MANAGEMENT WORKSTATION ANALYSIS

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MANAGEMENT WORKSTATION ANALYSIS

Prepared for:

CITIBANK

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MANAGEMENT WORKSTATION ANALYSIS

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MANAGEMENT WORKSTATION ANALYSIS

LIST OF EXHIBITS

1 INTRODUCTION

I INTRODUCTION

- This report defines the concepts for the introduction of a management work station into the marketplace which was performed jointly with Citibank.

- The primary objectives of this report were:

  - Analyze which executive information needs can be fulfilled with a management work station.

    . This included the determination of the source and content of information needed of an executive.

    . Equipment features which would satisfy the information requirements of an executive were defined.

  - Determine the total number of executives employed in the sectors analyzed.

    . These executives are the potential management work station users.

  - Analyze which equipment features are most important to executives.

    . Importance of equipment features was determined by factoring executives' information needs.

  - The importance of each equipment feature was analyzed for both 1978 and 1985.

- Analyze the market potential for a management work station using:

  - The value of time of people savings.

  - A portion of present expenditures.

  - A portion of the 1985 word processing market.

  - A model based on the success of new entrants in the office automation equipment market.

- The analysis was performed in three iterations which allowed Citibank to participate in the goals and premises of the study. These iterations each had separate goals which were (by iteration):

  - Iteration I - Consider the needs of the manager for information and how he uses the information. Thus, deriving the functions of the system.

  - Iteration II - Consider (by industry sector) the relative importance of each of the features to the manager to determine which features are "key" to the system.

  - Iteration III - Analyze the time savings of each feature of the management workstation and compare this savings to savings rates in order to develop a potential market for the managing workstation. Compare this figure to existing market sizes of similar (but <u>not</u> equivalent) equipment.

- This volume consists of the basic report, followed by the three iterations bound in as Appendices. The development of the concepts can be traced by reading the iterations in sequence.

II ANALYSIS AND SUMMARY

CONTENTS

- Market analysis (Iteration III), in appendix.
  - Introduction to the analysis.
  - What is the potential market for a management workstation.
  - How have other entrants into a similar but different market faired.

OBJECTIVES

- Perform an overall examination of the management workstation as a product to determine what functions a management workstation must perform (in contrast to a text processing system).
  - A workstation to aid the manager in management tasks.
  - Derivation of key system features.
- Provide an analysis of management workstation/features/functions to determine:
  - Which features/functions are key (by industry sector).
  - Which features/functions to offer as a "cluster."
- Provide an analysis of the theoretical market potential of a management workstation by:
  - Time savings obtained by using the mangement workstation, and the value of that time.
  - A percentage of the present market for text editing and computer equipment.

- Examine the market growth of word processing equipment as a guidline for how fast the market for a management workstation can develop.

OVERALL CONCLUSIONS

- The concept of a mangement workstation is viable in the areas of:
  - Value of time savings of a manger or a professional.
  - Unique manager support functions which can be implemented by such a workstation.
  - Number of management employees who could use such a workstation.
- Although this analysis has shown that a management workstation is a viable concept, it was not performed by field research with managers, and with specific workstation designs. Thus, the analysis does not show:
  - Which specific management workstation designs will be accepted and what users will pay for these specific designs.
  - How fast managers will accept specific product offering, and how much "user eduction" will be required to sell the product.
  - The attitude of managers toward Citicorp or one of its subsidiaries as a vendor.

MARKET ESTIMATES

- About a 10% savings of manager/professional time can be expected by use of the management workstation.

- The management workstation is a new idea and users will find new applications for it in time.

- This factor was not included in the potential analysis but will increase the market potential and system value.

- Market estimates were made by the value of worker time saved through use of the manager workstation. The following market segments (only) were considered:

  - Federal government.

  - State government.

  - Local government.

  - Manufacturing.

  - Banking.

  - Insurance.

  - Accounting.

  - Finance.

  - The time savings was 1.58 billion hours for manager/professional employees.

  - The actual dollar savings depends upon assumed salary levels (including overhead). The gross savings are:

    . At the low end, $10/hour for a manager/professional employee. Total gross savings were $16.8 billion.

. At the high end, $40/hour for a manager/professional employee. Total gross savings were $67.2 billion.

- The gross potential savings can be converted to market potential by:

  - Dividing potential savings by a factor of three because a user expects large improvement savings for the investment.

  This results in an annual potential of:

  - High $22.4 billion

  - Medium $11.2 billion

  - Low $5.6 billion.

- Note that this analysis does not include sectors such as wholesale, retail, utilities, and education. Thus the total U.S. market will be larger than listed.

- This potential (by time savings) can be compared to existing markets by assuming a comparison can be made with:

  - 10% of the computer equipment market, plus;

  - 10% of the office equipment market.

  Which is $261 million and has an annual growth of between 15 and 25%.

- As a third comparison the shared processor text editing market is about 15 to 25% of the $460 million text editor market or $70 million to $184 million with a growth of 30% a year.

  Details of this analysis are in Iteration III.

EXECUTIVE FUNCTIONS AND RELATIONSHIPS

- The complexity and scope of executive functions and relationships are a driving force which both set the requirements for the mangement workstation and also the need for such a device. Major executive functions and relationships that affect the system are:

  - The hundreds of individuals which an executive can relate to both intra company and inter company, and remote and co-located, place significant filing, directory, and interfacing requirements upon the system.

  - The executive can relate to the management workstation, directly, through his secretary, or through an assistant. In addition multiple executives can share assistants and secretaries. Thus the management workstation must be flexible in its configuaration to handle all of these internal organization possibilities.

  - The executive uses information which consists of data and text which can easily be stored by electronics, and also graphics, color prints, and other types of information which cannot be easily stored by electronics. Thus, the system filing structure must:

    . Store or access electronically stored material.

    . Provide a directory to locate physically stored information, such as photographs.

  - Information is communicated to and from an executive by a multitude of methods ranging from electronic text transmission to voice telephone calls and hand carried pictures on diagrams. The system must handle this information by:

    . A directory for information received which cannot be stored electronically.

. Manual or electronic entry for information received which can be stored electronically.

The time sensitivity of this information can range from a few hours to a few days. Thus, information entry must be rapidly accomplished to accommodate the information which must be immediately available.

- The executive must function in many locations which include his office, offices in his own company in remote locations of his own company, offices in other companies, and even in a hotel or his home. The workstation must take its information available to him at these remote locations by use of:

. Remote information processing devices such as portable terminals.

. Multi-location workstations sold and installed as systems.

MANAGEMENT WORKSTATION FUNCTIONS

The functions which the management workstation should perform, for a full system are:

- Filing and control of information.
- Scheduling of the executive time and meetings.
- Sorting and light computation.
- Interfacing with all electronic systems and networks.
- Document preparation (the executive interaction with the process).
- Message control/alerting.

- Remote location operation.

FUNCTIONAL COMPARISON

- An analysis of the value of each management workstation function was made to highlight the importance of each function. This analysis was performed by the two ways used to analyze the workstation market which are:

  - Factored needs (importance of the function multiplied by the number of potential users it is important to).

  - Factored time savings. (Savings of time for each of user multiplied by the number of potential users of each type of user).

  The results are shown in Exhibit A.

- Note that importance of a function and time savings from having the function available will not be exactly the same since a key task may not take very much time to accomplish. For example the time saved by having the system interface with other information resources may be large. However, the function may not be as important as another function such as document preparation and review.

- The functional comparison between the two methods of time savings and factored needs were quite similar.

  - In both cases filing, control of information, and sorting of data/text and light computation were determined to be key functions.

  - By factored needs document preparation assistance (for the manager) is of key importance, although his time savings may not be so large.

EXHIBIT A

PERCENTAGE OF OVERALL VALUE OF THE MANAGEMENT WORKSTATION OF EACH FUNCTION IMPORTANCE

INDUSTRY SECTOR	BY FACTORED NEEDS	BY FACTORED TIME SAVED
Filing Control	21.3%	21.3%
Scheduling	9.8%	4.3%
Sorting and Light Computation	16.6%	14.9%
Interfacing	8.6%	21.3%
Document Preparation	23.0%	10.6%
Message Control/ Alerting	9.2%	17.0%
Remote Location Operation	11.5%	10.6%

- Remote location operation, message control and scheduling, and interfacing all are important functions but not as key as the other three functions.

- Functional analysis for each industry sector by both the time and feature importance analysis are in Iteration III and II respectively.

MARKET POSSIBILITIES

- The annual reports of Wang (which makes shared processor text editing equipment and small business computers,) and CPT Corporation were analyzed to determine how fast their share of the text editing market grew. In addition Wang was interviewed by telephone.

  - Wang has (December 1978) 262 word processing salesmen in 207 offices. Their sales of their new word processor line increased from 200 systems/month in year end 1976 to 800 systems/month at year end 1978.

  - CPT sells equipment through 144 independent sales agencies. Sales of the new CPT 8000 went to $7 million within one year of introduction.

- Thus rapid new product growth has been demonstrated in this field.

SECTOR POTENTIAL COMPARISON

- A comparison of the importance or potential for the management workstation for each industry sector is shown in Exhibit B. This comparison was made by the two methods of:

  - The importance of the functions of the workstation (factored needs).

EXHIBIT B

PERCENTAGE OF TOTAL MARKET (OF THE SECTORS ANALYZED) OF EACH INDUSTRY SECTOR

INDUSTRY SECTOR	BY FACTORED NEEDS	BY FACTORED TIME SAVED
Federal Government	7.1%	7.9%
State Government	4.8%	4.8%
Local Government	11.6%	10.4%
Manufacturing	43.5%	51.4%
Banking	10.2%	7.7%
Insurance	14.9%	11.5%
Accounting	2.8%	2.0%
Finance	5.1%	4.3%

- The time saved for each potential user for the functions of the workstation. (factored time saved).

- Both analysis have results which are just about identical. Which indicates that the two analysis methods are comparable, and that the number of employees in each industry sector who can use the workstation is the key parameter of importance.

- The results show that all industries can use a management workstation.

ITERATION I - SUMMARY

- Purpose to examine what a management workstation is, and what it must do by considering the managers operations.

  - How many there are.

  - What information they use, and where they obtain it.

  - Where they function.

  - What they do.

  and use this information to define system functions.

- Major conclusions resulting from this iteration:

  - A manager is not a secretary, thus functions performed by a system designed for the manager are unique to him.

  - Managers relate to a large number of people inter/intra company and this implied a large directory of names and information about them.

- The executive nucleus, i.e. executive, secretary, and assistant must be considered when designing the system.

  . The executive himself may not physically use the system. However, it can still be an effective management workstation.

- The executive uses information which:

  . Can be stored electronically such as data.

  . Which can not be stored electronically (now) such as color pictures. The system must be able to index the location of information it can not store.

- The executive obtains information from many organizations, physical locations, and in ways which range from electronic communications to couriers. The system must accept least file all inputs.

- The executive must function in his own office and away from his office, and in his own or different companies. The system must be accessible to him at all of these locations for maximum system benefits.

ITERATION I - FUNCTIONS DEFINED

- Functions performed by an executive workstation (differing from a text processor) are:

  - Filing control and search and retrieval of critical and back up information.

  - Scheduling appointments and other coordination services.

  - Sorting or information, analysis of this information and light computation.

- Interfacing to internal MIS systems, remote databanks, and other electronic network.

- Document preparation from the executives point of review in terms of reviewing and monitoring not as a text editor, (text editing is a function which adds much value to the system in a shared move. However, it is not manager time savings.)

- Message control, and alerting the executive when key messages arrive.

- Remote operation of a duplicate station with the executives home station.

ITERATION II - SUMMARY

- Construct a matrix for each industry sector under consideration to show which functions of the manager workstation are most important for that sector.

- Sector definitions were obtained from Citibank as key for the study, they are:

  - Federal government.

  - State government.

  - Local government.

  - Manufacturing.

  - Banking.

  - Insurance.

  - Accounting.

- Finance.

- Employee or job function definitions were obtained from government data, for each sector.

- The importance or each function for each sector was chosen as high, medium, or low, in a judgemental manner by INPUT personnel. Weights were given to the function importance and they were multiplied by the number of employees in the sector to obtain:

  - Which are the most important functions for the sector.

  - Which are the most important functions for all sectors.

  - Which are the most important sectors for a market.

- Note that the importance of a function as analyzed in Iteration II is not necessarily equivalent to the time spent in performing that function. (Time savings is analyzed in Iteration III.)

- Key conclusions of Iteration II are listed in the conclusions section of this report.

ITERATION III - SUMMARY

- Purpose to estimate market size for the manager workstation concept so that a market size judgement can be made.

  - Perform this analysis in various manners as a cross check against each other.

  - Examine the market development of other similar products as a test case.

- The methods of analyzing the market size for the executive workstation were:

  - Assign (in a judgemental manner) a time savings to the executive for each function and industry sector. Multiply by the number of employees by total time saved. The value of the managers time, $/hour multiplied by the total time saved in hours for all managers becomes a gross market value which must be factored to obtain a "reachable market value."

  - Compare the market to the existing EDP and word processing market by using 10% of the EDP market and 10% of the word processor market as obtainable values.

  - Compare the market to the shared text processor market for similarity.

- The information to base a comparison or new product introductions into the "office automation" area were obtained from vendor annual reports and from vendor interviews.

- Conclusions are in the conclusion section of the report.

III ITERATION I

PURPOSE OF FIRST ITERATION

DEFINE THE SCOPE OF EXECUTIVE FUNCTIONS AND INFORMATION NEEDS TO:

- ALLOW IMPLICIT DEFINITION OF THE SYSTEM PARAMETERS.

  IN PARTICULAR:

  - FILE SIZE AND TYPE
  - NUMBER AND TYPE OF INTERFACES
  - OUTPUT DEVICES
  - SYSTEM FUNCTIONS (MAJOR)
  - NUMBER OF WORKSTATIONS ASSOCIATED WITH THE SYSTEM
  - USERS OF THE SYSTEM
  - LOCATIONS OF THE SYSTEM (OR REMOTE ACCESS DEVICES)
    - INTERNAL TO THE EXECUTIVE ESTABLISHMENT
    - EXTERNAL TO THE EXECUTIVE ESTABLISHMENT
- INSURE THAT THE ANALYSIS IS COMPATIBLE WITH CITIBANK GOALS

PARAMETERS TO BE ANALYZED

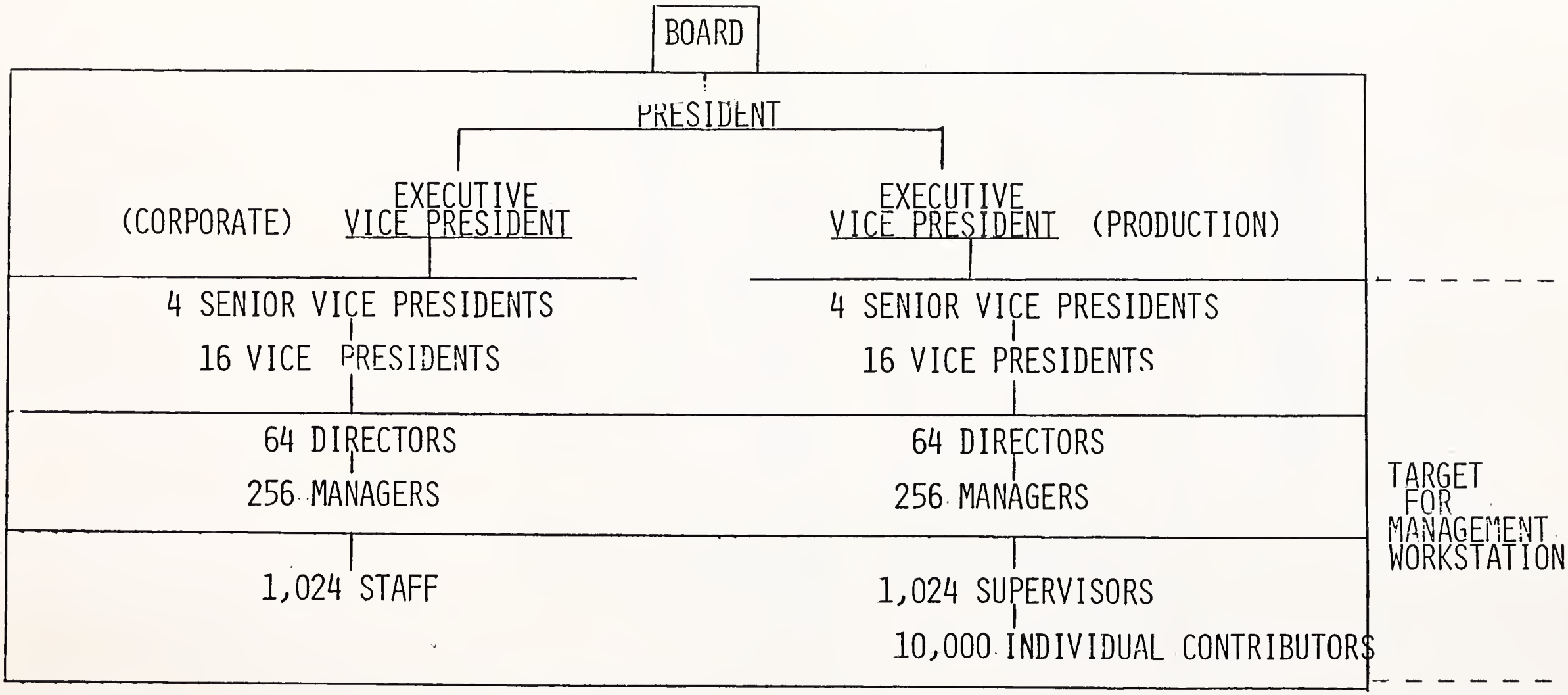
- EXECUTIVE RELATIONSHIPS
- TYPES OF INFORMATION USED BY THE EXECUTIVE
- SOURCES OF INFORMATION THE EXECUTIVE USES
- LOCATIONS WHERE THE EXECUTIVE FUNCTIONS
- STEPS IN HANDLING INFORMATION
- FUNCTIONS THE EXECUTIVE PERFORMS

EXECUTIVE RELATIONSHIPS

- PURPOSE OF THE ANALYSIS IS TO DETERMINE HOW MANY DIFFERENT PEOPLE AN EXECUTIVE MUST RELATE TO
  - INTER COMPANY AND LOCATION
  - INTRA COMPANY

- THIS INFORMATION IS A GUIDE FOR
  - INTERFACE REQUIREMENTS
  - FILE SIZE AND DICTIONARY REQUIREMENTS TO HANDLE COMMUNICATIONS

ABSTRACT MODEL TO SHOW THE
LARGE AMOUNT OF INTRA COMPANY RELATIONSHIPS
"FORTUNE 500" COMPANY



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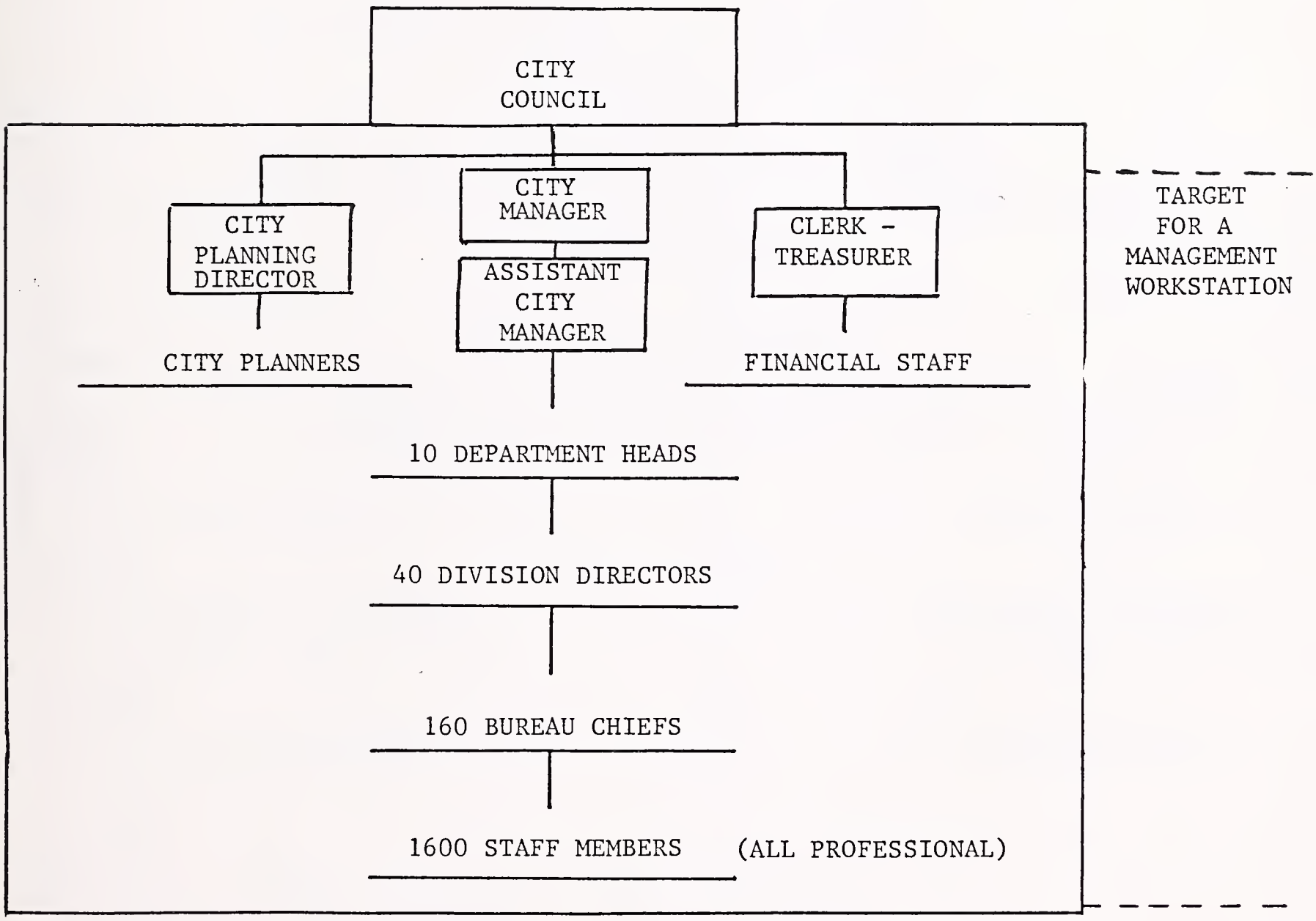
ABSTRACT MODEL TO SHOW THE LARGE
AMOUNT OF INTRA-COMPANY RELATIONSHIPS

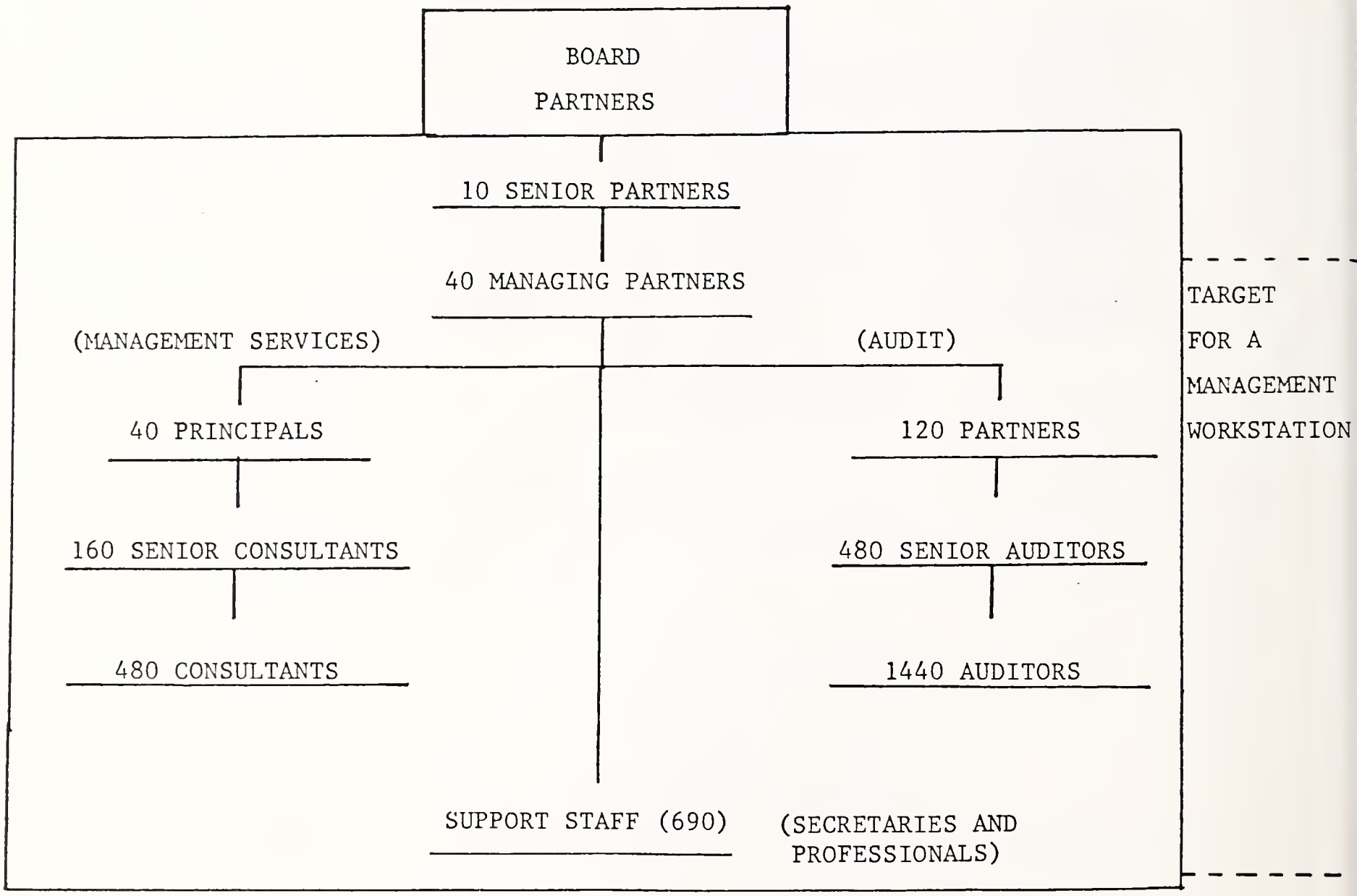
(OBTAINED FROM EX CITY EMPLOYEES)



ABSTRACT MODEL TO SHOW THE LARGE AMOUNT
OF INTRA-COMPANY RELATIONSHIPS

AN ACCOUNTING FIRM

(OBTAINED FROM INPUT REPORT AND FEDERAL STUDY)



INTER AND INTRA COMPANY EXECUTIVE RELATIONSHIPS

FROM \ TO	MFG.	SALES	FINANCE	PLANNING	RESEARCH AND DEVELOPMENT	ADM.
MFG.	E,A	E,A	A	A	E,A	E,A
SALES	E,A	E,A	E,A	E,A	E,A	E,A
FINANCE	A	E,A	E,A	E,A	A	E,A
PLANNING	A	E,A	E,A	E,A	E,A	A
RESEARCH AND DEVELOPMENT	E,A	E,A	A	E,A	E,A	A
ADM.	E,A	E,A	E,A	A	A	E,A

E = INTER COMPANY RELATIONSHIPS

A = INTRA COMPANY RELATIONSHIPS

EXECUTIVE RELATIONSHIPS CONCLUSIONS

- IN A "FORTUNE 500" FIRM, IF A DIRECTOR LEVEL CAN RELATE TO UP TO HALF OF THE MANAGER LEVEL AND ALL THE DIRECTOR LEVEL PERSONNEL HE CAN RELATE TO:

  300 INTERNAL PERSONNEL

- INTER COMPANY RELATIONSHIPS INVOLVE ABOUT HALF OF THE INTER COMPANY/INTRA COMPANY MATRIX,

  OR

  - IF THREE PEOPLE AT 100 DIFFERENT COMPANIES OR AGENCIES ARE RELATED TO

    300 EXTERNAL EXECUTIVES CAN BE RELATED TO

- MANY, IF NOT MOST OF THESE RELATIONSHIPS ARE <u>NOT</u> CO-LOCATED.

- THERE ARE SIMILAR RELATIONSHIPS IN OTHER TYPES OF ORGANIZATIONS, SUCH AS:

  - GOVERNMENT OFFICES
  - ACCOUNTING FIRMS

THE EXECUTIVE NUCLEI

FOR INFORMATION FLOW ANALYSIS

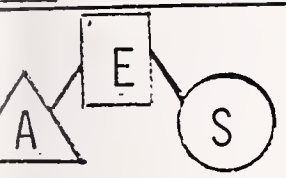
POSSIBLE OFFICE

CONFIGURATIONS WHICH

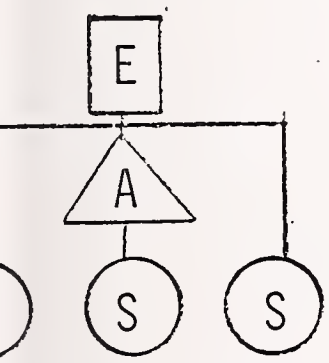
A MANAGEMENT

WORKSTATION SYSTEM MUST SUPPORT

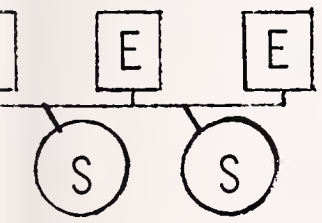
AN EXECUTIVE AND HIS SECRETARY



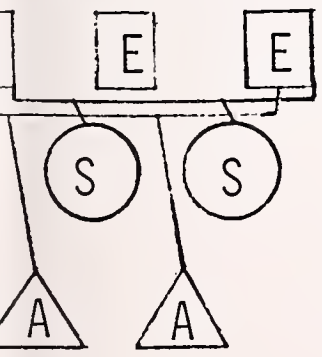
AN EXECUTIVE, AN ASSISTANT, AND
A SECRETARY



AN EXECUTIVE, AN ASSISTANT, AND
A SECRETARIAL POOL



A CLUSTER OF EXECUTIVES SHARING
SECRETARIES



A CLUSTER OF EXECUTIVES SHARING
SECRETARIES AND ASSISTANTS

E EXECUTIVE S SECRETARY A ASSISTANT PROFESSIONAL (CONTRIBUTING)

THE EXECUTIVE NUCLEI CONCLUSIONS

- EXECUTIVES CAN RECEIVE INFORMATION FROM THE WORKSTATION SYSTEM:
  - DIRECTLY
  - THROUGH HIS SECRETARY
  - THROUGH HIS ASSISTANT

- THUS
  - THE SYSTEM MUST SUPPORT ALL TYPES OF EXECUTIVE NUCLEI
  - A DETERMINATION OF WHETHER THE EXECUTIVE MUST OR MUST NOT DIRECTLY USE THE SYSTEM DOES NOT HAVE TO BE MADE NOW
  - ACCESS TERMINALS MUST BE AVAILABLE TO ALL POSSIBLE USERS
  - CONFIGURATION FLEXIBILITY IS REQUIRED

TYPES OF INFORMATION USED BY THE EXECUTIVE

- PURPOSE OF THE ANALYSIS IS TO DETERMINE HOW MANY KINDS OF INFORMATION THE EXECUTIVE USES, TO DETERMINE:
  - WHAT TYPE OF STORAGE IS NEEDED,
    - . TEXT/DATA
    - . GRAPHICS
    - . REFERENCE TO HARD COPY OR PHYSICAL STORAGE
  - IF THE WORKSTATION IS USED AS:
    - . A STORAGE UNIT ITSELF,
    - . A CONNECTION TO OTHER STORAGES SUCH AS MIS,
    - . A DIRECTORY AS TO WHERE ITEMS ON REPORTS ARE LOCATED.

TYPES OF INFORMATION

TYPE	EXAMPLES
PHYSICAL MODELS	SAMPLE, TOOL
AUDIO	VOICE OR TELEPHONE
HARD COPY/GRAPHICS/DRAWINGS	
COLOR	PHOTOGRAPH/CHART
BLACK, WHITE	PHOTOGRAPH/CHART
MUST BE "ATTRACTIVE"	BROCHURE
HARD COPY/TEXT/DATA	
GRAPHICALLY LAID OUT	PROSPECTUS/BROCHURE
MESSAGE/BOOK FORMAT ONLY	MEMO
MAGNETIC MEDIA	DISC/CARD/TAPE
MICROGRAPHIC	MICROFICHE

INFORMATION TYPE & WORKSTATION STORAGE FUNCTIONS

INFORMATION TYPE	WORKSTATION STORAGE FUNCTION		
	STORE ITSELF	ACCESS STORAGE	REFERENCE LOCATION
PHYSICAL MODELS			X
AUDIO	X	X	X
HARD COPY			
GRAPHICS/DRAWINGS		X	X
HARD COPY			
TEXT/DATA	X	X	X
MAGNETIC MEDIA		X	X
MICROGRAPHIC		X	X

TYPES OF INFORMATION CONCLUSIONS

- MANY TYPES OF "INFORMATION" ARE REQUIRED BY THE EXECUTIVE
  - ALL OF THEM CANNOT BE ELECTRONICALLY STORED
  - SOME OF THE INFORMATION REQUIRES MASSIVE COMPUTER STORAGE

- THE WORKSTATION MUST BE ABLE TO
  - INTERNALLY STORE INFORMATION
  - ELECTRONICALLY ACCESS COMPUTER STORAGE
  - SERVE AS A DIRECTORY FOR PHYSICAL STORAGE
  - ACCESS (PAGE) PEOPLE

SOURCES OF INFORMATION THE EXECUTIVE USES

- PURPOSE OF THE ANALYSIS IS TO DETERMINE HOW INFORMATION REACHES THE EXECUTIVE;

  - SO THAT THE SYSTEM CAN HANDLE THESE SOURCES FOR BOTH ELECTRONIC AND PHYSICAL COMMUNICATIONS,

  - TO UNDERSTAND THE POSSIBLE GEOGRAPHIC INTERACTION OF THE SYSTEM,

    . INTRA ESTABLISHMENT

    . INTER ESTABLISHMENT

  - UNDERSTAND THE TIME SENSITIVITY OF THE INFORMATION

SOURCES OF INFORMATION

- IN PERSON DISCUSSIONS
  - MEETINGS - OUT OF OFFICE
  - MEETINGS IN OFFICE
  - INSPECTION TRIPS
  - SALES CALL
- PHYSICAL TRANMISSION
  - MAIL
  - COURIER
  - PICK UP HIMSELF
  - PART OF A MEETING
- ELECTRONIC TRANMISSION
  - TELEPHONE CALL (VOICE) OR TELEPHONE ORIGINATED MESSAGE
  - TELEX/TWX
  - FACSIMILE
  - DATA
  - TELECONFERENCING

INFORMATION CONTENT & LOCATION

CONTENT	LOCAL SOURCE	REMOTE SOURCE: INTRA COMPANY	REMOTE SOURCE: INTER COMPANY
MEMO	X	X	X
REPORT	X	X	X
CONTACT REPORT	X	X	
SCHEDULE	X	X	X
DATA BASE DATA	X	X	X
FORECAST	X	X	X
POLICY MANUAL	X	X	
NEW PRODUCT ANNOUNCEMENT	X	X	X
POLICY CHANGES	X	X	
PRICE LIST	X	X	X
NEWSLETTERS	X	X	X
TRADE JOURNALS			X
COMPUTER PRINTOUTS	X	X	X
INVOICES	X	X	X
PRODUCTION REPORTS	X	X	

INFORMATION CONTENT & LOCATION (CONT.)

CONTENT	LOCAL SOURCE	REMOTE SOURCE	
		INTRA COMPANY	INTER COMPANY
BLUEPRINTS	X	X	X
LETTERS		X	X
SPECIFICATIONS	X	X	X
INSTRUCTION MANUALS	X	X	X
CONFIDENTIAL INFORMATION	X	X	X
SUMMONSES			X
CONTRACTS	X	X	X

TIME SENSITIVITY

FEW HOURS

- PROBLEMS OF ALL KINDS
- SALES IN PROGRESS
- LEGAL ISSUES
- MEETING SCHEDULE
- SAFETY OR RECALL DATA
- CONTRACTS IN PROGRESS

DAY

- MEMOS
- POLICY MANUAL
- PRICE LISTS
- INVOICES
- CUSTOMER LETTERS

WEEK

- SPECIFICATIONS
- JOURNALS
- NEWSLETTERS
- COMPETITIVE INFORMATION

SOURCES OF INFORMATION CONCLUSIONS

- SOURCES OF INFORMATION ARE VARIED. HOWEVER, IN PERSON, AND PHYSICALLY TRANSMITTED INFORMATION ARE AS IMPORTANT AS ELECTRONICALLY TRANSMITTED INFORMATION.

- THERE IS NO DIFFERENCE IN IMPORTANCE FROM INFORMATION OBTAINED:
  - LOCALLY OR REMOTE.
  - INTRA OR INTER COMPANY.

- MOST INFORMATION HAS A TIME SENSITIVITY FROM A FEW HOURS TO A FEW DAYS.

LOCATIONS WHERE THE EXECUTIVE FUNCTIONS

- PURPOSE OF THE ANALYSIS IS TO DETERMINE AT WHAT LOCATIONS SECONDARY SYSTEMS MUST BE AVAILABLE TO THE EXECUTIVE.

- PROVIDE INFORMATION FOR SYSTEM DESIGN OF THE WORKSTATION, WHICH MAY RESULT IN A MULTISYSTEM MARKET.

LOCATIONS WHERE AN EXECUTIVE CAN FUNCTION

- ESTABLISHMENT LOCATION (HIS OWN)
  - HIS OFFICE
  - OTHER OFFICES
  - CONFERENCE ROOM
  - SHOP
  - LABORATORY
- OTHER LOCATIONS HIS COMPANY
  - OTHER OFFICES
  - CONFERENCE ROOM
  - SHOP
  - LABORATORY
- OTHER COMPANIES
  - OTHER OFFICES
  - CONFERENCE ROOM
  - SHOP
  - LABORATORY

LOCATIONS WHERE AN EXECUTIVE CAN FUNCTION (CONT.)

- GOVERNMENT OFFICES
  - OTHER OFFICES
  - CONFERENCE ROOM
  - COURTROOMS
- HIS HOME
- HOTELS (TRAVELING)
  - CHAIN SELECTED BY HIS COMPANY
  - ANY HOTELS
- IN TRANSIT
  - PLANE
  - CAR

CONCLUSIONS ON LOCATIONS WHERE AN EXECUTIVE CAN FUNCTION

- MULTI-LOCATION CAPABILITY IS A STRONG SYSTEM ASSET
  - PERHAPS A MUST

- ALL OF THE MANY DIFFERENT LOCATIONS WHERE AN EXECUTIVE FUNCTIONS INDICATE TRANSPORTABLE "TERMINALS" ARE NEEDED
  - CONNECTABLE TO PHONES, TV SETS, EDP TERMINALS ETC.

- NETWORKS ARE A STRONG POSSIBILITY FOR MULTI-LOCATION ENTERPRISES.

STEPS IN HANDLING INFORMATION

- PURPOSE OF THE ANALYSIS IS TO SERVE AS A CHECK ON FUNCTIONS ASSIGNED TO THE MANAGEMENT WORKSTATION TO INSURE COMPLETENESS.

STEPS

SOURCE

- DEVELOPING INFORMATION
- GATHERING INFORMATION
- SEARCHING FOR INFORMATION

ENTRY

- KEYBOARDING OR AUTOMATIC ENTRY
- RECEPTION OF ELECTRONIC INFORMATION
- VERIFICATION OF ENTRY

MANIPULATION/COMPUTATION

- SORTING
- MERGING
- STORAGE
- COMPUTATION
- TRANSLATION OF FORMATS, LANGUAGES

STEPS (CONT.)

OUTPUT

- COMMUNICATIONS CONTROL
- SIGNALING AVAILABILITY
- RETRIEVAL
- REPRODUCTION
- TRANSMISSION

FUNCTIONS THE EXECUTIVE PERFORMS

- PURPOSE OF THE ANALYSIS IS TO INSURE THAT THE SYSTEM:
  - IS COMPATIBLE WITH ALL EXECUTIVE FUNCTIONS.
  - PROVIDES AS MUCH ASSISTANCE AS IS POSSIBLE TO ALL EXECUTIVE FUNCTIONS.
  - EXECUTIVE FUNCTIONS WERE DERIVED FROM THE POLICY FORMULATION MANUALS BY THE AMERICAN MANAGEMENT ASSOCIATION.

EXECUTIVE FUNCTIONS

GENERAL TASKS

- MONITORING ACTIONS AND EVENTS
- PLANNING
- RECEIVING ASSIGNMENTS
- INITIATING ASSIGNMENTS
- LEARNING NEW TASKS
- THESE TASKS CAN BE PERFORMED/RELATE TO
  - INTERNAL SOURCES
  - EXTERNAL LOCATIONS

EXECUTIVE FUNCTIONS (CONT.)

CORPORATE PLANNING

ADJUST PRICES

COORDINATE STRATEGIES

MONITOR GROWTH

MONITOR SALES

MONITOR PRODUCTION

MONITOR FINANCIAL CONDITION

FORECAST COMPANY CONDITION

REPORT COMPANY CONDITION

LEARN NEW TASKS

RECEIVE NEW DIRECTIVES

INITIATE ASSIGNMENTS

EXECUTIVE FUNCTIONS (CONT.)

FINANCE

MAINTAIN AUDIT ON OPERATIONS

MONITOR ACCOUNTING AND BOOKKEEPING

MONITOR COSTS OF PRODUCTION

MONITOR OPERATIONAL EXPENDITURES

FORECAST AND CONTROL OPERATIONS

REPORT CHANGES IN FINANCIAL POSITION

REPORT FINANCES

RECOMMEND CHANGES IN PRICES AND EXPENDITURES

LEARN NEW TASKS

RECEIVE NEW DIRECTIVES

INITIATE NEW ASSIGNMENTS

EXECUTIVE FUNCTIONS (CONT.)

PRODUCTION

PLAN PRODUCTION

MONITOR INVENTORIES

MONITOR SHIPMENTS OF FINISHED GOODS

FORECAST INVENTORIES

FORECAST PRODUCTION

REQUISITION MATERIALS

REPORT CHANGES IN PRODUCTION COSTS

QUALITY CONTROL

REPORT PERFORMANCE

ROUTE AND SCHEDULE DELIVERIES

LEARN NEW TASKS

RECEIVE NEW DIRECTIVES

INITIATE ASSIGNMENTS

EXECUTIVE FUNCTIONS (CONT.)

MARKETING

PLAN AN ORDERLY LIQUIDATION OF FINISHED GOODS

MONITOR COMPETITION

MONITOR SALES

MONITOR THE SUPPLY OF FINISHED GOODS

REPORT PERFORMANCE

CONTACT CUSTOMERS

ENTER NEW CONTRACTS

LEARN NEW TASKS

RECEIVE NEW DIRECTIVES

INITIATE ASSIGNMENTS

SYSTEM FEATURE DESCRIPTIONS

SYSTEM FEATURE

FILE

- A CONVENTIONAL FILE DRAWER CONTAINS ABOUT 5 MILLION BYTES OF TEXT
  - AT LEAST 5 MILLION BYTES/EXECUTIVE
  - IDEALLY 25 MILLION BYTES/EXECUTIVE

- ACCESS & COMPATIBILITY WITH COMPUTER AND MIS STORAGE

- A DIRECTORY FOR MESSAGES AND INFORMATION ABOUT 1,000 TO 3,000 PEOPLE (INTER, INTRA-COMPANY).

- A DIRECTORY WHICH SHOWS THE LOCATION AND EXISTENCE OF 500-2000 ITEMS/EXECUTIVE. FOR EXAMPLE PICTURES/ BOOKS/DRAWINGS ETC.

- ACCESS TO MICROFICHE (PERHAPS)

- ACCESS TIME IN SECONDS

SYSTEM FEATURE INTERFACES

- COMMUNICATIONS
  - ALL STANDARD COMMUNICATIONS NETWORKS
  - FACSIMILE

- COMPANY SYSTEMS
  - MIS
  - DOCUMENT STORAGE (MICROFICHE)

- TO MANUAL SYSTEM OPERATION BY ENTRY OF THE FACT THAT THE ITEM WAS RECEIVED
  - MAIL
  - COURIER

- OTHER MEDIA
  - MAGNETIC
  - OPTICAL SCANNING

- VIDEO, ETC.

SYSTEM FEATURE

OUTPUT DEVICES

- DATA TERMINALS & TEXT EDITING SYSTEMS
- CORRESPONDENCE QUALITY PRINTERS
- INK JET
- FACSIMILE
- HIGH SPEED PRINTERS
- CRT DISPLAYS
- TV MONITORS
- TRANSPORTABLE KEYBOARD TERMINALS
- NON IMPACT OUTPUT DEVICES (WHICH CAN DO GRAPHICS)

NUMBER OF WORKSTATIONS ASSOCIATED WITH THE SYSTEM

- SIMULTANEOUS CAPABILITY FOR THE EXECUTIVE, HIS ASSISTANT, AND HIS SECRETARY
  - MAY NOT ALL BE USED
- CAPABILITY OF HANDLING AN EXECUTIVE GROUP OF 8-10 OR SO
- CAN "LINK" MULTIPLE SYSTEMS TOGETHER
- CAN HANDLE A NUMBER OF REMOTE TERMINALS EQUIPMENT TO THE COMPLEMENT OF EXECUTIVE NUCLEI
- THIS RESULTS IN ABOUT
  - 8 EXECUTIVE NUCLEI, EACH WITH EXECUTIVE, ASSISTANT AND SECRETARY
    - 24 "STATIONS"
  - INTERFACE TO 8 REMOTE TRANSPORTABLE TERMINALS (ONE FOR EACH EXECUTIVE)
- PRINTER AND HARD COPY OUTPUT DEVICES CAN BE LESS THAN NUMBER OF WORKSTATIONS

SYSTEM FUNCTIONS (MAJOR)

- FILING CONTROL SEARCH AND RETRIEVAL OF CRITICAL AND BACKUP INFORMATION
- SCHEDULING, APPOINTMENTS AND OTHER COORDINATION SERVICES
- SORTING, ANALYSIS AND "LIGHT" COMPUTATION
- INTERFACE TO ALL COMMUNICATIONS NETWORKS MIS AND OTHER COMPANY SYSTEMS AND REMOTE DATABANKS (THIRD PARTY)
- DOCUMENT PREPARATION INCLUDING REVIEW AND DISTRIBUTION
- MESSAGE CONTROL AND REMOTE SYSTEM OPERATION

IV ITERATION II

ITERATION II

- ANALYZE THE IMPORTANCE OF EACH SYSTEM FEATURE FOR EACH INDUSTRY SECTOR AND MANAGEMENT FUNCTION

- PURPOSE IS TO DETERMINE
  - WHICH FEATURES ARE MOST IMPORTANT
    - BY INDUSTRY
    - OVERALL
  - WHICH MANAGEMENT FUNCTIONS ARE MOST IMPORTANT
  - WHICH INDUSTRIES ARE MOST IMPORTANT

- DETERMINE HOW THE ANALYSIS WILL CHANGE BY 1985

INDUSTRY SECTORS TO ANALYZE

- GOVERNMENT
  - FEDERAL
  - STATE
  - LOCAL

- MANUFACTURING

- FINANCIAL RELATED
  - BANKING
  - FINANCE (HOLDING CO.'S, INVESTMENT BANKING)
  - INSURANCE
  - ACCOUNTING

POTENTIAL U.S. WORKSTATION USERS

SECTOR	POTENTIAL WORKSTATION USERS
FEDERAL GOVERNMENT	656,000
STATE GOVERNMENT	399,000
LOCAL GOVERNMENT	861,000
MANUFACTURING	4,244,000
BANKING	632,000
INSURANCE	952,000
FINANCE	345,000
ACCOUNTING	166,000
TOTAL	8,255,000

FEATURES & SECTOR ANALYSIS

- CONSTRUCT A MATRIX FOR EACH INDUSTRY SECTOR SHOWING MANAGEMENT WORKSTATION FEATURES VERSUS MANAGEMENT JOB FUNCTIONS.

- ATTRIBUTE IMPORTANCE OF FEATURES FOR EACH MANAGEMENT FUNCTION AND INDUSTRY SECTOR (HIGH, MEDIUM, LOW).

- WEIGHT FEATURES

  - HIGH - H = 5
  - MEDIUM - M = 2
  - LOW - L = 0

- MULTIPLY WEIGHTED VALUES BY EMPLOYEES FOR EACH JOB FUNCTION AND EACH INDUSTRY SECTOR TO DETERMINE EACH FEATURES WEIGHTED IMPORTANCE.

- RANK FEATURES FOR EACH INDUSTRY SECTOR BY WEIGHTED IMPORTANCE

FEATURES & SECTOR ANALYSIS (CONT'D)

- RECOMMEND "FEATURE PACKAGE" FOR EACH SECTOR
- SUMMARIZE MOST IMPORTANT FEATURES FOR ALL SECTORS

FEDERAL GOVERNMENT (NOT INCLUDING EDUCATION)

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS / SYSTEMS FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING	H	H	H	H	H	M	H
LEGAL	H	H	L	M	H	M	H
OPERATIONS & SERVICE MANAGEMENT	M	L	M	L	H	L	L
ENGINEERING/ TECHNICAL	H	L	H	L	H	L	M

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

FEDERAL GOVERNMENT

FACTORED NEEDS (RANKING x EMPLOYEES)
(,000's)

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
129	ACCOUNTING	600	600	600	600	600	240	600	3840
68	LEGAL	290	290	0	136	290	136	290	1432
165	OPERATIONS & SERVICES MANAGEMENT	320	0	329	0	820	329	0	1807
303	ENGINEERING/ TECHNICAL	1515	0	1515	0	1515	0	606	5151
656	TOTAL	2734	890	2444	736	3225	705	1496	12,230

FEDERAL GOVERNMENT

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

- DOCUMENT PREPARATION	3225
- FILING CONTROL	2734
- SORTING AND LIGHT COMPUTATION	2444
- REMOTE LOCATION OPERATION	1496
- INTERFACING	736
- MESSAGE CONTROL	705
- SCHEDULING	890

FEDERAL GOVERNMENT

- IMPORTANT MANAGEMENT WORKSTATION FEATURES ARE:
  - DOCUMENT PREPARATION
  - FILING CONTROL
  - SORTING AND LIGHT COMPUTATION

- THE THREE HIGHEST RATED WORKSTATION SYSTEM FUNCTIONS WERE CHOSEN BECAUSE THERE IS AN OBVIOUS DIFFERENCE IN RATINGS BETWEEN SORTING AND LIGHT COMPUTATION AND REMOTE LOCATION OPERATION

STATE GOVERNMENT (NOT INCLUDING EDUCATION)

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
FINANCIAL ADMINISTRATION	H	L	H	L	H	L	L
GENERAL CONTROL	H	H	M	H	M	H	H
SERVICES MANAGEMENT	L	M	M	M	H	H	H
TRANSPORTATION (MGMT)	H	M	M	L	M	H	H
POLICE (MGMT)	H	M	M	H	H	H	H

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

STATE GOVERNMENT

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS / SYSTEM FUNCTIONS	FACTORED NEEDS (RANKING x EMPLOYEES) (,000's) FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
97	FINANCIAL ADMINISTRATION	485	0	485	0	485	0	0	1455
52	GENERAL CONTROL	260	260	104	260	104	260	260	1508
232	SERVICES MANAGEMENT	0	464	464	464	1160	1160	1160	4872
6	TRANSPORTATION (MANAGEMENT)	30	12	12	0	12	30	30	126
12	POLICE (MANAGEMENT)	60	24	24	60	60	60	60	348
399	TOTAL	835	760	1089	784	1821	1510	1510	8,309

STATE GOVERNMENT

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

- DOCUMENT PREPARATION	1821
- MESSAGE CONTROL/ALERTING	1510
- REMOTE LOCATION OPERATION	1510
- SORTING AND LIGHT COMPUTATION	1089
- FILING CONTROL	835
- INTERFACING	784
- SCHEDULING	760

STATE GOVERNMENT

- IMPORTANT MANAGEMENT WORKSTATION FEATURES ARE:
  - DOCUMENT PREPARATION
  - MESSAGE CONTROL/ALERTING
  - REMOTE LOCATION OPERATION
  - SORTING AND LIGHT COMPUTATION
- THE 4 HIGHEST RANKED WORKSTATION FUNCTIONS WERE CONSIDERED IMPORTANT, BECAUSE THERE IS A SERIOUS DIFFERENCE BETWEEN SORTING AND LIGHT COMPUTATION AND FILING CONTROL.

LOCAL GOVERNMENT (NOT INCLUDING EDUCATION)

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
FINANCIAL ADMINISTRATION	H	L	H	L	H	L	L
GENERAL CONTROL	H	H	M	H	M	H	H
SERVICES MANAGEMENT	L	M	M	M	H	H	H
TRANSPORTATION (MANAGEMENT)	H	M	M	L	M	H	H
POLICE (MANAGEMENT)	H	M	M	H	H	H	H

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

LOCAL GOVERNMENT

FACTORED NEEDS (RANKING x EMPLOYEES) (,000's)

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
126	FINANCIAL ADMINISTRATION	630	0	630	0	630	0	0	1890
233	GENERAL CONTROL	1165	1165	466	1165	466	1165	1165	6757
394	SERVICES MANAGEMENT	0	788	788	788	1970	1970	1970	8274
23	TRANSPORTATION (MGMT)	115	46	46	0	46	115	115	483
85	POLICE (MANAGEMENT)	425	170	170	425	425	425	425	2465
861	TOTAL	2335	2169	2100	2378	3537	3675	3675	19,869

LOCAL GOVERNMENT

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

- MESSAGE CONTROL/ALERTING	3675
- REMOTE LOCATION OPERATION	3675
- DOCUMENT PREPARATION	3537
- INTERFACING	2378
- FILING CONTROL	2335
- SCHEDULING	2169
- SORTING AND LIGHT COMPUTATION	2100

LOCAL GOVERNMENT

- IMPORTANT MANAGEMENT WORKSTATION FEATURES ARE:
  - MESSAGE CONTROL/ALERTING
  - REMOTE LOCATION OPERATION
  - DOCUMENT PREPARATION
  - FILING CONTROL
  - INTERFACING
  - SCHEDULING
  - SORTING AND LIGHT COMPUTATION
- ALL FUNCTIONS ARE IMPORTANT TO LOCAL GOVERNMENT, AS SHOWN WITH THE MANAGEMENT FUNCTION WORKSTATION RATINGS WHERE NO MAJOR DIFFERENTIAL EXISTS.

MANUFACTURING

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS / SYSTEMS FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING AND FINANCE	H	M	M	L	H	L	M
LEGAL	H	M	L	H	H	M	L
OPERATIONS	H	H	M	L	H	H	H
ENGINEERING/ TECHNICAL	H	L	H	L	H	L	L
MARKETING/ SALES	H	H	M	M	H	H	H
WAREHOUSING	H	M	L	M	M	L	L

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

MANUFACTURING

FACTORED NEEDS (RANKING x EMPLOYEES)
(,000's)

NUMBER OF EMPLOYEES	JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
561	ACCOUNTING	2805	1122	1122	0	2805	0	1122	8976
22	LEGAL	110	44	0	110	110	44	0	418
118	OPERATIONS	590	590	236	0	590	590	590	3186
2550	ENGINEERING/ TECHNICAL	12750	0	12750	0	12750	0	0	38,250
728	MARKETING/ SALES	3640	3640	1456	1456	3640	3640	3640	21,112
265	WAREHOUSING (MGMT)	1325	530	0	530	530	0	0	2915
4244	TOTAL	21,220	5926	15564	2096	20425	4274	5352	74,857

MANUFACTURING

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

- FILING CONTROL	21,200
- DOCUMENT PREPARATION	20,425
- SORTING AND LIGHT COMPUTATION	15,564
- SCHEDULING	5,926
- REMOTE LOCATION OPERATION	5,352
- MESSAGE CONTROL/ALERTING	4,274
- INTERFACING	2,096

MANUFACTURING

- IMPORTANT MANAGEMENT WORKSTATION FEATURES ARE:
  - FILING CONTROL
  - DOCUMENT PREPARATION
  - SORTING AND LIGHT COMPUTATION

- THE 3 HIGHEST RATED MANAGEMENT WORKSTATION SYSTEM FUNCTIONS WERE CHOSEN BECAUSE THERE IS AN OBVIOUS DIFFERENCE IN FUNCTION RATINGS BETWEEN SCHEDULING AND SORTING AND LIGHT COMPUTATION.

BANKING

RANKING SYSTEM FUNCTIONS

SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
BANK OFFICERS & FINANCIAL MANAGERS	H	M	H	H	H	M	H
GENERAL MANAGERS	H	M	M	H	H	M	H
MARKETING/ SALES	M	H	M	M	H	H	H

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

BANKING

FACTORED NEEDS (RANKING x EMPLOYEES)
(,000's)

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
353	BANK OFFICERS AND FIN. MGRS.	1765	706	1765	1765	1765	706	1765	10,237
217	GENERAL MANAGERS	1085	434	434	1085	1085	434	1085	5,642
62	MARKETING/ SALES	124	310	124	124	310	310	310	1,612
632	TOTAL	2974	1450	2323	2974	3160	1450	3160	17,491

BANKING

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

-	DOCUMENT PREPARATION	3160
-	REMOTE LOCATION OPERATION	3160
-	INTERFACING	2974
-	FILING CONTROL	2974
-	SORTING AND LIGHT COMPUTATION	2323
-	SCHEDULING	1450
-	MESSAGE CONTROL/ALERTING	1450

BANKING

- IMPORTANT MANAGEMENT WORKSTATION FUNCTIONS ARE:
  - FILING CONTROL
  - INTERFACING
  - DOCUMENT PREPARATION
  - REMOTE LOCATION OPERATION
- THE FOUR HIGHEST RATED WORKSTATION SYSTEM FUNCTIONS WERE CHOSEN BECAUSE THERE WERE OBVIOUS DIFFERENCES IN FUNCTION RATINGS BETWEEN REMOTE LOCATION OPERATION AND SORTING AND LIGHT COMPUTATION. HOWEVER, A CASE CAN BE MADE FOR INCLUSION OF ALL FUNCTIONS BECAUSE THE DIFFERENCE WAS NOT AS MARKED AS IN OTHER SECTORS.

INSURANCE

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS \ SYSTEMS FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING AND FINANCE	H	M	H	H	H	L	H
INVESTIGATION	H	H	M	H	H	M	H
GENERAL MANAGERS	H	M	H	H	H	L	L
ACTUARY TECHNICAL	L	L	H	H	H	L	L
MARKETING/ SALES/AGENTS	H	H	M	M	H	H	H

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

INSURANCE

FACTORED NEEDS (RANKING x EMPLOYEES)
(,000's)

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
168	ACCOUNTING AND FINANCE	840	336	840	840	840	0	840	4536
96	INVESTIGATION	480	480	192	480	480	192	480	2784
142	GENERAL MANAGERS	710	284	710	710	710	284	0	3408
61	TECHNICAL (ACTUARIAL, D.P.)	0	0	305	305	305	0	0	915
485	MARKETING/ SALES / AGENTS	2425	2425	970	970	2425	2425	2425	14065
952	TOTAL	4455	3525	3017	3305	4760	2901	3745	25,708

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

- DOCUMENT PREPARATION	4760
- FILING CONTROL	4455
- REMOTE LOCATION OPERATION	3745
- SCHEDULING	3525
- INTERFACING	3305
- SORTING AND LIGHT COMPUTATION	3017
- MESSAGE CONTROL/ALERTING	2901

INSURANCE

- IMPORTANT MANAGEMENT WORKSTATION FUNCTIONS ARE:
  - DOCUMENT PREPARATION
  - FILING CONTROL
  - INTERFACING
  - SORTING AND LIGHT COMPUTATION
  - REMOTE LOCATION OPERATION
  - SCHEDULING

- SIX OF THE SEVEN WORKSTATION FUNCTIONS WERE CONSIDERED IMPORTANT BECAUSE THERE WERE SIGNIFICANT WORKSTATION FUNCTION RATINGS FOR THESE SIX FUNCTIONS, AND NOT VERY SIGNIFICANT RATING DIFFERENCES.

ACCOUNTING

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS \ SYSTEMS FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTANTS	M	H	H	H	H	M	H
PARTNERS	M	H	M	H	H	H	M

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

ACCOUNTING

FACTORED NEEDS (,000's) (RANKING x EMPLOYEES)

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
154	ACCOUNTANTS	308	770	770	770	770	308	770	4466
12	PARTNERS	24	60	24	60	60	60	24	312
166	TOTAL	332	830	794	830	830	368	794	4778

ACCOUNTING

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

- DOCUMENT PREPARATION	830
- INTERFACING	830
- SCHEDULING	830
- REMOTE LOCATION OPERATION	794
- SORTING AND LIGHT COMPUTATION	794
- MESSAGE CONTROL/ALERTING	368
- FILING CONTROL	332

ACCOUNTING

- IMPORTANT MANAGEMENT WORKSTATION FUNCTIONS ARE:
  - DOCUMENT PREPARATION
  - INTERFACING
  - SCHEDULING
  - REMOTE LOCATION OPERATION
  - SORTING AND LIGHT COMPUTATION

- FIVE OF THE SEVEN WORKSTATION FUNCTIONS WERE CHOSEN BECAUSE IDENTICAL RATINGS WERE CALCULATED FOR REMOTE LOCATION OPERATION AND SORTING AND LIGHT COMPUTATION. NOTE THERE IS NOT THAT SIGNIFICANT DIFFERENCE IN RATINGS AS DIFFERENT FUNCTIONS ARE EXAMPLED.

FINANCE (i.e. Holding Co.s, Investment Houses)

RANKING SYSTEM FUNCTIONS

JOB FUNCTIONS / SYSTEMS FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING	H	M	H	H	H	L	M
TECHNICAL	H	H	H	M	H	H	L
CREDIT/SALES	H	H	M	H	H	H	L
GENERAL MGR. (BACK OFFICE)	H	M	H	H	H	L	L

H = HIGH IMPORTANCE
M = MEDIUM IMPORTANCE
L = LOW IMPORTANCE

FINANCE (HOLDING COMPANIES, INVESTMENT HOUSES)

FACTORED NEEDS (Ranking x Employees) (,000's)

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
98	ACCOUNTING	490	196	490	490	490	0	196	2352
44	GENERAL MANAGEMENT (BACK OFFICE)	220	88	220	220	220	0	0	968
25	TECHNICAL	125	125	125	50	125	125	0	675
178	CREDIT/ SALES	890	890	356	890	890	890	0	4806
345	TOTAL	1725	1299	1191	1650	1725	1015	196	8801

FINANCE

- MANAGEMENT WORKSTATION FUNCTION RATINGS ARE (,000's):

-	DOCUMENT PREPARATION	1725
-	FILING CONTROL	1725
-	INTERFACING	1650
-	SCHEDULING	1299
-	SORTING AND LIGHT COMPUTATION	1191
-	MESSAGE CONTROL/ALERTING	1015
-	REMOTE LOCATION OPERATION	196

FINANCE

- IMPORTANT MANAGEMENT WORKSTATION FUNCTIONS ARE:
  - DOCUMENT PREPARATION
  - FILING CONTROL
  - INTERFACING
  - SORTING AND LIGHT COMPUTATION
  - SCHEDULING

- THE FIVE HIGHEST MANAGEMENT WORKSTATION FUNCTIONS WERE CHOSEN BECAUSE THERE WAS NO SIGNIFICANT DIFFERENCE IN THE RATINGS BETWEEN SORTING AND LIGHT COMPUTATION AND SCHEDULING.

FEATURES OF A MANAGEMENT WORKSTATION
ALL INDUSTRIES - 1978
(FACTORED NEEDS: RANKING X EMPLOYEES (,000's))

INDUSTRY SECTOR / SYSTEM FEATURE	FEDERAL GOVT.	STATE GOVT.	LOCAL GOVT.	MANU-FACTURE	BANKING	INSURANCE	ACCOUNTING	FINANCE	TOTAL ALL FUNCTIONS	PERCENTAGE OF FEATURE IMPORTANCE
FILING CONTROL	2734	835	2335	21,229	2974	4455	332	1725	36,619	21.3
SCHEDULING	890	760	2169	5,926	1450	3525	830	1299	16,849	9.8
SORTING AND LIGHT COMPUTATION	2444	1089	2100	15,564	2323	3017	794	1191	28,522	16.6
INTERFACING	736	784	2378	2096	2974	3305	830	1650	14,753	8.6
DOCUMENT PREPARATION	3225	1821	3537	20,425	3160	4760	830	1725	39,433	23.0
MESSAGE CONTROL AND ALERTING	705	1510	3675	4274	1450	2901	368	1015	15.898	9.2
REMOTE LOCATION OPERATION	1496	1510	3675	5352	3160	3745	794	196	19,928	11.5
TOTAL (ALL SECTORS)	12,230	8309	19869	74,857	17,491	25,708	4,778	8801	172,043	
PERCENTAGE OF SYSTEM IMPORTANCE	7.1	4.8	11.6	43.5	10.2	14.9	2.8	5.1		

IMPORTANT FUNCTIONS OF A MANAGEMENT WORKSTATION

(BY INDUSTRY SECTOR)

	FEDERAL GOVERNMENT	STATE GOVERNMENT	LOCAL GOVERNMENT	MANUFACTURING	BANKING	INSURANCE	ACCOUNTING	FINANCE
FILING CONTROL	●		●	●	●	●		●
SCHEDULING			●			●	●	●
SORTING AND LIGHT COMPUTATION	●	●	●	●		●	●	●
INTERFACING			●		●	●	●	●
DOCUMENT PREPARATION	●	●	●	●	●	●	●	●
MESSAGE CONTROL/ ALERTING		●	●					
REMOTE LOCATION OPERATION		●	●		●	●	●	

● IMPORTANT FUNCTIONS OF A MANAGEMENT WORKSTATION

SCENARIO TO 1985

MAJOR CHANGES EXPECTED BY 1985, HOW THEY WILL EFFECT SYSTEM FUNCTIONS

FILING AND CONTROL

WILL BECOME MORE USEFUL AS MEMORY AND LOGIC COSTS DECREASE AND FILE SIZE INCREASES. HOWEVER, THE FILING CONTROL FUNCTION IMPORTANCE TO THE EXECUTIVE WILL BE UNCHANGED (DESPITE THE "PAPERWORK EXPLOSION").

SCHEDULING

TRAVEL WILL BECOME MORE EXPENSIVE AND ELECTRONIC MEETINGS WITH AND WITHOUT VIDEO WILL BECOME MORE IMPORTANT. THERE WILL BE MORE OF THESE MEETINGS, THEY WILL BE SHORTER. THUS, THE IMPORTANCE OF SCHEDULING WILL INCREASE FOR ALL EXECUTIVES.

SCENARIO TO 1985 (CONT'D)

SORTING AND LIGHT COMPUTATION

COMPUTATION COSTS WILL SHARPLY DECREASE AS TECHNOLOGY ADVANCES. NEW EXECUTIVES WILL BE MORE USED TO COMPUTATION, AND DATA BASES AND NUMERICAL REPORTS WILL INCREASE IN IMPORTANCE, AND GENERAL USAGE. THUS, THE IMPORTANCE OF SORTING AND LIGHT COMPUTATION WILL INCREASE AS A FUNCTION.

INTERFACING

THE NUMBER OF MIS SYSTEMS AND COMMUNICATIONS SYSTEMS WILL DRAMATICALLY INCREASE. HOWEVER, STANDARDIZATION OF INTERFACES PROBABLY WILL NOT OCCUR AND STANDARDIZATION OF PROTOCOLS AND FORMATS WILL NOT OCCUR. THUS, THE IMPORTANCE OF INTERFACING WILL INCREASE. ESPECIALLY AS ELECTRONIC COMMUNICATIONS ARE DATA BASIS INCREASED.

DOCUMENT PREPARATION

DOCUMENT PREPARATION WILL BECOME MORE SOPHISTICATED AS CHARACTER GENERATION TECHNOLOGY AND MORE SOPHISTICATED COMPUTER LOGIC BECOMES AVAILABLE. HOWEVER, THE IMPORTANCE OF THIS FUNCTION TO THE EXECUTIVE WILL NOT CHANGE.

MESSAGE CONTROL/ALERTING

ELECTRONIC MESSAGES WILL BECOME MORE IMPORTANT AS PHYSICAL TRAVEL DECREASES, AND NEW MESSAGE SERVICES BECOME MORE PREVELANT. IN ADDITION TIME TO RESPOND TO INFORMATION AND SITUATIONS WILL DECREASE. THUS MESSAGE CONTROL/ALERTING WILL INCREASE IN IMPORTANCE.

REMOTE LOCATION OPERATION

INCREASED COMMUNICATIONS WILL LESSEN THE TRAVEL OF THE EXECUTIVE. HOWEVER, IT WILL BE MORE IMPORTANT FOR THE EXECUTIVE TO COMMUNICATE TO HIS HOME OFFICE SYSTEM WHEN HE DOES TRAVEL. THUS, THE IMPORTANCE OF REMOTE LOCATION OPERATION WILL INCREASE.

SUMMARY AND WEIGHTING

THE FOLLOWING CHANGE IN WEIGHTING WILL BE USED TO RE-ANALYZE THE FUNCTIONS OF THE EXECUTIVE WORKSTATION IN THE 1985 TIMEFRAME:

FUNCTION	MULTIPLY PREVIOUS WEIGHTING BY	
FILING CONTROL	1.0	(UNCHANGED)
SCHEDULING	1.5	
SORTING & LIGHT COMPUTATION	1.3	
INTERFACING	1.5	
DOCUMENT PREPARATION	1.0	(UNCHANGED)
MESSAGE CONTROL/ALERTING	1.5	
REMOTE LOCATION OPERATION	1.3	

FEDERAL GOVERNMENT

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
ACCOUNTING	600	900	1080	900	600	360	780	5220
LEGAL	290	435	0	204	290	204	377	1800
OPERATIONS AND SERVICES MANAGEMENT	329	0	592	0	820	494	0	2235
ENGINEERING/ TECHNICAL	1515	0	2727	0	1515	0	788	6545
TOTAL	2734	1335	4399	1104	3225	1058	1945	15,800

STATE GOVERNMENT

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
FINANCIAL ADMINISTRATION	485	0	873	0	485	0	0	1843
GENERAL CONTROL	260	390	187	390	104	390	338	2059
SERVICES MANAGEMENT	0	696	835	696	1160	1740	1508	6635
TRANSPORTATION (MGMT)	30	18	22	0	12	45	39	166
POLICE (MGMT)	.60	36	43	90	60	90	78	457
TOTAL	835	1140	1960	1176	1821	2265	1963	11,160

LOCAL GOVERNMENT

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
FINANCIAL ADMINISTRATION	630	0	1134	0	630	0	0	2394
GENERAL CONTROL	1165	1748	839	1748	466	1748	1515	9229
SERVICES MANAGEMENT	0	1182	1418	1182	1970	2955	2561	11268
TRANSPORTATION (MGMT)	115	69	83	0	46	173	150	636
POLICE (MGMT)	425	255	306	638	425	638	553	3240
TOTAL	2335	3254	3780	3568	3537	5514	4779	26,767

MANUFACTURING

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
ACCOUNTING	2805	1683	2020	0	2805	0	1459	10,772
LEGAL	110	66	0	165	110	66	0	517
OPERATIONS	590	885	425	0	590	885	767	4142
ENGINEERING/ TECHNICAL	12750	0	22950	0	12750	0	0	48,450
MARKETING/ SALES	3640	5460	2621	2184	3640	5460	4732	27,737
WAREHOUSING	1325	795	0	795	530	0	0	3,445
TOTAL	21,220	3889	28016	3144	20425	6411	6958	95,063

BANKING

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
BANK OFFICERS/ FINANCIAL MANAGERS	1765	1059	3177	2648	1765	1059	2295	13768
GENERAL MANAGERS	1085	651	782	1628	1085	651	1411	7293
MARKETING/SALES	124	465	223	186	310	465	403	2176
TOTAL	2974	2175	4182	4462	3160	2175	4109	23,237

INSURANCE

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
ACCOUNTING AND FINANCE	840	504	1512	1260	840	0	1092	6048
INVESTIGATION	480	720	346	720	480	288	624	3658
GENERAL MANAGERS	710	426	1278	1065	710	426	0	4615
TECHNICAL (ACTUARIAL, D.P.)	0	0	549	458	305	0	0	1312
MARKETING/SALES/ AGENTS	2425	3638	1746	1455	2425	3638	3153	18480
TOTAL	4455	5288	5431	4958	4760	4352	4869	34,113

ACCOUNTING

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
ACCOUNTANTS	308	1155	1386	1155	770	462	1001	6237
PARTNERS	24	90	43	90	60	90	36	433
TOTAL	332	1245	1429	1245	830	552	1037	6679

FINANCE

FACTORED NEEDS - 1985 (RANKING x EMPLOYEES)
(,000's)

JOB FUNCTIONS / SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	TOTAL
ACCOUNTING	490	294	882	735	490	0	255	3146
GENERAL MANAGEMENT (BACK OFFICE)	220	132	396	330	220	0	0	1298
TECHNICAL	125	188	90	75	125	188	0	791
CREDIT/SALES	890	1335	1602	1335	890	1335	0	7387
TOTAL	1725	1949	2970	2475	1725	1523	255	12,622

FEATURES OF A MANAGEMENT WORKSTATION

ALL INDUSTRIES - 1985

(FACTORED NEEDS: RANKING X EMPLOYEES (,000's))

INDUSTRY SECTOR / SYSTEM FEATURES	FEDERAL GOVT.	STATE GOVT.	LOCAL GOVT.	MANU-FACTURE	BANKING	INSURANCE	ACCOUNTING	FINANCE	TOTAL (ALL FUNCTIONS)	PERCENTAGE OF FEATURE IMPORTANCE
FILING CONTROL	2734	835	2335	21220	2974	4455	332	1725	36610	16.2
SCHEDULING	1335	1140	3254	3839	2175	5288	1245	1949	25275	11.2
SORTING AND LIGHT COMPUTATION	4399	1960	3780	28016	4132	5431	1429	2970	52167	23.1
INTERFACING	1104	1176	3568	3144	4462	4958	1245	2475	22132	9.8
DOCUMENT PREPARATION	3225	1821	3537	20425	3160	4760	830	1725	39483	17.5
MESSAGE CONTROL AND ALERTING	1058	2265	5514	6411	2175	4352	552	1523	23850	10.6
REMOTE LOCATION OPERATION	1945	1963	4779	6958	4109	4869	1037	255	25915	11.6
TOTAL (ALL SECTORS)	15,300	11,160	26,767	95,063	23,237	34,113	6670	12,622	225432	
PERCENTAGE OF SYSTEM IMPORTANCE	7.0	5.0	11.9	42.2	10.3	15.1	3.0	6.0		

IMPORTANT FUNCTIONS OF A MANAGEMENT WORKSTATION

(BY INDUSTRY SECTOR)

1985

	FEDERAL GOVERNMENT	STATE GOVERNMENT	LOCAL GOVERNMENT	MANUFACTURING	BANKING	INSURANCE	ACCOUNTING	FINANCE
FILING CONTROL	●			●	●			●
SCHEDULING						●	●	●
SORTING AND LIGHT COMPUTATION	●	●	●	●	●	●	●	●
INTERFACING			●		●	●	●	●
DOCUMENT PREPARATION	●	●	●	●	●	●	●	●
MESSAGE CONTROL/ ALERTING		●	●					
REMOTE LOCATION OPERATION		●	●		●	●	●	

● IMPORTANT FUNCTIONS OF A MANAGEMENT WORKSTATION

- THE MOST IMPORTANT FUNCTIONS OF A MANAGEMENT WORKSTATION IN BOTH 1978 AND 1985 ARE:
  - FILING CONTROL
  - SORTING/LIGHT COMPUTING
  - INTERFACING
  - DOCUMENT PREPARATION

NECESSARY FUNCTIONS OF A

MANAGEMENT WORKSTATION (BY INDUSTRY SECTOR)

(1978)	FILING CONTROL	SORTING/ LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION
FEDERAL GOVERNMENT	●	●		●
STATE GOVERNMENT		●		●
LOCAL GOVERNMENT	●	●	●	●
MANUFACTUR.	●	●		●
BANKING	●		●	●
INSURANCE	●	●	●	●
ACCOUNTING		●	●	●
FINANCE	●	●	●	●

NECESSARY FUNCTIONS OF A

MANAGEMENT WORKSTATION (BY INDUSTRY SECTOR)

	(1985) FILING CONTROL	SORTING/ LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION
FEDERAL GOVERNMENT	●	●		●
STATE GOVERNMENT		●		●
LOCAL GOVERNMENT		●	●	●
MANUFACTUR.	●	●		●
BANKING	●	●	●	●
INSURANCE		●	●	●
ACCOUNTING		●	●	●
FINANCE	●	●	●	●

NECESSARY FUNCTIONS OF A

MANAGEMENT WORKSTATION (BY INDUSTRY SECTOR)

	(1985) FILING CONTROL	SORTING/ LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION
FEDERAL GOVERNMENT	●	●		●
STATE GOVERNMENT		●		●
LOCAL GOVERNMENT		●	●	●
MANUFACTUR.	●	●		●
BANKING	●	●	●	●
INSURANCE		●	●	●
ACCOUNTING		●	●	●
FINANCE	●	●	●	●

SYSTEM FUNCTION DEFINITION

- THE FILING CONTROL FEATURE OF A MANAGEMENT WORKSTATION PROVIDES AN EXECUTIVE ACCESS TO INFORMATION OR LISTS LOCATIONS OF INFORMATION NOT ACCESSIBLE ELECTRONICALLY. THIS IS POSSIBLE WITH:

  - ACCESS TO ELECTRONICALLY OR MAGNETICALLY STORED INFORMATION.

    . ELECTRONICALLY AND MAGNETICALLY STORED INFORMATION INCLUDES BOTH TEXT AND DATA.

  - A DIRECTORY LISTS LOCATIONS OF HARD COPY AND PHYSICAL INFORMATION.

    . HARD COPY INCLUDES BOOKS, MANUSCRIPTS, PAMPHLETS, PRINT-OUTS, AND OTHER TEXT NOT ACCESSIBLE THROUGH THE MANAGEMENT WORKSTATION.

    . PHYSICAL INFORMATION INCLUDES SUCH ITEMS AS PICTURES, BLUEPRINTS, AND SAMPLES.

  - MAINTENANCE OF THE FILES.

  - ELECTRONIC SEARCHES FOR INFORMATION CONTAINED IN THE FILES.

- CROSS-REFERENCE TAGGING OF INFORMATION CONTAINED IN THE FILES.
- WITH A MANAGEMENT WORKSTATION, AN EXECUTIVE WILL BE ABLE TO ACCESS PAYROLL, JOB PERFORMANCE, AND HEALTH RECORDS SIMULTANEOUSLY.

• THE SCHEDULING FEATURE OF A MANAGEMENT WORKSTATION ALLOWS MANY PEOPLE TO COORDINATE THEIR ACTIVITIES WITH THE AID OF A MASTER SCHEDULE.

- INFORMATION CONTAINED ON A MASTER SCHEDULE INCLUDES LOCATION OF OTHER PEOPLE, TIME AND LENGTH OF COMMUNICATIONS AND MEETINGS, AND ATTENDANCE LISTS OF MEETINGS.
- THE SCHEDULING FUNCTION WOULD AID AN EXECUTIVE IN SCHEDULING A CONFERENCE OF SUBORDINATES. WITH A MANAGEMENT WORKSTATION, HIS JUDGEMENT CAN BE USED TO DETERMINE PRIORITIES.

- THE SORTING AND LIGHT COMPUTATION FUNCTION ALLOWS AN EXECUTIVE TO EXTRACT MATERIAL FROM THE FILES, COMPARE IT TO OTHER STORED MATERIAL, AND PERFORM ARITHMETIC OPERATIONS ON THE RETRIEVED INFORMATION. THIS IS POSSIBLE WITH:
  - PROGRAMS EQUIVALENT IN POWER TO A DESK-TOP COMPUTER.
  - PROGRAMS WRITTEN IN A SIMPLE TO USE, HIGH LEVEL LANGUAGE.
  - ACCESS TO STORED DATA AND TEXT.
  - AN EXECUTIVE WOULD BE ABLE TO EXTRACT INFORMATION DIRECTLY FROM MIS AND OTHER FILES FOR COMPUTATIONAL WORK, AND THEN STORE THE RESULTS IN A FORMAT USABLE BY OTHER WORKSTATION USERS.
- THE INTERFACING FUNCTION ALLOWS AN EXECUTIVE TO ACCESS INFORMATION FROM MANY SOURCES JUST AS EASILY AS GATHERING INFORMATION OFF HIS OWN ELECTRONIC FILES. ACCESSIBLE INFORMATION INCLUDES:

- INTRA COMPANY MIS SYSTEM.
- EXTERNAL DATA BANKS.
- TELEX/TWX.
- WORD PROCESSING SYSTEMS.
- MANY OTHER SOURCES.
- WITH THE INTERFACING FUNCTION, A MANAGER COULD CHECK ALTERNATIVE DATABASES BY INTERFACING DIRECTLY INTO THEM.

• THE DOCUMENT PREPARATION FUNCTION WOULD PROVIDE AN EXECUTIVE WITH THE ABILITY TO REFER TO SEVERAL STORED PARAGRAPHS AND MERGE THEM INTO A DOCUMENT BEING MODIFIED.

- DOCUMENT PREPARATION IS ESSENTIALLY AN ELECTRONIC "CUT AND PASTE" SYSTEM.

• THE MESSAGE CONTROL AND ALERTING FEATURE IS USEFUL TO AN EXECUTIVE BECAUSE HE IS NOT WAITING FOR CALLS OR LOSING IMPORTANT CALLS. THIS FEATURE WILL ALERT AN EXECUTIVE UPON ARRIVAL OF:

- AN ELECTRONIC MESSAGE (TEXT/DATA/FAX).

- A VOICE CALL
- A DELIVERY BY MAIL OR COURIER.

• THE REMOTE LOCATION OPERATION FEATURE ALLOWS AN EXECUTIVE ACCESS TO KEY INFORMATION DURING TRAVEL.

- ACCESS TO INFORMATION IS POSSIBLE WITH A PORTABLE TERMINAL USED DURING TRAVEL OR AWAY FROM THE OFFICE.

JOB FUNCTION DEFINITIONS

(OBTAINED FROM CENSUS DATA- U.S. GOVERNMENT)

- ACCOUNTING
  - ACCOUNTANTS
  - FINANCIAL MANAGERS

- LEGAL
  - LEGAL DEPARTMENTS (COMPANY COUNSEL)

- OPERATIONS
  - PURCHASING
  - PERSONNEL

- SERVICES MANAGEMENT
  - MANAGEMENT OF GOVERNMENT SERVICES

- GENERAL MANAGERS
  - "BACK-OFFICE" MANAGERS

- ENGINEERING/TECHNICAL
  - ENGINEERS
  - TECHNICIANS

JOB FUNCTION DEFINITIONS (CONT'D)

- RESEARCH AND DEVELOPMENT
- DATA PROCESSING
- MATHEMATICAL/STATISTICAL

- MARKETING/SALES
  - MARKETING MANAGERS, DIRECTORS
  - SALESMEN
  - OTHER SALES

- INVESTIGATION
  - CLAIMS INVESTIGATION (INSURANCE)

SIC CODES INCLUDED IN ANALYSIS

- MANUFACTURING

-	FOOD AND KINDRED PRODUCTS	(SIC 20)
-	TOBACCO MANUFACTURERS	(SIC 21)
-	TEXTILE MILL PRODUCTS	(SIC 22)
-	APPAREL	(SIC 23)
-	LUMBER AND WOOD PRODUCTS, EXC. FURNITURE	(SIC 24)
-	FURNITURE AND FIXTURES	(SIC 25)
-	PAPER AND ALLIED PRODUCTS	(SIC 26)
-	PRINTING, PUBLISHING, AND ALLIED, INDUSTRIES	(SIC 27)
-	CHEMICALS AND ALLIED PRODUCTS	(SIC 28)
-	PETROLEUM REFINING AND REL. INDUSTRIES	(SIC 29)
-	RUBBER AND MISC. PLASTICS PRODUCTS	(SIC 30)
-	LEATHER AND LEATHER PRODUCTS	(SIC 31)
-	STONE, CLAY, GLASS, AND CONCRETE PRODUCTS	(SIC 32)
-	PRIMARY METAL INDUSTRIES	(SIC 33)
-	FABRICATED METAL PRODUCTS	(SIC 34)
-	MACHINERY, EXCEPT ELECTRICAL	(SIC 35)

SIC CODES INCLUDED IN ANALYSIS (CONT'D)

- ELECTRICAL AND ELECTRONIC MACHINERY (SIC 36)
- TRANSPORTATION EQUIPMENT (SIC 37)
- MEASURING, ANALYZING, AND CONTROLLING EQUIPMENT (SIC 38)
- MISC. MANUFACTURING INDUSTRIES (SIC 39)

• FINANCE

- CREDIT AGENCIES, EXC. SAVING AND LOAN ASSOCIATIONS (SIC 61,PT)
- SECURITY AND COMMODITY BROKERS (SIC 62)
- COMBINATION INVESTMENT HOUSES (SIC 66)
- HOLDING AND OTHER INVESTMENT OFFICES (SIC 67)

• BANKING

- COMMERCIAL BANKING (SIC 60)
- SAVINGS AND LOAN ASSOCIATIONS (SIC 61,PT)

• INSURANCE

- INSURANCE (SIC 63)
- INSURANCE AGENTS, BROKERS, & SERVICE (SIC 64)

SIC CODES INCLUDED IN ANALYSIS (CONT'D)

- ACCOUNTING
  - ACCOUNTING FIRMS (SIC 893)
- GOVERNMENT (FEDERAL, STATE, AND LOCAL)
  - PUBLIC ADMINISTRATION (SIC 91-97)

V ITERATION III

ITERATION III

- ANALYZE THE MARKET FOR A MANAGEMENT WORKSTATION.
- THE MARKET SIZE WILL BE ANALYZED THREE WAYS.
  - THE POTENTIAL MARKET BASED ON TIME AND PEOPLE SAVINGS.
  - THE POTENTIAL MARKET BASED ON A PORTION OF PRESENT EXPENDITURES.
  - A PORTION OF THE MARKET FOR MULTI-STATION WORD PROCESSING SYSTEMS IN 1985.
- THE SUCCESS OF NEW ENTRANTS WILL BE ANALYZED AS A MODEL. THE COMPANIES WHICH HAVE RECENTLY INTRODUCED NEW PRODUCTS AND WILL BE VIEWED IN DETAIL ARE:
  - WANG LABORATORIES
  - CPT CORPORATION

ITERATION III (CONT'D)

- THE MARKET POTENTIAL FOR A MULTI-TERMINAL SHARED LOGIC SYSTEM IS ANALYZED.
- A DIRECTORY OF PRESENT VENDORS IS PROVIDED TO ILLUSTRATE POTENTIAL COMPETITORS OF A MANAGEMENT WORKSTATION.

DETERMINATION OF THE MARKET POTENTIAL

FOR MANAGEMENT WORKSTATIONS

- THREE METHODS ARE AVAILABLE TO ANALYZE THE MARKET POTENTIAL FOR MANAGEMENT WORKSTATIONS. THESE METHODS ARE:

  - ANALYZE THE MARKET BASED ON MONETARY SAVINGS INVOLVED FROM TIME OF PEOPLE SAVINGS GAINED WITH A MANAGEMENT WORKSTATION.

  - ANALYZE THE MARKET BASED ON A PERCENTAGE OF PRESENT EXPENDITURES ON COMPUTER AND OFFICE EQUIPMENT AND SERVICES.

  - ANALYZE THE MARKET BASED ON A PROJECTION OF THE PRESENT MARKET FOR MULTI-STATION SHARED LOGIC INFORMATION PROCESSORS.

- ALL THREE METHODS OF ANALYSIS LEAD TO THE CONCLUSION THAT THERE IS A CONSIDERABLY LARGE MARKET FOR A MANAGEMENT WORKSATION SYSTEM WHICH CAN EASILY BE SEVERAL BILLION DOLLARS WHEN THE TIME SAVINGS POTENTIAL IS CONSIDERED.

A. TIME SAVED BY THE USE OF A MANAGEMENT WORKSTATION

- THE TIME SAVED BY THE USE OF A MANAGEMENT WORKSTATION WAS ASSIGNED JUDGEMENTALLY FOR EACH JOB FUNCTION AND SYSTEM FUNCTION BY INDUSTRY SECTOR. THESE JOB FUNCTIONS, SYSTEM FUNCTIONS, AND INDUSTRY SECTORS ARE IDENTICAL TO THOSE PRESENTED IN ITERATIONS I AND II.
- JOB FUNCTIONS ARE (BY INDUSTRY):
  - FEDERAL GOVERNMENT
    - ACCOUNTING
    - LEGAL
    - OPERATIONS AND SERVICES MANAGEMENT
    - GENERAL ADMINISTRATION/CLERICAL
    - ENGINEERING/TECHNICAL
  - STATE GOVERNMENT
    - FINANCIAL ADMINISTRATION
    - GENERAL CONTROL
    - SERVICES MANAGEMENT

- . TRANSPORTATION
  - . POLICE
- LOCAL GOVERNMENT
  - . FINANCIAL ADMINISTRATION
  - . GENERAL CONTROL
  - . SERVICES MANAGEMENT
  - . TRANSPORTATION
  - . POLICE
- MANUFACTURING
  - . ACCOUNTING
  - . LEGAL
  - . OPERATIONS
  - . GENERAL ADMINISTRATION/CLERICAL
  - . ENGINEERING/TECHNICAL
  - . MARKETING/SALES
  - . WAREHOUSING
- BANKING
  - . BANK OFFICERS AND FINANCIAL MANAGERS
  - . TELLERS

- . GENERAL MANAGERS
- . GENERAL ADMINISTRATION/CLERICAL
- . MARKETING/SALES

- INSURANCE
  - . ACCOUNTING/FINANCE
  - . INVESTIGATION
  - . GENERAL MANAGER
  - . GENERAL ADMINISTRATION/CLERICAL
  - . TECHNICAL
  - . MARKETING/SALES/AGENTS

- ACCOUNTING
  - . ACCOUNTANTS
  - . PARTNERS
  - . GENERAL ADMINISTRATION/CLERICAL

- FINANCE
  - . ACCOUNTING
  - . GENERAL MANAGEMENT
  - . GENERAL ADMINISTRATION/CLERICAL

- TECHNICAL
- CREDIT/SALES

- SYSTEM FUNCTIONS ARE:
  - FILING CONTROL
  - SCHEDULING
  - SORTING AND LIGHT COMPUTATION
  - INTERFACING
  - DOCUMENT PREPARATION
  - MESSAGE CONTROL/ALERTING
  - REMOTE LOCATION OPERATION
- TIME SAVED WAS DETERMINED JUDGEMENTALLY BY A GROUP OF INPUT CONSULTANTS AND WAS ASSIGNED TO SYSTEM FUNCTIONS REGARDLESS OF INDUSTRY SECTOR JOB FUNCTION.
- TIME WAS ASSIGNED IN MINUTES PER WEEK FOR EACH WORKSTATION USER. FOR EXAMPLE, IN THE MANUFACTURING SECTOR IT WAS ASSUMED THAT 50 MINUTES PER WEEK WOULD BE SAVED FOR AN ACCOUNTANT BY THE FILING CONTROL FEATURE OF THE WORKSTATION. (SEE "TIME SAVED WITH A MANAGEMENT WORKSTATION (PER EMPLOYEE) - MANUFACTURING", PAGE III - 28).

- FOR EACH INDUSTRY SECTOR, THE TOTAL TIME SAVINGS FOR THE MANAGEMENT WORKSTATION WAS CALCULATED BY SUMMING INDIVIDUAL TIME SAVINGS FOR EACH JOB FUNCTION AND SYSTEM FUNCTION. FOR EXAMPLE, IN MANUFACTURING, THE TOTAL TIME SAVINGS IS 16,624 (000) HOURS PER WEEK (SEE "TIME SAVED WITH A MANAGEMENT WORKSTATION - MANUFACTURING", PAGE III - 29).

- SYSTEM FUNCTION IMPORTANCE WAS KEPT CONSTANT FOR DIFFERENT BUSINESS SECTORS BECAUSE THE EXECUTIVE FUNCTIONS WERE ASSUMED SIMILAR FOR EACH BUSINESS SECTOR. EXECUTIVE FUNCTIONS WERE DERIVED FROM THE POLICY FORMULATION MANUALS PUBLISHED BY THE AMERICAN MANAGEMENT ASSOCIATION.

- THE TIME SAVINGS FOR EACH SYSTEM FUNCTION WAS CHOSEN (JUDGEMENTALLY) AS FOLLOWS:

  - FILING CONTROL ALLOWS A WORKSTATION USER TO RAPIDLY FIND EITHER THE INFORMATION NEEDED OR THE LOCATION OF THE NEEDED INFORMATION (IF IT IS NOT IN ELECTRONIC STORAGE.)

. AN EXECUTIVE WILL BE ABLE TO SAVE TIME WITH A MANAGEMENT WORKSTATION BY BEING ABLE TO ACCESS INFORMATION ELECTRONICALLY RATHER THAN SEARCHING THROUGH MULTIPLE PHYSICAL FILES. THE TIME SAVINGS GAINED FROM FILING CONTROL IS APPROXIMATELY FIFTY MINUTES PER WEEK.

. AN EXAMPLE OF THE USE OF FILING CONTROL ON A MANAGEMENT WORKSTATION IS AN EXECUTIVE BEING ABLE TO ACCESS PAYROLL RECORDS TOGETHER WITH JOB PERFORMANCE, AND HEALTH RECORDS ALL AT THE SAME TIME.

- SCHEDULING IS IMPORTANT AND USEFUL BECAUSE IT ALLOWS MANY PEOPLE TO COORDINATE THEIR ACTIVITIES. HOWEVER, TIME SAVED IN THE SCHEDULING FUNCTION IS NOT GREAT BECAUSE LOOKING AT SCHEDULE BOOKS IS FAIRLY FAST. THUS, ONLY 10 MINUTES OF SAVINGS WAS ATTRIBUTED PER WORKSTATION USER PER WEEK FOR THIS FUNCTION.

. AN EXAMPLE OF THE USE OF THE SCHEDULING FUNCTION WOULD BE THE SCHEDULES OF MANY EXECUTIVES DISPLAYED ON NON-CO LOCATED WORKSTATION SCREENS TO AID THE EXECUTIVE IN THE SCHEDULING OF A CONFERENCE OF SUBORDINATES, WHEN HIS JUDGMENT CAN BE USED TO DETERMINE PRIORITIES.

- SORTING AND LIGHT COMPUTATION ALLOWS A WORKSTATION USER TO EXTRACT MATERIAL FROM THE FILES, COMPARE IT TO OTHER STORED MATERIAL, AND PERFORM ARITHMETIC OPERATIONS UPON THE RETRIEVED INFORMATION. THIS FUNCTION IS VERY IMPORTANT. THIS IMPROVEMENT RESULTS FROM THE FILE ACCESSIBILITY OF THE WORKSTATION, WHICH IS WHAT DIFFERENTIATES IT FROM A DESK CALCULATOR. IN GENERAL, LESS THAN AN HOUR WAS ASSIGNED FOR THE TIME DIFFERENTIAL. HOWEVER, THE TIME SAVINGS WOULD INCREASE DRAMATICALLY IF SOPHISTICATED APPLICATION PROGRAMS WERE AVAILABLE FOR USE ON THE MANAGEMENT WORKSTATION. FURTHER

TIME SAVINGS WOULD BE POSSIBLE IF THE WORKSTATION WAS AVAILABLE AS A USER PROGRAMMABLE DESK TOP BUSINESS COMPUTER.

- A WORKSTATION USER WOULD SAVE TIME BY BEING ABLE TO EXTRACT INFORMATION AND DATA DIRECTLY FROM FILES FOR COMPUTATIONAL WORK. THE TIME SAVINGS IS THE ELIMINATION OF INTERMEDIATE STEPS INVOLVED IN SORTING AND LIGHT COMPUTATION, SUCH AS RETRIEVAL OF INFORMATION, SORTING IT INTO A USABLE FORMAT, KEYING IT INTO A CALCULATOR, AND THEN TRANSFERRING THE RESULTANT INFORMATION TO STORAGE (PAPER, MAGNETIC, ETC.).

- AN EXAMPLE OF AN EXECUTIVE BEING ABLE TO USE THE WORKSTATION FOR SORTING AND LIGHT COMPUTATION WOULD BE EXTRACTING INFORMATION DIRECTLY FROM MIS FILES AND PERHAPS ALSO EXTERNAL FILES FOR COMPUTATIONAL WORK, AND THEN STORING THE

RESULTS IN A FORMAT USABLE BY OTHER WORKSTATION USERS. AN ANALYSIS OF THE FREIGHT CHARGES FOR FACTORY OUTPUT (WHICH INCLUDES EXTERNAL SHIPPING COST DATA) IS AN EXAMPLE.

- INTERFACING WITH VARIOUS ELECTRONIC COMMUNICATIONS SYSTEMS, MIS SYSTEMS, AND EXTERNAL DATA BASES CAN BE VERY TIME CONSUMING AS AN ELECTRONIC "TOWER OF BABEL" EXISTS, AND THE SITUATION WILL GET WORSE. THE TIME SAVINGS CAN BE QUITE VARIABLE, DEPENDING ON THE WORK ENVIRONMENT. HOWEVER, 50 MINUTES PER WEEK WAS USED AS AN AVERAGE.

. INTERFACING ALLOWS A WORKSTATION USER TO ACCESS INFORMATION FROM MANY SOURCES JUST AS EASILY AS GATHERING INFORMATION OFF HIS OWN ELECTRONIC FILES. THE PRIMARY TIME SAVINGS IS TIME TO DECIDE WHAT INFORMATION IS WORTH THE EFFORT TO OBTAIN IT AND THIS IS AN EXECUTIVE JUDGMENT PROBLEM, BECAUSE TRANSLATION TIME AND COST MUST BE COMPARED WITH EQUIPMENT VAL

IN

FOR EXAMPLE, TO USE AN EXTERNAL DATABASE, A MANAGER MUST EITHER USE IT IN HARD COPY AND MODIFY IT BY HAND (OFF THE WORKSTATION) OR HAVE IT MODIFIED TO BE USED ON HIS SYSTEM. IF A MANAGER WERE ABLE TO INTERFACE THE DATA-BASE DIRECTLY, THERE WOULD BE A TIME SAVINGS.

- THE NEED FOR THE INTERFACING FUNCTION IS ILLUSTRATED WITH THE PROBLEMS IN CHOOSING AN EXTERNAL DATABASE. IN CHOOSING AN EXTERNAL DATABASE, A MANAGER MUST FIRST HAVE SOMEONE CHECK ALTERNATIVE DATABASES, DISCUSS THE PROS AND CONS OF EACH DATABASE, AND THEN WORRY ABOUT INTERFACING THE EXTERNAL DATABASE WITH COMPANY-OWNED FILES. WITH THE INTERFACING FUNCTION, A MANAGER COULD CHECK ALTERNATIVE DATABASES BY INTERFACING DIRECTLY INTO THEM.

- THE TIME SAVINGS FOR DOCUMENT PREPARATION IS THE DECREASE IN TIME NECESSARY FOR A MANAGER TO REVIEW AND MODIFY A DOCUMENT OR BOILERPLATE. ESSENTIALLY,

IT IS AN ELECTRONIC "CUT AND PASTE" SYSTEM.

THEREFORE, THE TIME SAVINGS IS THE DIFFERENCE BETWEEN "CUT AND PASTE" AND ELECTRONIC EDITING. THE TIME SAVINGS WAS DETERMINED TO BE APPROXIMATELY TWENTY FIVE MINUTES ON AVERAGE. BECAUSE MANY MANAGERS SEND VERY FEW LETTERS AND MEMOS, AND ALSO HAVE EFFICIENT WAYS TO HANDLE EDITING THEM.

. THE TIME SAVINGS FOR DOCUMENT PREPARATION IS THE TIME NO LONGER USED TO PHYSICALLY MODIFY A DOCUMENT, INCLUDING MERGES WITH PORTIONS OF OTHER DOCUMENTS.

. AN EXAMPLE OF THE USE OF DOCUMENT PREPARATION IS A MANAGER, IN MODIFYING A DOCUMENT, MAY REFER TO SEVERAL STORED PARAGRAPHS OR PREVIOUS DOCUMENTS AND MERGE THEM INTO THE DOCUMENT. PHRASES MAY ALSO BE ALTERED ELECTRONICALLY.

. PLEASE NOTE THAT THE TIME SAVINGS FOR THE SECRETARIAL TEXT EDITING FUNCTION IS NOT

INCLUDED IN THE MANAGEMENT WORKSTATION, AS THAT WAS NOT THE SCOPE OF THIS STUDY.

- MESSAGE CONTROL AND ALERTING OF AN EXECUTIVE WHEN A CALL COMES IN CAN SAVE TIME BECAUSE HE IS NOT WAITING FOR CALLS OR LOSING IMPORTANT CALLS. SINCE MANAGERS OFTEN COMMUNICATE VERY OFTEN WITH EACH OTHER, THE TIME SAVINGS WAS DETERMINED TO BE APPROXIMATELY 40 MINUTES PER WEEK.

  . AN EXAMPLE OF THE USE OF A MESSAGE CONTROL AND ALERTING FUNCTION IS A MANAGER HAVING ALL MESSAGES DISPLAYED WHEN CALLING FOR THEM FROM THE MANAGEMENT WORKSTATION OR A SALES EXECUTIVE BEING NOTIFIED WHEN HIS KEY CUSTOMER IS CALLING.

- REMOTE LOCATION OPERATION CAN ENSURE THAT THE EXECUTIVE HAS KEY INFORMATION WITH HIM AS HE TRAVELS. THUS TIME SAVINGS ARE PACKING DATA AND FILES NECESSARY FOR TRAVEL. A TIME SAVINGS OF

ABOUT TWENTY FIVE MINUTES WAS CHOSEN, BASICALLY BECAUSE THIS IS SUCH A NEW WAY FOR AN EXECUTIVE TO OPERATE.

- REMOTE LOCATION OPERATION TIME SAVINGS ARE POSSIBLE THROUGH THE ABILITY TO ACCESS KEY INFORMATION DIRECTLY WITHOUT HAVING TO TRANSPORT HARD COPY AND WORK WITH IT OFF THE MANAGEMENT WORKSTATION SYSTEM.
- TIME SAVINGS MAY INCREASE DRAMATICALLY IN THE FUTURE.
- AN EXAMPLE OF THE USE OF A MANAGEMENT WORKSTATION SYSTEM FOR THE REMOTE LOCATION OPERATION FUNCTION IS A MANAGER WOULD ACCESS THE FILES OF A WORKSTATION SYSTEM WITH PORTABLE TERMINAL USED DURING TRAVEL OR AWAY FROM THE OFFICE.

- THE BASIC PHILOSOPHY IN ASSIGNMENT OF TIME SAVINGS IS TO BE CONSERVATIVE.

CONVERSION OF TIME SAVINGS TO DOLLAR VALUE

SEPARATION OF MANAGEMENT TIME SAVINGS IS REQUIRED TO CONVERT TIME SAVINGS TO DOLLAR VALUE.

SECTOR	NUMBER OF PERSONNEL (000'S) MANAGEMENT/PROFESSIONAL
FEDERAL GOVERNMENT	656
STATE GOVERNMENT	399
LOCAL GOVERNMENT	861
MANUFACTURING	4244
BANKING	632
INSURANCE	952
ACCOUNTING	166
FINANCE	345
	8255

- WORKSTATION USERS WERE CHOSEN TO PERFORM MANAGEMENT/ PROFESSIONAL TASKS.

- DATA FOR THESE CLASSIFICATIONS WAS OBTAINED BY DETAILED OCCUPATIONAL STATISTICS PUBLISHED BY THE U.S. CENSUS DEPARTMENT.
  - DETAILED OCCUPATIONAL STATISTICS CAN BE FOUND IN THE 1970 U.S. POPULATION CENSUS (U.S. SUMMARY PAGES 1-739 - 1-745 DOCUMENT NUMBER 1973-511-762/34).

FOR ALL INDUSTRIES STUDIED

THE TOTAL TIME SAVINGS ATTRIBUTED TO THE MANAGER WORKSTATION IS 32,335/WEEK OR 2,542,800 HOURS/YEAR FOR EACH 1000 EMPLOYEES.

- A TOTAL OF 1.7 BILLION HOURS

  (10% OF INDUSTRY WORK TIME)

- FOR MANAGEMENT/PROFESSIONAL

  OR 1.68 BILLION HOURS

USING MANAGEMENT/PROFESSIONAL COST RATES INCLUDING OVERHEAD

THE SAVINGS ARE:

LOW $10/HR. X 1.68 = $16.8 BILLION

MEDIUM $20/HR. X 1.68 = $33.6 BILLION

HIGH $40/HR. X 1.68 = $67.2 BILLION

ASSUMING A FIRM WILL PAY 1/3 OF SAVINGS FOR EQUIPMENT, THE YEARLY POTENTIAL MARKET IS:

LOW $ 5.6 BILLION

MEDIUM $11.2 BILLION

HIGH $22.4 BILLION

TIME SAVED WITH A MANAGEMENT WORKSTATION

(PER USER, PER 40 HOUR WEEK)

SYSTEM FUNCTION	MINUTES/WEEK SAVED
• FILING CONTROL	50
• SCHEDULING	10
• SORTING AND LIGHT COMPUTATION	35
• INTERFACING	50
• DOCUMENT PREPARATION	25
• MESSAGE CONTROL/ALERTING	40
• REMOTE LOCATION OPERATION	25
• TOTAL TIME SAVED (PER 40 HOUR WEEK)	235

* NOTE: TIME SAVINGS ARE CONSERVATIVE TO ENSURE THAT THE FORECAST IS SECURE

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

FEDERAL GOVERNMENT

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING	50	10	35	50	25	40	25
LEGAL	50	10	35	50	25	40	25
OPERATIONS AND SERVICES MANAGEMENT	50	10	35	50	25	40	25
ENGINEERING/TECHNICAL	50	10	35	50	25	40	25

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

FEDERAL GOVERNMENT

NO. EMPLOYEES IN 000's	JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
120	ACCOUNTING	100	20	70	100	50	80	50		470
68	LEGAL	57	11	40	57	28	45	28		266
165	OPERATIONS AND SERVICES MANAGEMENT	137	27	96	137	69	109	69		644
303	ENGINEERING/TECHNICAL	253	51	177	253	126	202	126		1188
656	TOTAL	547	109	383	547	273	436	273		2568

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

STATE GOVERNMENT

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
FINANCIAL ADMINISTRATION	50	10	35	50	25	40	25
GENERAL CONTROL	50	10	35	50	25	40	25
SERVICES MANAGEMENT	50	10	35	50	25	40	25
TRANSPORTATION	50	10	35	50	25	40	25
POLICE	50	10	35	50	25	40	25

STATE GOVERNMENT

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
97	FINANCIAL ADMINISTRATION	81	16	57	81	40	65	40		380
52	GENERAL CONTROL	43	9	30	43	22	35	22		204
232	SERVICES MANAGEMENT	193	39	135	193	97	155	97		909
6	TRANSPORTATION	5	1	4	5	3	4	3		25
12	POLICE	10	2	7	10	5	8	5		47
399	TOTAL	332	67	233	332	167	267	167		1565

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

LOCAL GOVERNMENT

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
FINANCIAL ADMINISTRATION	50	10	35	50	25	40	25
GENERAL CONTROL	50	10	35	50	25	40	25
SERVICES MANAGEMENT	50	10	35	50	25	40	25
TRANSPORTATION	50	10	35	50	25	40	25
POLICE	50	10	35	50	25	40	25

LOCAL GOVERNMENT

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
126	FINANCIAL ADMINISTRATION	105	21	74	105	53	84	53		495
233	GENERAL CONTROL	195	39	136	195	97	155	97		914
394	SERVICES MANAGEMENT	328	66	230	328	164	263	164		1543
23	TRANSPORTATION	19	4	13	19	10	15	10		90
85	POLICE	71	14	50	71	35	57	35		333
361	TOTAL	713	144	503	718	359	574	359		3375

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

MANUFACTURING

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING	50	10	35	50	25	40	25
LEGAL	50	10	35	50	25	40	25
OPERATIONS	50	10	35	50	25	40	25
ENGINEERING/TECHNICAL	50	10	35	50	25	40	25
MARKETING/SALES	50	10	35	50	25	40	25
WAREHOUSING	50	10	35	50	25	40	25

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

MANUFACTURING

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
561	ACCOUNTING	468	94	327	468	234	374	234		2199
22	LEGAL	18	4	13	18	9	15	9		86
118	OPERATIONS	98	20	69	98	49	79	49		462
2550	ENGINEERING/TECHNICAL	2125	425	1487	2125	1063	1700	1063		9,988
728	MARKETING/SALES	607	121	425	607	303	485	303		2,851
265	WAREHOUSING	221	44	155	221	110	177	110		1,038
4244	TOTAL	3537	708	2476	3537	1768	2830	1768		16624

BANKING

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

JOB FUNCTION \ SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
BANK OFFICERS AND FINANCIAL MANAGERS	50	10	35	50	25	40	25
GENERAL MANAGERS	50	10	35	50	25	40	25
MARKETING/SALES	50	10	35	50	25	40	25

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

BANKING

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
353	BANK OFFICERS AND FINANCIAL MGRS.	294	59	206	294	147	235	147		1382
217	GENERAL MANAGERS	181	36	127	181	90	145	90		850
62	MARKETING/SALES	52	10	36	52	26	41	26		243
632										
	TOTAL	527	105	369	527	263	421	263		2475

INSURANCE

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING/FINANCE	50	10	35	50	25	40	25
INVESTIGATION	50	10	35	50	25	40	25
GENERAL MANAGER	50	10	35	50	25	40	25
TECHNICAL	50	10	35	50	25	40	25
MARKETING/SALES/AGENTS	50	10	35	50	25	40	25

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

INSURANCE

NUMBER OF EMPLOYEES (000's)	JOB FUNCTIONS \ SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
168	ACCOUNTING/FINANCE	140	28	98	140	70	112	70		658
96	INVESTIGATION	30	16	56	80	40	64	40		376
142	GENERAL MANAGER	118	24	83	118	59	94	59		555
61	TECHNICAL (ACTUARIAL/D.P.)	51	10	36	51	25	41	25		239
485	MARKETING/SALES AGENTS	404	81	283	404	202	323	202		1899
952										
	TOTAL	793	159	556	793	396	634	396		3727

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

ACCOUNTING

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTANTS	50	10	35	50	25	40	25
PARTNERS	50	10	35	50	25	40	25

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

ACCOUNTING

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
154	ACCOUNTANTS	128	26	90	128	64	103	64		603
12	PARTNERS	10	2	7	10	5	8	5		47
166	TOTAL	133	28	97	138	69	111	69		650

TIME SAVED WITH A MANAGEMENT WORKSTATION
(PER EMPLOYEE)

FINANCE

JOB FUNCTION / SYSTEM FUNCTION	FILING CONTROL	SCHEDULING	SORTING AND COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION
ACCOUNTING	50	10	35	50	25	40	25
GENERAL MANAGEMENT	50	10	35	50	25	40	25
TECHNICAL	50	10	35	50	25	40	25
CREDIT/SALES	50	10	35	50	25	40	25

TIME SAVED WITH A MANAGEMENT WORKSTATION
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

FINANCE

NUMBER OF EMPLOYEES (000's)	SYSTEM FUNCTIONS / JOB FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT COMPUTATION	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION		TOTAL HOURS/WEEK
98	ACCOUNTING	82	16	57	82	41	65	41		384
44	GENERAL MANAGEMENT (BACK OFFICE)	37	7	26	37	18	29	18		172
25	TECHNICAL	21	4	15	21	10	17	10		98
178	CREDIT/SALES	148	30	104	148	74	119	74		697
345	TOTAL	288	57	202	288	143	230	143		1351

TIME SAVED WITH A MANAGEMENT WORKSTATION
HOURS PER INDUSTRY-WEEK)
(THOUSANDS OF HOURS = EMPLOYEES X HOURS SAVED)

ALL INDUSTRIES

NO. OF EMPLOYEES (000's)	SYSTEM FUNCTIONS	FILING CONTROL	SCHEDULING	SORTING AND LIGHT	INTERFACING	DOCUMENT PREPARATION	MESSAGE CONTROL/ ALERTING	REMOTE LOCATION OPERATION	% OF SECTOR		TOTAL HOURS/WEEK
656	FEDERAL GOVERNMENT	547	109	333	547	273	436	273	7.9%		2568
399	STATE GOVERNMENT	332	67	233	332	167	267	167	4.8%		1565
861	LOCAL GOVERNMENT	718	144	503	718	359	574	359	10.4%		3375
4244	MANUFACTURING	3537	708	2476	3537	1768	2830	1768	51.4%		16,624
632	BANKING	527	105	369	527	263	421	263	7.7%		2475
952	INSURANCE	793	159	556	793	396	634	396	11.5%		3727
166	ACCOUNTING	138	28	97	138	69	111	69	2.0%		650
345	FINANCE	288	57	202	288	143	230	143	4.3%		1351
8255	TOTAL	6880	1377	4819	6880	3438	5503	3438			32,335
	PERCENT IMPORTANCE OF FUNCTION	21.3%	4.3%	14.9%	21.3%	10.6%	17.0%	10.6%			

B. ANALYZING THE MARKET FOR MANAGEMENT WORKSTATIONS BASED ON A SMALL PERCENTAGE OF PRESENT EXPENDITURES PER USER FOR COMPUTER AND OFFICE EQUIPMENT

- EXPENDITURES PER EMPLOYEE FOR COMPUTER AND OFFICE EQUIPMENT, SERVICE AND SUPPLIES WERE PRESENTED IN THE SMALL ESTABLISHMENT SERVICE ANNUAL REPORT (INPUT RESEARCH).
  - FACTOR THESE EXPENDITURES AND REMOVE EXPENDITURES FOR SUPPLIES.
    - ASSUME THAT 70 PERCENT OF OUTSIDE COMPUTER RELATED EXPENDITURES IS FOR EQUIPMENT OR SERVICES.
  - MULTIPLY RESULTANT EXPENDITURES BY .9 TO APPROXIMATE IN A CONSERVATIVE MANNER EXPENDITURES OF ALL COMPANY SIZES.
    - ASSUME THAT LARGER COMPANIES ARE MORE EFFICIENT IN EXPENDITURES ON OFFICE AND COMPUTER EQUIPMENT THAN SMALLER COMPANIES.
  - IN THE BANKING INDUSTRY, TOTAL EXPENDITURES WERE $588 PER EMPLOYEE DERIVATION OF THIS FIGURE IS:

. MULTIPLY $414 PER EMPLOYEE X .7 TO REMOVE EXPENDITURES FOR SUPPLIES.

. MULTIPLY 290 (414 X .7) AND 363 TIMES .9 TO ADJUST FOR MORE EFFICIENT LARGE FIRMS (290 X .9 + 363 X .9 = $588 PER POTENTIAL MANAGEMENT WORKSTATION USER ON OFFICE AND COMPUTER EQUIPMENT).

- MULTIPLY THE EXPENDITURES PER EMPLOYEE BY THE NUMBER OF POTENTIAL MANAGEMENT WORKSTATION USERS IN EACH SECTOR.

. FOR EXAMPLE, EXPENDITURES PER EMPLOYEE FOR COMPUTER EQUIPMENT/SERVICES IN THE BANKING INDUSTRY IS $588. WHEN MULTIPLIED BY 632,000 POTENTIAL MANAGEMENT WORKSTATION USERS (DEFINED BELOW) THE MAXIMUM POTENTIAL AVAILABLE DOLLARS FOR MANAGEMENT WORKSTATIONS IS CALCULATED (ASSUMING ALL EXPENDITURES FOR COMPUTER AND OFFICE EQUIPMENT ARE APPLIED TO MANAGEMENT

IN

WORKSTATIONS), WHICH IS $371 MILLION ($165 MILLION + 206 MILLION).

. ASSUME ALL MANAGERIAL EMPLOYEES, AS PRESENTED IN ITERATION II, ARE POTENTIAL MANAGEMENT WORKSTATIONS USERS (PAGE III - 43).

. ASSUMING 100 PERCENT OF CURRENT EXPENDITURES FOR COMPUTER AND OFFICE EQUIPMENT AND SERVICES FOR MANAGEMENT EMPLOYEES WERE APPLIED TO A MANAGEMENT WORKSTATION, THE ULTIMATE MARKET COULD BE CALCULATED, WHICH IS 2.6 BILLION.

- OBVIOUSLY, 100 PERCENT OF COMPUTER AND OFFICE RELATED EXPENDITURES WILL NOT BE APPLIED TO MANAGEMENT WORKSTATIONS.
- ASSUME EXPENDITURES AVAILABLE FOR MANAGEMENT WORKSTATIONS WILL BE THE SUM OF:

- 10 PERCENT OF COMPUTER EXPENDITURES.
- 10 PERCENT OF OFFICE EQUIPMENT EXPENDITURES.

- USING THE EXPENDITURES AVAILABLE FOR MANAGEMENT WORKSTATIONS, THE POTENTIAL MARKET FOR MANAGEMENT CAN BE CALCULATED.
  - THE POTENTIAL FOR MANAGEMENT WORKSTATIONS IS (.10 x $1,205) + (.10 x $1,407) OR $261 MILLION.

THE ULTIMATE MARKET

FOR MANAGEMENT WORKSTATIONS

	EXPENDITURES PER EMPLOYEE			POTENTIAL WORK-STATION USERS (,000's)	PRESENT EXPENDITURE ($ MILLIONS)	
	COMPUTER (SMALL ESTAB.)	OFFICE (SMALL ESTAB.)	OFFICE AND COMPUTER EQUIPMENT		COMP.	OFC.
FEDERAL GOVERNMENT	175	122	220	656	73	72
STATE GOVERNMENT	167	117	210	399	42	42
LOCAL GOVERNMENT	142	99	179	861	77	77
MANUFACTURING	208	167	281	4244	556	638
BANKING	414	363	588	632	165	206
FINANCE	368	329	528	952	221	282
INSURANCE	217	191	308	345	47	59
ACCOUNTING	234	205	332	166	24	31
TOTAL					1205	1407

C. ANALYSIS USING A PROJECTION OF THE CURRENT WORD PROCESSING MARKET

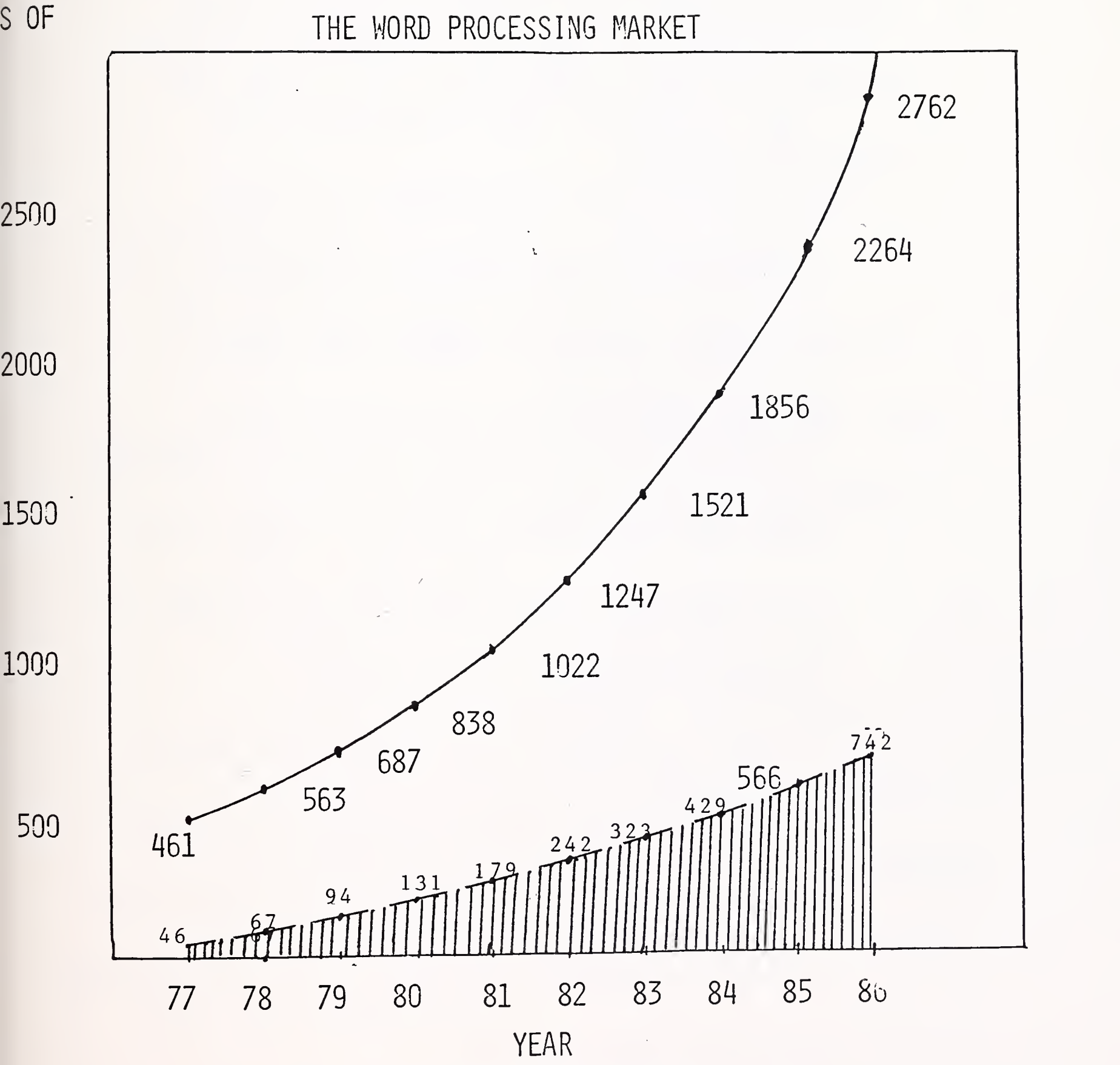
- THE METHODOLOGY USED TO CALCULATE THE FUTURE FOR MULTI-STATION SHARED LOGIC SYSTEMS WAS:
  - CALCULATE THE TOTAL SALES FOR MEMORY TYPEWRITERS AND WORD PROCESSORS. COMPANIES ANALYZED IN THE 1977 MARKET WERE:
    - IBM
    - XEROX
    - WANG
    - BURROUGHS
    - EXXON
    - LEXITRON
    - CPT
    - ADDRESSOGRAPH-MULTIGRAPH
    - LITTON
    - OTHER WORD PROCESSING VENDORS WERE COMBINED.

- IT WAS ASSUMED THAT 67 PERCENT OF 1977 SALES (UNITS) WERE FOR THE MEMORY TYPEWRITER COMPONENT OF THIS MARKET.
- A MARKET GROWTH FIGURE OF 22 PERCENT ANNUALLY HAS BEEN ASCERTAINED FROM OTHER STUDIES.
- ASSUMING THAT ONE THIRD OF SALES WILL BE FOR WORD PROCESSING EQUIPMENT IN 1985, THE MARKET PROJECTION FOR THE 1985 WORD PROCESSOR MARKET CAN BE MADE.
- ASSUMING IN 1985 ALL MULTI-STATION SYSTEMS WILL USE SHARED-LOGIC PROCESSORS, THE 1985 MARKET FOR MULTI-STATION SHARED LOGIC SYSTEMS CAN BE CALCULATED.
  - IN 1985, 25 PERCENT OF THE WORD PROCESSOR MARKET WILL BE MULTI-STATION SHARED LOGIC SYSTEMS.

• IN 1977, VENDOR SALES FOR WORD PROCESSING SYSTEMS WERE $461 MILLION.

- THE CONSENSUS OF VENDOR OPINION IS THAT 22 PERCENT ANNUAL GROWTH RATE OF THE WORD PROCESSING MARKET, VENDOR SALES FOR WORD PROCESSING SYSTEMS IN 1985 WILL BE ABOUT $2.3 BILLION.
  - 25 PERCENT, OR $566 MILLION WILL BE SALES OF MULTI-STATION SHARED LOGIC SYSTEMS.
    - THE MARKET FOR MANAGEMENT WORKSTATIONS IS THE MULTI-STATION SHARED LOGIC SYSTEMS MARKET.

S OF


THE WORD PROCESSING MARKET
2500
2000
1500
1000
500
2762
2264
1856
1521
1247
1022
838
687
563
461
742
566
429
323
242
179
131
94
67
46
77
78
79
80
81
82
83
84
85
86
YEAR
TOTAL WORD PROCESSOR MARKET
MULTI-STATION SHARED LOGIC SYSTEMS MARKET

SUCCESS OF NEW PRODUCT ENTRANTS

- THE FIRST ENTRANT INTO THE WORD PROCESSING MARKET WAS IBM WITH THE INTRODUCTION OF THE IBM MAG CARD TYPEWRITER IN 1964.
  - INDUSTRY SOURCES (XEROX, ETC.) STATE APPROXIMATELY 70 PERCENT OF PRODUCTS (UNITS) INSTALLED ARE MANUFACTURED BY IBM.
  - THE REMAINING 30 PERCENT OF THE MARKET IS DIVIDED AMONG OVER 50 COMPANIES IN FIERCE COMPETITION, AND COMPETITION IN THE WORD PROCESSING MARKET IS EXPECTED TO INCREASE IN THE FUTURE.
  - IN 1976, THE FEDERAL TRADE COMMISSION ADVISED IBM THAT IT WOULD CONDUCT AN INVESTIGATION TO DETERMINE WHETHER IBM MONOPOLIZES ANY PORTION OF THE OFFICE TYPEWRITER BUSINESS. THIS INVESTIGATION WAS CLOSED EARLY IN 1978.
- MAJOR COMPETITION IN THE WORD PROCESSING MARKET IS FROM IBM, XEROX, BURROUGHS (REDACTRON), EXXON (VYDEC),

MAI (WORDSTREAM), CPT, WANG, AND OTHER COMPANIES.

- TWO COMPANIES WHO RECENTLY INTRODUCED NEW PRODUCTS INTO THE WORD PROCESSING MARKET WILL BE ANALYZED.
  - WANG LABORATORIES, INC. CHANGED ITS WORD PROCESSING PRODUCT LINE FROM CASSETTE BASED EQUIPMENT TO DISKETTE BASED EQUIPMENT IN JUNE, 1976. WANG IS A LEADING MANUFACTURER OF BOTH COMPUTER AND WORD PROCESSING EQUIPMENT AND IS SEEN AS BEING IN A VERY ENVIABLE POSITION IN TERMS OF THE FUTURE.
  - CPT CORPORATION'S EFFORTS ARE SOLELY AIMED AT THE WORD PROCESSING MARKET. UNLIKE WANG, CPT PURCHASES OFF-THE-SHELF COMPONENTS DIRECTLY FROM MANUFACTURERS AND MODIFIES THEM FOR MANUFACTURE OF THE CPT 4200 AND THE NEWLY INTRODUCED CPT 8000.
- OTHER NEW ENTRANTS INCLUDE:
  - THE INTRODUCTION OF THE WORDSTREAM SYSTEM BY MANAGEMENT ASSISTANCE, INC. IN LATE 1977, MADE

POSSIBLE THROUGH THE ACQUISITION OF AVIONIC PRODUCTS ENGINEERING CORP.

- INTRODUCTION OF THE XEROX 850 ELECTRONIC DISPLAY TYPING SYSTEM IN 1977.
- INTRODUCTION OF THE TEXT ED III DISTRIBUTED WORD PROCESSING SYSTEM BY EDIT SYSTEMS, INC. IN 1978.
- INTRODUCTION OF DATA WORD, A PACKAGE BY BASIC FOUR (MAI), WHICH COMBINES WORD PROCESSING AND DATA PROCESSING FUNCTIONS ON THE COMPANY'S 610 AND 730 COMPUTER MODELS.
- INTRODUCTION OF A DEVICE BY XEROX TO READ IBM MAG CARDS ONTO A XEROX 850 FLOPPY DISK STORAGE.

INP

WANG LABORATORIES, INC.

- MANY PROJECTIONS SEE WANG AS BEING A STRONG FORCE IN THE OFFICE EQUIPMENT MARKETPLACE, PRIMARILY DUE TO THE ESTABLISHED REPUTATION AND TECHNOLOGICAL EXPERTISE IN BOTH THE WORD AND DATA PROCESSING AREAS.
- WANG LABORATORIES, INC. SEES THE WORD PROCESSING MARKET AS THE "MARKET FOR COMPUTERS SOLD FOR INCREASED EFFICIENCY IN TEXT PROCESSING AND REPETITIVE TYPING."
- THE FIRST WORD PROCESSING SYSTEM WAS INTRODUCED IN 1972. IT WAS A CASSETTE BASED SYSTEM. IN JUNE, 1976, WANG DEPARTED FROM CASSETTE BASED EQUIPMENT WITH THE INTRODUCTION OF THE WPS SYSTEMS 10, 20 AND 30. NEW ADDITIONS TO THE WANG WORD PROCESSING SYSTEMS LINE ARE THE SYSTEM 5, SYSTEM 25, AND THE SYSTEM 10A.
- THE SYSTEM 5 IS CHARACTERIZED AS THE LOWEST PRICED CRT, FLOPPY-DISKETTE BASED TEXT-EDITING EQUIPMENT AVAILABLE.

THE PRICE RANGE FOR THE SYSTEM 5 IS $5,900 (FOR USERS WITH MODEST EDITING REQUIREMENTS AND NO NEEDS FOR A PRINTER) TO $13,900 (FEATURES FOR HEAVY REVISION, COMPLICATED DOCUMENT ASSEMBLY, MATH SUPPORT, SORT, DECISION PROCESSING, AND INFORMATION PROCESSING AND INCLUDES A PRINTER). ANY OF THE SYSTEM 5 MACHINES CAN BE UPGRADED TO A SYSTEM 20, 25, OR 30 AS USER REQUIREMENTS INCREASE.

- INDUSTRY SOURCES NOW ACKNOWLEDGE WANG AS THE LEADING SUPPLIER OF CRT-BASED WORD PROCESSING SYSTEMS, BASED ON BOTH, TECHNOLOGICAL INNOVATIONS AND WORKSTATIONS INSTALLED.

- WANG IS CURRENTLY SHIPPING WORD PROCESSING WORKSTATIONS AT THE RATE OF 700-800 WORKSTATIONS PER MONTH.

- WANG CONSIDERS ITS MAJOR COMPETITORS TO BE IBM, XEROX, BURROUGHS (REDACTRON), AND EXXON (VYDEC).

  - WANG LABORATORIES SEES ITS ABILITY TO COMPETE IN THE WORD PROCESSING MARKET DEPENDANT ON ITS

CONTINUED CAPABILITY TO INNOVATE BY APPLYING LARGE SCALE COMPUTER TECHNOLOGY TO DEDICATED TEXT EDITING SYSTEMS.

- WANG BELIEVES THE INDUSTRY WILL CONTINUE TO MAKE SIGNIFICANT TECHNOLOGICAL ADVANCES AND COMPETITION IS LIKELY TO INCREASE.

CPT CORPORATION

- CPT CORPORATION, FOUNDED IN 1971, IS DEDICATED SOLELY TO THE DESIGN AND MANUFACTURE OF WORD PROCESSING EQUIPMENT.
  - CPT PURCHASES PRINTERS (IBM, QUME) AND OTHER OFF THE SHELF COMPONENTS DIRECTLY FROM MANUFACTURERS.
  - WITH SUBCONTRACTED AND MODIFIED OFF THE SHELF COMPONENTS, CPT MANUFACTURES THE TWO WORD PROCESSING SYSTEMS AVAILABLE. THE CPT 4200 AND THE CPT 8000.
- THE CPT 8000 WAS INTRODUCED IN SEPTEMBER, 1977 AS THE COMPANIES SECOND GENERATION WORD PROCESSOR. THE SYSTEM INCORPORATES A CRT, A PROGRAMMABLE MICROCOMPUTER, AN ASCII KEYBOARD, A DUAL FLOPPY DISK DRIVE, AND SEPARATE PRINTERS.
  - THE CPT 8000 HAS A PRICE RANGE OF FROM $10,000

TO $24,000, DEPENDING ON THE MODEL SELECTED AND NUMBER OF PRINTERS USED.

- BY THE END OF OCTOBER, 1977, APPROXIMATELY 75 CPT 8000 SYSTEMS WERE SOLD OR RENTED. 174 ADDITIONAL ORDERS OF THE CPT 8000 WERE EXPECTED TO BE DELIVERED BY THE END OF 1977.
- 1978 FISCAL YEAR REVENUES FOR CPT CORPORATION INCREASED 55 PERCENT OVER THE PREVIOUS YEAR. CPT STATES THE GAIN WAS DUE BOTH TO THE STEADY DEMAND FOR THE CPT 4200 AND THE CPT 8000.
- CPT VIEWS THE COMPETITIVE NATURE OF THE MARKET AS INTENSE. APPROXIMATELY 70 PERCENT OF THE MARKET IS HELD BY IBM. THE REMAINING 30 PERCENT OF THE MARKET IS DIVIDED AMONG APPROXIMATELY 50 OTHER COMPANIES.
  - CPT REALIZES THAT BECAUSE IT IS A RELATIVELY SMALL COMPANY ENGAGED ONLY IN THE BUSINESS OF SELLING AUTOMATIC TEXT-EDITING WORD PROCESSORS AND THEIR COMPONENTS, IT MAY HAVE A COMPETITIVE

DISADVANTAGE IN WITHSTANDING INTENSE PRICE COMPETITION FROM COMPETITORS WITH LARGER, MORE DIVERSIFIED BUSINESSES.

- THE QUARTER ENDING SEPTEMBER 30, 1978, MARKED CPT'S 25TH CONSECUTIVE PROFITABLE QUARTER, WITH AFTER TAX EARNINGS UP OVER 100 PERCENT OF THOSE 1 YEAR AGO.

INP

MANAGEMENT ASSISTANCE, INC.

- MAI ACQUIRED THE WORD PROCESSING BUSINESS OF AVIONIC PRODUCTS ENGINEERING CORP. FOR APPROXIMATELY $3.8 MILLION IN OCTOBER, 1977, AND DEVELOPED THE WORDSTREAM SYSTEM.
  - THE WORDSTREAM SYSTEM IS A COMPUTER BASED, SHARED LOGIC, MULTI-TERMINAL WORD PROCESSING SYSTEM.
  - THE BASIC WORDSTREAM SYSTEM INCLUDES:
    - A CENTRAL PROCESSING UNIT
    - TWO DISPLAY TERMINALS
    - ONE STANDARD WIDTH PRINTER
    - A 30,000 WORD DICTIONARY TO VERIFY SPELLING.
    - AN IBM MAG CARD READER/CONVERTER
  - THE COST OF A BASIC WORDSTREAM SYSTEM IS APPROXIMATELY $40,000.
- THE WORDSTREAM SYSTEM WAS TEST MARKETED IN THE NEW YORK CITY METROPOLITAN AREA IN 1977.

- BY THE END OF 1977, MORE THAN 25 MAJOR COMPANIES HAD WORDSTREAM SYSTEMS INSTALLED.
- THE WORDSTREAM SYSTEM WAS INTRODUCED NATIONWIDE AND INTERNATIONALLY LATE 1978 AFTER A SUCCESSFUL TEST MARKETING PROGRAM.

INP

XEROX

- XEROX ENTERED THE WORD PROCESSING FIELD LATE IN 1974 WITH THE XEROX 800 SERIES.
- THE XEROX 850 ELECTRONIC DISPLAY TYPING SYSTEM WAS ONE OF 5 MAJOR NEW PRODUCTS INTRODUCED IN 1977.
- THE WORD PROCESSOR LINE OFFERED BY XEROX INCLUDES:
  - SINGLE AND DUAL CARD OR TAPE WORD PROCESSORS.
  - SHARED LOGIC WORD PROCESSING SYSTEMS.
- THE OFFICE SYSTEMS DIVISION, WHICH IS RESPONSIBLE FOR WORD PROCESSING AND FACSIMILE EQUIPMENT, INCREASED ITS REVENUES BY 40 PERCENT IN 1977.
- XEROX SEES ITS COMPETITION AT THE HIGH END OF THE PRODUCT AREA (CRT DISPLAY SYSTEMS). COMPANIES WHICH ALSO PRODUCE CRT DISPLAY WORD PROCESSING SYSTEMS ARE VYDEC, LEXITRON, LINOLEX/3M, WANG, CPT, IBM AND OTHERS. COMPETITION, ALREADY FIERCE, WILL INCREASE IN THE HIGH END OF THE CRT DISPLAY WORD PROCESSING SYSTEMS MARKET.

A SUMMARY OF THE MARKET POTENTIAL

FOR A MANAGEMENT WORKSTATION

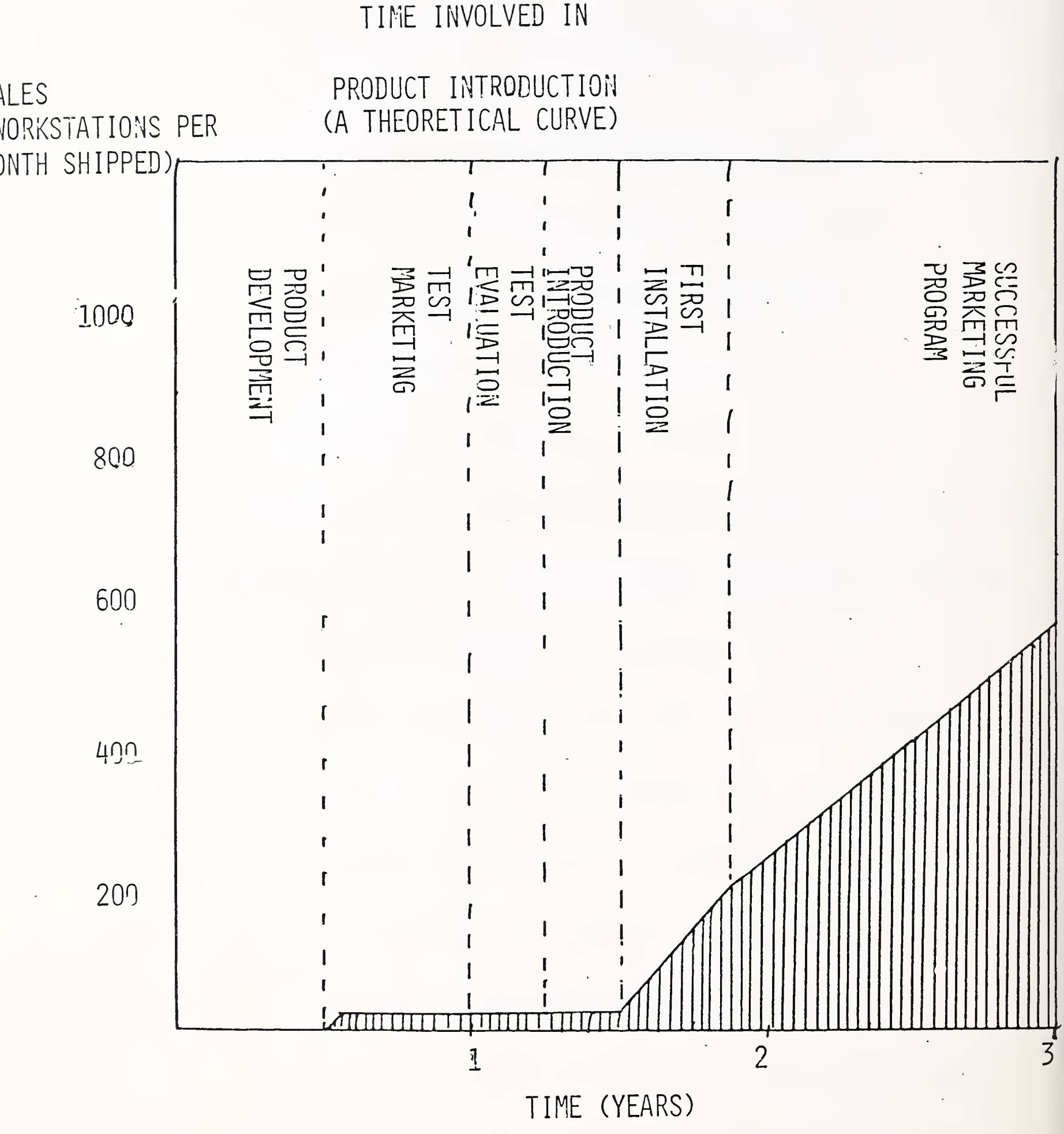
- THE SALES GROWTH ATTRIBUTED TO WANG AND CPT SECOND GENERATION WORD PROCESSING EQUIPMENT ARE GOOD EXAMPLES OF MARKET ACCEPTANCE OF SALABLE EQUIPMENT.
- SALES OF WANG'S NEW WORD PROCESSOR LINE INCREASED SHIPMENTS OF WORD PROCESSING SYSTEMS FROM 200 SYSTEMS PER MONTH AT YEAR END, 1976 TO 800 SYSTEMS PER MONTH AT YEAR END, 1978. THIS IS AN AAGR OF 100 PERCENT PER YEAR.
- SALES OF THE NEW CPT8000 WERE OVER $7 MILLION WITHIN 1 YEAR AFTER INTRODUCTION, THERE WAS NO DECREASE IN SALES OF THE OLDER CPT 4200.
- SALES OF WORD PROCESSING EQUIPMENT PER OUTLET WAS (PER YEAR):
  - $359,000 FOR WANG. THIS IS $284,000 SALES VOLUME ANNUALLY PER SALESMAN.
  - 140,000 PER INDEPENDENT SALES AGENCY.

- WANG AND CPT USE DIFFERING MARKETING STRUCTURES.
  - WANG HAS A TOTAL OF 262 WORD PROCESSING SALESMEN SITUATED IN 207 OFFICES. EACH OFFICE ALSO CONTAINS DATA PROCESSING SALESMEN AND A SUPPORT STAFF.
  - CPT SELLS ALL EQUIPMENT THROUGH 144 INDEPENDENT SALES AGENCIES, ALSO SELLING OTHER EQUIPMENT.

MARKET POTENTIAL FOR A MANAGEMENT WORKSTATION

- THERE ARE TWO INTERRELATED COMPONENTS NECESSARY FOR A SUCCESSFUL PRODUCT. THESE COMPONENTS ARE:
  - A SALABLE PRODUCT BACKED BY A COMPETENT MARKETING PROGRAM.
  - A RESPONSIVE MARKET.
- THERE IS A TIME ELEMENT INVOLVED TO TURN A CONCEPTUALIZED PRODUCT INTO A SUCCESSFUL PRODUCT. IN ORDER TO DEVELOP A SUCCESSFUL PRODUCT:
  - A CONCEPTUALIZED PRODUCT MUST BE DEVELOPED INTO A SALABLE PRODUCT. BY ASSUMPTION, TIME INVOLVED IN PRODUCT DEVELOPMENT IS APPROXIMATELY 6 MONTHS.
  - THE SALABILITY OF A PRODUCT MUST UNDERGO A TEST.
    - A TEST MARKETING PROGRAM IS ASSUMED TO TAKE APPROXIMATELY 6 MONTHS FOR A MULTI-STATION SHARED LOGIC INFORMATION PROCESSING SYSTEM. ACTUAL TIME INVOLVED IN TEST MARKETING MAY BE MUCH LONGER THAN 6 MONTHS.

- AFTER THE TEST MARKETING PROGRAM IS EVALUATED AND A COMPANY IS ASSURED THEY HAVE A SALABLE PRODUCT, THE PRODUCT WILL BE INTRODUCED OUTSIDE THE TEST MARKETING AREA.
- AFTER ORDERS ARE TAKEN, A PRODUCT, OR A MULTI-STATION SHARED LOGIC INFORMATION PROCESSING SYSTEM, MUST BE ASSEMBLED AND TESTED PRIOR TO INSTALLATION. IF INITIAL INSTALLATIONS ARE FAVORABLE, AND THE PRODUCT IS ACCEPTED, THEN THIS CAN BE A SUCCESSFUL PRODUCT.


TIME INVOLVED IN
PRODUCT INTRODUCTION
(A THEORETICAL CURVE)
ALES
WORKSTATIONS PER
ONTH SHIPPED)
1000
800
600
400
200
PRODUCT DEVELOPMENT
TEST MARKETING
EVALUATION TEST
PRODUCT INTRODUCTION TEST
FIRST INSTALLATION
SUCCESSFUL MARKETING PROGRAM
1
2
3
TIME (YEARS)

INPU

- TO ANALYZE THE RESPONSIVENESS OF THE MARKET, TWO COMPANIES THAT RECENTLY INTRODUCED THEIR SECOND GENERATION WORD PROCESSING SYSTEMS AND WERE ANALYZED AS COMPANIES WITH SUCCESSFUL NEW PRODUCT ENTRANTS ARE ANALYZED. THESE COMPANIES ARE:
  - WANG LABORATORIES, INC.
  - CPT CORPORATION
- CPT CORPORATION INTRODUCED THEIR SECOND GENERATION WORD PROCESSOR IN SEPTEMBER, 1977.
- WANG LABORATORIES, INC. INTRODUCED THE FIRST STAGE OF ITS SECOND GENERATION WORD PROCESSING SYSTEM LINE IN JUNE, 1976.

WANG LABORATORIES, INC.

- WANG LABOROATORIES, INC. CONSIDERS THE DATA-PROCESSING MARKET TO CONTAIN 4 SEGMENTS. THESE MARKET SEGMENTS ARE:

  - INFORMATION PROCESSING
    - . THIS IS THE MARKET FOR SMALL BUSINESS SYSTEMS.
    - . THE PRICE RANGE OF SYSTEMS SOLD TO THIS MARKET SEGMENT IS $10,000 TO $70,000.
  - PROBLEM SOLVING
    - . THIS IS THE MARKET FOR COMPUTERS SOLD PRIMARILY TO PERFORM REPETITIVE NUMERICAL CALCULATIONS.
    - . SYSTEMS SOLD IN THIS MARKET SEGMENT HAVE A PRICE RANGE OF FROM $5,400 TO $35,000.
  - DISTRIBUTED DATA PROCESSING
    - . THIS IS THE MARKET FOR INTELLIGENT TERMINALS OR SMALL COMPUTERS.

- . THE PRICE RANGE OF AVAILABLE WANG SYSTEMS IS FROM $9,000 TO $45,000

- WORD PROCESSING

  . THE WORD PROCESSING MARKET IS COMPUTERS SOLD FOR INCREASED EFFICIENCY IN TEXT PROCESSING AND REPETITIVE TYPING.

  . THE PRICE RANGE OF WANG WORD PROCESSING SYSTEMS IS FROM $6,000 TO $100,000.

- WANG LABORATORIES DOES NOT SEGMENT ITS SALES FORCE BY PRODUCT LINE. THE PRIMARY REASON FOR THIS IS A DEFINED SET OF MARKET SEGEMENTS IN TERMS OF DIFFERENT COMPUTER APPLICATIONS.
  - IN 1978, WANG INCREASED ITS SALES FORCE BY APPROXIMATELY 20 PERCENT.
  - THE SALES FORCE INCREASE WAS MINIMAL IN FISCAL YEAR, 1977.
- IN MAY, 1972, INITIAL DELIVERIES OF WANG'S FIRST WORD PROCESSOR SYSTEM WERE MADE. THIS WAS THE ONLY WORD

PROCESSOR SYSTEM AVAILABLE FROM WANG UNTIL JANUARY, 1975, WHEN THE MODEL 1222, AN UPDATED VERSION OF THE MODEL 1220, WAS INTRODUCED.

- BOTH SYSTEMS UTILIZED AN IBM SELECTRIC TYPEWRITER AS AN INPUT-OUTPUT DEVICE, AND BOTH WERE DEDICATED TO A SINGLE LINE OF TEXT.

- WANG INTRODUCED ITS SECOND GENERATION WORD PROCESSOR LINE AT THE BEGINNING OF THE 1977 FISCAL YEAR IN JULY, 1976.

- PRIOR TO THE INTRODUCTION OF THE SECOND GENERATION WORD PROCESSOR SYSTEM LINE, WANG WAS DELIVERING FEWER THAN 200 WORKSTATIONS PER MONTH.

- AT THE END OF FISCAL YEAR, 1978, ONLY 2 YEARS AFTER THE INTRODUCTION OF THE NEW WORD PROCESSOR SYSTEM LINE, WANG WAS DELIVERING APPROXIMATELY 800 WORKSTATIONS PER MONTH.

- ONLY 20 PERCENT OF WORD PROCESSING SYSTEMS SOLD BY WANG ARE UNDER SHORT TERM LEASE AGREEMENTS.

- TYPICAL CUSTOMERS OF WANG WORD PROCESSING SYSTEMS ARE:
  - CERTIFIED PUBLIC ACCOUNTING FIRMS.
  - COMMERCIAL BANKS.
  - HEADQUARTERS OF MAJOR RETAIL CHAINS.
- THE SALES FORCE OF WANG IS SPLIT BY PRODUCT, BUT EACH SALES OFFICE HANDLES ALL WANG PRODUCTS.
- THE SALES FORCE SIZE FOR WORD PROCESSING EQUIPMENT IS APPROXIMATELY 1/3 OF THE COMPANIES ENTIRE SALES FORCE.
  - THE COMPANY'S ENTIRE SALES FORCE IS OVER 700 PEOPLE.
  - THE SALES FORCE FOR WORD PROCESSING IS 262 SALESMEN IN 207 OFFICES.
- ASSUME, FOR SIMPLICITY:
  - ALL SALESMEN SELL AN EQUAL AMOUNT (BY DOLLAR VOLUME).
  - THERE ARE NO SIGNIFICANT DIFFERENCES IN WORD PROCESSING SALES FORCE SIZE BETWEEN OFFICES.

- A SALES OFFICE WITH 3 WORD PROCESSING SALESMEN WILL HAVE $852,000 SALES, OR $284,000 SALES VOLUME PER SALESMAN.

WANG LABORATORIES, INC.

(TOTAL SALES EDP & WORD PROCESSING)

SALES	(MILLIONS OF DOLLARS)	INCREMENT (% CHANGE)
1974	59.7	-
1975	71.2	19
1976	91.0	28
1977	126.8	39
1978	198.1	56

CPT CORPORATION

- CPT CORPORATION IS DEDICATED SOLELY TO THE DESIGN AND MANUFACTURE OF WORD PROCESSING SYSTEMS.
  - PRODUCTS OF CPT CORPORATION ARE ITS FIRST GENERATION WORD PROCESSOR, THE CPT 4200, AND ITS SECOND GENERATION PRODUCT, THE CPT 8000.
- THE CPT 8000 WAS INTRODUCED IN SEPTEMBER, 1977.
  - OVER SEVEN MILLION DOLLARS IN INCREASED REVENUES HAD BEEN ATTRIBUTED TO THE NEW CPT 8000 SERIES WORD PROCESSOR BY JULY, 1978.
  - NO SIGNIFICANT INCREASES IN SALES REVENUES HAVE BEEN ATTRIBUTED TO THE FIRST GENERATION WORD PROCESSING SYSTEM, THE CPT 4200.
  - SALES OF THE CPT 4200 HAVE NOT DECREASED SINCE THE INTRODUCTION OF THE NEWER CPT 8000.
- MARKETING OF THE CPT PRODUCT LINE IS ACCOMPLISHED PRIMARILY THROUGH 144 INDEPENDENT SALES AGENCIES.

- THIS REPRESENTS A 25 PERCENT INCREASE IN SALES OUTLETS OVER FISCAL YEAR, 1977.

CPT CORPORATION

SALES	(MILLIONS OF DOLLARS)	INCREMENT (% CHANGE)
1974	6.7	-
1975	7.7	15
1976	10.9	42
1977	13.0	19
1978	20.3	56

DIRECTORY OF WORD PROCESSORS

- A B DICK
  - MAGNA I
  - MAGNA II
- ADDRESSOGRAPH-MULTIGRAPH
  - AMTEXT 225
  - AMTEXT 425
- AES
  - AES PLUS
- AMERICAN TELEPHONE & TELEGRAPH
  - DATASPEED 40/4
- ANDERSON JACOBSON, INC.
  - MODEL 1522
  - MODEL 1562
- APPLIED COMPUTER SYSTEMS
  - SA - 300
  - SA - 400

DIRECTORY OF WORD PROCESSORS (CONT'D)

- ARTEC INTERNATIONAL CORPORATION
  - DISPLAY 2000
- BASE INFORMATION SYSTEMS, INC.
  - ULTRA TEXT - 1
  - ULTRA TEXT F/100
- BONNE TIME SHARING
  - WORD/ONE
- CASCADE DATA
  - CONCEPT II
- COMPAL, INC.
  - WP 56-D
  - WP 32-5
- COMPLETE COMPUTER SYSTEMS
  - 10-WP
- - 12-WP
  - 26-WP

DIRECTORY OF WORD PROCESSORS (CONT'D)

- COMTEK RESEARCH
  - ACCUTEXT
- COMPUGRAPHIC
  - MDT 350
  - WORDCOM
  - UNIFIED COMPUSER
  - EDITWRITER
- COMPUSOURCE
  - WORD PRO
- COMPUTERM
  - 32-630
- CPT CORPORATION
  - CASSETYPE 4200
  - DISKTYPE 8000
- DATAPOINT CORPORATION
  - MODEL 1800
  - MODEL 1152

- DATAPOINT CORP. (CONT'D)
  - 4220 DATASHARE
  - 4533 DATASHARE
- DELTA DATA SYSTEMS CORP.
  - MODEL 7300
- DIABLO SYSTEMS, INC.
  - 1355 WP
- DIGITAL EQUIPMENT CORP.
  - WT78-AA
  - WS78
  - WS100
  - WS200
  - WS102
- DOCUMATION, INC.
  - DOC 5000
- EDIT SYSTEMS, INC.
  - TEXT ED II
  - TEXT ED III

DIRECTORY OF WORD PROCESSORS (CONT'D)

- FOUR-PHASE SYSTEMS, INC.
  - FOREWORD
- GENERAL COMPUTER SYSTEMS, INC.
  - DT IV/8
  - DT II/8
  - SL-600
- INFORMATION CONTROL SYSTEMS
  - WORD SYSTEM
  - ASTROCOMP
- INTERNATIONAL BUSINESS MACHINES
  - IBM MAG CARD/MAG TAPE
  - IBM MEMORY TYPEWRITER 60
  - IBM MEMORY 100
  - IBM OFFICE SYSTEM 6
  - IBM WORD PROCESSOR 32

DIRECTORY OF WORD PROCESSORS (CONT'D)

- JACQUARD SYSTEMS
  - 550 VIDEOCOMPUTER
  - 5100 VIDEOCOMPUTER
- LANIER BUSINESS PRODUCTS
  - LTE
  - NO PROBLEM
  - WORDPLEX 1
  - WORDPLEX/7
- LCS CORPORATION
  - COMPUTEXT
- LEXITRON
  - MODEL 911/912/913
  - MODELS 920/921/922
  - MODELS 941/942/945
  - 1100 SERIES
  - 1200 SERIES
  - 1300 SERIES

DIRECTORY OF WORD PROCESSORS (CONT'D)

- MEGA DATA, INC.
  - MODEL 2001
- MICOM
  - DISPLAY 2000
- MINNESOTA MINING AND MANUFACTURING
  - SERIES 4000
- NBI, INC.
  - SYSTEM I
  - SYSTEM II
  - SYSTEM 3000
- NORELCO
  - WPS
- OLIVETTI
  - S-14/S-24
- - TES 401
  - TES 501
- OMNITEXT CORPORATION
  - SERIES 16 SYSTEM

DIRECTORY OF WORD PROCESSORS (CONT'D)

- ONTEL
  - OPI
- PHILLIPS BUSINESS SYSTEMS, INC.
  - MODEL A
  - MODEL B
- Q1 CORPORATION
  - Q1/LITE
- QUADEX CORP.
  - MODEL 210
  - MODEL 220
  - MODEL 260
  - MODEL 265
  - MODEL 280
- QUALTERM TERMINALS
  - TOM
- QYX (EXXON)
  - LEVEL 1

DIRECTORY OF WORD PROCESSORS (CONT'D)

- QYX (CONT'D)
  - LEVEL 2
  - LEVEL 3
  - LEVEL 4
  - LEVEL 5
- REDACTRON (BURROUGHS)
  - REDACTOR I
  - REDACTOR II
- RICOH OF AMERICA
  - WP/1
- ROYAL
  - CTS
- SAVIN BUSINESS MACHINES
  - 900 WORDMASTER
  - 950 VERITEXT
- SHASTA GENERAL SYSTEMS
  - DAISY

DIRECTORY OF WORD PROCESSORS (CONT'D)

- SPERRY UNIVAC
  - DUAL TAPE MT200
- SYSTEMS MARKETING CONSOLIDATED, LTD.
  - MODEL 332
- TY-DATA
  - EDITER 3600
- TRANSACTION DATA SYSTEMS, INC.
  - TRANS WRITER
- TYCOM
  - STARCOMP
  - DATAMASTER
  - EDITYPER VIP
- VYDEC (EXXON)
  - TEXT PRINTER
  - EDITOR 1146
  - EDITOR 1200
  - EDITOR 1400

DIRECTORY OF WORD PROCESSORS (CONT'D)

- WANG LABORATORIES
  - MODELS 1200/1220/1222
  - WPS 5
  - WPS 10A
  - WPS 20
  - WPS 25
  - WPS 30
- WORDSTREAM (MANAGEMENT ASSISTANCE, INC.)
  - WORDSTREAM
- WORLD INFORMATION SYSTEMS
  - TDS/36
  - TDS/37
- XEROX CORPORATION
  - 800 SERIES
  - 850 SERIES
  - VISUAL TYPE 5400
- XMARK
  - 2002 INFORMATION PROCESSING SYSTEM