THE PLUG COMPATIBLE INDUSTRY

OVERVIEW AND TRENDS

NOVEMBER 16, 1979

INPUT
2471 East Bayshore Road, Suite 600
Palo Alto, California 94303
(415) 493-1600

MAJOR CONCLUSIONS

- IT WILL BE MORE DIFFICULT FOR PCs TO COMPETE OVER THE NEXT SEVERAL YEARS

  - IBM HAS MADE MAJOR TECHNOLOGICAL BREAKTHROUGHS WITH NEW SYSTEMS

    - 4300 (4 MODELS)

    - 8100

    - SYSTEM 38

    - H-SERIES (4 TO 5 MODELS)

    - NEW ROTATING STORAGE DEVICES AT 4X DENSITY

    - 64,000 RAM CHIP AT $0.15/BYTE

  - MAJOR PORTIONS OF OPERATING SYSTEMS IN GP MACHINES (4300 AND H-SERIES) TO BE IMPLEMENTED IN FIRMWARE

  - H-SERIES WILL RUN NEW RELATIONAL DBMS (SYSTEM R), LARGELY IMPLEMENTED IN FORMWARE

  - IBM'S AGGRESSIVE PRICING IMPACTING PCs REVENUES AND PROFITS

MAJOR CONCLUSIONS

- DOCUMENTATION ON NEW SYSTEMS WILL NOT BE RELEASED UNTIL FIRST CUSTOMER SHIPMENT

- RELEASED DOCUMENTATION WILL NOT CONTAIN DETAILS SUFFICIENT TO COPY SYSTEMS

  - DETAILED LOGIC DIAGRAMS, ETC. WILL BE AVAILABLE ONLY AT IBM "SYSTEM SUPPORT CENTERS"

  - IBM FIELD SERVICE WILL HAVE ONLY "BIT PATTERNS"

- THE UNITED STATES GOVERNMENT ANTI-TRUST ACTION IS COMPLETELY STALLED

  - IBM HAS WON EVERY PRIVATE CASE IN COURT (GREYHOUND, MEMOREX, TELEX, TRANSAMERICA)

  - IBM CONTRIBUTES TO UNITED STATES BALANCE OF PAYMENTS AND NATIONAL PRESTIGE

MAJOR CONCLUSIONS

- IBM's NEW PRICING POLICIES WILL EMPHASIZE "PAY FOR WHAT YOU GET"

  - AS HARDWARE COSTS DECREASE, IBM WILL INCREASINGLY EMPHASIZE SOFTWARE, SUPPORT, AND MAINTENANCE AS PRIMARY REVENUE AND PROFIT GENERATORS

  - PC VENDORS WILL HAVE TO IMPLEMENT A STRONG SOFTWARE AND SUPPORT PROGRAM TO COMPETE

- ALL 4300 AND H-SERIES MACHINES WILL BE FULLY SOFTWARE COMPATIBLE WITH 370 FOR <u>APPLICATIONS</u> SOFTWARE

  - AMERICAN USERS WILL NOT ACCEPT ANY SYSTEM THAT WILL NOT RUN EXISTING SOFTWARE

MAJOR CONCLUSIONS

- IBM WILL EVENTUALLY DROP SUPPORT OF ALL "PUBLIC DOMAIN" OPERATING SYSTEMS EXCEPT VM AND MVS

  - VM WILL STAY IN PUBLIC DOMAIN

  - MVS WILL HAVE MICROCODED INSTRUCTIONS FOR BOTH 4300 AND H-SERIES

- PROGRAM PRODUCTS WILL BE A MAJOR REVENUE PRODUCING THRUST OF IBM

- IBM WILL SELL SOFTWARE TO ANY PCM

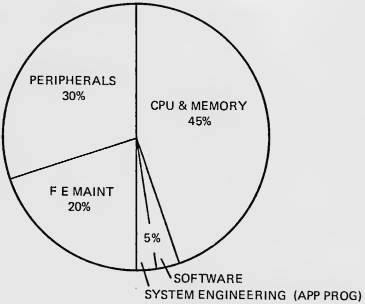
  - MACHINE OWNERSHIP GUARANTEES SUPPORT

- PCMs PROVIDE SUPPORT AT NO CHARGE

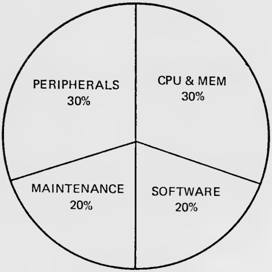
  - IBM WILL CHARGE $45 TO $75 PER HOUR FOR ON-SITE SUPPORT

  - CALLS TO SYSTEM CENTER NOT CHARGED

REVENUE SHIFT: HARDWARE TO SOFTWARE



1978 IBM REVENUE SHARES



1982 IBM REVENUE SHARES

MAJOR CONCLUSIONS

- EXISTING 370 SYSTEMS SOFTWARE WILL RUN ON NEW MACHINES

  - NEW SYSTEM SOFTWARE DEVELOPMENT WILL FOCUS ON UTILIZING FIRMWARE OF NEW MACHINES

  - ALL SOFTWARE VERSIONS OF NEW SYSTEMS SOFTWARE WILL RUN ON 370, BUT VERY INEFFICIENTLY

  - STRATEGY IS TO GET USERS TO UPGRADE TO NEW MACHINES TO OBTAIN INCREASED EFFICIENCY ONLY AVAILABLE ON THEM

  - VM AND MVS BRIDGE TO H-SERIES, CUSTOMER PREPARES NOW

  - CENTRAL SITE SOFTWARE STRATEGIES MEANS "LOCK IN AND CONTROL" ESPECIALLY FOR DBMS AND DDP

MAJOR CONCLUSIONS

- IBM WILL MOVE AGGRESSIVELY TO MAINTAIN AND EXPAND DOMINANCE IN SOFTWARE

- SOFTWARE STRATEGY BUILT ALONG LINES OF FOUR-TIER STRUCTURE:

  - LEVEL 1: SYSTEM CONTROL PROGRAM WITH ENABLING MICROCODE

  - LEVEL 2: "ADVANCED FUNCTION SYSTEMS" E.G., DATA BASE, DATACOM SOFTWARE

  - LEVEL 3: PROGRAM PRODUCTS INCLUDING LANGUAGES, SUBROUTINES, AND OTHER APPLICATIONS ENABLERS

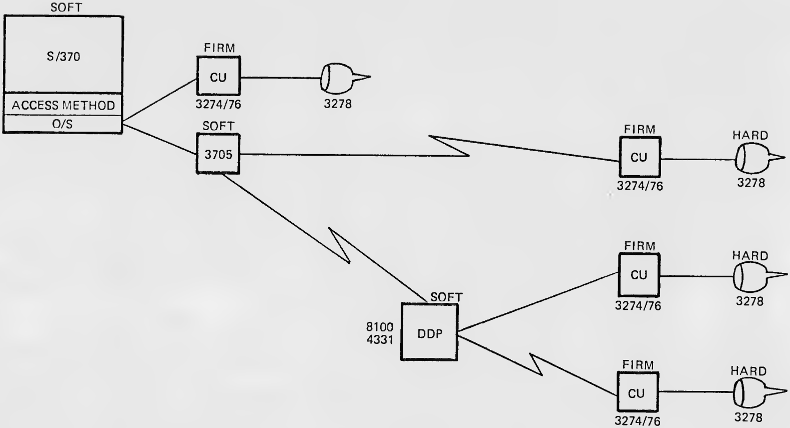
  - LEVEL 4: APPLICATION PROGRAM

- SYSTEM WILL MAKE IT DIFFICULT FOR VENDORS TO COMPETE AT FOURTH LEVEL

MAJOR CONCLUSIONS

- IBM's MAINTENANCE POLICIES WILL BE "FLEXIBLE" ACCORDING TO CUSTOMER
  - LARGE CUSTOMERS WILL BE ABLE TO GET MORE COOPERATION THAN SMALL ONES
  - IBM WILL NOT MAINTAIN ANY EQUIPMENT OTHER THAN ITS OWN SYSTEMS
  - SYSTEMS SOFTWARE AND HARDWARE MAINTENANCE ARE INTEGRATED AT IBM
- SYSTEMS MUST BE FULLY COMPATIBLE WITH SNA STANDARDS AND SDLC PROTOCOLS
- PC VENDORS MUST STAY CONSISTENT WITH IBM's H/F/S STRATEGIES
  - E.G., LITTLE ADVANTAGE TO OFFERING ADDITIONAL INTELLIGENCE AT THE DISPLAY TERMINAL LEVEL
  - IBM HOST SOFTWARE WILL PROVIDE THE REQUIRED INTELLIGENCE

HARDWARE FIRMWARE/SOFTWARE INTEGRATION



PENDING ANNOUNCEMENTS

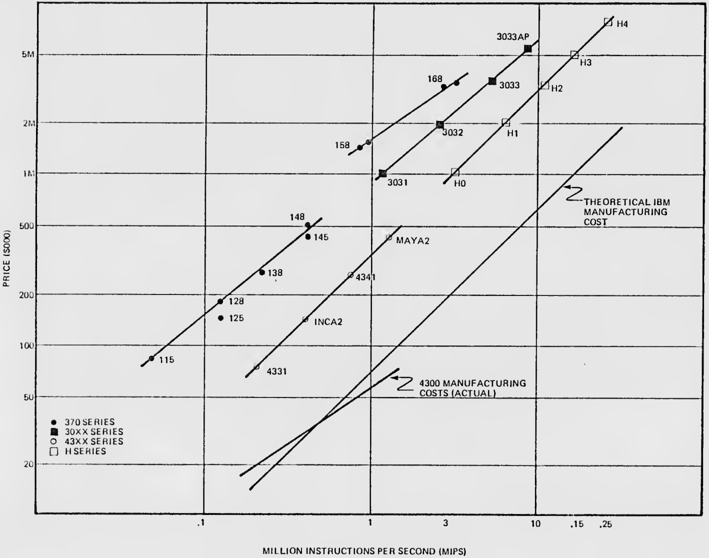
- INTELLIGENT PABX FOR U.S. A POSSIBILITY
- LARGE SCALE SYSTEMS FOR SECOND HALF 1980
  - DELIVERY SCHEDULE
  - FINANCIAL CONSIDERATIONS
  - COMPETITION
  - SOFTWARE
  - RELATIONAL DBMS
  - ON SAME PRICE/PERFORMANCE CURVE AS THE 4300
- IMAGE PROCESSING
  - VIDEODISK
- EXTEND 4300
- DOS ON SERIES/1

MAINFRAMES

IBM PCM PARTICIPANTS

IBM CPU Plug Compatible Manufacturers and/or Marketers	.3 to .6 MIPS	.6 to 1. MIPS	1 to 2 MIPS	2 to 3 MIPS	3 to 5 MIPS	5 to 9 MIPS	9 to 13 MIPS
AMDAHL			Design not sold	V5,6	V7,8		
CAMBRIDGE MEM. INC, CMI	1/79	from IPL					
CONTROL DATA CORP, CDC		78 from	IPL				
HITACHI				AS6	sold by ITEL	AS8	
ITEL		AS3 NS	AS5.3 NS	AS6 Hit	AS7 1/80		
IPL, 40% Owned by CMI	to CMI NCSS	to CDC	to ITEL				
MAGNUSON	1/79	9/79	9/80				
NANODATA	7/79 to Nixdorf	7/80					
NATIONAL CSS	2 Pi CMI						
NATIONAL SEMICONDUCTOR	TO NIXDORF 400 DIRECT		AS3 DIRECT AS5.0 TO ITEL	9/79 Lightning			
NIXDORF (Scrapped in-house)	7/79 NS400						
TWO PI (Philips)	9/78	9/80					
Being Developed: MICROCOMPUTER SYSTEMS				6/79 R1	1/81 R2		

PRICE/PERFORMANCE: IBM CURRENT AND FUTURE



STORAGE PERIPHERALS

STORAGE PERFORMANCE CONSIDERATIONS

- OVER THE LAST FEW YEARS CPU PRICE/PERFORMANCE HAS IMPROVED BY A FACTOR OF 15, WHILE STORAGE PERIPHERALS HAVE IMPROVED ONLY BY A FACTOR OF 4

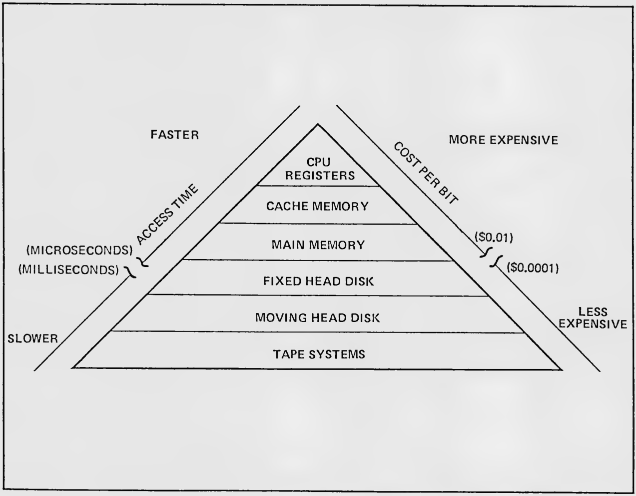
  - THE BALANCE OF HARDWARE SYSTEMS COSTS HAS CHANGED DRAMATICALLY AND WILL CONTINUE TO DO SO

- PC STORAGE SUPPLIERS HAVE AN UNIQUE OPPORTUNITY IF THEY CAN CAPITALIZE ON ADVANCED TECHNOLOGY

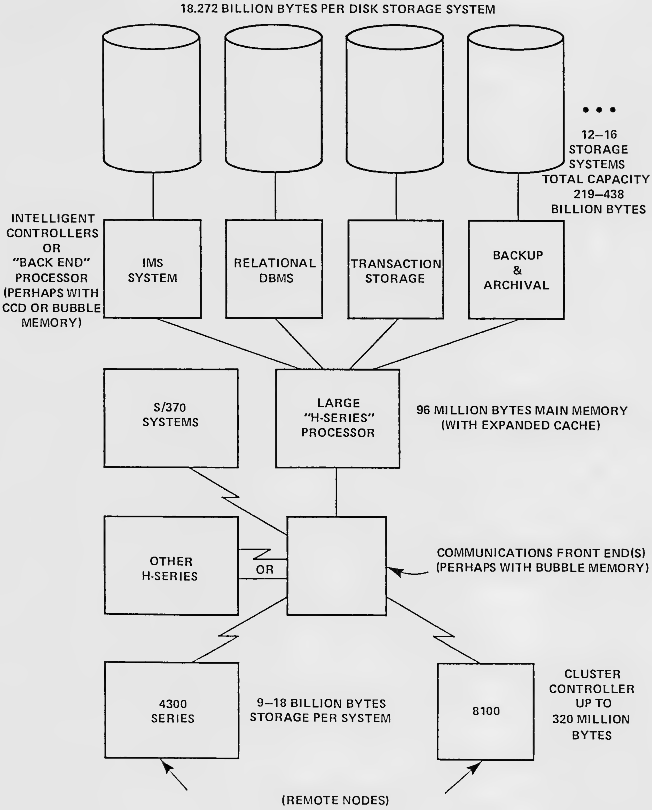
  - ESTIMATES OF DISC STORAGE MARKET GROWTH RANGE FROM 22-45% ANNUALLY OVER THE NEXT FIVE YEARS

  - NEW PROGRAMS HIGHLY INTERACTIVE AND REQUIRE EXPANDED DASD CAPABILITIES

THE MEMORY HIERARCHY

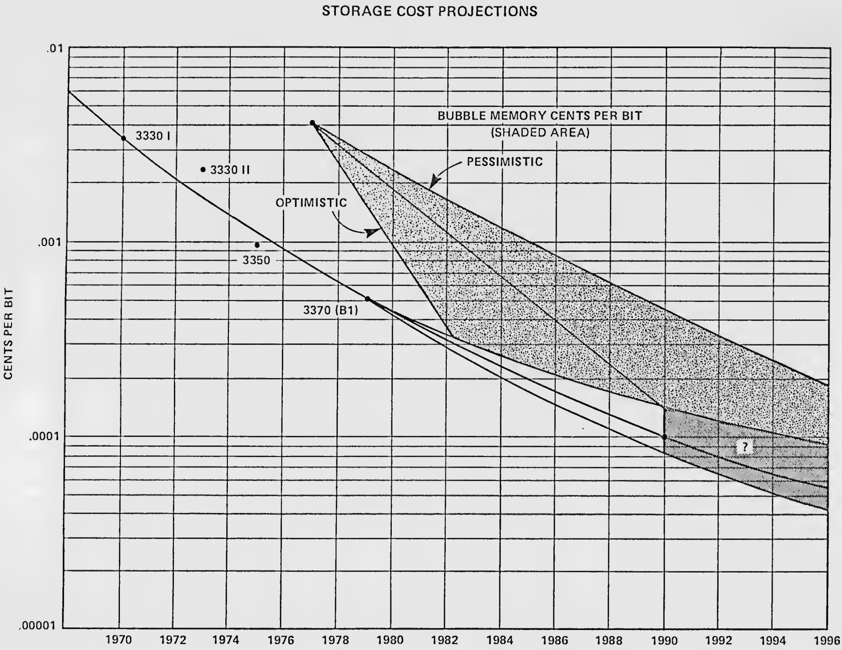


STORAGE DISTRIBUTION ON FUTURE SYSTEMS



PRICE HISTORY OF
IBM 3330-1, 3330-11, 3350-B2 AND 3370-B1 DISK DRIVES

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
3330-1 200 MB (6/70) $51,940 $260/MB			(10/73) $52,900 $265/MB		(7/75) $47,610 $238/MB		(4/77) $40,470 $202/MB		(5/79) $32,380 $162/MB
			3330-11 400 MB (7/73) $74,000 $185/MB (10/73) $75,400 $189/MB		(7/75) $67,860 $170/MB		(4/77) $57,610 $144/MB		(5/79) $46,090 $115/MB
					3350-B2 635 MB (7/75) $49,500 $78/MB			(10/78) $39,600 $62/MB	(5/79) $31,680 $50/MB
									3370-B1 571 MB (2/79) $23,400 $41/MB


STORAGE COST PROJECTIONS
CENTS PER BIT
.01
.001
.0001
.00001
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
3330 I
3330 II
3350
3370 (B1)
BUBBLE MEMORY CENTS PER BIT
(SHADED AREA)
PESSIMISTIC
OPTIMISTIC
?

TERMINALS

INPUT

TERMINALS

- 327X WILL CONTINUE TO BE IBM's PRINCIPAL DISPLAY SYSTEM FOR NEXT SEVERAL YEARS. PHILOSOPHY WILL BE MAINTAINED

  - RELIANCE ON SNA

  - COMMITMENT TO SDLC PROTOCOLS

  - SOFTWARE RESIDENT IN HOST

- IBM HAS TARGETED ON MAINTAINING 60 PERCENT MARKET SHARE

  - 40 PERCENT "OPPORTUNITY" WINDOW FOR PC VENDORS

- UNTIL AT LEAST 1981 - 1982, IBM WILL EMPHASIZE 3274/6/8 SERIES

TERMINALS

- PC VENDORS HAVE MADE SIGNIFICANT INROADS. IBM HAS COUNTERED BY:

  - REDUCING LEASE PRICES AND OFFERING TWO YEAR LEASES WITH PURCHASE OPTION CREDITS

  - REDUCING COSTS BY GOING TO HIGH VOLUME PRODUCTION CUSTOM LSI

  - MOVING INTELLIGENCE TO CONTROLLERS

  - EXPANDING INTO NEW MARKETS, COLOR GRAPHICS AND ASCII

- IBM HAS TIGHTENED DOCUMENTATION POLICIES SIGNIFICANTLY

  - MORE DIFFICULT FOR PC VENDORS TO OBTAIN INTERFACE DATA

  - UNITED STATES JUSTICE DEPARTMENT UNLIKELY TO HELP NOW

TERMINALS

- 8100 AND SYSTEM/38 EACH HAVE THEIR OWN DISPLAY DEVICES
  - 327X COULD SERVE ALL SYSTEMS EQUALLY WELL
  - INTERNAL COMPETITION FORCED IBM TO DUPLICATE EFFORT
  - BY MAINTAINING THREE SYSTEMS, IBM KEEPS ITS OPTIONS OPEN
- INPUT BELIEVES 3274/6/8 PROGRAM IS TARGETED AT SIX-YEAR LIFE CYCLE
  - NEW SYSTEM DELIVERIES NOT ANTICIPATED UNTIL 1983
- IBM IS FOLLOWING A CONSISTENT HARDWARE/FIRMWARE/SOFTWARE (H/F/S) STRATEGY
  - SOFTWARE IS THE PROVINCE OF THE HOST COMPUTER
  - FIRMWARE ESTABLISHED IN CONTROLLERS
  - DISPLAY DEVICES HARDWIRED

COMPETITION/MARKETS

- COMPETITORS TO 327X ARE OF THREE TYPES:

1. PC VENDORS OF INDIVIDUAL COMPONENTS
   - MEMOREX
   - COMPUTER OPTICS
   - GENESIS ONE

2. SYSTEM COMPATIBLE VENDORS
   - TELEX
   - TRIVEX
   - COURIER (ITT)
   - SYCOR (OLIVETTI)
   - RAYTHEON

3. SYSTEM VENDORS PROVIDING 327X COMPATIBILITY PLUS LOCAL PROGRAMMABILITY
   - FOUR PHASE
   - SYCOR
   - DATAPOINT
   - HARRIS

COMPETITION/MARKETS

- NOW THAT 4300 DIRECTLY SUPPORTS 327X, MOST TYPE 2 VENDORS WILL FOCUS ON 3278 DISPLAY

- TYPE 3 VENDORS WILL BE FORCED TO DEVELOP EXTENSIVE, SOPHISTICATED SOFTWARE (PROGRAM PRODUCTS) TO MAINTAIN A VIABLE MARKET POSITION