emphasis of our marketplace. We are now writing manuals on how to use our software instead of merely reference documentation on permissible syntax.

We must continue to improve the way in which we support the software in the field and respond to problems. We are already automating the SPR process, and the next move there is to utilize the remote communications capability inherent in our product to ease the burden on the field by improving outward communications of problems and solutions originating elsewhere. The field specialists have already introduced to customers the concept of planned support and critical problem identification; now we need to reflect those understandings in our own relationship between development and the field.

PRODUCT APPLICATIONS

Somehow we must take an initiative in foreseeing ways in which our product will be used and starting the long-term developments required. Most important of these is the concept of networks --- ARPA and Tymshare are years ahead of us and a replication of either involves non-DEC equipment. (Note that the DECNET is not the same ball game. The TSL study is not germane.) With our corporate combination of large and small computers, we have a potential lead over all competition except IBM and Honeywell, and we have both hardware and software flexibility in our products to technically best big brother.

Somewhat related to the concept of networks is a very real and immediate problem of shared files --- the ability for two or more otherwise independent, local systems to access the same

file structures at least on a spooled basis. Our larger customers need this as a tool to increase reliability through redundancy, and internally we must have this capability if we are to continue to develop software on four or more computer systems. (All too often our programmers find that their files are on the "wrong" system.)

We need a redesign in the way in which we support terminals. Our current product, both hardware and software, is based on the support of teletypes. We cannot handle fast terminals. We do not really support displays. The SCNSER portion of the monitor is incredibly delicate. We do not have cost-effective products for applications in which communication line costs ordain buffered terminals and polling; the DC71 software is not a solution. Our product offers little comfort to an installation manager faced with a proliferation of differing terminals. We should staff and fund a complete redesign of this portion of the system.