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

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 Leng

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-N
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 - LDA, 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

RS 3-23-72

FORECAST GROSS SHIPMENTS - USA

MILLION VALUE IF SOLD

YEAR	1/45 SYSTEM RENTAL VALUE * #K/MONTH 2-4.9	KH10 5-9.9	KL10 KA10 10-19.9	KI10 20-39.9
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:

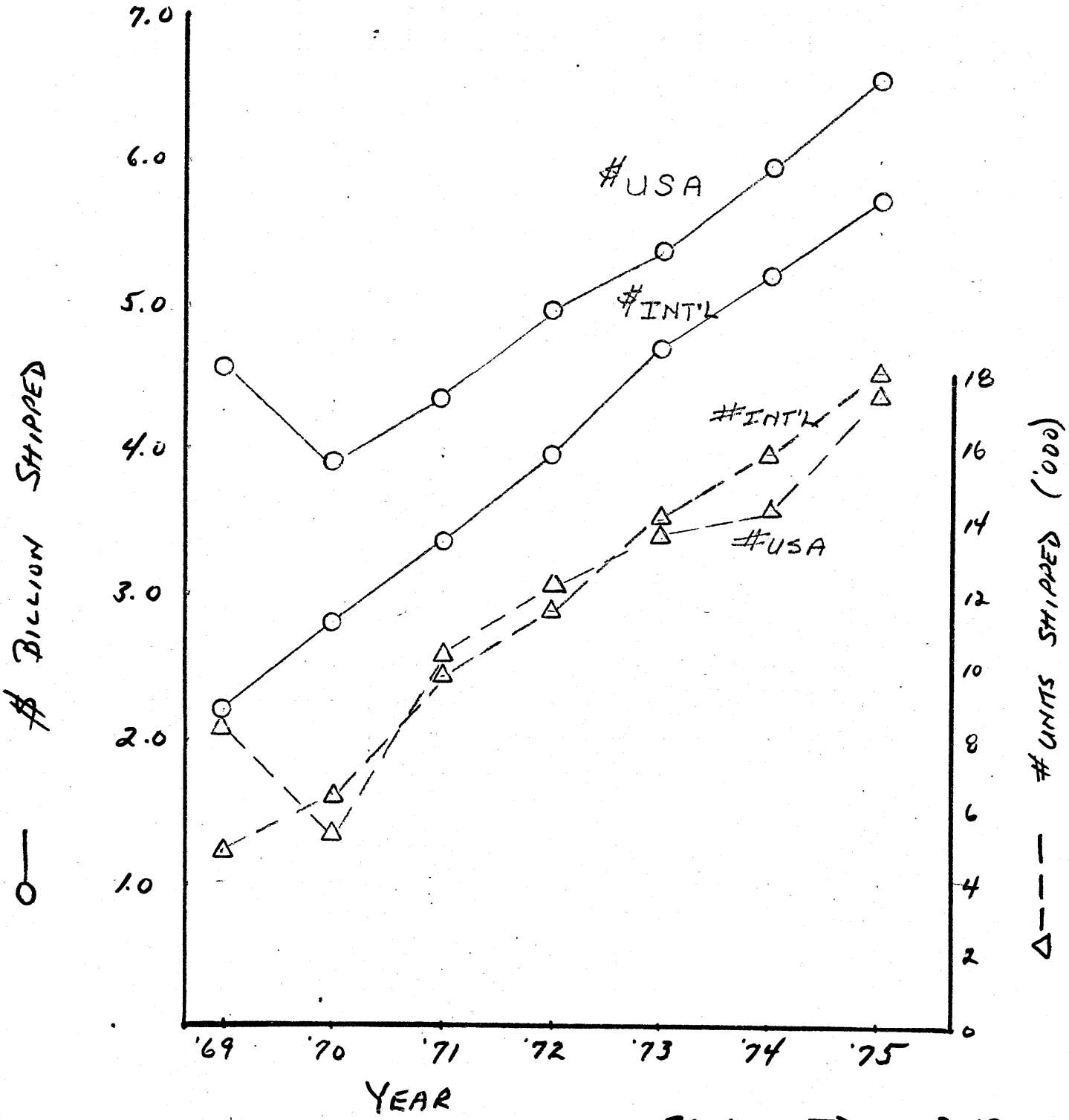
INDUSTRY RENTAL VALUE APPROXIMATES DEC 5-YEAR LEASE PURCHASE VALUE INCLUDING SERVICE. ONLY 4 OUT OF 7 RENTAL CLASSES SHOWN.

SOURCE: HIS MARKET DATA BOOK JUNE 1971

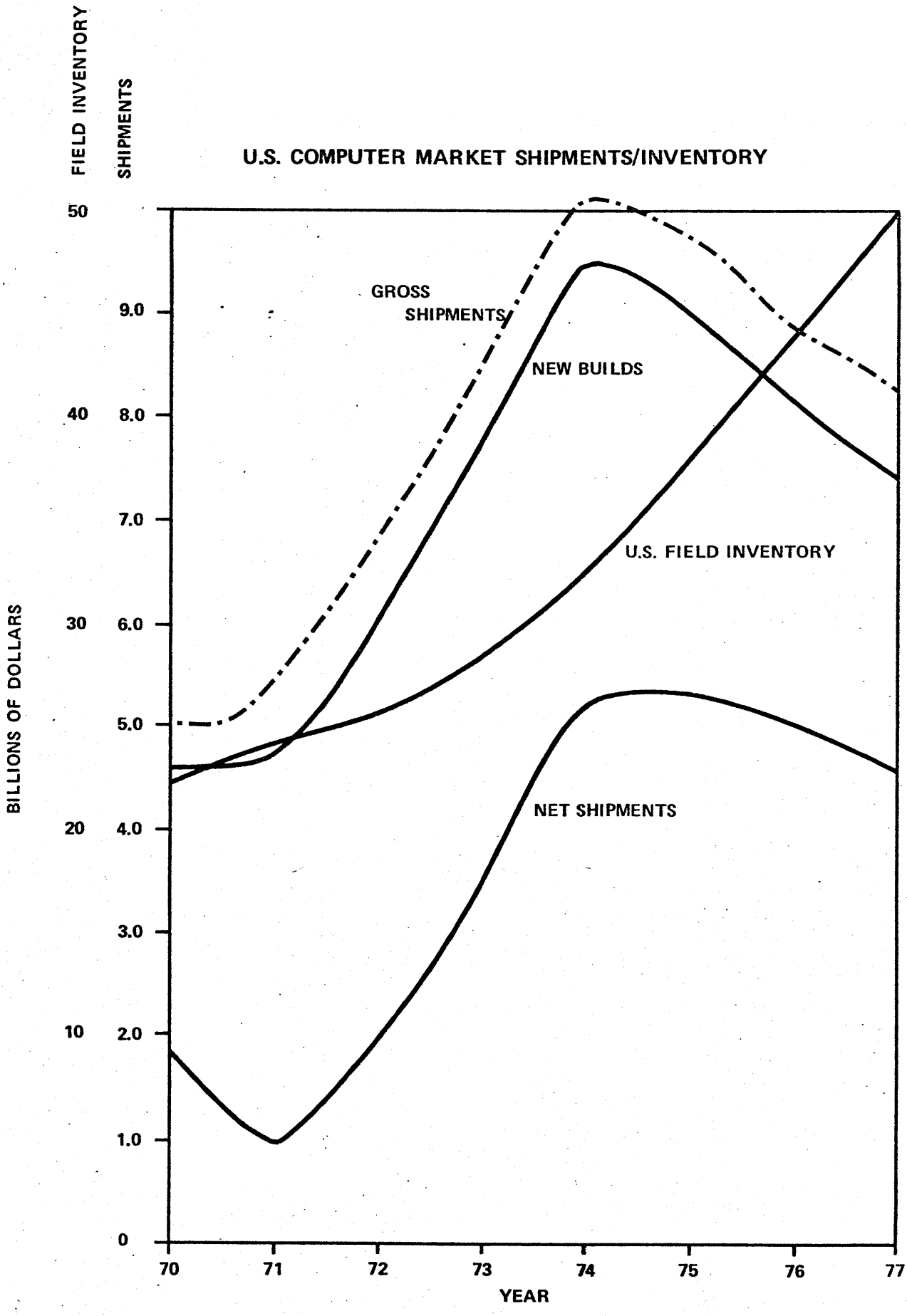
USA and INTERNATIONAL SHIPMENTS

and # (USA-BASED MANUFACTURERS ONLY)

GROUP A (NON-MINIS)



SOURCE: IDC 3-12-71



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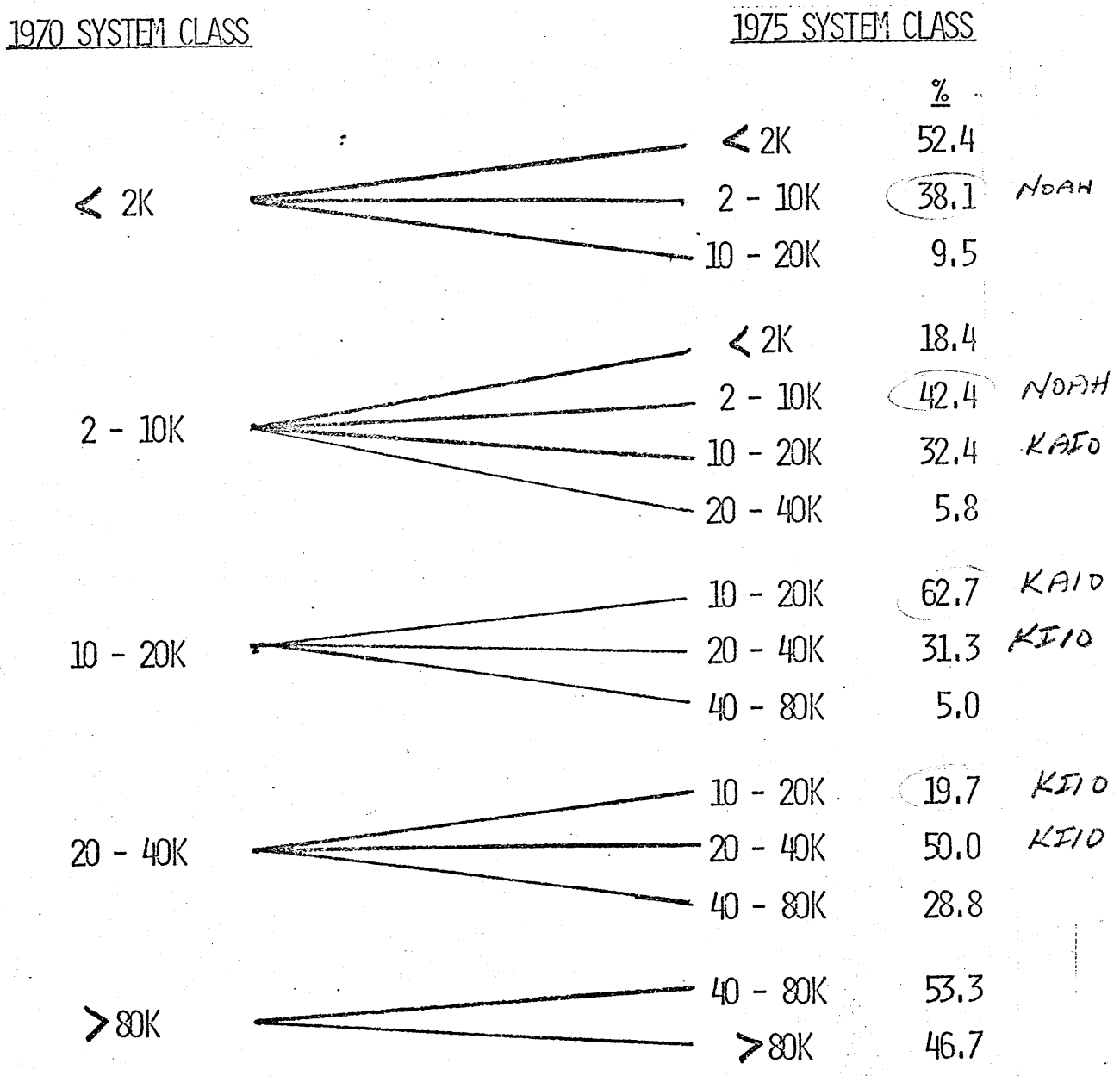
ESTIMATED WORLDWIDE INSTALLATIONS OF GENERAL-PURPOSE AND DEDICATED-APPLICATION COMPUTERS AT YEAREND 1971; COMPARISON OF COMPUTERS IN USE TO GNP AND POPULATION OF 20 TOP NATIONS

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

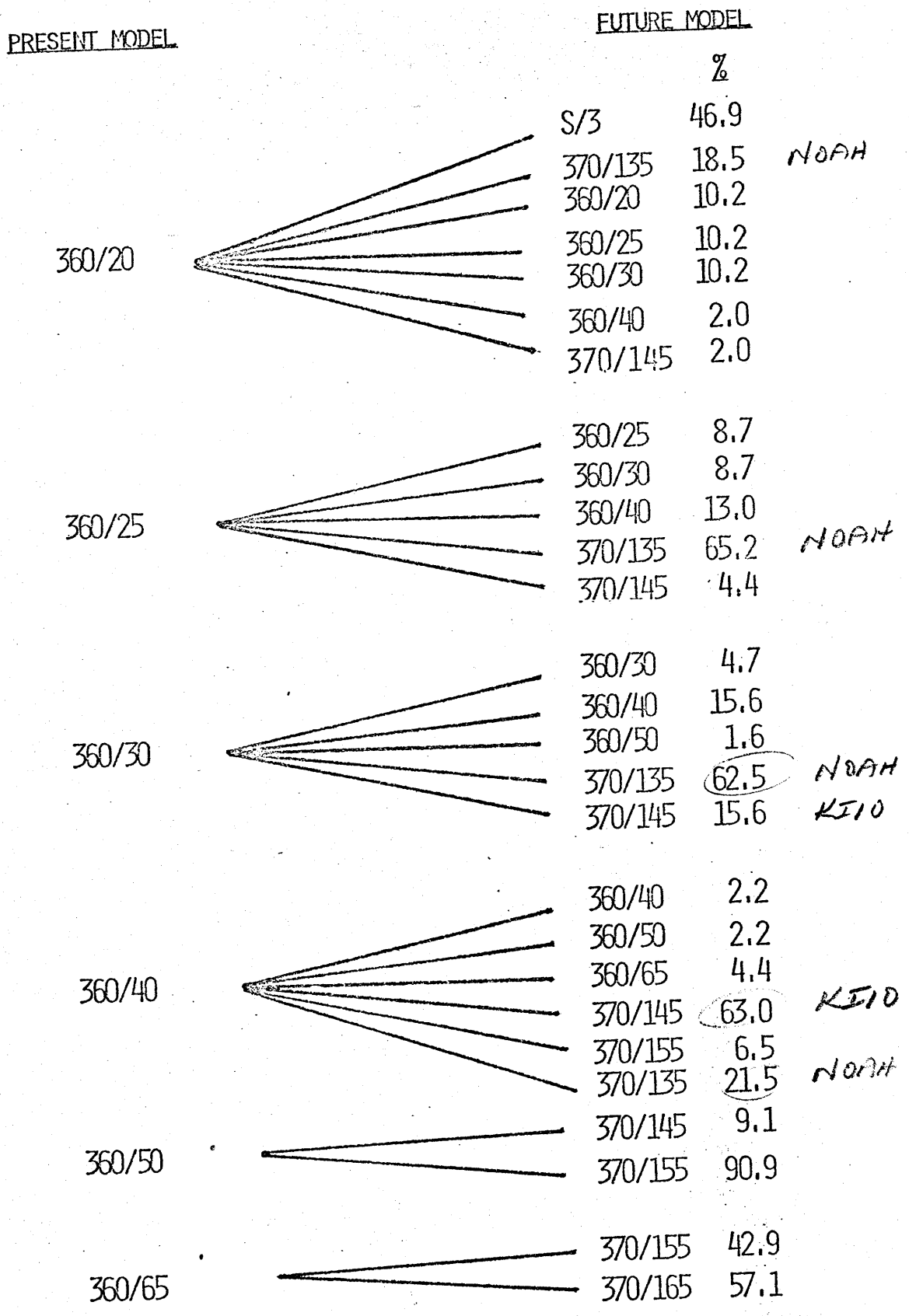
MAJOR MIGRATION PATTERNS BY SYSTEM CLASS

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 low 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, interactive 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

1RP03 = 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 meeting 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 - especially 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
# 2 M	$ 3M	# 6 M	$ 7M	# 8 M

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 prices 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.