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This report is an extension of the previously distributed "Summary of Results of the GUIDE/IBM Study of Advanced Applications" dated 12/70. The additions are primarily in the Preface, Section IV., and Section VI.

INTERNATIONAL BUSINESS MACHINES CORPORATION

Data Processing Division

Advanced Systems Planning

IBM CONFIDENTIAL

## CONTENTS

PREFA	CE	p.1
	Sponsorship of the Study How to Read the Report	p.1 p.1
ı.	INTRODUCTION	1.1
	Aims of the Study The Delphi Technique The Study	I.1 I.1 I.2
II.	GENERAL RESULTS	II.1
	The 1985 World of Data Processing Application Trends Major Required Capabilities	II.1 II.3 II.5
III.	DETAILED APPLICATION RESULTS	III.1
	Agriculture Airlines Business Assistance Computer Assisted Research Distribution and Retail Ecology Education Financial Freight Transportation Government Service Home Terminals Information Systems Information Utilities Judicial and Legislative Manufacturing and Process Media Medical Office Assistance Public and Private Transit Utilities	III.5 III.9 III.15 III.23 III.28 III.34 III.42 III.50 III.63 III.72 III.92 III.99 III.110 III.126 III.131 III.143 III.143 III.143 III.143 III.143 III.143

IV.	DETAILED CAPABILITIES RESULTS	IV.1
	Communication Requirements Terminal Capabilities Data Base Requirements Capacity and Availability Advanced Capabilities Application Software Requirements Data Processing Services Special Products	IV.4 IV.16 IV.33 IV.50 IV.59 IV.74 IV.104
V.	STUDY ORGANIZATION	V.1
VI.	DATA ANALYSIS	VI.1
	The Respondent Panel Distribution The Consensuses	VI.1 VI.2
	Comparison of Results With Other Studies and Published Articles	VI.4
APPEN	DICIES	
	Appendix A	A.1
	Applications Deleted From the Original List	A.1
	Appendix B	B.1
	List of Respondents	B.1
	Appendix C	C.1
	Alphabetic List of Applications	C.1
	Appendix D	D.1
	Drice /Derformance Consitive Applications	D. 7

#### **PREFACE**

## Sponsorship And Distribution

The study reported was sponsored jointly by the User Strategy Evaluation Committee (USEC) of GUIDE International and by the Advanced Systems Planning Department, Data Processing Division of International Business Machines Corporation.

The results of the study in the form of a summary have been distributed to all respondents, to a distribution list within IBM, and through USEC to the user community. This report is an extension of the summary and contains additional analysis particularly related to data processing capabilities. Because of the added analysis, the report has been classified IBM CONFIDENTIAL and will be distributed only within IBM.

## How To Read The Report

For ease of use, the report has been organized into levels of increasing detail. Most readers will find it unnecessary to read the whole report in order to satisfy their interests. Below are suggested reading plans for various classes of readers:

•	Added Sec	tions For Those Who Have Read The Summary	Page
	Read: .	The Detailed Capability Results A Comparison of the Results to Other	IV.1
	•	Forecasts and Published Articles Alphabetic List of Applications	VI.5 C.1
•	A General	Overview Of The Study And Results	Page
	Read: .	The Introduction The General Results Any Scenarios which are of particular	I.l II.l
•	•	interest Any Capabilities which are of particular	III.?
	•	interest	IV.?
•	Specific	Data Processing Areas Of Interest	Page
	Read: .	The Introduction The General Results The Scenario, Area Forecasts and Detailed	I.1 II.1
	•	Data Listings for the areas of interest Capabilities which are of interest	III.1 IV.1
	•	The Excluded Applications for the areas of interest as listed in the Appendix	A.1

DVALUE	tion and Verification of the Report	Page
Read:	. The Introduction	1.1
	. The General Results	II.1
	. The Data Analysis Section	VI.1
	. Such of the Scenarios and Data Printouts	
	as are of interest	III.?
	. Such of the Capabilities as are of interest	IV.?
An Und	erstanding of the Delphi Technique	Page
Read:	. The Introduction	1.1
	• THE THEFOUNCETON	
		v.1
	. The Detailed Description of the Study	v.1

#### I. INTRODUCTION

## AIMS OF THE STUDY

The growth and development of data processing equipment and the diverse uses that it has been put to has been one of the phenomenons of the 1960's. There is much reason to believe that this will continue into the 1970's and beyond. Ideally, technological decisions and the development of data processing equipment should be predicated on a knowledge of the future needs of the end users. Those needs are in turn based on future applications of data processing, when they can be economically, politically, and socially justified, and how the applications will be implemented. determine the needs, the planner must look far into the future of a dynamic field. The traditional approach of trend projection solves some of the forecaster's problems, but he faces two risks with this approach. Future unpredicted events may cause a radical change in a trend or there may be entirely new areas for which no trend exists.

In situations like this the usual solution is to turn to an expert for advice or if the subject is complex and involves obscure interrelationships between many disciplines, then a consensus of experts is sought. This study utilizes the Delphi Technique, an advanced method of obtaining such a consensus of experts, to investigate the future course of the use of data processing.

The general aims of the study were twofold:

- -- To determine to what uses data processing will be put in the future and when those uses will be generally in existence.
- -- To determine what data processing capabilities are required, when in the future they will be needed, and if applicable, what magnitudes of the capabilities will be required.

The specific approach was to view the future from the viewpoint of the user of data processing, focusing on what he intends to do, when he intends to do it, and what is required to make it viable, independent of technological constraints.

## THE DELPHI TECHNIQUE

The Delphi Technique was developed by the RAND Corporation in an effort to obtain consensus predictions of future events from a

panel of experts without encountering certain adverse psychological factors associated with open discussions and conferences. Those factors include: spurious influence by the more prestigious members of the group, reluctance to retreat from a publicly stated position, and bandwagon effect of majority opinion.

The technique consists of an iterative series of questionnaires which allow experts to anonymously interchange opinions through an intermediary. The intermediary compiles the opinions and provides them as controlled feedback in subsequent questionnaires. Experience has shown that this process causes a convergence of opinions or at least identifies schools of thought and reasons for nonconvergence.

It should be recognized that, while the Delphi Technique produces consensus judgments about the future, those judgments should not be considered to be "the truth about the future." The future will contain events that are totally unexpected today. Furthermore, the mere existence of the forecast may influence the future. Forecasts which predict undesirable results tend to be self-defeating, while forecasts with desirable results tend to be self-fulfilling. Thus, the current forecasts which deal with the extent to which we will pollute our environment will probably not come true because of all the effort exerted to avoid the predictions. In this sense, the Delphi Technique is not only a tool for predicting the future, but also a tool for shaping the future; and that after all is "the name of the game."

#### THE STUDY

The panel of respondents was selected from the companies and organizations that are members of the GUIDE users group and from throughout the IBM Corporation. Among the criteria for selection were:

- . An interest in the future of data processing
- . Acknowledged reputation
- . Responsible position in their organization
- . Breadth of knowledge in their organization's area
- . Contribution to the field under investigation
- Years of experience
- Educational background

An effort was made to insure that all facets of data processing use were represented and to avoid concentrations in any one area or organization. An analysis of the resultant group and a list of the respondents who allowed us to include their names is included in a later section of the report.

The study consisted of a series of four questionnaires during the course of which the respondents were asked to:

- Develop a representative list of new applications of data processing which are not normal extensions of existing applications.
- . Assign a measure of value to these applications.
- Forecast the date of implementation.
- Determine non-data processing factors whose occurrence or non-occurrence would cause the implementation date to be accelerated or retarded.
- Associate with each application critical data processing capabilities needed to make the application viable.
- Wherever possible, assign orders of magnitude to quantifiable requirements.
- Provide considerations and reasons for any strongly held positions or for any response not in general agreement with the rest of the panel.

In addition, for purposes of analysis, respondents were asked to evaluate their own degree of expertise relative to each application.

The study identified 134 future applications of which 108 of the more important ones were investigated through the full iterative process of the study. In the course of the investigation, 77 unique data processing capabilities were cited. Since many of the capabilities were required by more than one application, a total of 368 application-capability relationships were evaluated.

A detailed description of the study procedure with samples of questionnaires will be covered later in Section V.

#### II. GENERAL RESULTS

From the final results of the study it is possible to develop a number of subjective views of the future of data processing. They are:

- . An overview of the uses of data processing in 1985
- . An identification of general trends in applications
- A view of pervasive capabilities required by the applications
- . Detailed views of application areas (See Section III)

Although these are subjective representations of the future, they can be justified by the nature of the data produced by the Delphi Technique. In general, there is a high level of confidence associated with the quantitative data (dates, magnitudes, etc.) because of the controlled interchange and iteration of the technique. In addition, since the interchange is recorded, a large body of subjective data giving the reasons and considerations associated with the responses is collected. This can be used directly by the investigator without having to derive it from the raw data.

### THE 1985 WORLD OF DATA PROCESSING

By the year 1985 the use of computers will have reached into almost all areas of business, governmental, and private life. Most everyone will feel they enjoy the benefit of living in the age of the computer. A closer look discloses that it is also the age of communications, for it will be the marriage of computers to widespread, high speed switched communication networks that will have brought the computer into such pervasive use.

Home terminals will have passed the point at which one family in a hundred has one installed. These terminals will be initially installed to provide custom tailored entertainment and news. By 1985, with switching capability added to the CATV cables, a multitude of services will be offered to the terminal owner by entrepreneurs. The services include: home computer assisted instruction, control of home appliances, monitoring burglar and fire alarms, home banking and financial services, customized periodical printouts, and access to information data banks. The result will be an enhanced life style.

Businesses will have also taken advantage of data communication networks. Many day-to-day transactions will be effected by direct communication between computers. Businesses will purchase access to information maintained centrally by information utilities where the size or volatility of the information makes

it impractical for the individual business to maintain it themselves. Examples include: patent searches, freight rates, automobile and driver registration files and many others. Industry associations will have taken over monitoring and coordination of business operations affecting multiple members of an industry. For example, intermodal freight shipments will be centrally scheduled and tracked. Reservation systems will be interconnected so that reservations for travel, accommodations, and entertainment can be made through one intermediary. In general, day-to-day business transactions will be facilitated.

Computer/communication systems will have moved into the business office. Many secretarial services will be done through terminals which provide editing, hyphenation, proofreading and also serve as input to electronic filing and electronic intra-office mail services. With the advent of the home terminal, white collar workers and executives will find it possible to accomplish their work using the terminal as a home work center. All of the necessary work materials, references, and services as well as conference type calls could be made available at the home. Routine office functions will thus be facilitated.

Point of transaction terminals to service individual department stores, supermarkets, etc. will have become commonplace. By 1985 the additional step of interconnecting these terminals to a central facility for coordination and switching to financial institutions will have brought the "Cashless/Checkless Society" into reality in 20 percent of the metropolitan areas. A consumer would be able to effect a purchase by presenting his identification card at the point of sale. His demand deposit account balances or lines of credit are checked, debited, and the store's accounts credited while he makes his purchase no matter how many different financial institutions are involved. The result is additional services for the consumer.

Automation will have replaced many of the routine tedious tasks or tasks demanding great precision and accuracy in industry. Robots having the sensing and manipulatory capabilities of humans These robots will have the addiwill be in use in factories. tional asset of being on line to the factory computer which can change their functions on demand. In fact some plants will have become wholly automated running essentially without human inter-These plants will be highly adaptable, capable of changing their products and product mixes in response to actual and forecasted demands. Such plants may even accept orders for products requiring new design, for by 1985 computer systems capable of creative engineering design will be in existence. These systems drawing on engineering practice data, design rules, and previous designs will create new products based on customer The systems will carry the design results through requirements. to produce manufacturing specifications and procedures including instructions for automated machinery. Human drudgery will have been partially relieved.

Design is not the only area where computer creativity will exist. Today's much discussed Management Information Systems will have become a reality but with the added capabilities of creating strategic plans from external and internal environmental data and models of enterprise and economy. Scientific research will be assisted by computer systems which monitor research plans and results, and develop hypothesis of underlying relations and principles. Thus, the power of men's minds will have been extended.

The computer's power and capacity will have been turned to solving many social ills facing the nation and the world. Urban and suburban planning will be automated to suggest the best mixes of people, jobs, recreation and aesthetic qualities. Efforts will be made to protect the ecology through monitoring, prediction, and control of pollution sources and new product development. Traffic problems and accidents will have been alleviated by traffic control, dynamically scheduled mass transit, and automobiles equipped with collision avoidance. Nationwide job banks will attack unemployment and welfare will be centrally coordinated to assure fair coverage for all who require it. The end result is a better world in which to live in.

In summary, future applications will have progressed beyond the normal extensions of today's applications to encompass most areas of business, governmental and even areas which improve the quality of life.

#### APPLICATION TRENDS

Three major new trends were identified in the forecasts of future applications:

- . Tactical and Strategic Planning
- . The use of the Computer to Solve Social Ills and Problems
- . Home Terminals

In addition, an on-going trend of penetration of data processing into new areas was discerned.

#### 1. Tactical and Strategic Planning

Historically data processing has grown from the subapplications (sorting, collating, tabulating, etc.) of unit record days through individual applications (payroll, inventory control, accounts receivable, etc.) of the first computer systems to the integrated operational systems being installed today to take care of the day-to-day operations of a business.

The panel indicates that during the period 1975-1980 computer systems will begin to play a significant role in first assisting and then completing tactical and strategic planning via models of operations, enterprises, the economy, political regions and even whole countries.

## 2. The Use of the Computer to Solve Social Ills and Problems

Many of the applications rated most highly by the panel were associated with the utilization of computers to attack social ills and problems. Six applications focused on pollution prevention and protection of the ecology. Public safety was addressed through applications to minimize aircraft and automobile accidents, and to provide better crime protection through rapid information interchange. Unemployment has generated the need for nationwide job banks to match jobs to job seekers and to level pockets of unemployment. Urban and suburban and regional planners will have data banks of land usage and models to plan the best use of land resources balancing such factors as: labor and job mix, transportation costs, tax base, recreational facilities, school requirements, environment pollution, aesthetic qualities, etc.

Most of these will come about either as government services or via government subsidy of private enterprise.

## 3. Home Terminals

The widespread advent of Cable Area Television (CATV) in 1980-1985 will provide high speed, high capacity two-way communication channels into the home. The initial impetus will come from the entertainment field as extended television offerings. The communication capability will be exploited to allow program transmission on individual request. Once the communication capability exists and is incorporated into a switched network, entrepreneurs will provide a widerange of services to the home consumer; these will include: home education via Computer Assisted Instruction (CAI), selective printout of newspaper or magazine articles, home shopping services, automatic meter readings, burglar and fire alarm monitoring, and the use of the terminal as a home work station.

The home terminal would become a modular device priced within the reach of the majority of families. Basically it would be available as a television-type device with simple keyboard or push button input. Additional capabilities could be added to provide hard copy output, light pen input, sensor inputs and analog and digital control output.

## 4. New Areas of Use of Data Processing

In the 1975-85 time period several industries will experience their first significant use of data processing. This will come about either because of the emergence of new industries, or improved cost justification or data processing capabilities which open new areas. The following is a partial list identified by the panelists:

Agriculture Oceanography Information Retrieval Data Banks Labor Negotiations Information Utilities

## MAJOR REQUIRED CAPABILITIES

Many of the forecasted data processing capabilities were found to be pervasive over a number of applications. The major capabilities can be categorized as follows:

#### 1. Data Base

The need for large data bases was recognized by the group with 64 out of the 108 applications requiring it. The size data base required ranged from ten billion to a trillion bytes.

A second aspect of data bases was identified; that is, the necessity to provide the functions to build, maintain, and use large data bases with large numbers of access for reading and updating. These functions would include:

- Data Independence making it possible to change the data base organization without changing the programs.
- Dynamic Reorganization the ability to reorganize all or part of the data base dynamically to provide better overall response for a particular application.

- . Data Base Protection protection of the data base against inadvertent or malicious alteration or destruction.
- . Dynamic Recovery the ability to dynamically correct errors or loss of the data base.
- Data Base Security the ability to monitor and control access to the data base so as to permit only authorized access to the data.

## 2. Communication Network Systems

Almost half (52) of the applications suggested require large numbers of terminals with many requiring the interconnection of computer systems into networks for information interchange. Simple information retrieval utilities providing remote access to voluminous or volatile data can involve computer-to-computer data requests. The "Checkless/Cashless Society" requires hundreds of thousands of terminals and hundreds of computer systems interconnected. One terminal purchase might require access to three or four systems to check lines of credit, make the necessary loan to the buyer, debit his account, and credit the seller's account all while the buyer is standing at the point of sale terminal.

## 3. Sensing and Controlling

Sensing of environments, the progress of operations, and in some cases providing closed loop control was involved in 29 out of the 108 applications. These ranged from relatively small systems to diagnose car repairs to worldwide weather and pollution monitoring networks for input into weather and pollution forecasting systems. Control systems ranged from automated warehouses, which are beginning to be installed now, to robots capable of performing by 1985 many of the sensing and manipulating operations of a human. The scope included self-contained systems to take control of a car to prevent a collision to large systems for control of takeoff and landings at a major metropolitan airport.

#### 4. Software

The types of applications forecasted require that the logic directing function will have to take on new levels of capabilities resembling functions that have been thought to be reserved for human intelligence.

Programs will be asked to create original work, such as new engineering designs. To accomplish this, systems will make use of such capabilities as:

- Multi-Attribute Pattern Matching -- comparing patterns of variables and selecting ones that most nearly match.
- Discovery Systems -- systems capable of selective browsing through text and data arrays leading to the formulation of underlying principles and relationships.

One major use of these kinds of program capabilities will be to relieve the programming load itself. Many of the complex systems forecasted will require the automatic generation of programs and data base organizations.



#### III. DETAILED APPLICATION RESULTS

The applications forecasted by the panelists can be grouped into areas of data processing uses. Most of the areas identify applications unique to an industry, others represent identifiable areas which appear in many industries, while some new applications are identified with the consumer. Listed below are the application groupings:

**AGRICULTURE AIRLINES** BUSINESS ASSISTANCE COMPUTER ASSISTED RESEARCH DISTRIBUTION & RETAIL ECOLOGICAL EDUCATION FINANCIAL & INSURANCE FREIGHT TRANSPORTATION GOVERNMENT SERVICES HOME TERMINALS INFORMATION SYSTEMS INFORMATION UTILITIES JUDICIAL & LEGISLATIVE MANUFACTURING & PROCESS MEDIA MEDICAL OFFICE ASSISTANCE PUBLIC AND PRIVATE TRANSIT UTILITIES

The detailed results of the study are organized into the application groupings. In this way the reader may review only those groups for which he has a particular interest. Each application grouping contains a scenario derived from the applications, data, comments and reasons provided by the respondents, and two detailed data presentations.

The first presentation lists the applications included in the grouping in chronological sequence. Figure 3.1 is a sample of one application "Inflight Monitoring and Diagnostics of Aircraft" in the Airlines grouping. The distribution of respondent date forecasts are illustrated by a percentage histogram. i.e., 65.5% of the respondents forecasted an implementation date in 1975-1977.

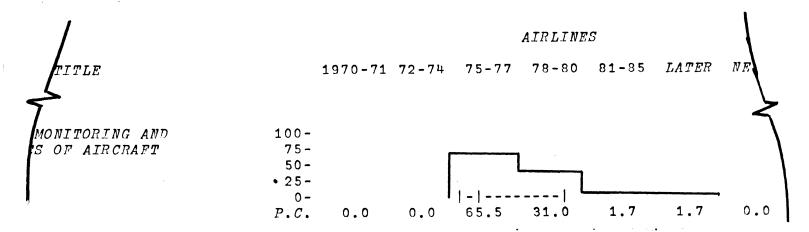


Figure 3.1

In addition, the application values are presented in terms of: Impact on Society, Profitability to the Implementor, Usefulness to the Public, and Will Not be Implemented. Figure 3.2 indicates how the application values would appear for the above application.

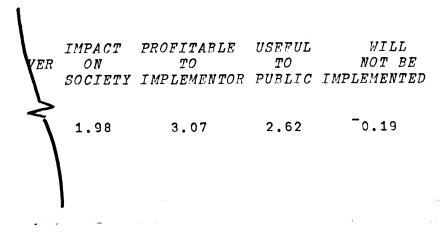


Figure 3.2

The value numbers are derived by assigning weights to the response categories and computing averages. The weights assigned were:

Weight	Major 5	Impact on Society Significant 3	Little 1	No 0
Weight	Very 5	Profitability to Implem Moderate 3	entor Marginal l	
Weight	Very 5	Usefulness to Publi Moderate 3	.c Marginal 1	
Weight		Will Not be Implement	ted	

Thus the highest possible rating would be five.

The second data presentation consists of a detail sheet per application containing the complete description of the applications, capabilities and accelerating and retarding factors as evaluated by the respondents. Final response counts are listed for all areas addressed with counts for those respondents who identified themselves as experts listed separately.

In the controlled interchange between respondents, response patterns were indicated by consensuses. For the study purposes consensus was defined as the interquartile range i.e., the range containing 50 percent of the respondents with 25 percent of the respondents above and 25 percent below. On the detail presentations consensuses are represented by horizontal dashed lines with verticals at each end. In addition, the median response (50 percent above and 50 percent below) is also shown by a third vertical line between the end verticals.

For required data processing capabilities the respondents were asked to measure the relative magnitude of any quantifiable data relative to the original suggested quantity. This was done by giving them the opportunity to check fields to

identify whether the quantity was O.K. or should be some multiple of ten greater or less. In the detail printouts these responses are identified as shown below:

>10x- 10x- 0.K. 10x+ 100x+ 1000x+ >1000x+

The first is read as "greater than 10 times less," the second "10 times less, etc.

#### **AGRICULTURE**

By 1981-1985 computers will begin to find direct use in agriculture. The first to take advantage will be large agri-businesses.

For example, in this period five percent of the irrigated farms will use computerized systems to monitor soil moisture content and to automatically regulate frequency and intensity of irrigation in order to maximize quality and quantity of the crops.

The advent of the home terminal in 1980-1985 will put the power of the computer within the reach of the average farmer. One percent of the farmers will subscribe to services capable of recommending agriculture product mixes taking into account consumer requirements, transportation costs, forecasted prices, local environment, etc. Also the service would provide accounting, inventory control, tax computation and other administrative services necessary to manage a successful farm.

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APPLICATION TITLE	1970-71 72-	74 75-77 78-80	81-85 <i>LATER</i>	NEVER	MPACT PROFITAB ON TO OCIETY IMPLEMEN	TO	NOT BE
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AGRICULTURE INFORMATION AND ADMINISTRATION SYSTEM	100- 75- 50- 25- 0- P.C. 0.0 0.1	0.0 7.4	- -  81.5 9.3	1.9	1.72 2.64	2.09	0.47

III.6

Automatic Irrigation Control -- The installation of systems in 5 percent of the irrigated farms to sense the moisture content of the soil and to automatically regulate the frequency and intensity of irrigation required to maximize quality and quantity of crops.

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CONSENSUS

Agriculture Information And Administration System -- The utilization by 1 percent of the farmers of a system providing terminal access to a data bank of agricultural information and business and management assistance. The system would be capable of recommending agriculture product mixes taking into account food mix requirements, transportation costs, price forecasts, local environment, and ecology that would result in optimum profit production. It would also provide accounting, inventory control and other administrative assistance required to manage a successful farm.

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B. Voice input	and res	ponse ca	pability	<i>!</i> •									
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EXPERT TOTALS CONSENSUS 4 3

#### AIRLINES

Airlines, perhaps more than any other industry, have come to rely on computers in the main stream of their business. Consequently, they may be more disposed than others to make early ventures into new application areas.

Automatic ticket vendor systems are already being tested by airlines. These systems dispense tickets for destinations designated by pressing a button. Payment is by credit card. By 1977 at least one airline will have expanded this capability to include: fare quotation, checking and boarding control, and will have installed it in all of its airport terminal areas.

Airlines are beginning to let contracts for installation of computerized baggage control. 1978-80 will find similar installations at 20 percent of the nation's commercial airports. One factor that may discourage installation of these two applications is continued concern about hijacking and bombing and the difficulty of monitoring unmanned facilities.

Airlines will also move to improve aircraft availability by installing onboard systems to monitor and diagnose inflight performance. Malfunctions are read out to the crew and either stored or telemetered for ground maintenance scheduling and analysis. Once in the maintenance shop, ground checks will be accomplished by computer. Twenty percent of the aircraft will use inflight monitoring by 1977 and 20 percent of the commercial airlines will have computerized ground diagnostics by 1980.

					A. III LIII	· L						
APPLICATION TITLE		1970-71	72-74	<b>7</b> 5-7 <b>7</b>	78-80	31-85	LATER	NEVER		PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
IN-PLIGHT MONITORING AND DIAGNOSTICS OF AIRCRAFT	100- 75- 50- 25-				1.				1.98	3.07	2.62	-0.19
	0- P.C.		0.0	65.5	31.0	1.7	1.7	0.0				
AUTOMATED AIRLINE PASSENGER SERVICES SYSTEM	100- 75- 50- 25-				1				1.58	2.98	2.97	-0.14
	0 - P.C.		0.0	-  55.0	38.3	6.7	0.0	0.0				
AUTOMATED AIRCRAFT DIAGNOSTICS	100- 75- 50- 25-								1.57	3.38	2.76	-0.05
	0- P.C.		0.0	23.7	- -  <b>1</b> 74.6	1.7	0.0	0.0				
AUTOMATED BAGGAGE CONTROL	100- 75- 50- 25-								1.54	2.95	3.13	-0.20
	0 -		<del></del>	I	1-1-1	1		<del></del>	•			
	P.C.	0.0	1.7	18.3	70.0	8.3	0.0	1.7				

III.1

Automated Aircraft Diagnostics -- The accomplishment by 20 percent of the commercial airlines of their ground checks of aircraft by computerized diagnostic systems.

	TMDAC	r on soc.	ナマかマ	1	IMPACT_	AND_YAL	<u>UE</u> REASONS FO	D TMDTTMI	מאר אייד אייד אייד		WILL
	IMPACI	ON BOC.	1611		PROFTT	_	IMPLEMENT		SFUL TO		NOT BE
14.4	JOR SIGNI	TF. LIT	יז די	NO	VERY	MODER					IMPLEMENTED
GROUP TOTALS	3 16			8	17	41	5 MANGINA	16	26	16	1
EXPERT TOTALS	-	3 1	-	1	3	11	0	10	8	3	Ô
BAIBHI TOTABO			o .	•	·		v	•	Ü	v	•
				I	MPLEMEN!	TATION I	DATE				
	1970-71	72-74 7	5-77 7	8-80	81-85	LATER	NEVER				
GROUP TOTALS	0	0	14	44	1	0	0				
CONSENSUS			1	-1-1							
EXPERT TOTALS	0	0	2	11	0	0	0				
CONSENSUS			1	-1-1							
						<u>CAPABIL</u>	<u>ITIES</u>				
A. Extensive d	ata base c	of malfur	nction o	experi	lence.						
	NECESSRY	ASSET	USEFUL	SOME	USE NO	NEED >	10×- 10×	- O.K.	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS	37	13	2	0	0	0		• • • • •			
CONSENSUS	11	1	•		Ü	ŭ					
EXPERT TOTALS	, 'g	2 '	, 0		0	0					
CONSENSUS	11-1	•	v			•					
B. Installatio		er sensir	na eanii	oment	on comm	ercial	aircraft				
<b>5</b> ,			ig ogui	Pincire	OII COIII	MCI CIGI	arrorarc.				
	NECESSRY	ASSET,	USEFUL	SOME		NEED >	10×- 10×	- O.K.	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS	46	3	1		0	1					
CONSENSUS	11-1	_	_		_	_					
EXPERT TOTALS	11	0	0		0	0					
CONSENSUS	11-1										

Automated Airline Passenger Services System -- The installation by one airline of a system capable of providing fare quotations, issuing tickets, and handling check-in and boarding control. The system would be operated by agents during heavy traffic periods and self-operated by the passenger at other times.

					<u>IMPACT</u>	AND V		wa man	7W77 7W7				11 T T T
	IMPA	CT ON S	OCIETY		DD0777	14077				NTATION	חוומדדמ		WILL MOT BE
• • •			T M M T T	NO.	VERY			EMENTOR RGINAL	VERY	FUL TO . MODERT	MARGI	THAT TH	PLEMENTED
	JOR SIC		ITTLE	NO			387 MA	10	20	28	12		<i>: пишвит «D</i> 3
GROUP TOTALS	1	21	36	8	14 8		17	3	10	13	3		<b>2</b>
EXPERT TOTALS	1	11	15	2	В		1 /	3	10	13		)	2
				I	<u>MPLEMEN</u>	ITATIO	<u> </u>						
	1970-71	72-74	75-77	78-80	81-85	LATE	R NEVE	$\mathcal{R}$					
GROUP TOTALS	0	0	33	23	4	0	0						
CONSENSUS			1-1										
EXPERT TOTALS	0	0	17	6	2	0	0						
CONSENSUS			1-1										
GROUP TOTALS	NECESSI 33	? <i>Y ASSE</i> 15		L SOME	USE NO	NEED 0	>10×- 0	10×-	0.K. 36	10×+ 0	100×+ 0	1000×+	>1000×+
CONSENSUS	11		1					1	-				
EXPERT TOTALS	9	10	1		0	0	0	6	13	0	0	0	0
CONSENSUS	1	1-	1						-				
B. Ticket tak:	ing term	inal wou	ald also	accept	airli	ne cre	dit car	ds.					
	NECESSI	RY ASSE	T USEFU	L SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	071000×+
GROUP TOTALS	38	13	3 2		0	0							
CONSENSUS	11-												/ · · · ·
EXPERT TOTALS	15	7	1		0	0							
CONSENSUS	-		·										\

 $\mathcal{C}$ . Public operatable display terminal for fare quotation, ticket sales and fare collection.

	NECESSRY	•		USE	NO N	VEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	37	14	1	0		0					•		
CONSENSUS	11	1											
EXPERT TOTALS	14	8	1	0		0							
CONSENSUS													

<u>Automated Baggage Control</u> -- The availability at 20 percent of the commercial airports of systems for automatic pickup, control, loading, unloading, and delivery of passenger baggage.

	IMPAC	CT ON SOC	IFTY		<u>ZT_AND_VA</u> FITABLE 1	REASON			NTATION	PUBLIC	WILL NOT BE
MA	JOR SIGI	IIF. LIT	TLE NO	מש כ	ery mode	RT MAR	GINAL	VERY	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS	2	.6 3	6	5 :	11 3	19	8	22	24	9	4
EXPERT TOTALS	2	7	7	2	7 1	.1	0	6	8	2	0
				IMPLE	MENTATION						
	1970-71	72-74 7	5-77 78	-80 81-8	35 LATER	NEVER	•				
GROUP TOTALS	0	1		· <del></del> ·	5 0	1					
CONSENSUS			•	1-1							
EXPERT TOTALS	0	1 .	14	13. (	0	0					
CONSENSUS		1		-							
A. Standardize	d baggage	labelin	g and lak		E <u>D_CAPABl</u> ers.	LITIES					
	NECESSRI	ASSET	USEFUL :	SOME USE	NO NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS CONSENSUS	41   -	8	2	0	1						
EXPERT TOTALS CONSENSUS	13	2	0	0	1						

CONSENSUS |--|-|

B. Ten-fold increase in baggage handling equipment - conveyors, sensing, loaders, etc.

GROUP TOTALS	NECESSRY 35	ASSET 14	USEFUL 1	SOME USE	NO NEE	D >10×- 0	10×- 0	0.K. 35	10×+ 7	100×+ 0	1000×+ 0	>1000×+
CONSENSUS EXPERT TOTALS CONSENSUS	9	5 l	0	1	0	0	n	- -   - -	51	0	0	0

 ${\it C}$  . Computer controlled baggage sorters for check throughs.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	30	16	ų		0		1							
CONSENSUS	11													
EXPERT TOTALS	9	6	0		0		1							
CONSENSUS		1												

<u>In-Flight Monitoring and Diagnostics of Aircraft</u> -- The utilization of computers to monitor and diagnose the in-flight performance of 20 percent of the commercial aircraft. The performance and environment is compared against a performance profile. Any malfunctions detected are read out to the crew and telemetered to the ground for maintenance scheduling and analysis.

	IM	PACT ON	SOCIETY				T BASONS FOR 1 IMPLEMENTOR		NTATION FUL TO P	URLIC	WILL NOT BE
MA	JOR S	GNIF.	LITTLE	NO	VER Y	MODERT	MARGINAL	VERY	MODERT	MARGINAL	
GROUP TOTALS	13	19	38	9	21	45	9	21	29	20	5
EXPERT TOTALS	6	10	8	2	9	11	6	11	11	3	0
						TATION DA					
	1970-	1 72-74	75-77	78-80	81-85	LATER N	IEVER				
GROUP TOTALS	0	0	38	18	1	1	0				
CONSENSUS			1-1								
EXPERT TOTALS	0	0	15	7	1	0	0				
CONSENSUS			-								

# REQUIRED CAPABILITIES Ten-fold improvement in current telemetry equipment.

	NECESSRY	ASSET US	EFUL SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	10	35	5	0	2	1	7	37	0	0	0	0
CONSENSUS		11-1						1-1-1				
EXPERT TOTALS	3	15	2	0	1	1	2	13	0	0	0	0
CONSENSUS		11-1						1-1-1			_	-
B. Reduction	in size	of airborne	computer	system	s by	a factor	of 10	•				

GROUP TOTALS CONSENSUS	NECESSRY 0	32	USEFUL 12	SOME	USE N 2	O NEED 5	>10×- 1	10×- 9	0.K. 35	10×+ 1	100×+ 0	1000×+ 0	>1000×+ 0
EXPERT TOTALS CONSENSUS	0	13		:	1	2	1	5	12	0	0	0	0

#### BUSINESS ASSISTANCE

Sophisticated general business assistance applications in the areas of tactical and strategic planning are on the verge of widespread implementation. Simulation of cash flow by corporations may become common with 20 percent of the larger companies using it by as early as 1972-74 and certainly no later than 1975-77.

Investment models for predicting security markets, analyzing potential investments and recommending buying and selling will be used by one out of ten of the more sophisticated banks, insurance companies, and investment firms by 1975-77.

In 1978-80 econometric models will be generally available and the majority of large companies will employ simulations of their enterprises to make strategic decisions. The two applications may be coupled so that econometric models provide environmental input into enterprise simulations.

Modeling and simulation efforts by companies will offer an entrepreneural marketing opportunity for groups experienced in model development or with pattern matching and discovery type software systems.

In the 1978-80 period industrial and military organizations will use computer assisted instruction to accomplish 20 percent of their on-the-job training. In the same period 20 percent of the larger corporations will be using the computer in such subjective areas as career path planning, matching personality traits, basic capabilities, ambitions, education, job evaluations, etc. to map career opportunities.

By 1981-85 five percent of the businesses and labor unions will use sophisticated models of economic and business cause and effects for simulation and evaluation of alternative proposals in labor/management negotiations.

Å	APPLICATION TITLE		1970-71	72-74		78-80		LATER	NEVER		PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
(	CASH FLOW SIMULATION	100- 75- 50- 25- 0- P.C.	0.0	24.1	- -    65.5	8.6	0.0	1.7	0.0	1.40	3.40	1.98	-0.10
	NVESTMENT MODELS	100- 75- 50- 25- 0- P.C.	0.0	5,3		31.6	3.5	0.0	0.0	1.84	3.60	2.63	0.00
Z	ECONOMETRIC MODELS OF THE ECONOMY	100- 75- 50- 25- 0- P.C.	0.0	0.0	13.8	1-1-1	15.5	0.0	0.0	2,27	2,92	2.24	<sup>-</sup> 0.14
	COMPUTER ASSISTED INSTRUCTION - ON THE JOB TRAINING	100- 75- 50- 25- 0- P.C.	0.0	1.5	10.6	- -  78.8	6.1	3.0	0.0	3.10	3.23	3.28	-0.11
E	ENTERPRISE SIMULATION	100- 75- 50- 25- 0- P.C.	0.0	1.6	14.3	-  57.1	27.0	0.0	0.0	2.09	3.38	1.70	-0.30
Ó	CAREER PATH PLANNING	100- 75- 50- 25- 0- P.C.	0.0	0.0	4.9	-  47.5	I 26.2	14.8	6.6	2.37	2.35	2.34	-0.24
	COMPUTER-ASSISTED LABOR/MANAGEMENT VEGOTIATIONS				-		1-1		-	2.29	2.38	2.57	-0.48
		P.C.	0.0	0.0	0.0	26.4	50.9	13.2	9.4				

III.1

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Career Path Planning -- The ulitization by 20 of the Fortune 500 Companies of a computerized system for matching personality traits, basic capabilities, ambitions, education and training as they relate to job opportunities. This would require a much more objective view of "career path" planning than is now being done by most major corporations.

					IMPACT_	AND_YALU	_				
		IMPACT C	N SOCIETY			* R	EASONS FOR .	<i><b>IMPLEME</b></i>	INTATION		WILL
					PROFIT	ABLE TO	IMPLEMENTOR	USE	FUL TO F	PUBLIC	NOT BE
M	4JOR	SIGNIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODFRT	MARGINAL	IMPLEMENTED
GROUP TOTALS	7	30	22	2	10	25	21	11	24	18	5
EXPERT TOTALS	7	13	11	0	5	14	9	6	13	8	2
				1	MPLEMEN	TATION D	ATE				
	197	0-71 72-	74 75-77	78-80	81-85	LATER	NEVER				
GROUP TOTALS		0	0 3	29	16	9	4				
CONSENSUS				-							
FYPERT TOTALS		n	0 2	1.1	10	4	1				

#### REQUIRED CAPABILITIES

## A. Multi-attribute pattern matching.

CONSENSUS

	NECESSRY	ASSET	USEFUL S	OME USE	NO NEED	>10×- 10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	34	10	5 .	1	1						
CONSENSUS											
EXPERT TOTALS	16	5	4	0	1						
CONSENSUS _	11		_								
B. Input langu	age for de	escription	on of tra	aits, amb	oitions,	capabilities,	etc.				

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	35	12	14		1		0							
CONSENSUS														
EXPERT TOTALS	15	7	3		1		0							
CONSENSUS														

Cash Flow Simulation -- The utilization of 20 percent of the Fortune 500 Companies of a simulation of their corporation cash flow.

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GROUP TOTALS EXPERT TOTALS	0 1	-		5 4	13	_	.8	1	3	14	13		1
BALIMI TOTABO	. • •	-			-			-	Ŧ				_
						CATION		_					
	1970-71				-85	LATER		4					
GROUP TOTALS CONSENSUS	0	14	38 -1-1	5	0	1	0						
EXPERT TOTALS CONSENSUS	0	6 	20	2	0	1	0						
				REQUIT	ת ת	CAPARI	LITIES						
A. Ten-times	improvemen	nt in ei	mulation				DETTED						
TOTAL CENTED	TWNTOAGWE	ic in si	muracion	recuur	ues.								
	NECESSRY	ASSET	USEFUL S	SOME US	א א	NEED	>10x-	10×-	O.K.	10×+	100×+ 10	00×+	>1000×+
GROUP TOTALS	10	26	13	0		0	0	8	31	1	0	0	0
CONSENSUS									1-1-1				
EXPERT TOTALS CONSENSUS	6	10	9	0		0	0	5	11	0	0	0	0
B. Model deve	1							1					
b. Moder deve	TODMENT SE	ervice.											
	NECESSRY	ASSET	USEFUL S	SOME US	E NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 10	00×+	>1000×+
GROUP TOTALS	8	28	10	3		0							2000
CONSENSUS													
EXPERT TOTALS	. 7	11	6 .	1		0							
CONSENSUS													(
C. Interactive building, e	e terminal evaluating	system	with com timizing	plex se the mod	arch lel.	and i	interac	tive pa	ttern m	atching	for use	in	-
	NECESSRY	ASSET	USEFUL S	SOME US	E NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 10	00×+	>1000×+
GROUP TOTALS CONSENSUS	10	33	7	1		0							
EXPERT TOTALS	7	13	5	0		0							
CONSENSUS	1		_										

IMPACT AND VALUE
REASONS FOR IMPLEMENTATION

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Computer Assisted Instruction - On the Job Training -- The replacement of 20 percent of on-the-job training hours in industrial and military organization by computer assisted instruction.

IMPACT ON SOCIETY

CONSENSUS

	IMP	ACT ON B	SOCIETY						MPLEMEI	VTATION		ī	WILL
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MA	JOR SI	GNIF.	LITTLE	NO	VER Y	MODE	RT $MAR$	GINAL	VERY	MODERT	MARGINAL	IMPLI	EMENTI
GROUP TOTALS	21	43	17	0	27	4	0	7	34	29	9	:	3
EXPERT TOTALS	3	8	2	0	4		8	0	5	7	0		0
				-			D 4 777						
	4070 7	1 72-74	75-7 <b>7</b>	78-80	<u>MPLEMEN:</u> 81-85	<u>TATION</u> LATER		,					
ROUP TOTALS	1970-7	1 /2-/4	75-77	78-80 52	81 <b>-</b> 85	LATER 2	NEVER O						
CONSENSUS	U	1	,	1-1-1	4	2	U						
XPERT TOTALS	0	1	1	10	1	0	0						
CONSENSUS	U	1	1	1-1-1	1	U	U						
ONDENDOD				1-1-1									
			A	CCELERA	TING AND	D RETA	RDING F	ACTORS					
• Successful	n+ilig:	ation ir	_						ction.				
Duccessiai	uciiiz	101011 11	. IO IUI	ge corp.	J_		Juc u						
	ABSOLUT					72-74		78-80	81-85	LATER	<i>NE VER</i>		
ROUP TOTALS	1		30	8	0	7	22	17	1	0	1		
XPERT TOTALS		14	4	3	0	1	4	3	0	0	1		
• Fe <b>de</b> ral su	bsidy.												
	ARSOLU	TE POSS	TRIE NO	REFECT	1970-71	72 - 74	75-77	78-80	81-85	LATER	NEVE?		
ROUP TOTALS	1		31	6	13,0,1	7	14	12	3	uri u	2		
XPERT TOTALS		5	6	0	ő	3	2	1	ő	2	0		
					<del>-</del>	•	-	-	ŭ	•-	v		
				RE	QUIRED (	CAPABI	<i>LITIES</i>						
. Course pre	paration	n langua	age to r	educe the	he prepa	aration	n cost	by a fa	ctor of	5 over	today's	CAI sy	stem
-	_	-	-					<del>-</del>		_	_	_	
	NECES 8	RY ASSI	रक ग्रह्म	UL SOME	USE NO	מימימי זו	<b>\10</b> 4	10×-	O.K.	10×+	100×+ 100	<b>0</b> S.	1000
ROUP TOTALS	33	11 ADDI		3	1	1	0	6	0.K. 41	10×+		0×+ >. 0	
ONSENSUS	11-		<u>,</u>		1	1	U	0	1-1-1	4	0	U	0
XPERT TOTALS	' '6	,	2	1	0	1	0	0	8	2	0	0	0
ONSENSUS	11-	·	-	-	Ü	1	U	U	1-1-1	2.	U	U	U
· Terminal w			•	oard 1	iaht nor	funa	tion ko	··baard		doo/231d	io output	\$200	nor
month.	ich dis	play, I	III. Keyb	oard, 1	igne per	Lunc	CION KE	yboaru,	and vi	deo/ aud	10 Output	3200	ber
	NECESSI	RY ASSI	ET USEF	UL SOME	USE NO	NEED	>10×-	10×-	O.K.	10×+	100×+ 100	0×+ >	1000×
ROUP TOTALS	32	2:		1	0	1	1	2	47	0	0	0	0 0
ONSENSUS	-		- 1			-		-	1-1-1	Ŭ	•	,	3
XPERT TOTALS	5	1	<b>+</b>	0	0	1	0	1	8	0	0	0	0
					-	-	•	-		•	•	J	0

Computer-Assisted Labor/Management Negotiations -- The availabilities in 5 percent of the labor/management negotiations of models of cause and effect that would enable the parties and/or arbitrators to evaluate the effect of various alternative proposals.

IMPACT AND VALUE

IMPACT ON SOCIETY

EXPERT TOTALS CONSENSUS

REASONS FOR IMPLEMENTATION

WILL

	7	MPACT OF	N POCTETT					NO TON					MTTP
					PROFI	TABLE	TO IMPL	EMENTOR	USE	FUL TO	PUBLIC		NOT BE
MA	<b>J</b> OR	SIGNIF.	LITTLE	NO	VER	Y MOD	ERT MA	RGINAL	VER Y	MO DER T	MARGIE	IAL IM	PLEMENTED
GROUP TOTALS	8	27	2 <b>3</b>	2	9		30	<b>1</b> .5	15	24	15		10
EXPERT TOTALS	2	8	8	0	2		11	4	4	7	5		0
					IMPLEME	NTATIO	N DATE						
	1970	-71 72-	74 75-77	78-80	81-85	LATE	RNEVE	<b>'</b> R					
GROUP TOTALS		_	0 0	14	27	7	5						
CONSENSUS				1	1-1								
EXPERT TOTALS		0 (	0 0	, 6	10	1	0	ı					
CONSENSUS				!	1-1	-							
				R.	EQUIRED	CAPAB	ILITIES	•					
A. Search eng	ine 1	) times	today's	_				•					
bearen eng	1110 1	CIRCO	coddy 5	-apastas									
	NECE			FUL SOM.	E USE N		>10×-	10×-	0.K.	10×+	100×+ 1	.000×+	>1000×+
GROUP TOTALS		13	20	8.	1	3	1	2	. 36	2	1	0	0
CONSENSUS			-	1					1-1-1				
EXPERT TOTALS		4	, 5	1	0	1	0	1	8 .	1	1	0	0
CONSENSUS			-   -						1-1-1				
$^B$ . Mass stora	ge of	100 bil	lion byte	es.									
	NECE	SSRY AS	SSET USE.	FUL SOM	र ११८५ म	ת אידות מ	>10×-	10×-	О.К.	10×+	10001 1	000×+	>1000×+
GROUP TOTALS		11	24	q DOM	2	1	4	31	6	1 1	100%+ 1	.000x+ 0	
CONSENSUS		!	-	1	-	*	7		U	1	U	U	0
		1		_ '	_	_		1-1-1					

Econometric Models of the Economy -- The utilization by 20 percent of the large corporations, large banks, and government agencies of econometric models of the economy to predict business growth, wages, and inflation for guidance in business planning and fiscal and monetary policy decisions. The models could provide direct input of external environment to enterprise simulation.

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EXPERT TOTALS CONSENSUS	19	8	0		0	1						
C. Model deve	lopment se	rvice.										
GROUP TOTALS CONSENSUS	NECESSRY 8	ASSET 35	USEFUL 4	SOME	USE 1	NO NEED 1	>10×-	10×-	O.K.	10×+	100×+ 100	0×+ >1000×+
EXPERT TOTALS CONSENSUS	5	20	2		0	1						
D. Data banks	of econom		ors avai	lable	as i	nput.						
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CONSENSUS EXPERT TOTALS CONSENSUS	-  26   -	1	1		0	0						

Enterprise Simulation -- The utilization by 50 percent of the Fortune 500 companies of models of their enterprises. The model would be capable of testing varying organizations and policies under varying external environments.

IMPACT_AND_VALUE	
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<u>IMPLEMENTATION_DATE</u> 1970-71 72-74 75-77 78-80 81-85 LATER NEVER	
GROUP TOTALS 0 1 9 36 17 0 0	
CONSENSUS  -	
EXPERT TOTALS 0 0 5 3 2 0 0	
CONSENSUS	
<u>REQUIRED_CAPABILITIES</u>	
A. A model development service.	
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+	100×+ 1000×+ >1000×+
GROUP TOTALS 5 34 8 4 2	
CONSENSUS	
EXPERT TOTALS 0 6 0 0 2	
CONSENSUS	
B. Mass storage of 100 billion bytes.	
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+	100×+ 1000×+ >1000×+
GROUP TOTALS 6 30 11 3 3 1 12 28 1	0 0 0
CONSENSUS    -	ů ů
EXPERT TOTALS 0 5 1 0 1 1 5 0	0 0 0
CONSENSUS	
C. Advanced data base management system.	
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NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 0.K. 10x+	100×+ 1000×+ >1000×+
GROUP TOTALS 36 10 5 0 1 CONSENSUS	
EXPERT TOTALS 6 1 0 0 0	
CONSENSUS   -	
D. Interactive terminal system with complex search and interactive pattern matchi	ng for use in building
evaluating and optimizing the model.	9 101 000 111 00111119
NECESSRY ASSET USEFUL SOME USE NO NEED > 10x- 0.K. 10x+	100×+ 1000×+ >1000×+
GROUP TOTALS 12 38 3 0 1	
CONSENSUS    -	
EXPERT TOTALS 1 7 0 0 0 0 CONSENSUS   -	
	footowa oa sawas
F. A data bank of national and international economic, population, political, etc for input of the external environment.	. lactors as source
Tot input of the excernal environment.	
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EXPERT TOTALS	3	5	0		0		0							
CONSENSUS		1-1												

IMPACT\_AND\_VALUE

Investment Models -- The utilization by 20 percent of the investment firms, banks, and insurance companies of investment models. The models will be used to forecast the security markets, analyze potential investments against general criteria of asset selection, and make recommendations for buying and selling securities.

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EXPERT TOTALS	1	12		16	1	12	1	7	1	3	18	8	0
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EXPERT TOTALS		0	3	19	14	1	0	. 0					
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#### COMPUTER ASSISTED RESEARCH

1978-80 will find the beginning of the utilization of computer systems to monitor, coordinate and assist in highly creative areas such as scientific research. Such systems will take advantage of the computers ability to retain and refer to large amounts of data and software with the capability of discovering underlying principles and relationships. The scientist will use the system to record his research plan and the results as they develop. The system will assist him by suggesting apparent relationships for his evaluation. Practical applications will include: computer coordinated tests of medical drugs for effectiveness and long range side effects and monitoring of research for adverse ecological effects.

By 1985 complete systems will exist for assistance in whole scientific disciplines particularly in newly developing areas such as oceanography. An oceanography system would correlate data drawn from ocean explorations, satellite observations, and scientific studies to predict locations of undersea mineral resources and to provide development data for farming of fish and other sea crops.

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APPLICATION TITLE		1970-71					LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
COMPUTER COORDINATED TESTING OF MEDICAL DRUGS	100- 75- 50- 25- 0- P.C.		0.0	0.0	68.6	31.4	0 <b>.0</b>	0.0	2.95	2.37	3.54	0.25
RESEARCH MONITORING FOR ECOLOGICAL EFFECTS	100- 75- 50- 25- 0- P.C.		0.0	7.8	-  45.1	37.3	5.9	3.9	3.24	2.41	2.98	-0.41
COMPUTER ASSISTED OCEANOGRAPHY	100- 75- 50- 25- 0- P.G.		0.0	7.4	 40.7	-  48.1	3.7	0.0	2.87	2.59	2.89	70.50

Computer Assisted Oceanography -- The existence of systems to correlate data drawn from ocean explorations, satellite observations, and scientific studies to locate undersea mineral resources and to provide development data for farming of fish and other sea crops.

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CONSENSUS	11													
EXPERT TOTALS		4	1	1		0	1							
CONSENSUS	11			1										
B. Mass storag	e of I	l00 bi	.llion b	ytes f	or th	ne data.								
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CONSENSUS

Computer Coordinated Testing of Medical Drugs -- The implementation of a mandatory comprehensive testing program for drugs and food products prior to their release to general use. The program would be administered and/or coordinated by the government and would be aimed at detecting long-range adverse side effects as well as determining drug effectiveness. The coordination and analysis would be computer assisted

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EXPERT TOTALS	0	0	0	7	4	0	(	)						
CONSENSUS			1-	-										
				REQ	<u>UIRED</u>	CAPAB.	LLITIES	<u>5</u>						
A. Mass data	storage of	f one tr	illion b	ytes.										
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CONSENSUS														
EXPERT TOTALS	6	3	0		1	0								
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Research Monitoring for Ecological Effects -- The utilization of computer systems in 20 percent of the Fortune 500 Companies to monitor stages of developmental research to predict the ecological implications relative to the manufacture, use, and disposal of potential products.

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# DISTRIBUTION AND RETAIL

The computerization thrust in the retail market will be toward point of transaction terminals for capture of sales data, credit check, and credit sales entry. Within the next four years the first successful implementation will be completed. This will counteract the recent adverse publicity caused by the failure of some pilot systems. By as early as 1975 and certainly before 1980 there will be such systems in 5 percent of the department stores. The terminals will probably use magnetic stripe credit cards for user identification but may incorporate more positive identification methods such as voice-print, fingerprint, or retina-print.

By 1980 the low markup stores such as supermarkets will have gone to terminals for checkout. These systems would sense identifying marks on the product or as in the case of produce be identified by keyboard entries. Scales would have direct read-out capability. Prices are determined from latest price lists and the customer receives a printout of description and prices of his purchases. Inventory control and automatic reorder follow from the data capture.

In another significant step forward distribution industry will begin to accept computer-to-computer orders and use automated warehouses and freight terminals to speed their distribution.

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		DISTRIBUTION AND RETAIL											
	APPLICATION TITLE	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED	
	RETAIL TERMINAL SYSTEMS       100         75       50         25       25	- -							2.01	3.98	2.51	0.00	
	0 P. <i>C</i>		3.1	67.2	29.7	0.0	0.0	0.0					
	AUTOMATED WAREHOUSES 100 75 50 25 0	- -		1-1	1				1.48	3.35	1.74	-0.19	
	P.C		1.7	58.3	35.0	5.0	0.0	0.0	•				
	SUPERMARKET CHECKOUT SYSTEMS 100 75 50 25	- - -			1-1-1		t-mysensoni de telestropis de la co		1.55	2,95	2.53	-0.44	
	P.C		0.0	14.5	74.2	6.5	3.2	1.6					
777 29	AUTOMATED FREIGHT TERMINALS 100 75 50 25 0	- - -	,		1-1	1	and the second s		1.38	2.90	1.59	0.63	
	P.C	. 0.0	0.0	1.6	65.6	29.5	3.3	0.0					

III.29

<u>Automated Freight Terminals</u> -- The automation of 1 percent of the freight terminals. Based on teleprocessed manifests of incoming shipments the terminal system schedules the docks and storage facilities optimumly. Loading, unloading, movement and storage within the terminal is done automatically by automated equipment under computer control.

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CONSENSUS			-		*	O						
C. Relatively	high rel	iability	- no out	tages	of over	one	hour.					
	NECESSR	Y ASSET	Herrit	CONE	USE NO	uran	× 1 0 ··	40	0 "	4.4		
GROUP TOTALS	34	15	2	HOME	038 70	1	) ) )	10×- 2	0.K. 39	10×+ 3	0 ×+ 100t	×+ >1000×+
CONSENSUS	• .	1	-		U	7	0		1-1-1	3	U	0 0
EXPERT TOTALS	15	3 '	2		0	1	0	1	15	1	. 0	0 0
CONSENSUS	11		-		•	•	·		1-1-1	•	. 0	0
D. Mass storag	e of <u>100</u>	billion	bytes.									
	NECESSR	Y ASSET	USEFUI.	SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100 - 1000	×+ >1000×+
GROUP TOTALS	11	36	4		0	1	1	14	31	0	0	0 0
CONSENSUS		11-1				-	-		-	•	•	• 0
EXPERT TOTALS	4	13	3		0	1	1	4	12	0	0	0 0
CONSENSUS		11-1							1-1			

Automated Warehouses -- The conversion of 1 percent of the warehouses in Fortune 500 Companies to computerized control of stacking and picking, and movement to and from docks and/or manufacturing floor.

			IMPACT_	AND VAL	<u>UE</u>					,
IMPAZ	T ON SOCIE	TY								WILL
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	-				r MARC					IMPLEMENTED 5
_	-									2
2	3 10	3	17	14		2	7	10	12	2
			<u>IMPLEMEN</u>	TATION_	2ATE					
1970-71					NEVER					
0			3	0	0					
•		•	4	•	•					
U			1	U	U					
	1-1									
		ACCELER.	ATING AN	D RETAR	DING FA	ACTORS				
reduction	in cost o									
						70.00	04 05	r 4 m		
			-	-		-	_		-	
•		•	•		-	•	U	3	2	
nt or tax	incentive	s for inve	es thent.	In auco	Macion	edarbue	:IIC.			
ABSOLUTE	POSSIBLE	NO EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	
19	22	9	0	5	10	5	3	5	8	
		_	-		•	2	2	•		
nt of gua:	ranteed an	nual inco	me remov	ing mos	t labor	r's obje	ections	to aut	omation.	
ARSOLUTE	POSSTBLE	NO EFFE <b>CT</b>	1970-71	72-74	75-77	78-80	81-85	T. 4 ጥ ም. P	פאעאו	
3			0			9	5			
6	14	6	0	1	8	2	3	2		
		R.	<u>equired</u>	<u>CAPABIL</u>	<u>TIES</u>					
ta base m	anagement.									/
										7
NECESSRY	ASSET U	SEFUL SOM	E USE NO	NEED >	10×-	10×-	0. K.	10x+	100×+ 100	)x+ >1000x+
NECESSRY 30	ASSET U.	SEFUL SOM	E USE NO 6	NEED >	10×-	10×-	O.K.	10×+	100×+ 100	0×+ >1000×+
	10				10×-	10×-	O.K.	10×+	100×+ 1000	0×+ >1000×+
30	10				10×~	10×-	O.K.	10×+	100×+ 1000	0×+ >1000×+
30    13 	10	4 3 1	6 5	2			O.K.	10×+	100×+ 1000	0×+ >1000×+
30    13 	10	4 3 1	6 5	2			O.K.	10×+	100×+ 100	0×+ >1000×+
30    13 	10	4 3 1	6 5	2			O.K.	10×+	100×+ 100	0×+ >1000×+
30    13 	10   3 ability.	4 3 1	6 5 s of gre	1 ater th	an one		O.K.			0×+ >1000×+ 0×+ >1000×+
30    13    high reli	10   3 ability.	4 3   No outage	6 5 s of gre	1 ater th	an one	hour.				
30    13    high reli	10   3 	4   No outage SEFUL SOM	5 s of gre E USE NO O	1 ater the	an <u>one</u> 10×-	hour.	0.K.	10×+	100×+ 1000	0×+ >1000×+
30    13    high reli NECESSRY 27	10   3 	3   No outage SEFUL SOM	6 5 s of gre E USE NO	1 ater the	an <u>one</u> 10×-	hour.	O.K. 43	10×+	100×+ 1000	0×+ >1000×+
	JOR SIGN 4 1 2  1970-71 0 0  reduction ABSOLUTE 10 7 nt of tax ABSOLUTE 19 12 nt of gua	JOR SIGNIF. LITTL 4 18 46 2 9 16  1970-71 72-74 75- 0 1 3  -  0 0 1  -  reduction in cost of  ABSOLUTE POSSIBLE 10 29 7 14 nt of tax incentive:  ABSOLUTE POSSIBLE 19 22 12 12 nt of guaranteed and  ABSOLUTE POSSIBLE 3 27	4 18 46 12 2 9 16 5  1970-71 72-74 75-77 78-80 0 1 35 21  -   0 0 17 11  -    **ACCELER** reduction in cost of picking  **ABSOLUTE POSSIBLE NO EFFECT 10 29 10 7 14 5 nt of tax incentives for involution in cost of picking  **ABSOLUTE POSSIBLE NO EFFECT 19 22 9 12 12 2 nt of guaranteed annual incompanies of the cost of guaranteed annual incompanies of guaranteed guaranteed annual incompanies of guaranteed g	## PROFIT.  ## 18	## 18	## PROFITABLE TO IMPLED  ## 18	## PROFITABLE TO IMPLEMENTOR  JOR SIGNIF. LITTLE NO VERY MODERT MARGINAL  4 18 46 12 31 37 5 2 9 16 5 14 14 2  ## 1970-71 72-74 75-77 78-80 81-85 LATER NEVER  0 1 35 21 3 0 0   -   0 0 17 11 1 0 0   -    **ACCELERATING AND RETARDING FACTORS**  reduction in cost of picking and stacking units.  ### ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80  10 29 10 0 5 17 7 7 14 5 0 2 8 3  nt of tax incentives for investment in automation equipmed  ### ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80  19 22 9 0 5 10 5 12 12 2 0 2 5 2  nt of guaranteed annual income removing most labor's object  #### ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80  19 27 14 0 3 12 9 6 14 6 0 1 8 2	## PROFITABLE TO IMPLEMENTOR USERS  JOR SIGNIF. LITTLE NO VERY MODERT MARGINAL VERY  18 46 12 31 37 5 8  2 9 16 5 14 14 2 4  ***IMPLEMENTATION DATE**  1970-71 72-74 75-77 78-80 81-85 LATER NEVER  0 1 35 21 3 0 0   -   0 0 17 11 1 0 0   -   0 17 11 1 0 0   -    **ACCELERATING AND RETARDING FACTORS**  reduction in cost of picking and stacking units.  **ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80 81-85  10 29 10 0 5 17 7 2  7 14 5 0 2 8 3 0  Int of tax incentives for investment in automation equipment.  **ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80 81-85  19 22 9 0 5 10 5 3  12 12 12 2 0 2 5 2 2  Int of guaranteed annual income removing most labor's objections  **ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80 81-85  2 7 14 0 3 12 9 5  6 14 6 0 1 8 2 3	## PROFITABLE TO IMPLEMENTOR USEFUL TO FE SIGNIF. LITTLE NO VERY MODERT MARGINAL VERY MODERT 1 18 46 12 31 37 5 8 23 2 9 16 5 14 14 2 4 10 10 10 10 10 10 10 10 10 10 10 10 10	### PROPITABLE TO IMPLEMENTOR USEFUL TO PUBLIC JOR SIGNIF. LITTLE NO VERY MODERT MARGINAL VERY MODERT MARGINAL 4 18 46 12 31 37 5 8 23 32 1

Retail Terminal Systems -- The implementation in 5 percent of the department stores of a system to capture sales data at the point of transaction and integrate it into systems which process inventory control, billing, purchasing, sales analysis, credit check, etc.

IMPACT ON SOCIETY
ACCELERATING AND RETARDING FACTORS  A. Successful implementation of one installation to counteract the recent failures in this area.
ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80 81-85 LATER NEVER GROUP TOTALS 18 33 4 3 24 17 3 0 0 0 EXPERT TOTALS 3 9 0 1 5 2 1 0 0 0
REQUIRED CAPABILITIES  A. Advanced data base management system.
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+ >1000x+ GROUP TOTALS 33 18 2 1 1 CONSENSUS     EXPERT TOTALS 8 3 0 0 0 0 CONSENSUS     B. Point-of-sale terminal for \$5-\$25 per month.
NECESSRY ASSET USEFUL SOME USE NO NEED > 10x-
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 0.K. 10x+ 100x+ >1000x+ >1000x+ CONSENSUS      EXPERT TOTALS 1 5 4 1 0  CONSENSUS      D. Label or price code scanners.
NECESSRY ASSET   USEFUL SOME USE NO NEED > 10x-   O.K.   10x+   100x+   1000x+   > 1000x+

<u>Supermarket Checkout Systems</u> -- The installation of systems in 1 percent of the supermarkets of systems to automatically enter the identification of items purchased. The system would price the item according to the latest price lists and deplete inventory.

					TMDACT	AND_VALUE	,					1
	IM	PACT OF	N SOCIETY		TGEURT-		L EASONS FOR I	MPLEME	NTATION		WILL	
			•		PROFIT	ABLE TO	MPLEMENTOR	USE	FUL TO F	PUBLIC	NOT BE	
MA	JOR S	IGNIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED	
GROUP TOTALS	4	14	34	7	17	29	11	12	27	16	9	
EXPERT TOTALS	2	4	15	1	10	11	1	6	11	4	2	
				1	MPLEMEN	TATION DA	l <i>TE</i>					
	1970-	71 72-	74 75-77	78-80	81-85	LATER 1	IEVER					
GROUP TOTALS	0	(	9	46	4	2	1					
CONSENSUS				1-1-1								
EXPERT TOTALS	0	(	5 6	14	0	0	1					
CONSENSUS			1									

#### REQUIRED\_CAPABILITIES

# A. Scanner for labels or price codes.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	42	11	0		0		0							
CONSENSUS	11-1													
EXPERT TOTALS	14	14	0		0		0							
CONSENSUS	11-1													

B. Checkout terminal to display prices as read and printout item description, price per unit measure, total price, etc. \$1,000 purchase.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	38	13	1		0		0	0	0	44	2	0	0	9
CONSENSUS										1-1-1				
EXPERT TOTALS	13	3	1		0		0	0	0	14	0	0	0	<b>n</b>
CONSENSUS	11-1									1-1-1				

#### ECOLOGICAL

Ecological problems are currently a matter of national concern. Much effort will be spent in the future endeavoring to solve these problems and the computer will play a major role. However, with the exception of pollution monitoring networks in general use in 20 percent of the metropolitan areas by 1975-77, the majority of the applications will require scientific development and will not become available untill 1978-1985. These include:

- . Monitoring of research and development and use of ecological balance calculations to predict the results of the introduction of new products, by 20 percent of the large corporations.
- . The extension of computerized weather forecasting to allow calculations of pollutant concentrations so that air pollution can be predicted.
- . The use in 20 percent of the metropolitan areas of computer analysis of waste products so that they can be broken down into harmless components and either recycled or safely disposed of.

Air pollution prediction will require processors capable of 30 million instructions per second and worldwide networks of sensors. Many of these applications such as research monitoring and ecological balance calculations require data processing systems capable of discovering underlying principles and relationships.

ECOLOGY

						ECOLOG	1			T1/D / 00			*****
	APPLICATION TITLE		1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
	POLLUTION MONITORING SYSTEMS	100- 75-								3.46	2.36	3.75	-0.15
		50- 25-	_	J		],							
	·	0- P.C.	0.0	3.6	-  49.1	40.0	5.5	1.8	0.0				
	RESEARCH MONITORING FOR ECOLOGICAL EFFECTS	75-								3.24	2.41	2.98	-0.41
		50- 25-				, ,							
		0- P.C.	0.0	0.0	7.8	45.1	37.3	5.9	3.9				
	COMPUTERIZED WASTE DISPOSAL PLANTS	75-								2.84	2.40	2.98	-0.90
		50- 25-				<b>.</b>							* ·
		0- P.C.	0.0	0.0	1.8	-  54.4	33.3	5.3	5.3				
III.	ECOLOGICAL BALANCE CALCULATIONS	100- 75- 50- 25-				ſ			ı	3.11	1.78	2.86	1.07
ဌ		0- P.C.	0.0	0.0	0.0	10.9	-  58.2	21.8	9.1				
	AIR POLLUTION PREDICTION	100- 75- 50-				ŗ				3.22	1.98	3.25	0.66
		25- 0- P.C.	0.0	0.0	0.0	1.9	-  60.4	35.8	1.9				
	ECOLOGICAL PLANT SCHEDULING	100-	0.0			1.3	00.	00.0	1.7	3.00	1.56	2.48	<sup>-</sup> 1.59
		50- 25-				ſ							
		0- P.C.	0.0	0.0	0.0	0.0	-  54.5	21.8	23.6				

Air Pollution Prediction -- The existence of a global circulation model of the atmosphere. The model would include the horizontal hydrodynamics and thermodynamics of the atmosphere so that calculations of pollutant concentrations can be made for a given input source of pollutants. This would provide a dynamic air pollution prediction.

		r on soci		PROF		REASO.		USEF	UL TO P		NO	WILL OT BE
	JOR SIGNI 19 29				ERY MO. 8	DERT MAI	RGINAL 17	<i>VERY</i> 31	MODERT 10	MARGINAL 7	: <i>IMPL!</i> 13	
GROUP TOTALS EXPERT TOTALS		-	-		8 1	20	1	31	10 3	0		4
EVLEUT TOTURA	2 .	_	-		•	•	•		•	Ť		, 1
	1970-71 7	<b>12-74</b> 75	5-77 78-8			<u>ON_DATE</u> ER NEVE.	R					
GROUP TOTALS CONSENSUS	0	0	0 1	1 32  - -	2 1	-						
EXPERT TOTALS CONSENSUS	0	0	0 0	0 6  - -	-	2 0						
			ACCELI	<u>ERATING</u>	AND_RE	TARDING_	<u>FACTORS</u>					
A. Legislation	ı enforcin	g pollut	ion contr	ol.								
	ABSOLUTE	POSSIBLE	NO EFFE	CT 1970.	-71 72-	74 75-7	7 78-80	81-85	LATER	NEVER		ļ
GROUP TOTALS	12	20	6	•	-	8 16	•	2	0	0		ļ
EXPERT TOTALS	2	3	2	(	0	2 3	0	0	0	0		
A. Processor s	speeds of					BILITIES	10×-	O.K.	10×+	100×+ 100	10 A T	1000**
GROUP TOTALS CONSENSUS	11	32   -	3	0	0	0	0	39  - -	2	0	0	0
EXPERT TOTALS CONSENSUS	1	2	•	0	0							
B. Massive com	munication	n interfa	ace - <u>10,</u>	000 lin	es to m	nonitor a	sensor	networ	۲.			
GROUP TOTALS CONSENSUS	NECESSRY 30	15	USEFUL SO	OME USE 0	NO NEE	D >10×- 0	10×- 4	0.K. 33	10×+ 3	100×+ 100 0	0×+ >: 0	1000×+ 0
EXPERT TOTALS CONSENSUS	3	,	1	0	0							
${\mathcal C}$ . Mass storag	e of 100 l	billion h	oytes.									
	NECESSRY	ASSET	USEFUL SO	OME USE	NO NEE	D >10×-	10×-	о.к.	10×+	100×+ 100	nx+ >	1000×+
GROUP TOTALS CONSENSUS	33	13	1	0	0	0	1	35  - -	6	1	0	0
EXPERT TOTALS CONSENSUS	1	3	1	0	0	0	0	1-1-1	0	1	0	0
						•						

Computerized Waste Disposal Plants -- The existence in 20 percent of the metropolitan areas of plants designed to analyze complex chemical waste products and break them down under computer control.

											,	_
	JOR SIGN 19 3			IMPACT PROFIT VERY 15 2	ABLE TO MODE.	REASON. O IMPLEI RT MAR			TATION UL TO 1 MODERT 18		WILL NOT BE IMPLEMENTED 24 2	
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	1970-71	72-74 75-7 0 1	31	<u>IMPLEMEN</u> 81-85 19   2 	TATION LATER 3	<u>DATE</u> NEVER 3						
A. Federal su	ubsidizing	•	ACCELER	ATING_AN	D_RETA	RDING F	ACTORS					
GROUP TOTALS EXPERT TOTALS	ABSOLUTE 19 2	POSSIBLE N 20 3	O EFFECT 7 0	1970-71 0 0	<b>72-</b> 74 6 2	75-7 <b>7</b> 13 1	78-80 12 1	81-85 2 0	<i>LATEI</i> 1 0	R NEVER 2 0		
A. Advanced a	nalytical	instrument		EQUIRED der comp								
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS B. Discovery	NECESSRY 40   -  5   -  system fo	9 1	2	USE NO 0 0 .s of the	0		10×-	O.K.	10×+	100×+ 1000	)×+ >1000×+	
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESSRY 39   -  	7	EFUL SOM 2	USE NO 0 3	NEED 1	>10×-	10×-	O.K.	10×+	100×+ 1000	0×+ >1000×+	

Ecological Balance Calculations -- The existence of systems capable of calculating in advance the regional results of such actions as "over use of fertilizer, which wash into ponds and rivers, which causes excessive growth of algae, which chokes the waterways and kills the fish."

MA GROUP TOTALS EXPERT TOTALS	4 <i>JOR</i> 24 4	SIGN:	TF. L	OCIETY ITTLE 12 0	<i>NO</i> 1 0	PROF VE		REA TO IM	SONS FOR PLEMENTOF MARGINAL 21 1		EFUL TO	PUBLIC " MARG		WILL NOT BE MPLEMENTER 29 2
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS  A. Discovery		0	0	75-77 0 0	78-80 6 3	81-8 32  - - 2  -	1 	ER NE 2 -   2 -   BILITI	VER 5 0					
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS B. Mass store	NEC   -	ESSRY 32 -  5 -	ASSE:	T USEF	<i>UL SOME</i> 3 0					O.K.	10×+	100×+	1000×	+ >1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS C. Search engi			ASSE: 28	!	UL SOME 7 0 apabili	0	2	7 >10× 1		0.K. 28  - -	10×+ 3	100×+ 0	1000× 0	+ >1000×+ 0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS		ESSRY 9 2	26    5	1:	UL SOME 2 -  0	0 USE 0	<i>NO NEE</i> : 2	7 >10×4 0	- 10×- 29  - -  4  - -	0.K. 8	10×+ 0	100×+ 0	1000× 0	+ >1000×+ 0

Ecological Plant Scheduling -- The establishment of a nationwide system to schedule the operation of pollution-prone plants based on weather forecasts.

				IMPACT_	AND_VA						
	IMPAC	T ON SOCI	ETY	777777	7 4 TO T TO . (T)		S FOR I.			UDTTA	WILL
MA	JOR SIGN.	IF. LITT	LE NO	VERY		O IMPLEI RT MAR	GINAL		'UL TO P MODERT		NOT BE IMPLEMENTED
	20 4			7 7	2		13	32	13	2	43
EXPERT TOTALS	7 1			1		9	2	10	2	0	12
				IMPLEMEN	<u>ITATION</u>	DATE					
	1970-71	72-74 75	-77 78-8		LATER						
GROUP TOTALS CONSENSUS	0	0	0 0		12	13					
EXPERT TOTALS CONSENSUS	0	0	0 0	11	6 	4					
			A C C F T. F	RATING AN	איי <i>יים א</i> ורינו	RDING F.	ACTORS				
A. Availabil	ity of acc	curate se					UATAUS				
			NO EFFEC								
GROUP TOTALS EXPERT TOTALS	9	23 10	12 5	0	3 1	6 3	16 6	3 0	4 1	2 2	
T	on enforci	<del>-</del> -	· ·	•	•	J	Ü	ŭ	*	4	
-			NO EFFEC		72 - 74	<b>75-77</b>	78-80	81-85	LATER	NEVER	
GROUP TOTALS	12	25	8	2	12	11	7	0	1	1	
EXPERT TOTALS	3	10	5	2	4	3	2	0	0	1	
				<u>REQUIRED</u>	CAPABI	<u>LITIES</u>					
A. Input from	m nationwi	de weath	er forecas	sts.							
	NECESSRY	ASSET	USEFUL SO	ME USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS CONSENSUS	42   -	2	1	0	0						
EXPERT TOTALS	16	2	1	0	0						
CONSENSUS	11-1										
B. Mass stora	ge of <u>100</u>	billion	bytes.								
	NECESSRY	ASSET	USEFUL SO	ME USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS	30	11	3	0	0	0	6	27	5	0	0 0
CONSENSUS EXPERT TOTALS	13	1 4	2	0	0	0	3	1-1-1	3	0	0 0
CONSENSUS					-	-	-	1-1-1	ŭ	v	

Pollution Monitoring Systems -- Installation of a pollution monitoring system in 20 percent of the metropolitan areas. The systems would monitor air, water and noise pollution, detecting and locating sources of pollution before they become irritants. Fixed sensors would provide continuous monitoring of areas with mobile sensors used to isolate sources of pollution.

				IMPACT A	<u>ND VALUE</u>	1					
	IMPACT OF	V SOCIETY			RE	ASONS FOR 1	MPLEME	NTATION		WILL	
				PROFITA	BLE TO 1	MPLEMENTOR	USE	FUL TO P	UBLIC	NOT BE	
MAJO!	SIGNIF.	LITTLE	NO	very	MODERT	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED	
GROUP TOTALS 21	31	6	1	11	22	18	35	13	7	3	
EXPERT TOTALS 6	8	1	0	3	6	5	10	2	3	0	
/ IMPLEMENTATION_DATE											
19	370-71 72-	74 75 <b>-77</b>	78-80	8 <b>1-8</b> 5	LATER N	IEVER					
GROUP TOTALS	0	2 27	22	3	1	0					

#### ACCELERATING AND RETARDING FACTORS

# A. Legislation enforcing pollution control.

CONSENSUS EXPERT TOTALS CONSENSUS

	ABSOLUTE	POSSIBLE	NO EFFE	CT 1970-7	1 72-74	75-77	78-80	81-85	LATER	NEVER
GROUP TOTALS	15	20	5	0	11	21	4	1	0	0
EXPERT TOTALS	6	5	1	. 0	4	6	1	0	0	0

# REQUIRED CAPABILITIES

# A. Massive communication interface - 10,000 lines.

	NECESSRY	ASSET	${\it USEFUL}$	SOME US	E NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	14	29	2	1		1	1	6	34	1	0	0	0
CONSENSUS		-							1-1-1				
EXPERT TOTALS	1	8	1	0		0	1	2	6	0	0	0	0
CONSENSUS		11-1							1-1				

B. Low cost sensors capable of detecting many types and combinations of pollutants.

GROUP TOTALS CONSENSUS	NECESSRY 45	ASSET 2	USEFUL 1	SOME	<i>USE</i> 0	NO	NEED O	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
EXPERT TOTALS CONSENSUS	10	1	0		0		0							

Research Monitoring for Ecological Effects -- The utilization of computer systems in 20 percent of the Fortune 500 Companies to monitor stages of developmental research to predict the ecological implications relative to the manufacture, use, and disposal of potential products.

MA GROUP TOTALS EXPERT TOTALS	1 <i>JOR SIGN</i> 19 2	TF. LIS		<i>NO</i> 1 0	PROF	ERY MOD	REASO TO IMP	ONS FOR I LEMENTOR ARGINAL 13	USEF	TATION TUL TO T MODERT 20 3		WILL NOT BE IMPLEMENTED 8 2
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	1970-31 0	<b>72-7</b> 4 0	4 1	8-80 23 -  4		3	R NEVI	2				
A. Legislation	enfor <b>c</b> in	g pollut	<u>4€€</u> cion con	ELERA trol.	<u>TING</u>	AND RET	<u>ARDING</u>	FACTORS				
GROUP TOTALS EXPERT TOTALS	ABSOLUTE 15 4	POSSIBI 20 4	)	FECT 6 0	1970- 0 0	8	4 75-7 18	8	81-85 0 0	<i>LATER</i> 0 0	R NEVER 0 0	
A. Discovery s	ystem.			<u>R</u> E	<u>QUIRE</u>	D_CAPAB.	<u>LLITIES</u>	:				
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESSRY 30 	10	3 1	SOME	USE 1	<i>NO NEED</i> 2 0	>10×-	10×-	O.K.	10×+	100×+ 1000	×+ >1000×+
B• Mass storag	e of 100	billion	bytes.									,
GROUP TOTALS CONSENSUS EXPERT TOTALS	NECESSRY 	ASSET 23 -	USEFUL 9	SOME	USE 10 0	NO NEED 1	>10×- 3	10×- 9	0.K. 23  -	10×+ 1	100×+ 1000	×+ >1000×+ 0 0

CONSENSUS

# EDUCATION

Popular magazines and the news media indicate that education is on the verge of a crisis. Many communities have refused to approve increased taxes to meet the increased cost of providing public education. Lack of funds makes it difficult to attract enough highly qualified, highly motivated people as teachers. Disagreements among parents, teachers and administration particularly in underprivilege areas raise questions as to whether our present educational institutions are meeting the needs of the public, all of this at a time when the demand for education is greater than ever.

The study indicates that in the future educational institutions will increasingly turn to the computer to provide quality education by conserving and maximizing the utilization of trained educators and school facilities. By 1980 one percent of the primary and secondary schools will use computer systems to provide dynamic day-to-day schedules for pupils, teachers, and facilities.

Scheduling becomes even more critical in 1980 when Computer Assisted Instruction (CAI) accounts for 20 percent of the teaching hours. In the same time period monitoring and directing of students' progress via Computer Managed Instruction (CMI) will be used either as an alternative or in conjunction with CAI in 5 percent of the schools. The type of computer/ student interaction presented by CAI will also be used to provide testing and guidance counseling, dynamically structuring the testing based on answers and response time to previous questions.

Interestingly enough although the emphasis on CAI has been primarily in relation to educational institutions, it will probably be industry and the military which will make the earliest progress with 20 percent of the on-job training hours being accomplished by CAI as early as 1975-77.

The next significant advance in education will be the utilization of the home terminal in the decade of the 80's as an educational device. Courses for all levels of education including graduate and post-graduate refresher will be available by then and used by at least 1 percent of the homes.

						EDUCATI	ON			IMPACT	PROFITABLE	USEFUL	WILL
	APPLICATION TITLE		1970-71	72-74	75-77	78-30	81-85	LATER	NEVER	ON	TO IMPLEMENTOR	TO	NOT BE
	DYNAMIC SCHEDULING OF EDUCATIONAL FACILITIES	100- 75- 50- 25- 0- P.C.	0.0	0.0	11.7	- -  65.0	21.7	0.0	1.7	2.23	2.34	2.77	-0.23
	COMPUTER ASSISTED INSTRUCTION - ON THE JOB TRAINING	75- 50- 25-								3.10	3.23	3.28	70.11
		0- P.C.	0.0	1.5	10.6	78.8	6.1	3.0	0.0				
	COMPUTER MANAGED INSTRUCTION	100- 75- 50- 25- 0-			***************************************	J	<u> </u>		<b>L</b> eadain an	2.71	2.29	3.13	-0.29
III.43	COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS	P.C. 100- 75- 50- 25-	0.0	0.0	5.1	50.8	32.2	8.5	3.4	3.56	2.86	3.73	-0.07
		0- P.C.	0.0	0.0	1.5	61.2	32.8	4.5	0.0				
	COMPUTER ASSISTED TESTING AND GUIDENCE COUNSELING	100- 75- 50- 25- 0- P.C.	0.0	0.0	4.6	]-  55.4		7.7	1.5	2.54	2.20	2.64	<sup>-</sup> 0.48
	HOME COMPUTER ASSISTED INSTRUCTION	100 - 75 - 50 - 25 -	3.3	0.0	7.0	J.			<b>4.</b> 0	3.41	2.52	3.66	-0.40
		0- P.C.	0.0	0.0	3.2	22.6	58.1	16.1	0.0				

2

Computer Assisted Instruction - On The Job Training -- The replacement of 20 percent of on-the-job training hours in industrial and military organization by computer assisted instruction.

						<u>IMPACT</u>	AND_V		CONC ROD	TWDIEWE	11 <i>m</i> 4 m T 0 11			******
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EXPERT TOTALS	3	8		2	Ö	4		8	0	5	7	0		0
BALDILL LOTUDO	Ü	ŭ		_										
					;	IMPLEME!	YTATIO.	N_DAT	<u> </u>					
	197	0-71 7	2-74 7	5-77	78-80	81-85	LATE		VER .					
GROUP TOTALS		0	1	7	52	4	2		0					
CONSENSUS		_			1-1-1		•		•					
EXPERT TOTALS		0	1	1	10	1	0		0 ·					
CONSENSUS					1-1-1									
					CCELER	ATTNG AT	UD RET	ARDTN	G FACTORS	S.				
A. Successful	l uti	lizati	on in 1											
,														
	ABS	OLUTE				1970-7	1 72-7		-7 <b>7</b> 78-8			NEVER		
GROUP TOTALS		19	30		8	0	7		22 17	_	0	1		
EXPERT TOTALS		4	ц		3	0	1		4 :	3 0	0	1		
B. Federal su	ıbsid	ly.												
	ABS	OLUTE	POSSIBI	E NO	EFFECT	1970-7	1 72-7	4 75	-7 <b>7 7</b> 8-8	8 <b>0 81-</b> 8	5 LATER	NEVER		
GROUP TOTALS		18	31		6	0	7		14 12	2 3	4	2		
EXPERT TOTALS		5	ε		0	0	3		2	1 0	2	0		
					_		<b>~</b> 4 D 4 D		<b></b>					
4					_	<u>EQUIRED</u>								
A. Course prosystems.	epara	tion 1	anguage.	to 1	reduce	the pre	parati	on co	st by a i	factor o	f $5$ over	today's	CAI	
	N F	ESSRY	ASSET	ucri	RIIT. SOM	E USE NO	משישוו ר	>10x	- 10×-	0.K.	10×+	100×+ 10	U U * T	>1000×+
GROUP TOTALS	NEC	33	17	0001	3	1	1	0	6	41	4	0	0	0
CONSENSUS	1-				•	_	-		_	1-1-1		-	_	_
EXPERT TOTALS	•	6	2		1	0	1	0	0	8	2	0	0	0
CONSENSUS	1 -	-								1-1-1				
B. Terminal v	with	displa	y, full	keyl	ooard,	light pe	en fun	ction	keyboard	d, and v	ideo/aud	lio outpu	t \$20	00/month.
		_	<del>-</del>	_					_		·	` -		
	NEC	ESSRY	ASSET	IIS FI	TIL SOM	E USE NO	משיעות ר	>10×	- 10×-	О.К.	10×+	100×+ 10	00×+	>1000×+
GROUP TOTALS	11 15 0	32	21	01/11/2	1	0	1	1	2	47	0	0	0	0
CONSENSUS	1 -	-	1			•	_	-	~	1-1-1	Ü	Ť	•	•
EXPERT TOTALS	,	5	4		0	0	1	0	1	່ ໌ 8 ໌	0	0	0	0
CONSENSUS	-	1	!							1-1-1				

Computer Assisted Instruction Educational Institutions -- The replacement of 20 percent of the teaching hours in educational institutions by computer assisted instruction.

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	AJOR SIGN		TTLE	NO	VER			ARGINAL		MODERI		NAL IN	NOI DE IPLEMENTED
		+0	8	0	18		44	10	44	26	4		2
EXPERT TOTALS	6	8	0	0	3		8	1	9	5	0		0
				Il	MPLEMEN	TATIO	N DATE						
	1970-71	72-74	75-77 7	78-80		LATE		ER					
GROUP TOTALS	0	0	1 ,	41	22	3	1	0					
CONSENSUS EXPERT TOTALS	0	0	0	-  6	8	0		0					
CONSENSUS	Ü	U	-		-	U	,	U					
			4.00	י א קריק דיקר	מו ביות ביות	חים כל תו	ADDTNC	_FACTORS					
A. Federal sub	sidies.		500	ZO DULLO.	77 U.O. H.	6-0EF	auntur.	TEMOTOUR					
	ABSOLUTE	POSSIBI	E NO EF	FECT :	1970-71	72-7	4 75-	7 <b>7 78-</b> 8	0 81-8	5 LATE	R NEVE	T?	
GROUP TOTALS	27	29		3	0	7						•	
EXPERT TOTALS	5	8		0	0	1	•	7 4	0	0	0		
B. Successful	demonstra	ition in	one lar	ge scr	roor sa	stem.							
	ABSOLUTE	E POSSIBI	E NO EF	FECT 1	1970-71	72-7	4 75-3	77 78-8	0 81-8	5 LATE	R NEVE	P.	
GROUP TOTALS	15	33		11	0	9	20					•	
EXPERT TOTALS	3			3	0	. 4		4 4	Q	. 0		c .	
C. Pupil to te	acher rat	los risi	ng to I	.00 to	lini	.0 per	cent of	t the sc	noors a	ue to I	ack or :	runas.	
	ABSOLUTE	POSSIBL	E NO EF	FECT 1	1970-71	72-7	4 75-7	77 78-8	0 81-8	5 LATE	R NEVE	,	
GROUP TOTALS	32	22	!	3	0	3	14		6	4			
EXPERT TOTALS	8	3	1	2	0	0	L	+ 3	2	1	2		
				D Fr	תידם דוו	CADAD	rrmrno	~					
A. Massive com	municatio	n interf	ace 10.		<i><u>WIRED</u></i> ines.	GALAG	THITTE	2					
													\
	NECESSRY	ASSET	uceeur	COMP	11CB NO	NDDD	. 4 6						
GROUP TOTALS	11	28	13	SUME	USE NO	**************************************	>10×- 9	10×- 15	0.K. 27	10×+ 0			>1000×+
CONSENSUS			1		•	3	,	1		U	0	0	9
EXPERT TOTALS	1	6	2		1	1	1.	2	6	0	0	0	0
CONSENSUS				c. 11 1				1	1-1		m1.		-
B. Inexpensive should be of	terminal	. With di	spray,	ruil a	keyboar nd wide	a, ru	nction ne dist	keyboar olave	a, ana sino ne	light p	en. The	e term	inai
Should be c	apable of	. CGIGVI	ston (ac	iuio ai	ia viae	.O, Cy	be are	prays.	vioo pe.	I MONEN	•		
	NHARACE:			~ ~									
GROUP TOTALS	NECESSRY 37	*		SOME	USE NO			10×-	0.K.	10×+	100×+ 3	1000×+	>1000×+
CONSENSUS			4		0	1	0	1	50	2	0	0	0
EXPERT TOTALS	່ ່ 5	5 ່	1		0	0	0	0	1-1-1	1	0	0	0
CONSENSUS	•	-				-	_		1-1-1		-	-	0
C. Course prep	paration 1	language	to redu	ice the	e prepa	ratio	n cost	by a fa	ctor of	<u>10</u> ove	r today	's CAI	systems.
	NECESSRY	ASSET	USEFUL	SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100-1	0000	>1000×+
GROUP TOTALS	32	24	0		1	1	2	0	49	2	0	0	0 >1000x+
CONSENSUS	11		_						1-1-1	***	•	V	O
EXPERT TOTALS CONSENSUS	6	4	0		1	0	0	0	9	1	0	0	0
D. Availabilit			n servic	e ora	anizati	ons.	\$200 1	per mont	- -  h-				
							7-00						
	NECESSRY	ASSET	USEFUL	SOME	USE NO	מית קון	>104-	10×-	0 V	10	100	000	
GROUP TOTALS	4	33	13		1	1	0	5	0.K. 39	10×+ 2	100×+ 1	+×000.	>1000×+
CONSENSUS							.*		1-1-1	4	U	U	0
EXPERT TOTALS	. 2	, 5	2.		1	1	0	0	9	0	0	0	0
CONSENSUS		11							1-1-1			-	Ü

Computer Assisted Testing and Guidance Counseling -- The accomplishment of 20 percent of the testing and guidance counseling in educational institutions with computer assistance. The system administers tests in subject matter, general IQ, aptitude, personality, etc., adapting the tests individually based on the answers and response time to previous questions. The results are evaluated and alternatives suggested to a counselor for individual guidance.

	IMPAC.	T ON SOCIETY		IMPACT_ PROFIT				MPLEMEN USEF	TATION UL TO F	PUBLIC		WILL NOT BE
	JOR SIGN		NO	VERY			GINAL		MODERT		AL IM	PLEMENTED
	13 3		0	8	3		21	21	30	19		13
EXPERT TOTALS	3	5 6	0	3		7	3	3	7	4		3
	1970-71	72-74 75 <b>-</b> 77		<u> </u>	TATION LATER							
GROUP TOTALS	0	0 3	36	20	5	1						
CONSENSUS EXPERT TOTALS	0	0 0	1-1		2	1						
CONSENSUS	v	· ·	•	11	-	•						
				ATING AN								
A. Social re	jection of	testing as	a means	of meas	uring	and ran	king in	.dividua	ıs.			
	ABSOLUTE	POSSIBLE NO	EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	R NEVER	ı	
GROUP TOTALS	22	26	10	0	3	11	2	5	8	16		
EXPERT TOTALS B. Federal su	abcidu.	6	3	0	3	1	1	0	0	3		
B. rederal so	ubsidy.											
	ABSOLUTE	POSSIBLE NO	EFFECT	1970-71	72-74	<b>7</b> 5-7 <b>7</b>	78-80	81-85	LATER	NEVER	•	
GROUP TOTALS	21	28	8	0	2	16	7	10	4	2		
EXPERT TOTALS	3	7	2	0	1	4	0	3	0	0		
A. Mass store	age <u>100 bi</u>	llion bytes		<u>EQUIRED</u>	<u>CAPABI</u>	LITIES						
	NECESSRY	ASSET USE	FUL SOM	E USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 1	000×+	>1000×+
GROUP TOTALS	7	21	18	4	5	11	29	11	0	0	0	0
CONSENSUS		11	•	_			1-1-1					
EXPERT TOTALS CONSENSUS	0	4	5	3	1	2	6	2	0	0	0	0
B. Terminal v	with displ				n. \$10	)O per m	- -  onth					
D. ICIMINAL I	Ten Gibpi	aj, rarr noj	Dour a,	rranc po	910	JO DEL M	011 011 .					
GROUP TOTALS	NECESSRY 12		FUL SUMI 10	USE NO	NEED O	>10×- 0	10×- 1	0.K. 47				>1000×+
CONSENSUS	14	11-1	10	V	Ū	U	_	1-1-1	2	0	0	0
EXPERT TOTALS	3	` 6	4	0	0	0	0	' '9 '	1	0	0	0
CONSENSUS		11	1					1-1-1				
C. Program p	roduct for	the applica	tion \$5	00 per m	onth.							
CROUD WOTATE	NECESSRY			USE NO			10×-	0.K.				>1000×+
GROUP TOTALS	NECESSRY 9	40	FUL SOMI 6	USE NO 0	NEED 1	>10×- 0	7	42	10×+ 1	100×+ 1 0	000×+ 0	>1000×+ 0
GROUP TOTALS CONSENSUS EXPERT TOTALS							7					

Computer Managed Instruction -- The implementation in 5 percent of the secondary schools of computer managed instruction. The system would individually prescribe course modules, schedule and score tests, and determin the next module.

	IMP	ACT ON	SOCIETY				E EASONS FOR I IMPLEMENTOR		INTATION IFUL TO P	URLIC	WILL MOT BE	1
MA	JOR SI	GNIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODERT		IMPLEMENTED	
GROUP TOTALS	10	35	13	3	5	33	18	20	29	7	6	
EXPERT TOTALS	6	15	5	1	3	17	5	11	12	3	2	
	1970-7	1 72-74	75-77	78-80	<u>MPLEMEN:</u> 81-85	TATION D	<u>4TE</u> NEVER					
GROUP TOTALS CONSENSUS	0	0	3	30	19	5	2					
EXPERT TOTALS CONSENSUS	0	0	2	12	10	1	0					
				DE		*****	n T m C					

# REQUIRED\_CAPABILITIES

#### A. Advanced data base management system.

	NECESSRY	ASSET	USEFUL	SOME	USE .	NO N	TEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	11	34	14		2		0							
CONSENSUS		11-1												
EXPERT TOTALS	2	19	1.		0		0							
CONSENSUS		11-1												
D Dometa have														

#### B. Remote handwriting input.

	NECESSRY	ASSET	USEFUL .	SOME USE	NO NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	1	18	21	6	6							
CONSENSUS		1										
EXPERT TOTALS	1	6	13	1	1							
CONSENSUS		1										

C. Availability of the programs for management of specific courses from service organizations \$50/month.

CDOUD MOMATC	NECESSRY	ASSET	USEFUL	SOME US	E NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS	15	24	8	3		0	0	2	31	7	0	n	0
EXPERT TOTALS	5	9	6	1		0	0	2	8	2	0	0	0
CONSENSUS		11							1-1-1				

Dynamic Scheduling of Educational Facilities -- The utilization of computers in 1 percent of the primary and secondary schools to dynamically schedule the utilization of facilities in conjunction with modern team and modular teaching methods and individual rates of progress made possible by Computer Assisted Instruction (CAI.)

					IMPACT A	AND YALU	<u>E</u>						
		IMPACT ON	SOCIETY			R	EASONS FOR 1	MPLEME	NTATION		WILL		
					PROFITABLE TO IMPLEMENTOR USEFUL TO PUBLIC								
MA	JOR	SIGNIF.	LITTLE	NO	very	MODERI	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED		
GROUP TOTALS	8	26	25	3	3	28	21	17	26	14	5		
EXPERT TOTALS	3	12	8	1	5	12	6	7	12	4	1		
				<u> </u>	MPLEMEN'	CATION D	ATE						
	197	0-71 72-74	75-77	78-80	81-85	LATER	NEVER						
GROUP TOTALS CONSENSUS		0 0	7	39  - -	13	0	1						
EXPERT TOTALS		0 0	2	1.5	6	0	0						
CONSENSUS				-									

### A. Better scheduling algorithms.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	13	39	0		1		0							
CONSENSUS		11-1												
EXPERT TOTALS	6	14	0		0		0							
CONSENSUS														

REQUIRED\_CAPABILITIES

B. Availability of the application program from a service organization \$100 per month.

	NECESSRY	ASSET	USEFUL	SOME USE	NO NE	ED >10×-	10×-	$o.\kappa.$	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	9	27	13	1	1	0	1	33	9	0	0	0
CONSENSUS		11						1-1-1				
EXPERT TOTALS	3	12	3	0	1	0	0	11	2	0	n	0
CONSENSUS		11-1						1-1-1				

Home Computer Assisted Instruction -- The availability of computer assisted instruction in one percent of the homes. This would supplement public education at all levels and provide post graduate refresher and extension courses. Most of the educational materials (graphical, printed and/or sound) are provided at the terminal. The students progress is monitored and he is advanced at his own speed.

	TMDA	am ax aa	OTHOU	<u> </u>	<u> 1PACT</u>	AND V							
	IMPA	CT ON SO	CIETI	7	PAORT	'ARTE	REASOL TO IMPLE	NS FOR I	MPLEMEN	TATION UL TO	מדדמוות		WILL
M	AJOR SIG	NIF. LI	TTLE	NO 1	VERY			RGINAL		<i>MODERT</i>		AT. Th	NOT BE APLEMENTED
GROUP TOTALS		40	10	2	13		43	13	50	14	8	AD II	11
EXPERT TOTALS	9	8	1	1	6		7	2	14	1	1		3
	1070 71	70 71	75 77 7				<u>N_DATE</u>	_					
GROUP TOTALS	19/0-/1	72-74 0	75-77 <b>7</b>	'8-80 8 14	36	LATEI 10	R NEVER O	₹					
CONSENSUS	Ū	0				10	U						
EXPERT TOTALS	0	0	1 '	4	11	1	0						
CONSENSUS			- [		-1-1								
4						D_RETA	<u>ARDING</u> E	<u> PACTORS</u>					
A. CATV insta	alled in o	one perc	ent of t	ne nome	es.								
	ABSOLUT	E POSSIB	LE NO EF	FECT 19	70-71	72 - 71	<b>75-77</b>	78-80	81-85	LATE	R NEVER		
GROUP TOTALS	14	2		7	0	7	13	14	9	1	0		
EXPERT TOTALS	6		8	1	0	1	4	6	3	0	0		
B. FCC regula	ation allo	owing ne	w two-wa	y switc	ched c	ommun	ication	network	s.				
	ARGOTIU	מדפפת א	LE NO EF	<i>ዩቴሮሞ</i> 10	7071	70 71	. 96 79	7 70 00	04.05	T 4 70 777			
GROUP TOTALS	12	2		3	0 7 7 1	72-75	10	78-80 16	81-85 5	LATER	R NEVER O		
EXPERT TOTALS	5		6	1	ő	1	2	8	1	0	0		
C. Availabil:	ity of co	llege cr	edits vi	a CAI c	ourse	_	-	•	•	v	v		
	-	-											
CDOUD MOMATC			LE NO EF								NEVER		
GROUP TOTALS EXPERT TOTALS	25 6	2	5	7 4	0	3 1	15 5	12	8	7	1		
D. Failure of				•				thools i	n the l	3 O large	est citi	es in	the U.S.
closing be	ecause of	conflic	t betwee	n paren	ts, t	eacher	s and a	dminist	ration,	recogn	ition o	f poc	r educationa
quality or				•	·				•			-	/ \
GROUP TOTALS			LE NO EF.							LATER			× 7
EXPERT TOTALS	23 7	1	7 . 5	10 ~ · · · · · · · · · · · · · · · · · ·	1 0	1 1	11 5	7 2	7 1	7	10		
	•		9	•	v	7	3	2	1	2	4		
				REQU	IRED	CAPABI	LITIES						
A. Inexpensiv	re two-way	y <mark>te</mark> levi	sion typ					nonth.					
	NECECCE	. ACCDM	uannur	2045 1	a=								
GROUP TOTALS	NECESSR 1 46	Y ASSET 6	08EF0L 2	SOME U				10×-	0.K.				>1000×+
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CONSENSUS	11-1							•	1-1-1	v	U	·	U
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GROUP TOTALS	NECESSRY 31	18	05EF0L	SUME U		NEED	>10×-	10×-	0.K.	10×+	100×+ 10	000×+	>1000×+
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EXPERT TOTALS	2	14	1	0		0							
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D. Course pre	eparation	1 <b>a</b> ngu <b>a</b> g	e to red	uce the	prep	aratio	on cost	by a fa	ctor of	10 ove	er today	's CA	I systems.
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GROUP TOTALS	15	34	3	SOME U	UE NU	<i>NEED</i> 0	>10×- 1	10×-	0.K.				>1000×+
CONSENSUS			3	1		v	1	6	37  - -	2	1	0	0
EXPERT TOTALS	2	12	0	1		0	0	3	11	0	0	0	0
CONSENSUS		11-1							1-1-1	·	~	J	
E. Massive co	ommunicat	ion inte	rface 10	0,000 1	ines.				•				
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### FINANCIAL AND INSURANCE

In the period 1975 through 1980 twenty percent of the banks will have completed the more advanced applications related to their day-to-day operations. Examples include: reserve requirements models, automatic evaluation of commercial loan applications, and terminals to automate bank teller functions including delivery and collection of cash.

Beginning in 1978-80 banks will be in the process of expanding their areas of business by providing increased computerized services to their customers in the form of advisory services for budget, tax, investment, savings and insurance planning. Insurance companies will provide similar services, but will use their marketing force to bring the service into the home via portable agent's terminals. By 1980 twenty percent of the banks and insurance companies will be offering these services.

By 1985 banks will be electronically interconnected to effect electronic transfer of funds and account information. The interconnection may be effected through an expanded Federal Reserve System or the banks in an area might set up a financial utility (perhaps a regulated monopoly) to act as the central switching and coordination function for the electronic interchange. Once this capability is in existence, banks and other financial institutions can offer additional new services to their customers. For example:

- . A bank could offer automatic salary deposit to companies, debiting the company's account and depositing in employee's accounts even though the the accounts are in different banks.
- . Similarly, individuals could pre-authorize payment of mortgages, car payments, insurance premiums, etc.
- . Individuals could establish lines of credit in multiple financial institutions and have them activated in a prescribed sequence as required to meet uncovered debits from a demand deposit account.

By 1985 twenty percent of the metropolitan areas will have electronic transfer of funds and will also have taken the additional step of allowing connection of the point of sale terminals located in retail and service outlets thus establishing the "Cashless/Checkless Society." In this environment a customer desiring to make a purchase

. Identifies himself via credit card, fingerprint, voice-print or some other means at the terminal,

- . His demand deposit account balance, credit lines and credit rating is checked.
- . The purchase is approved or denied.
- . If approved, his account is debited, activating credit lines or establishing a credit account if necessary.
- . The store's account is credited.

The transaction may involve three or four financial institutions, but it is all completed before the customer leaves the point of sale.

Toward the end of the 1980's when 1 percent of the homes have multiple use home terminals connected to switched networks, it will be possible to effect most financial transactions (payment authorization, establishment of credit lines, financial planning, etc.) directly from the home.

FINANCIAL

	APPLICATION TITLE		1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	ON	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
	BANK RESERVE REQUIREMENTS MODEL	100- 75- 50- 25- 0- P.C.	0.0	1.8	- -    78.6	17.9	1.8	0.0	0.0	1.15	3.44	1.41	0.00
	AUTOMATED STOCK TRANSFER	100- 75- 50- 25- 0- P.C.	0.0	0.0	24.6	- -    66.7	3.5	5.3	0.0	1.70	3.69	2.79	¯0.05
	COMMERCIAL LOAN CREDIT SCORING	100- 75- 50- 25- 0- P.C.	0.0	0.0	11.7	- -    66.7	18.3	0.0	3.3	1.64	2.54	1.64	-0.38
III.52	BANKING SERVICE SYSTEM	100- 75- 50- 25- 0- P.C.	0.0	0.0	14.5	-  56.4	25.5	3.6	, 0.0	1.67	2.73	2.72	-0.30
	INSURANCE SUPPORT SYSTEM	100- 75- 50- 25- 0- P.C.	0.0	0.0	5.5	1-1	38.2	0.0	1.8	1.26	3.08	2.13	0.25
	FINANCIAL UTILITY	100- 75- 50- 25- 0- P.C.	0.0	0.0	1.6	-  54.7	32.8	6.3	4.7	3.07	3.14	2.63	¯o.56
	CREDIT TRANSFER (GIRO) SYSTEM	100- 75- 50- 25- 0- P.C.	0.0	0.0	4.8	-  50.8	36.5	3.2	4.8	3.13	3.26	2.85	<sup>-</sup> 0.49
	INTEGRATED FINANCIAL SERVICE SYSTE	M100- 75- 50- 25- 0-				[				1.95	3.03	2.74	-0.39
		$P \cdot C$ .	0.0	0.0	1.8	47.3	41.8	7.3	1.8				

*PINANCIAL* CONT. IMPACT PROFITABLE USEFUL APPLICATION TITLE 1970-71 72-74 75-77 78-80 81-85 LATER NEVER ON TOTONOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 100-3.52 2.43 2.11 CHECKLESS SOCIETY 75-50-25-0 -P.C.69.7 10.6

III.5

Automated Stock Transfer -- The existence of a computer system supporting the transfer of securities. This system would eliminate certificates as evidence of ownership and make it possible to complete transfer transactions on the day of sale. Operation would be from terminals in broker's offices. The system would provide other services via the terminal such as bid and asked prices to facilitate large block transactions and quotations.

GROUP TOTALS EXPERT TOTALS GROUP TOTALS	IMPACT  JOR SIGNI 2 22 2 11  1970-71 7	2 1	TLE NO 8 9 4 5		ABLE : MOD	REASC TO IMPL ERT MA 27 12 N DATE R NEVE		USE	ENTATION FFUL TO 1 MODERT 33 17		L IM1	WILL NOT BE PLEMENTED 1
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CONSENSUS	11				Ū	Ü	1		v	Ū	J	v
B. Ten-fold i	ncrease in	n securi	ty features.	•								
	NECESSRY	ASSET	USEFUL SOME				10×-	0.K.	10×+	100×+ 10		
GROUP TOTALS CONSENSUS	47   -	0	1	2	0	0	2	37  - -	3	1	0	0
EXPERT TOTALS	23	0	0	2	0	0	1	15	3	1	0	0
CONSENSUS C. Network co	-  ntrol.							1-1-1				
GROUP TOTALS CONSENSUS	NECESSRY 38	ASSET 8	USEFUL SOMI O	e use No O	NEED 1	>10×-	10×-	O.K.	10×+	100×+ 10	00×+	>1000×+
EXPERT TOTALS CONSENSUS	19	, 4	0	0	1							
D. Massive co		on inter	face of 1000	lines.								
GROUP TOTALS	NECESSRY 37	ASSET 9	USEFUL SOMI 2	E USE NO	NEED 0	>10×- 0	10×- 2	0.K. 36	10×+ 3	100×+ 10	00×+	>1000×+ 0
CONSENSUS	11-1	3	2	U	U	U	2	- -	3	U	U	U
EXPERT TOTALS CONSENSUS	18	5	1	0	0	0	0	18  - -	1	0	0	0

Bank Reserve Requirements Model -- The implementation by 20 percent of the banks of a system to predict their day-to-day reserve requirements making it possible to make better use of their capital.

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191	70-71 72-74	<b>75-77 78-</b> 80 <sup>*</sup>	81-85	LATER	NEVER					
GROUP TOTALS	0 1	44 10	1	0	. 0					
CONSENSUS EXPERT TOTALS	0 0	1- -	1	0	0					
CONSENSUS	•	1-11	•	v	J					
A			EQUIRED_							_
A. Interactive to building, eval					nterac	tive pa	ttern r	natchin	g for use i	.n
-	-									
	CESSRY ASSET				10×-	10×-	0.K.	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS CONSENSUS	8 17	12	5	5						
EXPERT TOTALS	4 ' 4	1	3	2						
CONSENSUS  -			1	_		_				
B. Human interact mathematical s			nodel in	order	to fin	d a bes	t resul	lt even	though a c	losed
mathematical s	solution may	not exist.								
	CESSRY ASSET	USEFUL SOME			10×-	10×-	O.K.	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS CONSENSUS	12 30	4	1	1						
EXPERT TOTALS	6 5	2	1	0						
CONSENSUS  -		_	-	v						
C. Advanced data	base management	ent system.								
NEC	CESSRY ASSET	USEFUL SOME	USE NO	NEED >	10×-	10×-	0 . K .	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS	28 13	2	1	3				•		
CONSENSUS  -	9 3	1	0	1						
	-	1	J	Τ						

Banking Service System -- Availability in 25 percent of banks of a customer service system providing budget planning and surveillance, investment planning, tax calculating and related financial activities.

					IMPACT_	GAT- AGE	<u> </u>						
	IM	PACT ON	SOCIETY				REASO	NS FOR 1	<i>CMPLEME</i>	NTATION			WILL
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GROUP TOTALS	2	18	36	2	11	33	1	10	11	33	9		6
EXPERT TOTALS	2	8	17	1	7	15	i	4	6	<b>1</b> 6	3		2
				I	MPLEMEN	TATION	DATE						
	1970-	71 72 <b>-7</b>	4 75-77	78-80	81-85	LATER	NEVEL	R					
GROUP TOTALS CONSENSUS	0	0	8	31	14	2	0						
EXPERT TOTALS CONSENSUS	0	0	5	14	4	1	0						
A. Mass stor													
	NECES				USE NO	NEED >	10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS	1		21 1 	2 -	1	0	3	29  - -	9	0	0	0	0
EXPERT TOTALS CONSENSUS		4	•	8 -1	1	0	2	11  - -	3	0	0	0	
								1 1 1					0
B. Advanced	<b>data</b> ba	•	•	stem.									0
B. Advanced	data ba NECES	se manaq	gement sy:		USE NO	NEED >	10×-	10×-	0.K.	10×+	100×+	1000×+	0 ->1000×+
		se manag	gement sy: SET USEF		USE NO	NEED >	10×-		O.K.	10×+	100×+	1000×+	•
GROUP TOTALS	NECES	se manag	gement sy: SET USEF 11	UL SOME			10×-		O.K.	10×+	100×+	1000×+	•
B. Advanced of GROUP TOTALS CONSENSUS EXPERT TOTALS	NECES 3 	se manad SRY AS	gement sys SET USEF 11	UL SOME			10×-		O.K.	10×+	100×+	1000×+	•

Checkless Society -- The establishment of point of transaction debiting in 20 percent of the metro-politan areas. This application is an extension of the Financial Utility to include terminals at the point of sale so that at the time of sale, transactions can be recorded and authorized or rejected. Other services such as automatic budget control are possible by allowing the system to reject expenditures for items that would overrun the previously established budget.

	IMPA C	T ON SOC	CIETY	IMPACI	AND V		NS FOR	IM <b>PLEM</b> E	'NTATION	,		WILL
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GROUP TOTALS	<i>AJOR SIGN</i> . 36 3:		'TLE NO 9 0	<i>VER</i> 23		ERT MAI 26	R <i>GINAL</i> 4	<i>VERY</i> 20	MODERT 21		INAL IM B	<i>PLEMENTEL</i> 39
EXPERT TOTALS		2 1	3 0	23		2	2	20	2		2	2
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GROUP TOTALS	1970-71	72-74 7 0	75-77 78-8 0 11		LATE 7		7					
CONSENSUS	ŭ	· ·	• ••	1-1-1	•	-						
EXPERT TOTALS	0	0	0 1	6	1	0						
CONSENSUS				1-1-1								
				REQUIRED	CAPAB	ILITIES						
Positive etc.)	user ident	ificati	on at the f				rint,	credit (	card, re	etina-p	rint, v	oice-pri
	NECESSRY	ASSET	USEFUL SO	ME USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	57	0	0	0	0							
CONSENSUS	11-1	•	0	0	0							
EXPERT TOTALS	7   -	0	U	U	U							
_	age of 100	billio	n bvtes.									
			and the same of the same of the same									
	NECESSRY	ASSET	USEFUL SO	ME USE N	מאאו מו	>10x-	10×-	0.K.	10×+	100×+	1000x+	>1000×+
GROUP TOTALS	45	6	0	0	0	0	4	12	25	5	0	0
CONSENSUS	11-1								1-1			
EXPERT TOTALS	5	1	0	0	0	. 0	0	1	. 4	0	0	. 0
CONSENSUS	-	·			a			<b>0</b> 1	1-1-1			
· LOW COST	terminal i	or poin	t of sale e	entry and	a inqui	ries 32	00-\$30	o purcha	ase.			
ROUP TOTALS	NECESSRY 37	ASSET 17	USEFUL SO O	ME USE N 1	O NEED O	>10×- 0	10×- 6	0.K.	10×+	-		>1000×+
CONSENSUS	11	1	U	1	U	U	0	39  - -	6	0	0	0
EXPERT TOTALS	 5	2	0	0	0	0	0	` '4'	1	0	0	0
CONSENSUS	11							1-1-1				
Network o	control.											
	NECESSRY	ASSET	USEFUL SO	ME USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
ROUP TOTALS	44	6	1	0	1							
CONSENSUS EXPERT TOTALS	-  6	1	0	0	0							
CONSENSUS	11-1	•	Ü	Ū	Ü							
Massive o	communicati	on inte	rface <u>100,</u> 0	00 line	<u>s</u> .							
	NECESSRY		USEFUL SO	-		>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	31	19	2	1	0	0	10	30	4	0	0	0
CONSENSUS EXPERT TOTALS	5	1	1	0	0			1-1-1				
CONSENSUS	11	-	•	J	v							
· Advanced	data base	managem	ent with pa	rticula	r empha	asis on	securi	ty.				
		•			-			-				
	NECESSRY	ASSET	USEFUL SO	ME USE N	O NEED	>10×-	10×-	О.К.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	50	2	1	0	1						2000.	100011
CONSENSUS	11-1		•	_	_							
EXPERT TOTALS CONSENSUS	7   -	0	0	0 -	0							
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GROUP TOTALS	NECESSRY 13	ASSET 39	USEFUL SO 3	ME USE N 1	<i>io need</i> o	>10×- 0	10×- 7	0.K. 33	10×+ 9			>1000×+
CONSENSUS	10	11-1	3	•	U		<b>'</b> .	- -	Э	. 0	0	0
EXPERT TOTALS	0	. `7`	0	0	0	0	1	' '2'	2	0	0	0
CONSENSUS		11-1						1 1			-	-

Commercial Loan Credit Scoring -- The implementation of a system for automatic evaluation of loans based on credit reports, business analysis and business knowledge in 20 percent of the banks.

GROUP TOTALS EXPERT TOTALS GROUP TOTALS CONSENSUS	JOR SIGN	2	TLE 1 6 4 4 7	₹ <i>0</i> 7 2	PROF VE 1	ITA IRY .0 2	MODI	REASC TO IMPI ERT MA +5 5			ENTATION EFUL TO 1 MODERT 30 5	<i>MAR G.</i> 3		WILL NOT BE PLEMENTED 10
EXPERT TOTALS CONSENSUS	0	0	0	8 -	3 		0	0	)					
A. Multi-att	ribute pa	ttern ma	·	•		•	APABI	<u>LLITIES</u>	I					
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS B. Advanced	2	27  -  7   -	USEFUL 7 1 ent syst		<i>USE</i> 0	no	<b>NEED</b> 4 0	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS C. Search en	5	16   4	<i>USEFUL</i> 2 1 day's ca		0		NEED 3 0	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS D. Mass stor	NECESSRY 6 0 age <u>100 b</u>	31    6 	USEFUL 10   3   ytes.	SOME	USE 2	NO	NEED 3	>10×- 4 0	10x- 32  - -  5  - -	0.K. 6 0	10×+ 0	100×+ 0	1000×+ 0	>1000×+ 0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESSRY 9	ASSET 36   -  9   -	USEFUL 3	SOME	USE 1	NO	NEED 3	>10×- 7	10×- 16  -	0.K. 20   3	10×+ 0	100×+ 1	1000×+ 0	>1000×+ 0

Credit Transfer (Giro) System -- The establishment of a nationwide credit transfer system to supplement the existing check transfer system and to act as a predecessor to the "checkless society." In this system, the normal check flow of buyer to seller to seller's bank to buyer's bank to buyer is reversed so that a credit authorization goes from buyer to buyer's bank to seller's bank. Buyer and seller receive statements verifying the transfer. In this system, a bill may become a credit authorization by having the buyer endorse it and include his account number on it.

IMPACT AND VALUE

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GROUP TOTALS	23 40	-	. 5	1	2		;	37	5	27	26	15		13
EXPERT TOTALS	1 .3	3	2	0		3 .		2	1	2	2	1		0
F					,									
*				<u>I</u> l	MPLEM	ENT	CATIO!	<u> DATE</u>						
	1970-71 7	72-74 7	5-77 7	8-80	81-8	5	LATE	NEV	<b>E</b> R					
GROUP TOTALS	0	0	3	32	23		2	;	3					
CONSENSUS			1.	-		1								
EXPERT TOTALS	0	0	0	3	3	•	0		1					
CONSENSUS			1.		-	1								
					•	•								
				REC	QUIRE	ם מי	CAPAR	LITIE:	S					
A. Positive u	cer identi	ficatio	n n						-					
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	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	00×+	>1000×+
GROUP TOTALS	48	4	1		. 0		2							
CONSENSUS	11-1		-											
EXPERT TOTALS	5	0	0		0		0							
CONSENSUS	11-1													
B. Mass stora		lion by	tac											
- Habb beeta	ac 100 DII	TION DY												
	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	$o.\kappa.$	10×+	100×+ 100	0×+	>1000×+
GROUP TOTALS	39	11	1		0		1	1	2	35	9	0	0	0
CONSENSUS										1-1-1				
EXPERT TOTALS	3	2	0		0		0							
CONSENSUS	11													
C. Advanced d	ata basa m	anagemei '	nt eveto											
navanoca a	aca babe m	anageme	ac syste	-111 •										
	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	00×+	>1000×+
GROUP TOTALS	48	5	1		0		1							
CONSENSUS	11-1													
EXPERT TOTALS	4	1	0		0		0							
CONSENSUS	11-1	-	•		-		-							
D. Network con														
Nerwork CO	HLLOI.													
	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+	>1000×+
GROUP TOTALS	48	3	1		0		1							
CONSENSUS	-													

FXPERT TOTALS CONSENSUS

Financial Utility -- The establishement of an integrated financial service in 20 percent of the metro-politan areas. The utility (a regulated monopoly?) would primarily provide electronic transfer of funds between demand accounts in subscriber banks making possible such services as automatic deposit of salaries, automatic preauthorized debits and automatic activation of credit lines from various banks or financial institutions. Centralized credit checks could be made taking into account balance on hand, salaries, outstanding loans, and established credit lines. IMPACT\_AND\_VALUE
REASONS FOR IMPLEMENTATION

VERY MODERT MARGINAL

PROFITABLE TO IMPLEMENTOR USEFUL TO PUBLIC

NOT BE

VERY MODERT MARGINAL IMPLEMENTED

IMPACT ON SOCIETY

NO

MAJOR SIGNIF. LITTLE

GROUP TOTALS		39	17 17	1	27		88 M	ARGINAL 5	<i>VERY</i> 22	MODERT 30	MAR G. 1:		PLEMENTED 15
EXPERT TOTALS	7	7	4	0	ε	5	9	1	5	7	;	3	3
				<u>I</u>	MPLEME	<u>NTATIO</u>	N_DATE						
anaun mamara	1970-71			8-80	81-85								
GROUP TOTALS CONSENSUS	0	0	1	35 	21 	4	,	3					
EXPERT TOTALS CONSENSUS	0	0	0	10 -	5	1	•	0					
A. Massive co	mmunicat	ion inte	cface <u>10</u>	,000	QUIRE Lines.	<u>CAPAB</u>	ILITIE	<u>s</u>					
	NECESSR	Y ASSET	USEFUL	SOME	IICT X	תיביבוא ∩ו	>10v_	10×-	0.K.	10×+	100%	1000	>1000×+
GROUP TOTALS	36	13	3	DOME	1	1	0	8	39	10 * +	100×+	1000×+	) 1000×+
CONSENSUS EXPERT TOTALS	11				_	_			1-1-1				
CONSENSUS	9.	3	1		0	0	0	3	1-1	0	0	0	0
B. Network co	ntrol.	·						•					
anaun mamara	NECESSR		USEFUL	SOME			>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS	45   -	6	3		0	1							
EXPERT TOTALS	13	0	1		0	0							
CONSENSUS C	11-1												
Mass stora	ge of <u>10</u>	0 billion	bytes.										
	NECESSR	Y ASSET	USEFUL	SOME	USE N	O NEED	>10×-	10×-	о.к.	10×+	100×+	1000*+	>1000×+
GROUP TOTALS	37	15	2		1	1	1	12	33	1	0	0	0
CONSENSUS EXPERT TOTALS	9	3	1		0	0	0	2	l-l 8	4	•	^	•
CONSENSUS			•		J	v	U	2	1-1-1	1	0	0	0
D. Advanced d	ata base	manageme	ent syst	em.									
	NECESSR	Y ASSET	USEFUL	SOME	use n	חשישוא מ	>10v=	10×-	0.K.	10~.	100	1000	. 1000
GROUP TOTALS	38	13	2	20.12	0	1	- 100-	100-	U.A.	10×+	100×+	T000×+	>1000×+
CONSENSUS EXPERT TOTALS			4		^	•							
CONSENSUS		_	1		0	0							

Insurance Support System -- Establishment in 25 percent of the insurance companies of a consolidated system, accessible from a portable agent terminal, providing the functions of total insurance planning (file, health, casualty), customer reviews, and accounting (billing, payments, loans.)

MA GROUP TOTALS EXPERT TOTALS			SOCIETY LITTLE 38 11	<i>NO</i> 6 0	PROF.	7	REASO TO IMPL	ONS FOR EMENTOR RGINAL 7		NTATION FUL TO MODERT 22 7	PUBLIC MARGI		WILL NOT BE PLEMENTED 5 0
				7	MPLEM	ENTATION	N DATE						
	1970-7	1 72-74	75-77	78-80	81-8			?R					
GROUP TOTALS	0	0	3	30	21	. 0	1	•					
CONSENSUS				-		ļ							
EXPERT TOTALS CONSENSUS	0	. 0	1	9	5	0	1	•					
CONSENSUS				1-1		1							
				RE	QUIRE	D CAPAB.	ILITIES	•					
A. Mass data s	torage	of 100	billion			200 mm mm 100 mm		•					
	NECESS	RY ASS	ET USEF	UL SOME	USE .	NO NEED	>10×-	10×-	О.К.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	30	1	0	3	2	3	5	13	24	2	0	0	0
CONSENSUS	-		-1						-				
EXPERT TOTALS	7		1	1	1	2	2	4	5	1	0	0	0
CONSENSUS	-												
B. Massive com	municat	ion int	e <b>r</b> face o	f 1000	lines								
						<del></del>							
	NECESS	RY ASS	ET USEF	UL SOME	USE .	NO NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	37		9	1	0	0	0	3	40	0	0	0	0
CONSENSUS	-	1							- -				
EXPERT TOTALS	9		3	0	0	0	0	. 2	10	0	0	0	0

CONSENSUS

1-1-1

Integrated Financial Service Systems -- Utilization by 1 percent of the population of independent financial service systems which provide consolidated insurance, investment management, savings planning and financial administration services handled by a single service agent and administrated to a single billing account.

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мл	JOR SIGNI	TF. LIT	rle No				RGINAL	VERY	MODERT		NOT BE LIMPLEMENTED
GROUP TOTALS	5 2					26	10	18	21	17	8
EXPERT TOTALS		8 1:				10	3	4	11	6	3
		_	_			- •	•	•		-	•
				IMPLEME		Y_DATE					
	1970-71		-	80 81-85							
GROUP TOTALS	0	0		6 23	4	1					
CONSENSUS	_	_	•	-	_						
EXPERT TOTALS	0	0		.0 11	0	1					
CONSENSUS											
				REQUIRED	CAPAR	TTTTES					
A. Mass stora	ge 100 bi	llion by	tes	USESTUDS	-Zaraz:						
Hadd beer	ige <u>acc ba</u>	<u> </u>									
	NECESSRY	ASSET	USEFUL S	OME USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+ 100	00×+ >1000×+
GROUP TOTALS	27	<b>1</b> 5	3	0	1	0	10	30	1	0	0 0
CONSENSUS	11							1-1-1			
EXPERT TOTALS	. 5	. 8 .	3	0	1	0	. 5	. 8 .	0	0	0 0
CONSENSUS				_				-			
B. Advanced d	lata base	manageme	nt system	n.							
	NECESSRY	ASSET	USEFUL S	OME USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+ 100	00×+ >1000×+
ROUP TOTALS	39	6	0	0	1			•			
CONSENSUS	11-1										
EXPERT TOTALS	14	3	0	0	1						
CONSENSUS	11-1										
C. Massive co	mmunicati	on inter	face - $10$	0,000 line	es.						
	NECESSRY	ASSET	ugrrur g	OME USE N	משישוג מו	>1 0 V =	10×-	0.K.	10×+	100×4 100	0×+ >1000×+
GROUP TOTALS	13	27	3	0 BE 03E N	1	0	14	24	1077	0	0 0
CONSENSUS	1	[-	,	U	1	•	1	-	*	V	· ·
EXPERT TOTALS	<sup>'</sup> 6	' 8 <sup>'</sup>	1	0	1	0	5	7	0	0	0 0
CONSENSUS	1		-	ū	_	-			•	•	- •
	•	• •					•				

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### FREIGHT TRANSPORTATION

The freight transportation industries are made up of many independent carriers with the normal freight shipment involving two or more different carriers. The future will find a much greater degree of cooperation between carriers. This cooperation will be brought about primarily under the auspices of carrier associations or the Interstate Commerce Commission. Because of the numbers of carriers involved and their geographical dispersion, computers will play a large role in coordination and cooperation.

The study results show that by 1980 a shipment might follow this pattern: the shipper desiring to make a shipment from St. Louis to Hawaii has his computer consult with a freight rate service for optimum routings and rates. By this time, this service is routinely provided by information utilities to 20 percent of the shippers. Having determined the desired route, his system takes advantage of a service offered by 5 percent of the interstate carriers and has his computer forward the requests for pickup, bills of lading, and routings directly to the local carrier's The carrier's computer system schedules a local truck to make th pickup and matches this shipment with others with similar destinations. When the truck returns to the carrier's new automated freight terminal (1 percent of the terminals would be now automated) where the shipment is automatically stored, containerized with cargo for Hawaii and loaded onto flat cars for rail shipment to San Francisco. Because this is an intermodal shipment (truck, train, and ship) the carrier's computer system enters the necessary data into the central system sponsored by the Interstate Commerce Department which will coordinate the necessary carriers and track the shipment till it reaches its destination. Any inquiries are instantly answered by the system. At the destination the shipment may be again handled by several carriers with automatic terminals and interconnected systems until the shipment reaches its addressee.

The railroad industry is faced with growing financial problems. One solution might be to modernize and automate. Railroad car tracing, tracking and allocation beginning to be done by individual lines in 1970 will be a nationwide reality in 1980. The location of every car together with its contents will be known by a computer system maintained by a railroad association. Also this system will make nationwide allocations of cars to meet actual or forecasted needs and will make recommendations to lines on how to route cars to meet the allocations. Trains by this time will be largely computer controlled in 5 percent of the main lines and 5 percent of the yards. Each train will respond to control from a central system and will incorporate collision avoidance systems to detect blocked tracks.

Navigation and control of ships in open seas and all but the closest of piloting situations will be under computer direction reducing the sizes of crews needed to operate them.

FR	ET	CHT	TRA	NS	POF	? TA	TTO	À

				FREIGHT	TRANSF	PORTATIO	N					
APPLICATION TITLE		1970-71	72-74	75-77	78-80.	81-85	LATER	NEVER		PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
AUTOMATED VEHICLE DIAGNOSTIC CENTERS	100- 75- 50- 25- 0-			1-1	1				2.10	3.13	3.46	-0.26
	P.C.	0.0	0.0	65.1	31.7	1.6	1.6	0.0				
FREIGHT RATE SERVICE	100- 75- 50- 25-				÷				1.38	2.98	2,16	70.05
	0- P.C.	0.0	1.8	21.4	- -  71.4	5.4	0.0	0.0				
INTERCONNECTED SHIPPERS AND CARRIER SYSTEMS	100- 75- 50-	0.0	1.0	21.7	72.5	3.4	0.0	0.0	1.39	2.79	2.11	-0.30
	25- 0- P.C.	0.0	0.0	3.8	- -  71.7	24.5	0.0	0.0				
RAILROAD CAR TRACING, TRACKING AND ALLOCATION	100- 75- 50- 25-								1.50	3.06	2.55	-0.19
	0- P.C.	0.0	0.0	9.1	-  65.5	21.8	3.6	0.0				
AUTOMATED FREIGHT TERMINALS	100- 75- 50-								1.38	2.90	1.59	-0.63
	25 <b>-</b> 0 -				1-1							
	P.C.	0.0	0.0	1.6	65.6	29.5	3.3	0.0				•
NATION-WIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS	100- 75- 50- 25-								2.36	3.01	2.59	<b>-</b> 0.70
	0 -					1						•
	P.C.	0.0	0.0	0.0	61.9	31.7	6.3	0.0				
COMPUTER CONTROL OF FREIGHT AND PASSENGER TRAINS	100- 75- 50- 25-								1.52	2.66	2.09	-0.42
	0- P.C.	0.0	1.8	1.8	-  57.1	39.3	0.0	0.0				

III.64

Automated Freight Terminals -- The automation of 1 percent of the freight terminals. Based on teleprocessing manifests of incoming shipments the terminal system schedules the docks and storage facilities optimumly. Loading, unloading, movement and storage within the terminal is done automatically by automated equipment under computer control.

	TIAD A	T ON SOC	* T TO M V		IMPACT_	<u>AND_VA</u>		י ממק פ	MPLEMEN	~ A ~ T ~ N		WILL
	IMPAC	T ON SOC	IEII		PROFIT	ABLE T	O IMPLE.			UL TO 1	PUBLIC	NOT BE
MA	JOR SIGI	IIF. LIT	TLE	NO	VER Y	MODE	RT MAR	GINAL	VERY	MOD <b>E</b> RT	MARGINAL	IMPLEMENTE
GROUP TOTALS	3 1		6	11	26		3	6	5	25	29	17
EXPERT TOTALS	1	7 1	.5	6	10		9	4	2	8	12	5
				;	IMPLEMEN:	TATION	DATE					
	1970-71	72-74 7	5-77			LATER						
GROUP TOTALS	0	0	1	40	18	2	0					
CONSENSUS	•				1		•					
EXPERT TOTALS CONSENSUS	0	0	1	17  -	l	1	0					
	_				ATING_AN							
A. Establishm	ent of a	guarante	ed annu	ıal ir	come ren	noving	most of	f labor	's obje	ctions	to automat	ion.
		e Possibl										
GROUP TOTALS	8	29		13	0	4	10	13	5	4	2	
EXPERT TOTALS	6	13		4	0	2	5	3	3	1	2	
B. Establishm	ent of ta	x incent	ives fo	or inv	restment	in <b>au</b>	tomation	n.				
	ABSOLUTI	E POSSIBI			1970-71	72-74	75-7 <b>7</b>	78-80	81-85	LATER		
GROUP TOTALS	15	23		11	0	4	13	6	4	5	-	
EXPERT TOTALS	9	12		2	0	3	5	3	1	3	2	
				RI	EQUIRED !	CAPABI	LITIES					
A. Network co	ntrol.				m an an an an an an an an a		- etc age age age age					
	NECESSR	Y ASSET	USEFUI	L SOMI	E USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS	33	14	3		1	1						
CONSENSUS					•							
EXPERT TOTALS CONSENSUS	16	3	2		0	1						
F. Improved a	, ,	•	ource l	leveli	ng and s	chedu	ling.					
	unanaan											
GROUP TOTALS	NECESSK.	Y ASSET	05 6 7 0 7	L SUMI	T USE NO	0	>10x-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
CONSENSUS		·	•		•	· ·						
EXPERT TOTALS	. 8	12	1		1	0						
CONSENSUS	1	1										
C. Relatively	high rel	iability	- no c	utage	s of ove	r one	hour.					
	NECESSR	Y ASSET	USEFUL	L SOMI	E USE NO	NEED	>10×-	10×-	о.к.	10×+	100x+ 100	0×+ >1000×+
GROUP TOTALS	34	15	2		0	1	0	2	39	3	0	0 0
CONSENSUS	11								1-1-1			
EXPERT TOTALS CONSENSUS	15	3	2		0	1	0	1	15  - -	1	0	0 0
Mass stora	ge of <u>100</u>	billion	bytes.									
	NECESSRI	ASSET	USEFUI	L SOM	E USE NO	NEED	>10×-	10×-	O.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS	11	<b>3</b> 6	4		0	1	1	14	31	0	0	0 0
CONSENSUS		11-1										
EXPERT TOTALS	14	13	3		0	1	1	. 4	12	0	0	0 0
CONSENSUS		11-1							1-1			

Automated Vehicle Diagnostic Centers -- The availability in 20 percent of the metropolitan areas of computer controlled vehicle diagnostic centers. The center would analyze the performance of automobiles and trucks, diagnose all malfunctions (including anti-pollution devices,) recommend repairs and preventive maintenance with price estimates.

	TMPAC	T ON SOC	マアデザタ		<u>IMPACT</u>	AND V		NS FOR	IMPLEMEI	זור א מיד א מידו			WILL
	IMIAO	. ON DO	, 1 14 1 1		PROFI	TABLE	TO IMPL			FUL TO	PUBLIC		NOT BE
MA	JOR SIGN			NO	VER			RGINAL		MODER T		L IM	PLEMENTED
GROUP TOTALS			+1	2	23		44	10	37	29	12		7
EXPERT TOTALS	6 1	.0 1	18	1	11		18	14	19	11	4		2
				Т	MPLEME	NTATIO	N DATE						
	1970-71	72-74 7	75-77 7	8-80	81-85			R					
GROUP TOTALS	0	0	41	20	1	1	0						
CONSENSUS		,	•		^	•	•						
EXPERT TOTALS CONSENSUS	0	0	20	<b>.</b> .	0	0	0						
CONDENDOO		(		,									
							ARDING .						
A. Successfu	ul impleme	entation	of non-	-auton	nated d	liagnos	tic cen	ters.					
	ABSOLUTE	POSSIBI	E NO EF	FECT	1970-7	1 72-7	4 75-7	7 78-8	0 81-85	LATER	R NEVER		
GROUP TOTALS	12	31	•	10	6	13	12	8	1	1	4		
EXPERT TOTALS	4	15	;	6	3	5	8	4	1	0	2		
				יז כז	חשמדוות	CADAD	ILITIES						
A. Multi-at	tribute pa	attern m	atching.		RATURE	_ PAEAS	THITTES						
			J	-									
	NECESSRY	ASSET	uemmur	COME	וו מורות	0 NEED	. 4 0	4.0	A 77	40	400 40		
GROUP TOTALS	12	ASSET 28	10	SUME	0.5 E. 11	O NEED 2	>10×-	10×-	O.K.	10×+	100×+ 10	00×+	>1000×+
CONSENSUS		11-1	10		J	2							
EXPERT TOTALS	6	14	4		0	2							
CONSENSUS		-											
B. Low cost	less than	n \$500 p	er month	for	the co	mputer	system	١.					
		.,											
	NECESSRY	ASSET	USEFUL	SOME	USE N	O NEED	>10×-	10×-	0.X.	10×+	100×+ 10	00×+	>1000×+
GROUP TOTALS		. 20	2		3	3	0	0	38	10	0	0	0
CONSENSUS			_			_	_		1-1-1				
EXPERT TOTALS CONSENSUS	11	11	0		1	2	0	0	15	6	0	0	0
•	ost per ve								-				
37-310 6	nar her A	SHICLE											
	N TO COTO COTO	40000	uann	<b>a</b> 0112									
GROUP TOTALS	NECESSRY 9	ASSET 17	USEFUL 5	SUME	USE NO	O NEED O		10×- 0	0.K.	10×+	100×+ 10		
CONSENSUS			Ş		1	U	1	U	18  - -	2	0	0	0
FXPERT TOTALS	, 5	'g '	3		1	0	1	0	11	0	0	0	0
CONSENSUS		1-1						-	1-1-1	-	-	•	•

Computer Control of Freight and Passenger Trains -- The implementation of computer systems to control the operation of trains on 5 percent of the main lines and in 5 percent of the yards. The system would track all trains, cause them to respond to block signals, control their operation and utilize collision avoidance to slow or halt the train in the event of the detection of collision paths.

	IMP.	ACT ON	SOCIETY	•			EASONS FOR				WILL
							IMPLEMENTOR		FUL TO		NOT BE IMPLEMENTE
MA	AJOR SI		LITTLE	NO	VERY			VERY	MODERT	MARGINAL	9 - 1 <i>MPLEMENIE</i>
GROUP TOTALS	5	12	38	7	11	36	10	7	27	20 4	0
EXPERT TOTALS	2	4	10	0	4	10	2	3	,	4	U
				I	MPLEMEN	TATION D	ATE				
	1970-7	1 72-74	75-77	78-80	81-85	LATER	NEVER				
GROUP TOTALS	0	1	1	32	22	0	0				
CONSENSUS				1-1	1						
EXPERT TOTALS	0	0	0	8	5	0	0				
CONSENSUS				1-1						•	
				7.77	0117070	## D # D # F F T	m T T C				
				RE		CAPABLLI	TIES				
A Notronk a	- Tow-wa		at onboom			<u>CAPABILI</u>		~~~~			
A. Network co	ontrol t	o conne	ct onboar				TIES em control	compute	rs.		
A. Network co	ontrol t			d comp	uters w		em control	compute	rs. 10×+	100×+ 100	00×+ >1000×
		RY ASS	ET USEFU	d comp	uters w	ith syst	em control	-		100×+ 100	00×+ >1000×+
GROUP TOTALS	NECESS	RY ASS	ET USEFU	d comp	uters w	ith syst	em control	-		100×+ 100	00×+ >1000×+
GROUP TOTALS CONSENSUS	NECESS 40	RY ASS	ET USEFU	d comp	uters w	ith syst	em control	-		100×+ 100	00×+ >1000×
GROUP TOTALS	NECESS 40   -	RY ASS	ET USEF	ed composite	uters w USE NO 1	ith syst  NFED >1	em control	-		100×+ 100	00×+ >1000×
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESS 40   - 10   -	RY ASS	ET USEFU 3 1	od compo	uters w.  USE NO 1	ith syst  NEED >1  0	em control	-		100×+ 100	00×+ >1000×-
GROUP TOTALS CONSENSUS EXPERT TOTALS	NECESS 40   - 10   -	RY ASS	ET USEFU 3 1	od compo	uters w.  USE NO 1	ith syst  NEED >1  0	em control	-		100×+ 100	00×+ >1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESS 40   - 10   -	RY ASS	ET USEFO 3 1 1 (	UL SOME	uters w.  USE NO 1	NEED >1 0 0	em control	O.K.			00×+ >1000×
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESS 40   - 10   - ommunica	RY ASS	ET USEFO 3 1 1 (	UL SOME	USE NO 1 0 0 lines	NEED >1 0 0	em control 0x- 10x-	0, %,	10×+		

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	12	26	8		2		0	0	15	27	0	0	0	0
CONSENSUS	1	-								-				
EXPERT TOTALS	3	4	3		0		0	0	, <b>3</b>	. 6	0	0	0	0
CONSENSUS	1									-				
_														

C. Advanced data base management system.

GROUP TOTALS CONSENSUS	NECESSRY 33	10	USEFUL 3	SOME U	ISE N	O NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×1
EXPERT TOTALS CONSENSUS	7	3	1	0	)	0							

Freight Rate Service -- The availability of a freight rate service to 20 percent of the interstate shippers. The system would allow retrieval of freight rates and the determination of the optimum rate and route.

	IMPA	CT ON S	SOCIETY				EASONS FOR I			wn <b></b> .	WILL
	***			37.0			IMPLEMENTOR		FUL TO P		NOT BE
MA	<i>JOR SIGI</i>	NIF. I	CITTLE	NO	VERY	MODERT	MARGINAL	$v_{ERY}$	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS	2	12	38	9	12	37	11	6	27	21	1
EXPERT TOTALS	1	4	12	4	6	12	2	4	8	6	0
				I	<u>MPLEMEN</u>	TATION D	<u>ATE</u>				
	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER				
GROUP TOTALS	0	1	12	40	3	0	0				
CONSENSUS				1-1-1							
EXPERT TOTALS	0	0	3	12	1	0	0				
CONSENSUS				- -							

## REQUIRED CAPABILITIES

# A. Advanced data base management system.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	31	13	1		0		2							
CONSENSUS														
EXPERT TOTALS	11	3	1		0		0							
CONSENSUS	11													

B. Availability of the application programs from a service organization \$200 per month.

	NECESSRY	ASSET	USEFUL	SOME U	SE NO	NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	13	30	2	0		2	Ó	0	39	4	0	0	0
CONSENSUS		1-1							1-1-1				
EXPERT TOTALS	5	8	0	0		1	0	0	13	1	0	0	0
CONSENSUS		1-1							- -				

Interconnected Shippers and Carrier Systems -- The offering by 5 percent of the interstate freight carriers of the ability to interconnect their systems to those of the shippers they serve to allow the authorization to move freight, shipment traces, and bills to be interchanged directly.

					IMPACT	C_AL	VD_VA	<u>LUE</u>						
	IMPAC	T ON SOCI	T E T Y						S FOR I	MPLEMEN	TATION			WILL
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EXPERT TOTALS	1		8	2		1	1	2	1	2	6	4		0
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	1970-71	72-74 75	5-77 7	8-80	81-85	5 <i>I</i>	LATER	NEVER						
GROUP TOTALS	0	0	2	38	13		0	0						
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EXPERT TOTALS	0	0	1	9	3		0	0						
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			ACC.	<u>ELERA</u>	TING_	<u> 1ND</u> .	<u>RETA</u>	<u>RDING_F</u>	<u>ACTORS</u>					
A. Nationaliza	tion of t	ransporta	ation sy	ystem	s.				• •					
		POSSIBLE				71 7			78-80		LATER			
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EXPERT TOTALS	3	3		2	0		0	2	1	0	2	2		
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A. Network con	trol.													
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EXPERT TOTALS	· · · · · · · · · · · · · · · · · · ·	1	1		0		0	0	0	, 's'	0	0	0	0
CONSENSUS	11-1	_	-		•		-	-	. •	1-1-1	·	· ·	-	
C. Advanced da		anagement	•											
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CONSENSUS														
EXPERT TOTALS	3	1	1		0		0							

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CONSENSUS

Nationwide Coordination of Intermodal Freight Shipments -- The existence of a system to allow the scheduling, coordination and monitoring of freight shipments using any combination of transportation services (train, truck, air, waterway, etc.).

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	,	IMPACT	ON S	OCIETY						REASO		TMPLEMEN				WILL	
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CONSENSUS		Ü	Ū	,		٠.			v	•							
					ACCEL	ERA	TING	AN	D_RETA	ARDING_	FACTORS						
A. Government	owne	ership	of a	ll fre	ight s	ship	pers										
	ABS	OLUTE	POSSI	BLE NO	EFFE	CT	1970-	-71	72 - 74	4 75-7	7 78-86	81-85	LATE	R NEVE	'R		
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EXPERT TOTALS  B. ICC establ:	ishma	3 ent of	inte	2 rface s	1 stand:			)	1	0	0	0	1	. 3			
D. ICC CSCUDI.																	
anoun momata	ABS		POSSI	BLE NO		-		-71 )			7 78-80	0 <b>81-</b> 85 4					
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C. Anti-trust	acti	_	eclud	-	•				-	_	-	•	_	· ·			
	ABS	OLUTE	POSST	BLE NO	EFFF	CT	1970-	- 71	72 - 71	4 75-7	7 <b>78 -</b> 80	81-85	LATE	R NEVE	'R		
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EXPERT TOTALS		4		2	0		(	)	0	1	0	0	1	. 2			
A. Developmen	t of	comple	ex sc	hedulin	ng and					<i>ILITIES</i> .thms.							
	NEC		ASSE			OME		NO		>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+	
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EXPERT TOTALS	1-	3	2		0		0		0								
CONSENSUS	•	-1		•													
B. Mass storag	ge of	E <u>100 I</u>	billi	on byte	es.												
	N E C	naaby		m van	mur a	^247	a.	***	NDDD	. 40	40	o v	40	400	4000		
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C. Network Co.	ntrol	ι.	-	1								1-1-1					
		•															
	NEC	ESSRY	ASSE	T USE	FUL S	OME	USE	NO	NEED	>10×-	10×-	О.К.	10×+	100×+	1000×+	>1000×+	
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CONSENSUS	1-	-1-1					U		U								
D. Advanced da	ata k	ase m	anagei	ment sy	ystem.	•											
		naanu															
GROUP TOTALS	NEC	ESSRY 42	ASSE 10		701 S	OME	USE 1	NO	NEED O	>10×-	10×-	o.K.	10×+	100×+	1000×+	>1000×+	
CONSENSUS	-	-1-1			-		-		Ū								
EXPERT TOTALS	,	4	1		0		0		0								
<pre>CONSENSUS E. Automatic  </pre>		- -  age lai	hal r	arahea													A
racomacio j	pacito	age Iu	DCI I	eaders	•												/
	NEC	ESSRY	ASSE	T USE	FUL S	OME	USE	NO	NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+	
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CONSENSUS		-					. U		U								
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III.70

Railroad Car Tracing, Tracking and Allocation -- The establishment of a data base system maintaining the continuous location of all railroad cars throughout the North American continent together with their contents. This would allow the shipper to trace his shipment with only one inquiry and would allow optimum allocation of cars to meet actual or forecasted demands.

GROUP TOTALS	JOR SIGNI		TLE N	7 <i>0</i> .0	PROF1	PY MODE	REASO	NS FOR 1 EMENTOR RGINAL 7 2	USE	NTATION FUL TO MODERT 28 10	PUBLIC		WILL NOT BE PLEMENTED 4 0
GROUP TOTALS	1970-71	72 <b>-74</b> 7	5	3-80 36	MPLEME 81-85 12	2							
EXPERT TOTALS CONSENSUS	0	0	1  -	11	1	1	0						
				RES	<u>QUIREL</u>	CAPAB.	<u>ILITIES</u>						
A. Advanced sc	heduling a	algorith	ms.										
GROUP TOTALS CONSENSUS EXPERT TOTALS	NECESSRY 29 	15	<i>USEFUL</i> 3	SOME	USE N 1	0 NEED	>10×-	10×-	O.K.	10×+	100×+	1090×+	>1000×+
CONSENSUS  B. Mass storag	1	1-1			•	v							
anoun momenta	NECESSRY		USEFUL	SOME				10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS	11	14	1		0	0	0	7 0	38  - -  10	0	0	0	0
CONSENSUS C. Car identif	ication sy								1-1-1				
GROUP TOTALS CONSENSUS	NECESSRY 48   -	ASSET 1	<i>USEFUL</i> 0	SOME	USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
EXPERT TOTALS CONSENSUS D. Network of	13	0 ificatio	on sensor	·s.	0	0							
GROUP TOTALS CONSENSUS	NECESSRY 37   -	ASSET 12	USEFUL O	SOME	USE N	10 NEED 0	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×1
EXPERT TOTALS CONSENSUS .E. Massive com	7    munication		0 ace - 10	,000	0 lines	0							
			-			•							
GROUP TOTALS CONSENSUS	NECESSRY 17	ASSET 30	USEPUL 1	SOME	USE 1	10 NFED 0	>10×- 1	10×- 9	0.K. 33	10×+ 0	100×+ 0	1000×+ 0	>1000×1
EXPERT TOTALS CONSENSUS F. Network con	 	8	1		0	0	0	2	7	0	0	0	0
· Network con	CTOT.												
GROUP TOTALS CONSENSUS	NECESSRY   -	ASSET 2	USEFUL 1	SOME	0	1	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
EXPERT TOTALS	12	0	1		0	0							

CONSENSUS

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## GOVERNMENT SERVICES

Many of the problems facing modern man are of such magnitude or of such wide scope that they can only be solved by governmental agencies either through direct action or by providing incentives for private enterprise. Because of the size and pervasiveness of the problems the computer may offer the only feasible solution.

One example is the area of air safety. The Federal Aviation Authority today provides air control for scheduled flights and for landings and takeoffs. At the present time they are in the process of installing computerized systems to assist the air controllers in their task. The next logical step, providing actual control of the aircraft during landing and takeoff will be a reality at the ten largest metropolitan airports by 1980. Probably by the same date or certainly by 1985 all air traffic (public, private, and military) throughout the continental United States will be controlled by computer-assisted systems.

State and local governments will continue their search for funds to provide their services. The study indicated that the experience of the existing two state lotteries and the ultimate success of New York's offtrack pari-mutual will lead four more states to join New York with such solutions before 1980. Coordination and control of local betting problems can only be solved by a computer-driven communication network.

The Defense Department will continue to be a large user of computers for the foreseeable future. Such things as computer controlled anti-ballistic missile (ABM) systems capable of handling a 100 missile salvo attack will be a reality by the 1978-80 time period. If the SALT talks should fail and if Red China should develop an intercontinental missile capability by 1977 as predicted by the respondent panel, the implementation may be accelerated.

Public welfare is an area of widespread concern. The panel predicts by 1980 at least ten states will have consolidated their welfare systems into a single computerized system to manage all aspects of welfare, unemployment, workman's compensation, etc. The only factors mitigating against this development would be for the federal government to take over welfare either generally as it exists now or as some form of quaranteed annual income.

The rising costs of health care is another area of concern. The panel believes that compulsory national health insurance will be a reality by 1980. This would be supported by a computer network interconnecting regional and local administrative systems.

The U. S. Weather Bureau has been the prime source of weather forecasts and dates. By 1980 these services will be expanded to

provide two-week computerized forecasts based on circulation models and worldwide inputs from ground and spaceborne sensors. By 1985 the necessary hydro and thermodynamics will be included in the circulation model to make it possible to predict air pollution given known conditions or sources of pollution.

Effective planning for the utilization of land resources in the face of growing population and other competing needs will be attacked by metropolitan and regional planning models in 1978-80 and by a National Land Inventory in 1981-85. These systems will endeavor to indicate optimum population levels and land uses in light of such factors as: labor and job mix, transportation costs, tax base, recreation facilities, school requirements, environment pollution, aesthetic qualities, etc. On a national and international level, systems will be available after 1981 to assist governments in planning resource management, international trade, transportation, population growth, food resources management, etc. These systems will be of particular importance to developing countries.

Much concern is evidenced in the popular media over loss of privacy brought about by the creation of government data banks. Nevertheless, such systems—suitably controlled to insure against abuse—will be created because the advantages will be too large to ignore. 1981-85 will find such data banks as nationwide driver and vehicle registration, and nationwide voter registration file in existence. On the other hand, a single personal data bank containing birth to death information on everyone no matter how protected is so far in the future that it may be considered in the never category.

### GOVERNMENT SERVICES

				GOVE	CNMENT S	ERVICES			TMDACO	DD 0 # 7 # 4 D 7 #	певанг	<i></i>
APPLICATION TITLE		1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
AUTOMATED LANDINGS AND TAKEOFFS	100- 75- 50- 25-		1						2,78	2.73	3.21	-0.44
·	0- P.C.	0.0	0.0	25.4	57.1	14.3	3.2	0.0				
GOVERNMENT OPERATED LOTTERIES AND PARI-MUTUAL BETTING	100- 75- 50- 25- 0-			p	1-1-1				1.62	2.62	1.52	-0.49
1	P.C.	0.0	1.8	17.9	64.3	8.9	1.8	5.4				
NATIONWIDE AIR TRAFFIC CONTROL	100- 75- 50- 25-		1				<b>1</b>		3.41	3.14	4.38	<sup>-</sup> 0. <b>07</b>
<u>,</u> 1	0- P.C.	0.0	0.0	23.1	67.7	7.7	1.5	0.0				
DEFENSE AGAINST A 100 MISSILE SALVO ATTACK	100- 75- 50- 25-			·					2.74	2.29	2.77	<sup>-</sup> 0.55
1	0- P.C.	0.0	0.0	3.5	70.2	17.5	3.5	5.3				
CONSOLIDATED PUBLIC WELFARE SYSTEMS:	100- 75- 50- 25- 0-						Lancon and the section of the sectio		2.80	2.16	2.83	-0.48
	P.C.	0.0	1.7	1.7	65.0	26.7	1.7	3.3				
NATIONAL HEALTH INSURANCE SYSTEMS :	100- 75- 50- 25- 0-			<b></b>	-	1	L	•	2.49	2.25	2.66	-0.51
	P.C.	0.0	0.0	7.5	60.4	28.3	3.8	0.0				
AUTOMATED WEATHER FORECASTING	100- 75- 50- 25-				<u> </u>	L	L	•	2.89	2.28	3.61	-0.44
ī	0- P.C.	0.0	0.0	3.4	69.5	20.3	6.8	0.0				
METROPOLITAN PLANNING MODELS	100- 75- 50- 25- 0-						L	•	3.29	2.65	3.52	-0.24
	P.C.	0.0	0.0	0.0	59.3	37.0	3.7	0.0				

GOVERNMENT SERVICES CONT.

IMPACT PROFITABLE USEFUL

WILL

APPLICATION TITLE		1970-71	72-74	<b>75-77</b>	78-80	81-85	LATER	NEVER	ON	TO IMPLEMENTOR	TO PUBLIC	NOT BE IMPLEMENTED	
NATION-WIDE DRIVER AND VEHICLE DATA BANK	100- 75- 50- 25-								2.34	2.47	2.66	70.34	
	0- P.C.	0.0	0.0	0.0	27.1	66.1	5.1	1.7	•				
AUTOMATED FINGERPRINT ANALYSIS	100- 75- 50- 25- 0-				1	1-1	L		2.39	2.39	2.58	-0.34	
	P.C.	0.0	0.0	1.8	41.8	40.0	14.5	1.8					
GOVERNMENTAL PLANNING SYSTEMS FOR DEVELOPING COUNTRIES	100- 75- 50- 25-						L	1.	2.73	2.07	2.35	¯0 <b>.</b> 95	
	0- P.C.	0.0	0.0	0.0	5.8	-  -  51.9	36.5	5.8	٦.				
NATIONAL LAND INVENTORY	100- 75- 50- 25-						· L		2.63	1.77	2.65	-0.82	
75	0- P.C.	0.0	0.0	0.0	3.7	ار 53.7	31.5	11.1	י				
AUTOMATED PUBLIC LIBRARIES	100- 75- 50- 25-		. *					1	2.17	1.67	2.62	-0.74	
	0- P.C.	0.0	0.0	0.0	1.6	70.3	26.6	1.6					
NATION-WIDE VOTER REGISTRATION	100- 75- 50- 25-					<u></u>	L	L	2.37	1.75	2.35	-0.75	
	P.C.	0.0	0.0	0.0	5.5	60.0	29.1	5.5	•				
HUMAN RESOURCE SYSTEMS	100- 75- 50- 25- 0-						!-!-!		2.95	1.50	2.18	<sup>-</sup> 1.26	
	P.C.	0.0	0.0	0.0	0.0	7.5	73.6	18.9				. N	
PERSONAL DATA BANKS	100- 75- 50- 25-				·				3.19	1.56	1.83	<sup>-</sup> 1.67	
	0- P.C.	0.0	0.0	1.7	1.7	6.7	-  -   65.0	25.0	.*				

Automated Fingerprint Analysis -- The existence of a system that can, with reasonable probability, identify an arbitrary print from a master file without supporting data. This is in contrast to current systems, both manual and automated, where the probability of locating a match is virtually zero unless one has a small set of suspects.

					IMPA	CT_A	ND V							
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EXPERT TOTALS	2	3	2	0		3		3	0	3	3	1	0	
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CONSENSUS								l						
			AC	CELERA	TING	AND	RETA	ARDING	<b>FACTORS</b>					
A. Developmen	t of some	other p	hysical	iden	tific	ati	on me	ans to	replace	identi	ficatio	n for oth	er than la	tent
fingerprin	ts.								-					
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A. Multi-attr	ibute patt	tern mat	ching.											
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CONSENSUS														
B. Mass data	storage of	f 10 bil	lion by	tes.										
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EXPERT TOTALS CONSENSUS														
C. Ten-fold i	ncrease in	image	process	ing t	echno	log	v: sc	anning	. digita	al conve	rsion.	storage a	nd display	
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EXPERT TOTALS										1 1 1				
CONSENSUS		•												
D. Fingerprin	t scanning	g device	•											
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EXPERT TOTALS	11-1													
CONSENSUS														
E. Graphical	storage an	nd retri	eval -	one b	illio	n p	ages.							
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CONSENSUS	1	-									-	•	ý U	
EXPERT TOTALS														

CONSENSUS

Automated Landings and Takeoffs -- The utilization of automated control of airplanes in the patterns and during landing and takeoff at the ten largest metropolitan airports.

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				IMPACT	AND VA	LUE					
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	1970-71	72-74 75	-77 78-80		LATER						
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" A major c	rash shor	cry arter	start up	or the r	TISC S	увсеш.					
			NO EFFECT	1970-71	72-74		78-80	81-85	LATER	NEVER	
GROUP TOTALS	13	31	13	. 0	3	10	6	7	4	4	
EXPERT TOTALS	. 4	7	3	0	1	3	3	2	1	0	
	rash with	substant	ial loss o	f life d	uring '	take off	or lar	nding i	nvolving	one of t	he jumbo
jets.	ABSOLUTE	POSSIBLE	NO EFFECT	1970-71	72-74	75 <b>-77</b>	78-80	81-85	LATER	NEVER	
GROUP TOTALS	17	29	12	2	12	11	5	4	2	2	
EXPERT TOTALS	4	7	-3	1	4	4	1	0	1	0	
			D	EQUIRED	CADART	TTMTTC					
A. No-fail s	waten be		_		PAERDI	HTTTED					
NO-IAII S	ystem, bo	tn narowa	re and sof	cware.							
GROUP TOTALS	NECESSRY		USEFUL SOM			>10×-	10×-	0.K.	10×+ :	100×+ 1000	0×+ >1000×+
CONSENSUS	49 !!-!	4	0	1	0						(
EXPERT TOTALS	12	1	0	0	0						\
CONSENSUS	11-1	-	Ŭ								
B. On-board		for fast	rasnansa	and amar	aenav 1	hack un					
on board	compacers	IOI Tasc	response	and ener	gency i	back up.					
	NECESSRY	ASSET	USEFUL SOM	יי דופים אור	רוים ישוא ו	>10×-	10Y-	o.K.	104.	10041 100	Nu 1000
GROUP TOTALS	49	45 2 E 1	1	E ODE NO	0 NEED	~ 10×-	101-	U.K.	10×+ :	100×+ 100	0×+ >1000×+
CONSENSUS	11-1	•	-	•	·						
EXPERT TOTALS	11	2	0	0	0						
CONSENSUS	11-1										

Automated Public Libraries -- The availability in 20 percent of the metropolitan areas of computerized Tibraries providing terminal searches in the library of abstracts of their documents and automated retrieval and delivery of the selected document or a copy of it.

IMPACT AND VALUE IMPACT ON SOCIETY REASONS FOR IMPLEMENTATION	WILL
	W LI LI
PROFITABLE TO IMPLEMENTOR USEFUL TO PUBLIC	NOT BE
MAJOR SIGNIF. LITTLE NO VERY MODERT MARGINAL VERY MODERT MARGINAL IN GROUP TOTALS 11 28 37 2 7 22 34 20 32 16	<i>IPLEMENTED</i> 20
EXPERT TOTALS 2 9 10 0 1 7 10 4 13 2	4
<u>IMPLEMENTATION_DATE</u>	
1970-71 72-74 75-77 78-80 81-85 LATER NEVER GROUP TOTALS 0 0 0 1 45 17 1	
CONSENSUS  -	
EXPERT TOTALS 0 0 0 0 15 7 0  CONSENSUS  -	
ACCELERATING_AND_RETARDING_EACTORS	
A. Availability of two-way switched CATV in 20% of the metropolitan areas.	
ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80 81-85 LATER NEVER	
GROUP TOTALS 11 25 18 0 1 13 22 6 2 0 EXPERT TOTALS 5 10 5 0 1 4 11 1 0 0	
B. Federal subsidy.	
ABSOLUTE POSSIBLE NO EFFECT 1970-71 72-74 75-77 78-80 81-85 LATER NEVER	
GROUP TOTALS 27 20 5 0 4 10 13 10 4 6	
EXPERT TOTALS 9 8 1 0 2 5 4 3 0 3	
$\frac{REQUIRED\ CAPABILITIES}{A}.  \text{Mass storage - } \underline{1\ \text{trillion bytes.}}$	
Nagara Agang Names Calle Names and Names Calle	
NECESSRY ASSET USEFUL SOME USE NO NEED >10×- 0.K. 10×+ 1000×+ 1000×+ GROUP TOTALS 31 21 3 0 1 3 13 30 5 1 0	· >1000×+ 0
CONSENSUS	•
EXPERT TOTALS 11 7 0 0 0 0 1 12 2 0 0 CONSENSUS	0
B. Search engine 100 times as fast as today's.	
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+ GROUP TOTALS 12 36 7 0 1 1 8 34 7 1 0	· >1000×+ 0
CONSENSUS   -	
EXPERT TOTALS 4 10 4 0 0 0 1 13 2 0 0 CONSENSUS   -	0
C. Automated system for entry of the published data, includes multifont readers, page turners a selective scan to distinguish an article from its adjacent material and to follow continued page x situations.	
	>1000**
GROUP TOTALS 14 39 2 3 0	>1000x+
CONSENSUS   -  EXPERT TOTALS 4 16 0 0 0	
CONSENSUS   -	
D. Automated abstracting system.	
NECESSRY ASSET USEFUL SOME USE NO NEED >10×- 10×- 0.K. 10×+ 100×+ 1000×+	· >1000×+
GROUP TOTALS 19 34 4 0 0 CONSENSUS	
EXPERT TOTALS 4 14 1 0 0	
CONSENSUS   -  E. Computer network control.	
E. Computer network control.	
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+	>1000**
GROUP TOTALS 10 26 13 5 3	- 100047
CONSENSUS     EXPERT TOTALS 2 11 6 1 0	
CONSENSUS     F. Document display and reproduction terminal \$50 per month.	
Document display and reproduction terminal 300 per month.	
NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+	>1000×+
GROUP TOTALS 19 . 33 4 0 1 0 0 45 6 0 0 CONSENSUS	0
EXPERT TOTALS 6 12 2 0 0 0 12 1 0 0	0
CONSENSUS   -  III.78  - -	

Automated Weather Forecasting -- The availability of an automated weather forecasting system capable of producing weather forecasts for two weeks in advance which are at least as accurate as today's two-to-three day forecasts.

		,	•			1000							'	1
	IMPACI JOR SIGNI	ON SOCIE		P	ROFIT			MENTOR		NTATION FUL TO I		AL IMI	WILL NOT BE PLEMENTED	
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EXPERT TOTALS CONSENSUS	0	0	1 1	13  -	3	٥.	, 0							
A. Developmen	t of space	borne wea				<u>D_RETA</u>	RDING F	ACTORS		•				
	ABSOLUTE	DACCERTE	NO 1777	<i></i>	70 71	70 71	. <b>75-</b> 7 <b>7</b>	<b>78-</b> 8	0 81-8	5 LATEI	R NEVER			
GROUP TOTALS EXPERT TOTALS	5 1	30 12	11		1 0	8	17 6	9	0	0 0	0			
A. Mass stora rain and w	ge of <u>one</u> here, e.g.	trillion	bytes f				LITIES al expe	rience	(what w	veather	pattern	s prod	uce	
GROUP TOTALS	NECESSRY 16	32	USEFUL S 3	5 <i>0ME U</i>		NEED O	>10×- 2	10×- 8	0.K. 33	10×+ 2	100×+ 1	000×+ 0	>1000×+ 0	
CONSENSUS EXPERT TOTALS CONSENSUS	3	10	1	0	ŀ	0	0	2	- -  8  - -	2	0	0	0	
B. Processor	performanc	e of 100	MIPS (m	illio	ns of	instr	uctions	per se	econd.)					
			-					-						/
GROUP TOTALS	NECESSRY 18	23	USEFUL S	<i>50ME U</i> 0		NEED 1	>10×- 1	10×- 10	0.K. 29	10×+ 4	100×+ 1	000×+ 0	>1000×+	
CONSENSUS EXPERT TOTALS CONSENSUS	4		1	0	ı	0	0	3	-    -	0	0	0	0	
C. Core stora	ge of 10 m	illion by	tes.						, ,					
GROUP TOTALS CONSENSUS	NECESSRY 37	11	USEFUL S 3	5 <i>0ME U</i> 0		NEED 1	>10×- 1	10×- 2	0.K. 42	10×+ 1	100×+ 1	000×+ 0	>1000×+ 0	
EXPERT TOTALS CONSENSUS	10	2	1	0	1	. 0	0	1 .	10	0	0	0	0	
D. Advanced da	ata base m	anagement	•											
GROUP TOTALS	NECESSRY 33	14	USEFUL S 5	5 <i>0ME U</i> 0		NEED 1	>10×-	10×-	O.K.	10×+	100×+ 1	000×+	>1000×+	
CONSENSUS EXPERT TOTALS CONSENSUS	12   -	1	1	0		0								
E. Massive con	mmunicatio	n interfa	ce for	colle	ction	of wo	rldw <b>id</b> e	weathe	er data.					
GROUP TOTALS CONSENSUS	NECESSRY 47   -	ASSET (	USEFUL S 3	SOME U		NEED 1	>10×-	10×-	O.K.	10×+	100×+ 1	000×+	>1000×+	
EXPERT TOTALS CONSENSUS	11-1	1	1	0	)	1								

Consolidated Public Welfare Systems -- The implementation of systems to manage all aspects of public welfare in ten states. The system maintains an integrated data base of welfare, unemployment and workman's compensation recipients.

GROUP TOTALS EXPERT TOTALS GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	IMPACT 130R SIGNI 18 38 7 10 1970-71 7 0	3 23 5 6 72-74 75-	E NO 0 0 77 78-80 1 39	PROFIT. VERY 14 5	ABLE TO MODERS 27 7	EASON: IMPLEI MAR	S FOR II MENTOR GINAL 24 8	USEF	TATION UL TO P MODERT 30 9		WILL NOT BE IMPLEMENTED 13 2
A. Consolidat	tion of wel	lfare syst	<u>ACCELERA</u>	TING AN a feder	<u>RETARI</u> al agend	<u> </u>	4CTORS				
GROUP TOTALS EXPERT TOTALS	ABSOLUTE 31 15	POSSIBLE 18 5	NO EFFECT 4 0	1970-71 1 0	72-74 8 6	75-77 8 1	78-80 13 2	81-85 7 4	LATER 7 3	<i>NEVER</i> 4 2	
A. Mass data	storage, <u>l</u>	l00 billio		<u>QUIRED</u>	CAPABILI	TIES					
GROUP TOTALS CONSENSUS	NECESSRY 30 	17	SEFUL SOME 3	0	1	4	10×- 13	0.K. 30	0	0	0×+ >1000×+
EXPERT TOTALS CONSENSUS B. Automated	 generation		1 mation sys	otems.	1	1	5 	I-I	0	0	0 0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS C. Search eng	NECESSRY 4 0 ine 100 ti	30    10 	5	3	2	0×-	10×-	O.K.	10×+	100×+ 1000	0×+ >1000×÷
GROUP TOTALS CONSENSUS	NECESSRY 12		SEFUL SOME		<i>NEED</i> > 1	3	10×- 13	O.K.	10×+ 3	100×+ 1000	0×+ >1000×+ 0 0
EXPERT TOTALS CONSENSUS	4	7	2	1	2	1	2	-  9  - -	1	0	0 0

Defense Against a 100 Missile Salvo Attack -- The existence of a computerized system capable of detecting, distinguishing, tracking, and routing interceptor missile to destroy an attack by 100 missiles.

	IMPA	CT ON SO	CIETY		IMPACT .		REASON		MPLEMEN		ounera	WILL
MA	JOR SIG	NIF. LI	TTLE	NO			O IMPLE RT MAR			UL TO F MODERT		NOT BE IMPLEMENTED
	26	20	21	7	22	1		21	34	9	16	14
EXPERT TOTALS	3	0	4	1.	2		2	0	3	0	1	3
				I	MPLEMEN:	<u>TATION</u>	<u>DATE</u>					
	1970-71		75-77	78-80			NEVER					
GROUP TOTALS CONSENSUS	0	0	2	40	10	2	3					
EXPERT TOTALS	0	0	0	6	2	0	1					
CONSENSUS				1-1								
			<u>a</u> c	CELERA	TING AN	D_RETA	RDING F	ACTORS				
A. Failure to	the SALT	talks.										
	ABSOLUTI	E POSSIB	LE NO E	FFECT	1970-71	72-74	75-77	7 <b>8-</b> 80	81-85	LATER	NEVER	
GROUP TOTALS	12	2		6	5	16	6	3	0	1	2	
EXPERT TOTALS	1		5		1	6	0	0	0	. 0	0	
B. Development	or inte	rcontine	ntal m	issile	capabil	ity by	y Red Ch	ina.				
		E POSSIB								LATER		
GROUP TOTALS EXPERT TOTALS	. 19	2	1 1	5 2	1 0	11	22 5	5 0	1	0	0	
EXPENT TOTALS	*		1	2	U	2	3	0	U	U	O	
					QUIRED :							
A. Very high p	erforman	ce <u>1000</u>	MIPS (n	nillion	of ins	tructi	lons per	second	<u>(</u> .)			
	NECESSR:				USE NO			10×-		10×+		)×+ >1000×+
GROUP TOTALS CONSENSUS	37   -	6	2	!	- 0	0	0	5	33  - -	0	0	0 1
EXPERT TOTALS	5	1	O	)	0	0			1-1-1			
CONSENSUS	11-1				-	-						
$B \cdot Response ti$	me of on	e usec.										
	NECESSR	Y ASSET	USEFU	L SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 1000	)×+ >1000×+
GROUP TOTALS	31	10	1		0	1	1	2	35	0	0	0 0
CONSENSUS EXPERT TOTALS	2	1	a		0	0			1-1-1			
CONSENSUS		-			U	U						
C. Network con	trol.	• •										
	NECESSR	Y ASSET	USEFU	L SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 1000	)×+ >1000×+
GROUP TOTALS	44	1	C		0	1	-					,
CONSENSUS	-		_		•	•						
EXPERT TOTALS CONSENSUS	6   -	1	O	1	0	0						

William Communication (Alberta Communication)

NECESSRY ASSET

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GROUP TOTALS

EXPERT TOTALS

CONSENSUS

CONSENSUS

Government Operating Lotteries and Pari-Mutual Betting -- The use of computer-assisted systems in 10 percent of the states to support state lotteries and off-track betting. The systems would include the data processing associated with the administration of such systems and the calculation of odds and payoffs for the pari-mutual outlets.

IMPACT AND VALUE

100×+ 1000×+ >1000×+

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O.K.

34

1-1-1

1-1-1

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10×+

1

						<u>IMPACT A</u>	IND AUT	<u>U</u> E					*****
	II	IPAC:	T ON S	OCIETY						MPLEMEN			WILL
						PROFITA	ABLE TO	IMPLEM	IENTOR		UL TO P		NOT BE
M	AJOR S	IGN.	TF. I	ITTLE	NO	VERY	MODER	T MARG	FINAL	very	MODERT	MARGINAL	
GROUP TOTALS	6	1	-	27	9	13	29	)	8	3	16	30	10
EXPERT TOTALS	-	-	4	5	2	3	5	•	3	0	5	7	2
2													
					<u>I</u> .	<u>MPLEMEN:</u>							
	1970	-71	72-74	75 <b>-77</b>	78-80	81-85	LATER	NEVER					
GROUP TOTALS		)	1	10	36	5	1	3					
CONSENSUS					1-1-1								
EXPERT TOTALS	1	)	1	2	8	0	0	0					
CONSENSUS					-								
				£	ACCELERA	<u>TING AN</u>	<u>D_RETAB</u>	<u> DING_F</u>	<u>ACTORS</u>				
A. Success of	pilet	ins	talla	tion (N	YC):	4.5							
*	_			•								NEVER	
	ABSO	L <i>ute</i>	POSS1		EFFECT			75-77	78-80				
GROUP TOTALS		8		21	10	2	17	9	3	0	0	0	
EXPERT TOTALS		5		3	1	2	3	0	1	0	U	0	
					nn	0 11 T D 71 D	04D4DT1	TATES					
						QUIRED_		111100					
A. Ten-fold i	ncreas	e in	hard	ware se	curity f	eatures	•						
	NECE	SSRY	ASSE	er usei	FUL SOME	USE NO	NEED :	10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS		29	11		3	1	1	1	3	35	1	0	0 0
CONSENSUS	1			. 1	3	•	. •	-	-	1-1-1			
EXPERT TOTALS		3		5	1	0	0	0	1	, '4'	0	0	0 0
CONSENSUS	1			, . l	•	Ū	v	Ü	-	1-1-1	-		
		- <b></b>		٠,						, , ,			
B. Massive co	mmunic	atio	n inte	ertace	10,000 1	ines.							

USEFUL SOME USE NO NEED >10x-

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APPLICATION DESCRIPTION

Governmental Planning Systems for Developing Countries -- The utilization by 5 percent of the "Emerging Nations" of computerized systems to plan international trade, internal distribution, communications, transportation, business opportunities, resource development, etc.

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GROUP TOTALS		3		12		0		8	2	3	15	12 u	23	12		19
EXPERT TOTALS	2		4	3		0		2		6	0	4	3	2		1
						I	MPLEM	EN!	TATION	DATE						
	1970-	71	72-74	75-7	7 78	8-80 <sup>-</sup>	81-8		LATER		R	¥				
GROUP TOTALS	(	1	0	0		3	27	7	19	3						
CONSENSUS							1-1-									
EXPERT TOTALS	(	1	0	0		1	3	3 .	4	0						
CONSENSUS							1	1								
					ACCI	r t. T D A	TTNC	ANI	ת <i>ה</i> ייים מ	RDING	FACTORS					
A. Joint U.S.	- USSE	fın	ndina	effori		THETT	77777	-uni	N-UET4	WATER-	EUCTAUN					
	000.				••											
	ABSOL	UTE	POSSI	BLE NO	) EFI	FECT	1970-	71	72-74	75-77	78-8	0 81-85	LATER	? NEVER	?	
GROUP TOTALS		17		16		6	0	)	0	5	8	3	5	12		
EXPERT TOTALS		4		1		2	. 0	)	0	1	2	0	1	2		
B. Availabilit	y of p	lanı	ning m	odel.												
	ADCO	र शाम क	POSSI	מו הדמ	ו קד קד ר	o m a m	1070	74	70.71	75-77	7 78-8	0 81-85	LATER	R NEVER	n	
GROUP TOTALS	ADDUL	12		28	) EF	1	19,0-		1	. /5-/,	, ,6-8 14		) <i>DAIE</i> A	1 11 15 V 15 T	7	
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BAT MAI TOTABO		2		J		•	·	,	•	2	1	2	V	Ü		
						RE	QUIRE	[D_!	<u>CAPABI</u>	LITIES						
A. Model devel	opment.	sei	rvice.													
•																
	NECES	SRY	ASSE	T US	FFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 1	1000×+	>1000×+
GROUP TOTALS	3	0	10		6		0		0							
CONSENSUS				-												į
EXPERT TOTALS		4	2		1		0		0							
CONSENSUS	11			1												
B. Mass storag	e of l	00 1	oillio	n byte	s.											
	NECES	SRY	ASSE	T US	יוויקי.	SOME	usr	NΩ	NEED	>10x=	10×-	о.к.	10×+	100x+ 1	1000×+	>1000×+
GROUP TOTALS		8	12		3	JOHE	1	40	1	1	3	31	5	1	0	0
CONSENSUS	11			1	•		•		*	*	J	1-1-1	J	1	U	U
EXPERT TOTALS	, ,	3	3		0		0		1	0	0	4	1	0	0	0
CONSENSUS	1	•	!-		J		Ü			U	U	1-1-1	4		J	U
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Human Resource Systems -- The availability of international communications-based systems designed to evaluate and recommend alternative/optimum solutions to world health and welfare problems: such as population growth, food resources management, and general economic well being.

MA GROUP TOTALS EXPERT TOTALS GROUP TOTALS CONSENSUS EXPERT TOTALS	JOR SIGNI	7 3	TLE NO 7 1 2 0 5-77 78-	<i>PRO V IMPLE</i> 80 81-	ERY 3 0 MENTA 85 L	LE T MODE 2	REASONS O IMPLEM RT MARC O 14  DATE			UL TO E		WILL NOT BE IMPLEMENTED 26 2
CONSENSUS					1	-   -						'
4	A t						RDING_E	CTORS				
A. Legislated												
GROUP TOTALS EXPERT TOTALS	ABSOLUTE 14 1	POSSIBLE 14 3	E <i>NO EFFE</i> 9 <b>1</b>		-71 7 0 0	2-74 1 0	75-77 1 0	78-80 5 1	81-85 4 1	<i>LATEF</i> 12 2	R NEVER 6 0	
				REQUIR	ED_CA	<u>PABI</u>	<u>LITIES</u>					
A. Network con	trol.											
GROUP TOTALS CONSENSUS	32	11	USEFUL S 2	1		1	>10×-	10×-	O.K.	10×+	100×+ 1000	×+ >1000×+
EXPERT TOTALS CONSENSUS	5   -	1	0	0		0						
B. Multi langu		face capa	ability.									
GROUP TOTALS	NECESSRY 33	ASSET 11	USEFUL S	OME USE		EED 2	>10×-	10×-	0.K.	10×+	100×+ 1000	×+ >1000×+
CONSENSUS			1	. 1		2						
EXPERT TOTALS CONSENSUS	5 11-1	1	0	0		0						
C. Automated g		of info	cmation s	vstems.								
			•									
GROUP TOTALS CONSENSUS	NECESSRY 10	ASSET 24	USEFUL S	OME USE 2		FED 3	>10×-	10×-	O.K.	10×+	100×+ 1000	×+ >1000×+
EXPERT TOTALS CONSENSUS	1	4	0	0		0						
D. Development			ces simu	lation r	node)	_						
-				<b> · ·</b>		-						
anaun mamara	NECESSRY		USEFUL S				>10×-	10×-	O.K.	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS CONSENSUS	41   -	5	1	0		1						
EXPERT TOTALS CONSENSUS	5   -	1	0	0		0						

Metropolitan Planning Models -- The utilization by 5 percent of the metropolitan areas of planning models to aid officials in planning future expansion of cities. The models will provide optimum population levels by balancing such factors as: labor and job mix, transportation costs, tax base, recreational facilities, school requirements, environment pollution, government financing requirements, aesthetic qualities, etc.

MA GROUP TOTALS EXPERT TOTALS	1 <i>JOR</i> 20 7	SIGNII 33 6		TLE 1 8 1	10 1	1	RY 5 4	MODE 2	'RT' M 6 6	IARGINA 14 2	L	VERY 30 7	MODERT 22 6	6		IPLEMENTE: 5 1
								ATION								
anaun mamara	197	7-71 7:	2-74 7 0	5-77 78	3-80 32	81-8 20		LATER	NEV	0 ·						
GROUP TOTALS CONSENSUS		U	U		.	20	1	2		0						
EXPERT TOTALS		0	0	0	9	4	•	0		0						
CONSENSUS		Ů			-					_						
•					PR	OUTRR	י מי	APABI	T. T T T F	rs						
A. Ten-fold in	ncrea	se in	simulat	ion tecl			~_×	MLLE	. <b>2.</b> 1. 2.	. <del>.</del>						
											٠					
	NEC	ESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	- 10×	-	O.K.	10×+			- >1000×+
GROUP TOTALS		31	15	2	:	0		1	0	1		34	5	0	0	0
CONSENSUS	1-	-1								_		1-1-1	_	_		•
EXPERT TOTALS		. 7	5	0		0		0	0	0		7	0	0	0	0
CONSENSUS		-	•									1-1-1				
B. Mass storag	ge of	10 bi	llion b	ytes.								•				
	א ש זא	ESSRY	ASSET	USEFUL	SOME	USE	חמ	חישישוא	>10×-	· 10×	-	0.K.	10×+	100×+	1000×-	>1000×+
GROUP TOTALS	1000	13	32	1	00	1		0	0	- 4		33	4	2	0	0
CONSENSUS	1 -		-	_		_			_			1-1-1				
EXPERT TOTALS	•	4	6	0		0		0	0	1		7	0	1	0	0
CONSENSUS	1 -		-									1-1-1				
C. Interactive in building	ter the	minal s model	system	includir	g cor	nplex	se	arch	and i	nterac	tiv	e patt	ern mato	ching f	or ass	istance
	NEC	ESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	- 10×	-	0.K.	10×+	100×+	1000×	+ >1000×+
GROUP TOTALS		29	18	1		0		1	0	0	)	23	3	0	0	0
CONSENSUS	1-											1-1-1				

EXPERT TOTALS CONSENSUS 8

Nationwide Air Traffic Control -- The availability of a system for monitoring and controlling all air traffic -- public, private, and military throughout continental United States.

IMPACT ON SOCIETY

IMPACT AND VALUE REASONS FOR IMPLEMENTATION

WILL

		IMPAC:	T ON	SOCIEI	ľY							IMPLEMEN			WILL
14	A 70D	CTCN	TD	LITTLE		NO		FITI ERY	BLE I MODE		EMENTOR RGINAL		'UL TO E MODERT		NOT BE IMPLEMENTE
GROUP TOTALS	<i>AJOR</i> 38	SIGN. 2		17		3		30		10 MA	14	63	13	MANGINAD	2 2
EXPERT TOTALS			4	1		ō	,	6		3	3	12	2	ō	ō
	107	0-71	72-74	75-7	77 7	8-80			LATION LATER	LDATE NEVE	p				
GROUP TOTALS	157	0	0	15		44		5	1	0					
CONSENSUS		•				-1-1		-	_						
EXPERT TOTALS		0	0	ţ	5	5	;	2	. 0	0					
CONSENSUS						- -									
					ACC	ELERA	TING	ANI	RETA	RDING_	FACTORS				
A. Three ma	jor a	ccider	nts i	n a pe								collis	ions.		
	ABS	OLUTE	POSS	IBLE N	VO EF.	FECT	1970	-71	72-74	75-7	7 78-8	0 81-85	LATER	NEVER	
GROUP TOTALS		18		30		10		0	13	9		3	1	5	
EXPERT TOTALS		3		7		1	,	0	2	2	2	0	0	2	
Federal 7	appro	priati	ion f	or the	sys	tem.									
	ABS	OLUTE	POSS	IBLE N	VO EF.	FECT	1970	-71	72-74	75-7	7 78-80	81-85	LATER	NEVER	
GROUP TOTALS		33		21		4	(	0	13	27		3	0	0	
EXPERT TOTALS		7		4		0		0	1	7	. 1	1	0	0	
C. Rejection	n of	the sy	ystem	by th	e pil	lots	assoc	ciat	ion.						
	ABS		POSS	IBLE A	VO EF.		1970	-71	72-74	75-7	7 78-8	81-85			
GROUP TOTALS		23		25		5		0	5	2			6	22	
EXPERT TOTALS		6		3		1	,	0	3	0	0	1	0	4	
						RE	QUIR	ED_(	APABI	LITIES					
A. No-fail	syste	m; bot	th ha	rdware	and	soft	ware.								
	NEC	ESSRY	ASS	ET US	SEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 1000	0×+ >1000×+
ROUP TOTALS		46		9	1		0		1						
CONSENSUS	•	-1-1		•											
EXPERT TOTALS CONSENSUS		9 - -		0	1		0		0						
B. Network															
	NEC	ESSRY	ASS	ET US	SEFUL	SOME	USE	NO.	NEED	>10×-	10×-	0.K.	10×+	100×+ 1000	0×+ >1000×+
GROUP TOTALS		53		2	1		0		1			• • • • •		2000	
CONSENSUS	1 -	-1-1		_											
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ROUP TOTALS	WEC	18	3 AD B		3	DUME	058	NO	1	>10×-	10×-	0.K.	10×+	100×+ 1000	)×+ >1000×+
CONSENSUS	1-		Ī		J		v		•						•
EXPERT TOTALS		3		7	0		0		0						
CONSENSUS		 	•	•											
Reliable	posi	tion a	and io	dentif	icati	ion t	ransp	ond	ers f	or all	aircraf	t \$1,00	0 purch	ase.	
	11.00	na an v	400	n.m		2011									
GROUP TOTALS	NEC	ESSRY 41	ASS.		3 SEFUL	SUME	0 <i>SE</i>	NO	NEED .0	>10×- 0	10×- 3	0.K. 45	10×+ 2	100×+ 1000	)×+ >1000×+ 0 0
CONSENSUS	1 -				Ţ		,		.0	J	3	1-1-1	2	U	0 0
EXPERT TOTALS		. 8		2	0		0		0	0	0	7	0	0	0 0
CONSENSUS E. Mass stor	•	-1-1										1-1-1			
Mass sto	rage (	or 1 t	rill	on by	tes a	acces	sable	in	micr	osecond	ls.				
	א מו נו	שמממש		nm		ac									
GROUP TOTALS	NEC	ESSRY 32	ASS. 2		SEFUL 1	SOME	USE O	NO	NEED		10×-	0.K.	10×+		)×+ >1000×+
CONSENSUS	1 -	- ]	_		Ţ		U		2	5	16	29 !-!	0	0	0 0
EXPERT TOTALS	'	7		3	0		0		0	0	4	3	·ò	0	0 0
CONSENSUS	1 -	-1		- 1							1-1		•		·

Nationwide Driver and Vehicle Data Bank -- A national data bank of driver and vehicle licensing information. The system would be used by states to determine eligibility for license of a new resident and to check ownership of vehicles being newly registered in the state. The system would contain consolidated driving records and could be sold to instruct companies for use in determining premium rates.

M, GROUP TOTALS EXPERT TOTALS	9 26	SOCIETY  LITTLE NO 22 3 5 1	PROFII	AND VALUE REA TABLE TO IM W MODERT 29 13		MENTATION SEFUL TO MODERT 25 10	<b>PUBLIC</b>	WILL NOT BE IMPLEMENTED 7 3
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	1970-71 72-74 0 0	0 16   0 5		<u>VTATION DAT</u> LATER NE 3	E VER 1			
A. Network con	ntrol.	R	<u>EQUIRED</u>	<u>CAPABILITI</u>	<u>ES</u>			
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS B. Ten times	NECESSRY ASS 37 1    11 	1 2 -  3 1 -	0	0 NEED >10× 1	- 10×- 0.K.	10×+	100×+ 1000	×+ >1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS C. Mass storag	NECESSRY ASS. 31 1	1 7 -   6 1	E USE NO O	NEED >10× 2 0 0 0	- 10×- 0.K. 1 39  - -  0 10  - -	10×+ 4	100×+ 1000 0 0	0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS D. Advanced da	NECESSRY ASSI 35 11 	2 3 - l + 2 - l	E USE NO O	NEED >10× 1 0	- 10×- 0.K. 11 31  - -  5 6	10×+ 5	100×+ 1000× 0 0	0
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National Health Insurance Systems -- A system to support the requirements of a National Health Insurance Program. It would be linked to and support state/regional administration locations.

MA GROUP TOTALS EXPERT TOTALS	JOR SIGN	9 1	TLE N	PRO 0 1 2	OFITA VERY 8 3	ABLE TO MODER! 26 6	REASONS IMPLEN MARC	MENTOR		TATION TUL TO F MODERT 22 6			WILL NOT BE PLEMENTED 10 0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	1970-71	72-74 7	4 1-	-80 81	- 8 5 1 5	CATION I LATER 2 0							
A. Passage of	enabling	legisla		<u>LERATIN</u>	G_ANU	<u>RETARI</u>	OING_F	<u>ACTORS</u>					
GROUP TOTALS EXPERT TOTALS	ABSOLUTE 23 8	<i>POSSIBL</i> 15 1		ECT 1970 1 0	0 <b>- 71</b> 0 0	72-74 7 3	75-77 16 4	78-80 8 2	81-85 3 0	<i>LATER</i> 2 0	NEVE 0 0		
A. Mass stora	ge of <u>100</u>	billion	bytes.	REQUI	RED_C	<u> APABILI</u>	TIES						
GROUP TOTALS CONSENSUS	NECESSRY 29 	15	USEFUL . 2	SOME USE 0	e NO	NEED >1	.0×- 0	10×- 2	0.K. 38	10×+ 1	100×+ 0	1000×+ 0	>1000×+
EXPERT TOTALS CONSENSUS B. Network co	 ntrol.	-	0	0		1	0	1	5	0		0	0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESSRY 37   -  7	ASSET 8	USEFUL 1	SOME USE 0	e no	NEED >1 1	.0×-	10×-	o.K.	10×+	100×+	1000×+	>1000×+
C. Advanced da		managemer	nt system	ι.									
GROUP TOTALS	NECESSRY 42   -	ASSET 3	USEFUL 1	S <i>ome us</i> e o	r no	NEED >1	0×-	10×-	o.K.	10×+	100×+	1000×+	>1000×+
EXPERT TOTALS CONSENSUS	11-1	0	1	0		0							

National Land Inventory -- The implementation of a system to maintain an inventory of the uses of the nations land. Proposed new uses would be evaluated against a plan developed to consider the optimum use of our national land asset. The plan would balance competing uses for commercial, residential, recreational, urban, suburban, rural, etc., taking into account economical, socialogical, ecological, and aesthetic considerations.

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EXIENT TOTABE	•	2	<b>.</b>	-		<b>.</b>	•		-	·		J
				IMPLEME	NTATION	DATE						
	1970-71	72-74 75-	-7 <b>7 78-</b> 80	81-85	LATER	NEVE	R					
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A· Mass data s	storage of	100 billi	on bytes.									
	NECESSRY	ASSET U	USEFUL SOM	E USE NO	O NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	34	13	1	0	1	0	4	31	8	0	1	0
CONSENSUS	11	1	<del>-</del>	-	_	-	Ÿ	1-1-1	-			
EXPERT TOTALS	7	3	0	0	0	0	1	6	0	0	1	0
CONSENSUS	11	1						1-1-1				
$^B \cdot$ Advanced da	ıta base ma	nagement	system.									
	V747447						4.6	0 1/	40	400		
GROUP TOTALS	NECESSRY 44	ASSET U	USEFUL SOM		NEED	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
CONSENSUS	11-1	3	1	0	1							
EXPERT TOTALS	10	0	0	n	0							
CONSENSUS	11-1	U	0 1,	0	v							
C. Development		low land	model									
peveropment	or a comp	Tev Talla	woder.									(
												_
	NECESSRY		SEFUL SOM	E USE NO	O NEED	>10×-	10×-	$o.\kappa.$	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	33	12	3	0	1							
CONSENSUS	11											
EXPERT TOTALS	8	1	1 .	0	0							

CONSENSUS

1--1-1

<u>Nationwide Voter Registration</u> -- The existence of a data bank containing nationwide registration data on all voters. Voters would be required to report changes of address. Cities and states would use data bank to determine voter eligibility.

	<i>1AJOR</i>	IMPACT	r on so	CIETY				ND_V		NC DOD	IMPLEME	78 A TO A CO TE A 37			
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	AAJOR					PROF	ITA	ABLE 2	O IMPL	EMENTOR	USE	FUL TO	PUBLIC		NOT BE
L*		SIGNI	F. LI	TTLE	NO	VE.	RY	MODE	RT MA	RGINAL	VERY	MODERT	MARGINA	L $IM$	PLEMENTE
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EXPERT TOTALS	5 5	6		2	0		0		7	2	3	4	2		4
					7	MPLEM	ENS	ratioi	DATE						
	197	0-71 7	72-74	75-77	78-80	81-8		LATE		R					
GROUP TOTALS		0	0	0	3	33	3	16	3						
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EXPERT TOTALS	3	0	0	0	0	6		5	2						
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A. Security	, e														
A. Security/	rauc	detec	ction a	nd prev	ention	taci	.11,	ties.							
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CONSENSUS		-1-1	_			_									
EXPERT TOTALS		11	0	C		0		0							
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B. Mass data	stor	age of	100 b	illion	bytes.										
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GROUP TOTALS	17 15 C	30	14	2001511		0.5.5	110	0	0	3	38	3	0	0	0
CONSENSUS	١.	1		-	•	U		v	v	J	1-1-1	J	Ū	· ·	Ŭ
EXPERT TOTALS		7	4	c	١	0		0	0	1	' '7'	1	0	0	0
CONSENSUS					,	U		•	Ū	•	1-1-1	•	Ŭ	Ü	Ü
C. Network	•	•													
. MecMOIX (	OHCLO														
	NEC	CESSRY	ASSET		IL SOME		NO		>10×-	10×-	0.K.	10×+	100×+ 10	00×+	>1000×+
GROUP TOTALS		32	10	2	?	1		1							
CONSENSUS															
EXPERT TOTALS		9	2	C	)	0		0							
CONSENSUS	-														

Personal Data Banks -- The creation of a system that logically integrates all data related to individuals including but not limited to financial information, credit fatings, criminal conviction records, medical histories, scholastic histories, census data, etc. The individual would have complete access to the contents of his file and would have legal recourse to change any erroneous entries. No other files, public or private, commercial or governmental could legally contain personal information. Access to the files would be available to organizations with a need but it would be rigoruously controlled to prevent loss of privacy.

privacy.								_		; -		
	TMDACT	ON SOC.	T アクタ	IMPACT	_AND_Y		NS FOR 1	MPT.EME	NTATTON	1		$W.\Gamma L.L$
	IMPACI	ON DOG.	1011	PROFI	TABLE S		EMENTOR		FUL TO	PUBLIC		NOT BE
MA	JOR SIGNI	F. $LIT$	TLE NO	VER	Y MODI		RGINAL		MODERT		IAL IMP	PLEMENTED
	30 15		6 0	. 4		23	9 .	14	11	12		35
EXPERT TOTALS	15 3	}	0 0	1		8	1	5	3	3		14
			_	<u>IMPLEME</u>	NTATIO	DATE						
	1970-71 7	2-74 7	5-77 78-80	81-85	LATE	R NEVE						
GROUP TOTALS	0	0	1 1	14	39	15						
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CONSENSUS	U	U	1 0	1	1-1-		ı					
COMBINION					• •							
				<u>EQUIRED</u>	CAPAB.	<u> LLITIES</u>				-		
A. Mass data s	storage of	100 tr	illion bytes	<u>.</u> .								
	NECESSRY	ASSET	USEFUL SOM	e use n	O NEED	>10×-	10×-	O.K.	10×+	100×+ 1	+×000	>1000×+
GROUP TOTALS	42	1	3	• 1	1	3	. 12	31	0	0	0	0
CONSENSUS EXPERT TOTALS	-  14	0	1	0	0	0	6	7	0	0	0	0
CONSENSUS	11-1	U	•	٠,	V	Ū	1		•	v	Ü	Ü
B. Network cor							•					
	NECESSRY	ASSET	USEFUL SOM	R USE N	מאאות מ	>10x-	10×-	0.K.	10×+	100×+ 1	000×+	>1000×+
GROUP TOTALS	44	2	1	0	1	10.	40	0,	20.			
CONSENSUS	11-1											
EXPERT TOTALS	15	0	0	0	1							
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anoun momara	NECESSRY	ASSET	USEFUL SOM				10×-	0.K. 38	10×+ 0	100×+ 1	L000×+ 0	>1000×+ 0
GROUP TOTALS CONSENSUS	38   -	6	3	2	0	1	6	1-1-1	U	U	U	Ü
EXPERT TOTALS	13	2	0	1	0.	0	2	10	0	0	0	0
CONSENSUS	11-1							1-1-1				
D. Advanced da	ata base m	anagemer	nt system.									
	NECESSRY	ASSET	USEFUL SOM	E USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+ 1	1000×+	>1000×+
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CONSENSUS	11-1	U	*	U	U							
E. Ten-times in	nprovement	in secu	urity featur	es.								
	NECESSRY	ASSET	USEFUL SOM	e use m	O NEED	>10×-	10×-	0.K.	10×+	100×+ 1	1000×+	>1000×+
GROUP TOTALS	44	2	3	0	0	0	0	22	17	6	0	0
CONSENSUS	11-1							•	-			
EXPERT TOTALS	14	0	2	0	0	0	0	7	2	3	0	0
CONSENSUS F. One hundred	-    times im	nrovemer	it in privac	w fast.	irae			1-1				
one mandle	- CLINCO LIN	Provener	·c ru brrac	A react	TES.							
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EXPERT TOTALS	11	. 3	1	0	0	0	0	9,	2	0	0	0
CONCRNCIIC	1 1							1 1 1				

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CONSENSUS

#### HOME TERMINALS

The decade of the 80's will witness the beginning use of terminals in the home to tap the power of the computer and the benefits of a high capacity, widespread communications network. The panel projects that the use of home terminals will exceed the point where one out of one hundred families has one installed in the 1980-1985 period.

The initial impetus will be brought about by the general availability of Cable Area Television (CATV) providing high speed, two-way communication channels into the home. The CATV supplier will use the capacity to provide individualized news and entertainment in response to the users request. The selected program is sent to the requesting terminal at high speed at the viewers convenience. With this capability a viewer could "browse" through the day's news events and then request increasing levels of detail as his interest dictates, in much the same manner as we now read a newspaper.

The addition in 1985 of switching capabilities to CATV networks will provide an opportunity for entrepreneurs to provide a wide range of services to the home consumer. They include: home education via Computer Assisted Instruction (CAI) for all levels from pre-school to post-graduate refresher courses, home shopping services, home banking, automatic meter readings, burglar and fire alarm monitoring, control of home appliances, etc.

Businesses will take advantage of the terminal to make it possible for many white collar and management functions to be accomplished from a home work center without the necessity of commuting to a place of employment. The terminal would provide the worker with access to all the information, work materials, people and services he would normally have, including secretarial, filing and retrieval, mail pickup and delivery, and conference type communication hookups. Only unavoidable face-to-face meetings, on-site inspections, etc. would cause the worker to have to commute to the office and these occasions could be scheduled as business trips are now.

Some home terminal applications may precede the advent of general purpose home terminals due either to the magnitude of the need or because a limited set of facilities such as provided by picturephones may be adequate. For example, home CAI may become a major need, if existing education facilities fail to meet enlarging needs. Families may find it more economical to spend relatively large sums of money to provide special terminals and communication channels for home education rather than use expensive private schools. As another example, home shopping has been tried in San Diego using television and existing telephones. The panel suggests that this application may be viable prior to 1980 using the picture-phone.

HOME TERMINALS

	APPLICATION TITLE	1970-71	72-74	75-77	<b>78</b> -80	81-85	LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	NOT BE	)
	HOME COMPUTER ASSISTED INSTRUCTION 100								3.41	2.52	3.66	-0.40	
	50 25	- -		1				•					
	P. 0	7. 0.0	0.0	3.2	22.6	58.1	16.1	0.0					
	HOME SHOPPING SERVICES 100				,		,		2.32	2.74	2.70	0.59	
	50 25	- -			1			L					
	P. 6	0.0	0.0	1.5	4.6	- -  78.5	12.3	3.1	•				
	MULTIPLE USE HOME TERMINAL 100								2.64	2.58	2.77	-0.56	
	50 25	- -		1									
	. P . C	. 0.0	0.0	0.0	16.1	- -  59.7	21.0	3.2	<del>-</del>				
<b>I</b>	INTERACTIVE NEWS AND ENTERTAINMENT 100								2.22	1.95	2.11	<sup>-</sup> 1.35	
9 W	50 25	<u>-</u>					L	L					
	P. 6	0.0	1.5	1.5	7.5	61.2	25.4	3.0	<b>.</b>				
	ELECTRONIC DELIVERY OF HARD COPY 100	-						· .	2.08	2.00	2.35	70.83	
	25 0 P (		0.0	0.0	8.2	-  45.9	39.3	6.6	<b>-</b>				

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Home Computer Assisted Instruction -- The availability of computer assisted instruction in 1 percent of the homes. This would supplement public education at all levels and provide post graduate refresher and extension courses. Most of the educational materials (graphical, printed/and/or sound) are provided at the terminal. The students progress is monitored and he is advanced at his own speed.

	IMPACI	ON SOCIET	Y	IMPACT_	AND_VA		S FOR II	MPLEMEN.	TATION			$\forall ILL$
14.4					ABLE TO	O IMPLE	MENTOR	USEF	UL TO F		AT TM	NOT BE
GROUP TOTALS	I <i>JOR SI<b>GNI</b></i> 30 40		NO 2	13	MODE1		GINAL 13	<i>VERY</i> 50	14	MAR GIN 8	AL IM	PLEMENTED 11
EXPERT TOTALS	9 8	1	1	6	•	7	2	14	1	1		3
	4000 54 5		-	MPLEMEN								
GROUP TOTALS	1970-71 7 0	72-74 75-7 0 2		81-85 36	LATER 10	NEVER 0						
CONSENSUS EXPERT TOTALS	0	0 1		11	1	0						
CONSENSUS	v			1-1	-	J						
A. CATV insta	lled in l	percent of	ACCELERA the home		D RETAI	RDING_F	<u>ACTORS</u>					
	ABSOLUTE	POSSIBLE N	O EFFECT	1970-71	72-74	75-7 <b>7</b>	78-80	81-85	LATER	NEVER		
GROUP TOTALS EXPERT TOTALS	14 6	29 8	7	0	7	13	14	9	1	0		
B. FCC regula		_	1 o-way swi	tched c	1 ommunic	•	6 networks	3 3.	Ü	0		
	ABSOLUTE	POSSIBLE N	O EFFECT	1970-71	72-74	75-7 <b>7</b>	78-80	81-85	LATER	NEVER		
GROUP TOTALS EXPERT TOTALS	12	29	3	0	7	10	16	5	2	0		
C. Availabili	ty of coll	6 ege credit:	1 s via CAI	0 course:	1 s.	2	8	1	0	0		
		POSSIBLE NO				75-7 <b>7</b>	78-80	81-85	LATER	NEVER		
GROUP TOTALS	25	21	7	0	. 3	15	12	8	7	1		
EXPERT TOTALS  D. Failure of	6 urban hig	5 h schools:	4 at leas	0 t 10 pe:	1 rcent o	5 of all 1	1 high sch	2 nools in	3 n the l	1 0 large:	st cit	ies
in the Uni	ted States	closing be	ecause of	confli	ct betw	veen par	rents, t	eachers	and a	dminist	ratior	1,
recognitio												
GROUP TOTALS	ABSOLUTE 23	POSSIBLE NO	O EFFECT 10	1970-71	72 - 74 1	75-77 11	78-80 7	81-85 7	LATER 7	NEVER 10		
EXPERT TOTALS	7	5	3	0	1	5	2	1	2	4		
			RE	QUIRED	CAPABII	LITIES						
A. Inexpensiv	e two-way	television	type ter	minal -	\$5-\$30	per mo	onth.					
GROUP TOTALS	NECESSRY 46	ASSET US	EFUL SOME	USE NO			10×- 0	0.K.				>1000×+
CONSENSUS	11-1	U	2	U	1	0	-	47  - -	1	0	0	0
EXPERT TOTALS CONSENSUS	13   -	3	0	0	0	0	0	15 - -	0	0	0	0
B. High capac	ity two-wa	y communica	ation cha	nnels.	,		,					
	NECESSRY	ASSET USI	EFUL SOME	USE NO	NEED >	>10×-	10×-	O.K.	10×+	100×+ 1	000×+	>1000×+
GROUP TOTALS CONSENSUS	31	18	1	0	5							
EXPERT TOTALS CONSENSUS	8	8	0	0	1							
C. Availabili			ay's tele	phone s	ervice.	1						
	NECESSRY	ASSET US	EFUL SOME	USE NO	NEED >	>10x-	10×-	O.K.	10×+	100x+ 1	000×+	>1000×+
GROUP TOTALS CONSENSUS	11	35	7	1	3		440	J . 11. 6	4001	TOOLE T	UUUAT	- 1000×T
EXPERT TOTALS	2	14	1	0	0							
CONSENSUS D. Course pre	naration 1	-  anguage to	reduce t	he prep	aration	cost )	hy a fac	tor of	10 070	r today	ים ראז	sveteme
course pre												
GROUP TOTALS	NECESSRY 15	34	EFUL SOME 3	USE NO 1	NEED >	10×-	10×- 6	0.K. 37	10×+ 2	100×+ 1	+×000 0	>1000×+ 0
CONSENSUS EXPERT TOTALS	2	-  12	0	1	0	0	3	-1-1	0	_	^	
CONSENSUS		11-1			J	U		11	U	0	0	0
E. Massive co												
GROUP TOTALS	NECESSRY 9	ASSET USI	EFUL SOME 8	USE NO	NEED >	10×-	10×- 16	0.K. 31	10×+ 0	100×+ 10	000×+	>1000×+
CONSENSUS EXPERT TOTALS		11-1					1	-1-1	•	-	-	
CONSENSUS	2	11	2	1	0	0	5	10	0	0	0	0
				1	III.94		•	1 1				

Home Shopping Services -- The availability via a terminal to 1 percent of the homes of a home shopping service. Products would be displayed and described in response to inquiries. Purchases can be entered at the terminal and transmitted to producers and distributors.

			-	IMPACI	AND Y		0 DOD 7	14 Tr = 14 = 14			*****
	IMPAC	T ON SOCI	ETY	PROFI	TABLE 1		S FOR II M <b>ento</b> r			PUBLIC	WILL NOT BE
	JOR SIGN			VER	Y MODE	ERT MAR	GINAL	<b>VER Y</b>	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS EXPERT TOTALS		4 31 4 8				32 , 7	16 3	22 4	32 5	13 3	16 3
DAL BRI TOTABO	J	,	·				•	•.			· ·
	1070-71	72 <b>-</b> 74 75	-77 78-	IMPLEME 80 81-85		<u>L DATE</u> R NEVER					
GROUP TOTALS	0	0		3 51	8	2					
CONSENSUS	•	•	•	1-1-1							
EXPERT TOTALS CONSENSUS	0	0	0 .	2 12	2	1					
			4 6 6 77 7	TO LATE OF			4 G M O D G				
A. Availabili	ty of CAT	V in 1% c		<u>ERATING A</u> omes.	NU RETE	INDING E	ACTURE				
	ABSOLUTE	POSSIBLE	NO EFFE	CT 1970-7	1 72-74	75-77	78-80	81-85	LATER	RNEVER	
GROUP TOTALS	14	27	13		. 7	10	17	8	2	0	
EXPERT TOTALS  B. Fifty per		9 ase in wo	2 orkina co		1. h resul	4 Ltant li	6 mited s	2 hopping	0 time.	0	
rate, por			-								
GROUP TOTALS	ABSOLUTE 8	POSSIBLE 26	' NO EFFE 22	<i>CT</i> 1970-7	'1 72-74 1	1 75-77 8	78-80 13	81-85 12	LATER 3	? NEVER 6	
EXPERT TOTALS	1	7	6	0	0	3	4	2	1	1	
C. FCC regula	ation allo	wing new	two-way	switched	commun	ication	network	s.			
				CT 1970-7				81-85		NEVER	
GROUP TOTALS EXPERT TOTALS	16 6	23 5	9		7	12	16 7	2 0	3 0	0	
D. Establish	-	_		_		4	. <b>,</b>	v	Ū	. 0	
	ARSOLUTE	POSSTRIE	יוו אינו אינו אינו אינו אינו אינו	CT 1970-7	14 70 - 71	75_77	70_00	01_05	ramed	NEVER	
GROUP TOTALS	10	30	10 11 10		8	8	12	4	8	1	
EXPERT TOTALS	1	8	4	0	2	2	3	1	3	0	
A. High capac	city two-w	av commun	ication	REQUIRED Channels.		<u>LITIES</u>					
J											
	NECESSRY	ASSET	USEFUL S	OME USE N	O NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS CONSENSUS	33	18	1	1	2						
EXPERT TOTALS	9	3	0	. 0	1						
CONSENSUS  B. Inexpensive	 		4 a wmi n a 1				tion CE	-25 202	manth		
b. Hexpensi	Ae rerears	TOU TIVE	Cerminar	WICH CWC	o-way co	Jilliunica	cron 33	-23 per	RIOTICIT.	•	
	NECESSRY	ASSET	userut e	OME USE N	מששות מו	>10×-	10~-	O.K.	10~+	1000+ 100	0×+ >1000×+
GROUP TOTALS	51	3	0	0	1		1			0	
CONSENSUS EXPERT TOTALS	1 -	1	0	0	0	0	0	1-1-1	0	0	0 0
CONSENSUS	11-1		-	-	-	U	-	1-1-1	U	U	0 0
C. Massive co	ommunicati	on interf	ace 100,	000 lines	<u>.</u>						
GROUP TOTALS	NECESSRY 11	ASSET 35	USEFUL S 5	OME USE N 1	O NEED	>10×- 7	10×- 30	0.K. 11	10×+ 0	100×+ 100 0	0×+ >1000×+ 0 0
CONSENSUS		11-1		•	4	,	1-1-1	* 7	U	U	0 0
EXPERT TOTALS CONSENSUS		6  -	3	0	0	2	7	2	0	0	0 0
D. Positive			ificatio	on.			1-1-1				
anaun mamin "	NECESSRY			OME USE N		>10×-	10×-	O.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS CONSENSUS	49   -	14	1	0	0						
EXPERT TOTALS	10	1	1	0	0						
CONSENSUS	11-1										

Interactive News and Entertainment -- The availability in 1 percent of homes of media service that allows the subscriber to choose at his home terminal from a wide variety of offerings. His selection is individually transmitted to him. If he desires, he may request more in-depth coverage of particular items of interest.

MAJOR GROUP TOTALS 14 EXPERT TOTALS 4		ON SOCIETY LITTLE 28 8	<i>NO</i> 6 1	PROFIT	AND VAL CABLE TO MODER 24	REASON IMPLE T MAR		USEF	UL TO P		WILL NOT BE MPLEMENTED 37 12
19 CROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	70-71 72- 0	75-77 1 1 0 0	•	MPLEMEN 81-85 41  -  17  - -		PATE NEVER 2					
A. The availabili	ty of CA			ATING AND of the ho		DING_E	<u>ACTORS</u>				
AB: GROUP TOTALS EXPERT TOTALS B. FCC authorizat	14	OSSIBLE NO 1 28 9 new switche	12 5	0	5 2	14 7	78-80 20 8	81-85 7 1	LATER 0 0	NEVER 0 0	
AB: GROUP TOTALS EXPERT TOTALS	SOLUTE PO 12 6	0551BLE NO 1 27 8	EFFECT 8 3	1970-71 0 0	72-74 8 3	75-77 8 4	78-80 18 7	81-85 3 0	LATER 1 0	<i>NEVER</i> 0 0	
A. Inexpensive te	elevision	like termi		DOUIRED th two-			ion <u>\$5</u> -	25 per	month.		
GROUP TOTALS CONSENSUS EXPERT TOTAL:	50  -  20  -	6 1	•	0 USE NO	NEED > 2	10×- 0 0	0	0.K. 49  - -  16  - -	10×+ 1	100×+ 1000× 1 0	0
GROUP TOTALS CONSENSUS EXPERT TOTALS	CESCRY A 53  -  18  -  two-way	2 0	1	USE NO  0  0  nnels.	#FED > 1 0	10×-	10×-	O.K.	10×+	100×+ 1000>	+ >1000×+
GROUP TOTALS CONSENSUS !- EXPERT TOTALS	CESSRY A 35	18 1   11 0	ı	USE MO  1  0  eduled i	0		10×- er mont	o.K.		100×+ 1000×	
REC GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	1	30 16 	ı	. USE NO 2	#EED >	10x- 3	9 3	0.K. 40 -1-1 14 -1-1	10×+ 0	100×+ 1000× 0 0	c

<u>Multiple Use Homer Terminal</u> -- The installation of a home terminal in 1 percent of the homes to accomplish som combination of applications, assuming that most families would find the purchase of a home terminal to be uneconomical unless they could use it for a relatively wide assortment of applications.

				IMPACT	AND VAL	.IIF					
	TMPACT	ON SOCIETY		2-1-1-2-			S FOR I	MPLEMEN	TATTON		WILL
	In noi	011 00011111		PROFTT	ABLE TO				UL TO P	URLIC	NOT BE
MA	JOR SIGNI	F. LITTLE	NO	VERY			GINAL		MODERT		, IMPLEMENTED
	15 25	19	2	14	27		14	20	21	14	12
EXPERT TOTALS	6 8	7	1	8	7		5	8	7	4	2
EXPERT TOTALS	0 0	,	1	0	•		3	0		4	2
				<u>IMPLEMEN</u>	TATTON	יים אות אות					
	1970-71 7	2-74 75-77	78-80		LATER	NEVER					
CROUR MOMATC			10	37	13	19 E V E T					
GROUP TOTALS	. 0	0 0	10	1-1-1	13	2					
CONSENSUS			•	1-1-1	•	1					
EXPERT TOTALS	. 0	0 0	, 6		2	1					
CONSENSUS			1	-							
			<u>ACCELER</u>	ATING_AN	<u>D_RETAB</u>	DING_F	<u>ACTORS</u>				
A. CATV in 1	percent of	the homes.									
•											
		POSSIBLE NO			_	75-77	78-80				
GROUP TOTALS	6	31	: 13	0	8	11	11	5	1	1	
EXPERT TOTALS	5	11	5	0	3	2	6	2	1	1	
B. FCC allowi	ng the est.	ablishment	of new	t <b>w</b> o-way	switche	ed netw	orks.				
	ABSOLUTE !	POSSIBLE NO	EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	
GROUP TOTALS	10	31	8	0	11	8	14	4	1	0	
EXPERT TOTALS	6	11	2	0	3	3	6	1	1	0	
			R	EQUIRED_	CAPABIL	ITIES					
A. High capac	ity two-wa	y communica	tions c	hannels	switch	ble to	allow	access	to many	applica	tions.
	_	-							•		
	NECESSRY	ASSET USE	FUL SOM	E USE NO	NEED >	10×-	10×-	0.K.	10×+	100×+ 100	00×+ >1000×+
GROUP TOTALS	37	12	5	0	1						
CONSENSUS	11										
EXPERT TOTALS	12	7	3	0	0						
CONSENSUS											
B. Terminal w	ith displa	y, full key	board a	nd light	pen ca	pable	of prov	idina v	rideo an	d audio	displavs
and of acc	epting inp	uts from se	nsor de	vices.	Purchas	e \$500	to Sl.	500			1 2
	NECESSRY	ASSET USE	FUL SOM	E USE NO	NEED >	10×-	10×-	0.K.	10×+	100×+ 100	10×+ >1000×+
GROUP TOTALS	38	12	1	0	2	2	8	37	1	0	0 0
CONSENSUS	11		-		_	-	-	1-1-1	-	Ť	
EXPERT TOTALS	13	6	0	0	1	1	3	14	0	0	0 0
CONSENSUS			-	J	-	•	,	1-1-1	ŭ	J	., .,
		•						1 1 1			

Electronic Delivery of Hard Copy -- The availability of the electronic delivery of a wide variety of hard copy items via the home terminal to 5 percent of the homes. Items could be viewed, and hard copy selected or rejected. Items might include newspapers, periodicals, mail, etc.

	IMP	ACT ON S	OCIETY		IMPACT_	AND_V		NS FOR	IMPLEME	NTATION	,		WILL
					PROFI1	ABLE 2	O IMPL	EMENTOR	? USE	FUL TO	<b>PUBLIC</b>		NOT BE
MA	JOR SI	GNIF. L	ITTLE	NO	VER Y	. MODI	ERT MA	RGINAL	VERY	MODERT	' MARGI	NAL IM	PLEMENTED
ROUP TOTALS	8	23	26	2	6	2	27	19	13	24	16	5	18
XPERT TOTALS	3	6	4	1	2		9	2	6	6	1	L	2
					<u>MPLEMEN</u>								
	1970-7	1 72-74	75-77	78-80	81-85	LATER	REVE	R					
ROUP TOTALS	0	0	0	5	28	24	4						
XPERT TOTALS ONSENSUS	0	0	0	1	. 8	6	0						
COCNBCN					1-1								
. Low cost (	45 40 /			RE	QUIRED	CAPABI	LITIES				, ,		
. Low cost (	\$5-40/m	nonth) te	rminal w	ith bo	oth hard	і сору	and vi	deo dis	splay ca	pabilit	y (coul	ld be v	ideo casse
	NECESS	RY ASSE	T USEFUI	L SOMÈ	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
ROUP TOTALS	43	5	2		0	0	0	1	39	1	0	0	0
ONSENSUS	11-	1							1-1-1				
XPERT TOTALS	13	-	1		0	0	0	0	8	0	0	0	0
ONSENSUS	11-	•							1-1-1				
. Mass storag	e of <u>10</u>	0 billio	n bytes.										
		RY ASSE:	T USEFUI	L SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
ROUP TOTALS	31	12	5		1	0	0	4	31	8	0	0	0
ONSENSUS	-		1						1-1-1				
XPERT TOTALS	9	2	. 1		1	0	0	1	6	3	0	0	0
ONSENSUS	11-		1						1-1				
<ul> <li>High capac</li> </ul>	ity two	-way com	municatio	on <b>cha</b>	nnels.								
	NECESS.	RY ASSE	r useful	SOME	USE NO	NEED	>10×-	10×-	О.К.	10×+	100×+	1000×+	>1000×+
ROUP TOTALS	37	10	4		0	1			,		_ 0 0 1		20001
ONSENSUS	11-		·		-	-							
XPERT TOTALS	12		1		0	1							
			-		<b>-</b>	-							

CONSENSUS

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#### INFORMATION SYSTEMS

Information systems can be divided into three levels of increasing complexity -- operational, functional, and management. Operational systems maintain all the information relating to the status and control of an operation such as inventory, personnel, etc. Functional systems combine operational areas to provide integrated support to a complete function such as manufacturing, finance, etc. Management information systems integrate functional areas to provide support for higher management activities.

While each level can be thought of as being made up of an integration of the lower level systems, it is important to recognize that each is greater than the sum of its parts in that each must provide new information to support the roles of management that didn't exist at lower levels. These new roles are primarily associated with increased emphasis on longer range planning as you move up through management levels. Thus the operational manager is primarily concerned with planning the immediate operations, functional management is a tactical planner, while general managers and above are primarily strategic planners. At the operational level day-to-day status is needed to determine trends while at the general level external environmental information is required to make strategic plans.

We are now in the process of installing a great number of operational information systems, a fair number of functional systems, and a very few primitive management information systems. In the future we will continue to install new operational and functional systems and management information systems will be in a significant number of companies.

Many of the operational systems will be composed of geographically dispersed elements intercommunicating through high speed data A nationwide police information system is an example-already in the process of being implemented it will be reasonably completed in ten years providing files on unsolved crimes, stolen property, known and wanted criminals, fingerprints modus operandi, It may also by this time and certainly by 1985 incorporate automatic fingerprint analysis. In general this kind of interconnection is typical of the trend in state and local governments as they move to integrated functional systems with overtones of management systems. There is no need for multiple files of taxpayers or taxable property, etc. when single logical files will do. The study illustrates how local health information systems installed in 20 percent of the metropolitan areas by 1980 can be expanded into statewide health information systems by 1985.

By 1985 functional systems such as Automated Plant Information systems in twenty percent of the Fortune 500 Companies will automate the complete internal information requirements so that the plant can dynamically respond to changing information.

The true management information system, as evidenced by installation in 20 percent of the Fortune 500 Companies, may come into their own as early as 1980 but certainly no later than 1985. These systems will include internal operational and historic status as well as external environment statistics and forecasts. The planning process will be assisted by models of the enterprise in its environment and result in an automated plan which the system can translate into operational orders. The system will measure the results against the plan and report descrepancies to management for their action.

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III.101

Automated Fingerprint Analysis -- The existence of a system that can, with reasonable probability, identify an arbitrary print from a master file without supporting data. This is in contrast to current systems, both manual and automated, where the probability of locating a match is virtually zero unless one has a small set of suspects.

	TUDAG	m on coati	m m V		IMPAG	T_A	ND V		า <i>มเรา</i> ฮดอ 7	MDFFMFN	MATTON			WILL	
	IMPAC	r on socie	3 <i>I I</i>					O IMPI	ONS FOR I LEMENTOR	USEF	UL TO	PUBLIC		NOT BE	
GROUP TOTALS		5 23	LE I	V <i>O</i> 2		.0	MO DI	27	ARGINAL 17	13	MODERT 28	1:	L	PLEMENTED 7 0	
EXPERT TOTALS	2	3 2		0		3.		3	0	3	3		L	U	
								V_DATE							
GROUP TOTALS	1970-71	72 <b>-7</b> 4 75- 0	1	23	81-8	!	LATEI 8		8 <i>R</i> 1						
CONSENSUS EXPERT TOTALS CONSENSUS	0	0	0 1-	2	 2 	•	2		)						
				37 5 D 47		4 27.7	n 77 M		TA GMODG				,		
A. Development	of some	other phy							FACTORS	idantif	iantia	n fam	ntham t	ham la+am	_
fingerprint	s.													nan laten	C
GROUP TOTALS	ABSOLUTE 12	POSSIBLE 18		<i>PECT</i> :	1970- 0		72-71		<b>77 78-</b> 80 7 9	81-85 3	LATE 9		7 <i>R</i> 2		
EXPERT TOTALS	2	2	-	0	. 0		ō		0	ő	2			,	
				סדיו	7 <i>111</i> D T	חי	************	LITIES	2						
A. Multi-attri	bute patt	ern match:	ing.	1142	FATUR	. <del></del>	.01.014	FATTT	2						
	NECESSRY	ASSET I	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	о.к.	10×+	100×+	1000×+	>1000×+	
GROUP TOTALS	45	1	0	20	0		1		• •	• • • • • • • • • • • • • • • • • • • •					
CONSENSUS EXPERT TOTALS	11-1														
CONSENSUS									. `						
B. Mass data s	torage of	10 billio	on byte	<u>es.</u>											
GROUP TOTALS	NECESSRY 35	ASSET U	USEFUL 2	SOME	USE .0	NO	NEED O	>10×-	10×- 1	0.K. 37	10×+ 4	100×+ 2	1000×+	>1000×+ 0	
CONSENSUS			_		. •			•	_	1-1-1		_		•	
EXPERT TOTALS CONSENSUS															
C. Ten-fold in	crease in	image pro	cessir	ng ted	chnol	.ogy	; sca	nning	, digital	conver	sion,	storage	and d	isplav.	
	NECESSRY		<i>USEFUL</i>	SOME		NO			10×-	O.K.	10×+			>1000×+	
GROUP TOTALS CONSENSUS	37   -	7	2		1		1	0	0	35  - -	7	0	0	0	
EXPERT TOTALS															
CONSENSUS D. Fingerprint	scanning	device													
		acvice.													
	NECESSRY	ASSET U	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10x+	100x+	1000×+	>1000×+	
GROUP TOTALS	42	3	2		0		0			• • • • • • • • • • • • • • • • • • • •		200 .	2000	1,000	
CONSENSUS EXPERT TOTALS	11-1														
CONSENSUS															
E. Graphical st	torage and	i retrieva	11 - <u>on</u>	e bil	lion	pa	ges.								
	NECESSRY	ASSET I	US E <b>F</b> UL	COMP	1100	7.T.K	מששט	<b>\1</b> 0~.	100.	ο ν	1041	100=	1000=	.4000	
GROUP TOTALS	12	31	3	SUME	0 <i>5 B</i>	NO	<i>NEED</i> 2	>10×-	10×- 9	0.K. 28	10×+	100×+ 0		>1000×+ 0	
CONSENSUS		-								1-1					
EXPERT TOTALS															

CONSENSUS

IMPACT AND VALUE

Automated Plant Information Systems -- The implementation in 20 percent of the Fortune 500 Companies of systems to provide complete automation of the information requirements of a manufacturing plant. The information is derived from production scheduling systems, raw material analysis, etc. Production centers are under adaptive computer control and respond dynamically to changing information.

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	Il	VPACT	ON SOC	CIETY								RNTATION			WILL
						PROF	TTI	BLE 1	O IMPI	SEMENTOR	r use	FUL TO 1	PUBLIC		NOT BE
MA	JOR .	SIGNI	F. LIT	TTLE	NO	VE	RY	MODE	RT MA	RGINAL	very	MODERT	MARGINA	J IM	PLEMENTED
GROUP TOTALS	3	16		39	4	2	5	3	2	4	5	29	23		4
EXPERT TOTALS	2	8		21	1	1	. 6	1	.5	Ó.	4	. 15	9		1
									<u> DATE</u>						
		-71 7			8-80	81-8	-	LATER							
GROUP TOTALS	1	0	0	2	31	19	)	2	(	)					
CONSENSUS				1	-1		1								
EXPERT TOTALS	1	0	0	2	12	11		1	(	)					
CONSENSUS				1	-1	-,	٠ ١								
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1 Water shift			- +1							<u>FACTORS</u>	<u>.</u>				
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	ABSO.	LUTE	POSSIBI	LE NO EF	FECT	1970-	71	72-74	75-	77 78-8	80 81-8	5 LATE	R NEVER		
GROUP TOTALS		4	25	5	6	0	)	0	10	14	i, 3	1	0		
EXPERT TOTALS		3	1:	2	2	0	)	0	•	5 5	5, 2	1	0		
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A Trutomotod o		<b>.</b>	_ E : _ E.				<u> </u>	SAPABI	LITIES	<u>)</u>					
A. Automated o	genera	CTOH	or into	DIMATION	syst	ems.									
	NECE	SSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 10	)0×+	>1000×+
GROUP TOTALS		9	33	4		2		1							
CONSENSUS			11-1												
EXPERT TOTALS		5	14	2		1		1							
CONSENSUS			11-1												
B. Massive con	munic	ation	inter	face of	10,00	0 lin	es.								
	NECE	CCDV	ASSET	USEFUL	SOME	गटा	87 O	מששוג	>10x-	10×-	О.К.	10×+	100×+ 10	) N × +	>1000x+
GROUP TOTALS		11	27	4	DOME	3	140	2	4	11	27	1	0	0	0
CONSENSUS		11	11-1	-		3		2	4		-	1	U	U	U
EXPERT TOTALS		6	12	2		2		0	2	6	12	0	0	0	0
CONSENSUS	1		-	Z		2		U	2		-	U	U	U	U
C. Advanced da	•			.+						1					
	. Ju Nai	ma	ñ <i>2eme</i> 1												
	NECE		ASSET	USEFUL	SOME		NO		>10×-	10×-	$o.\kappa.$	10×+	100×+ 10	)0×+	>1000×+
GROUP TOTALS		43	2	3		1		0							
CONSENSUS															
EXPERT TOTALS		21	0	1		1		0							
CONSENSUS															
D. Mass storag	e of	100 b	illion	bytes.											
	NECE	SSRY	ASSET	USEFUI	SOME	USE	NO	NEED	>10×-	10×-	О.К.	10×+	100×+ 10	)0×+	>1000×+
GROUP TOTALS		15	27	6		0		0	1	14	28	1	0	0	0
CONSENSUS	1	 	[-1	ŭ		•		J	-	1	[-1	-	•	•	•
EXPERT TOTALS	,	9	10	4		0		0	1	' 7	13	0	0	0	0
		-		•		•		•	-	•		_	-	-	~

CONSENSUS

Consolidated Public Welfare Systems -- The implementation of systems to manage all aspects of public welfare in ten states. The system maintains an integrated data base of welfare, unemployment and workman's compensation recipients.

GROUP TOTALS EXPERT TOTALS GROUP TOTALS CONSENSUS EXPERT TOTALS	JOR SIGN 18 3	8 2	TLE NG 3 (6) 6 (7) 5-77 78- 1 (-)	PRO 0 V 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ERY 14 5 <u>MENTA</u> 85 L	LE 1 MODE 2	REASON TO IMPLE TO MAR TO TO T	MENTOR GINAL 24 8		TATION UL TO I MODERT 30 9		NAL IM	WILL NOT BE PLEMENTED 13 2
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			ACCEI	LERATING	AND	RETA	RDING_F	ACTORS					
A. Consolidat:	ion of wel	fare sys	tems unde	er a fed	eral	ager	cy.						
GROUP TOTALS EXPERT TOTALS	ABSOLUTE 31 15	POSSIBL. 18 5	Į	<b>t</b>	-71 7 1 0	2-74 8 6	75-77 8 1	78-80 13 2	81-85 7 4	<i>LATER</i> 7 3	NEVE! 4 2	-	
				REQUIR	ED_CA	PABI	LITIES						
A. Mass data	storage, <u>l</u>	00 billi	on bytes										
	ND ADAGO V												
GROUP TOTALS	NECESSRY 30	17	USEFUL S	OME USE		1 EED	>10×- 4	10×- 13	0.K. 30	10×+ 0	100×+ 3	1000×+ 0	>1000×+ 0
CONSENSUS EXPERT TOTALS	 6	8	1	0		1	1	5	7	0	0	0	0
CONSENSUS  B. Automated of		, ,	rmation o	a+oma				1	1-1				
2. Automateu (	delier action	Or Into	rmation s	systems.									
GROUP TOTALS CONSENSUS	NECESSRY 4	ASSET 30	USEFUL S 13	SOME USE 3		EED 2	>10×-	10×-	O.K.	10×+	100×+ 3	1000×+	>1000×+
EXPERT TOTALS	0	10	5 .	0		2							
CONSENSUS C. Search engi	ne 100 ti	mes toda	•	oilities									
, .	Jan Parker Parker				•								
GROUP TOTALS CONSENSUS	NECESSRY 12	ASSET 25	USEFUL S 7	SOME USE 4		EED 3	>10×- 3	10×- 13	0.K. 28	10×+ 3	100×+ 1	1000×+ 0	>1000×+
EXPERT TOTALS CONSENSUS	4	7	2	1		2	1	2	9	1	0	0	0

Health Information Systems -- The implementation of health information systems by 20 percent of the metropolitan areas. The system would provide for accumulation of health data for all individuals from hospital visits, school and visiting nurses, physicians and dentists. It provides the individual with a continuing health record, which is available to assist in diagnosing and treatment. The system can be used in epidemic detection and control and for the evaluation of the effectiveness of drugs and treatments.

IMPACT AND YALUE

REASONS FOR IMPLEMENTATION

PROFITABLE TO IMPLEMENTOR USEFUL TO PUBLIC

WILL

NOT BE

IMPACT ON SOCIETY

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CONSENSUS

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XPERT TOTALS	5	5	2	0		3	3		3	7	3	0		5
				7	MDT.FIL	אייי זו יוז א	TION !	יידיי א מ						
	1970-7	1 72-74	<b>75-77</b>	78-80 <sup>±</sup>					,					
ROUP TOTALS	0	0	2	40	17		3	3						
ONSENSUS		•	_	1-1			•	•						
XPERT TOTALS	0	0	0	` ' <u>9</u>	14		0	0						
ONSENSUS	•	•	ŭ	1-1	•		U	U						
			<u>A C</u>	CELERA	TING	AND I	RE <b>TA</b> RI	DING F	ACTORS					
<ul> <li>Passage of</li> </ul>	of a Nat	ional He	alth Ins	urance	Act	simi	lar to	Grea	t Brita	in.				
	ABSOLU	TE POSSI	BLE NO E	FFECT	1970-	71 7	2-74	75-77	<b>78-</b> 80	81-85	LATER	RNEVER		
ROUP TOTALS			29	4	0		5	22	8	5	6	2		
XPERT TOTALS			8	0	0		1	7	2	ō	2	Ô		
<ul> <li>Federal s</li> </ul>	subsidy.			•			-	,	•	ŭ	2	J		
	ABSOLU	TE POSSI	BLE NO E	FFECT	1970-	71 72	2-74	75-77	78-80	81-85	LATER	NEVER		
ROUP TOTALS	2	8	23	4	0		5	22	11	6	5	0		
XPERT TOTALS		7	5	0	ō		1	5	4	Õ	2	0		
. Mass stor	age of	100 bill	ion byte	<u>RE</u>	<u>QUIRE</u>	<u>D_CA</u> 1	P <b>A</b> BILI	TIES						
	NECESSI	RY ASSE	T USEFU.	L SOME	USE	NO NE	E <i>ED</i> >1	10×-	10×-	O.K.	10×+	100×+ 10	00×+	>1000
ROUP TOTALS	36	15			-1		1	1	8	30	8	0	0	0
ONSENSUS	11-				_		_	-	•	-1-1	0	0	U	U
XPERT TOTALS	9	2			0	ď	)	0	2	5	0	0	0	0
ONSENSUS	11-				-			-		-	J	J	U	U
. Advanced	data ba	se manag	ement sy	stem.					•	' '				
DOUD MOMATA	NECESSI							.0×-	10×-	0.K.	10×+	100×+ 10	00×+	>1000×
ROUP TOTALS	47	•	1		0	1	L							
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OUD MOMATO		RY ASSES		L SOME				0×-	10×-	0.K.	10×+	100×+ 10	00×+	>1000×
OUP TOTALS	36	14	. 4		1	1	Į.							
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Legislative Systems -- The availability of legislative support systems for Congress and 20 percent of the state legislatures. Services provided would include:
. Tracking of progress of bills through legislative process.
. Tracking the usage of programs under existing legislation.
. Financial analysis of proposed bills.
. Tracking of services to constituencies.

					IMPACT_	<u>AND VALU</u>	<u>g</u> .					
	IMI	PACT ON	SOCIETY			R	EASONS FOR	<i>IMPLEME</i>	NTATION		WILL	
					PROFIT	ABLE TO .	<i>IMPLEMENTOR</i>	USE	FUL TO F	UBLIC	NOT BE	
MA	JOR S	GNIF.	LITTLE	NO	VER Y	MODERT	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED	
GROUP TOTALS	5	20	24	2	6	22	19	15	18	15	6	
EXPERT TOTALS	1	5	4	0	2	7	0	4	5	1	1	
					Ç4,	100						
				I	MPLEMEN	TATION D.	4 <i>TE</i>					
	1970-	71 72-74	75-77	78-80	81-85	LATER	VEVER					
GROUP TOTALS	0	1	2	35	13	3	0					
CONSENSUS				1-1								
EXPERT TOTALS	0	1	0	. 9	3	0	0					
CONSENSUS				1-1-1								

#### REQUIRED CAPABILITIES

# A. Mass storage of 100 billion bytes.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	12	30	2		2		0	1	12	28	1	0	0	0
CONSENSUS	1	1-1							1	1-1				
EXPERT TOTALS	2	8	0		0		0	. 0	2	5	0	0	0	0
CONSENSUS		11-1												

Management Information Systems -- The existence of management information systems in 20 percent of the Fortune 500 Companies. The system would include assistance in the planaing area by provision of historical and environmental data and the availability of simulations and models. The plan itself would be automated in its preparation and retained in processable form. Day-to-day operational results from integrated operational systems will be monitored against the plan and deviations reported to management. Management will, in turn, use the system to make specific inquiries, to test their solutions by simulation, and to implement the decision.

IMPACT AND VALUE

### REASONS POR IMPLEMENTATION USERUL TO PUBLIC ON ONE STORM PROPERTY AND INCOMES TO THE CONTROL OF STORM PROPE	implement the	decision.		_	IMPAC	CT &	AND_YA	LUE				-		
### PROPITABLE TO INFLEMENTARY USERIES TO FREILE TO PROBLE MARGINAL INFLEMENTARY INCIDENT TO PROBLE 12 18 31 2 30 27 4 12 23 22 4 17 2 23 22 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		IMPACI	r on soc	IETY	<b>2,</b>			REASO	NS FOR .	IMPLEME	NTATION			
SADUP TOTALS 12 18 31 2 30 27 4 12 23 22 4  EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  EXPERT TOTALS 0 0 3 1-3 24 1 0  EXPERT POTALS 0 0 3 1-3 16 1 0  EXPERT POTALS 0 0 3 1-3 16 1 0  EXPERT POTALS 0 0 3 1-3 16 1 0  EXPERT POTALS 0 0 3 1-3 16 1 0  EXPERT POTALS 0 0 3 1-3 16 1 0  EXCUSTRED CAPABILITIES  A. Mass data storage of 100 billion bytes.  EXCUSTRED LANGUAGE POTALS 27 21 4 1 0 2 11 29 7 0 0 0  EXCUSTRED LANGUAGE POTALS 27 21 4 1 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 4 1 0 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 4 1 0 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 4 1 0 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 4 1 0 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 4 1 0 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 4 1 0 0 2 7 17 6 0 0 0  EXPERT POTALS 17 14 5 1 0 0 2 39 4 0 0 0  EXPERT POTALS 17 1 14 5 0 0 0 2 39 4 0 0 0  EXPERT POTALS 17 1 1 3 0 0 2 39 4 0 0 0  EXPERT POTALS 17 1 1 3 0 0 2 25 1 0 0 0  EXPERT POTALS 23 10 1 3 0 0 2 25 1 0 0 0  EXPERT POTALS 23 10 1 3 0 0 2 25 1 0 0 0  EXPERT POTALS 48 5 1 1 0 0  EXPERT POTALS 48 5 1 1 0 0  EXPERT POTALS 48 5 1 1 1 0 0  EXPERT POTALS 48 5 1 1 1 1 0 0 0  EXPERT POTALS 48 5 1 1 1 1 1 0 0 0  EXPERT POTALS 48 5 1 1 1 1 1 0 0 0  EXPERT POTALS 48 5 1 1 1 1 1 0 0 0  EXPERT POTALS 48 5 1 1 1 1 1 0 0 0  EXPERT POTALS 48 5 1 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 15 1 1 1 1 0 0 0  EXPERT POTALS 48 28 1 0 1 1 1 1 0 0 0  EXPERT POTALS 5 18 15 1 1 1 1 0 0 0  EXPERT POTALS 5 18 15 1 1 1 1 0 0 0  EXPERT POTALS 5 18 15 1 1 1 1 0 0 0  EXPERT POTALS 5 18 15 1 1 1 1 0 0 0  EXPERT POTALS 5 18 18 18 18 18 18 18 18 18 18 18 18 18					PRO	FITA	ABLE 2	O IMPL	EMENTOR					
### STATES 12 18 31 2 30 27 4 12 23 22 4  **EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  **EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  **EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  **EXPERT TOTALS 8 15 25 2 24 21 3 10 16 19 4  **EXPERT TOTALS 0 0 3 23 16 1 0  **EXPERT TOTALS 0 0 3 23 16 1 0  **EXPERT TOTALS 0 0 3 23 16 1 0  **EXPERT TOTALS 0 0 3 23 16 1 0  **EXPERT TOTALS 0 0 0 3 23 16 1 0  **EXPERT TOTALS 2 7 21 4 2 0 2 11 29 7 0 0 0 0  **CONSERSUS 1	MA	JOR STON	TF. LIT	TLE NO	V	ERY	MODE	RT MA	RGINAL	VERY	MODERT	MARGINA	L IM	P <i>LEMENTEI</i>
SECRET TOTALS   15   25   2   24   21   3   10   16   19   10   10   10   10   10   10   10					;	30	2	27	4	12	23	22		4
INPLEMENTATION DATE   1970-71 72-74 75-77 78-80 81-85 LATER MEYER   1970-12   1970-71				_	:	24	2	21	3	10	16	19		4
GROUP TOTALS 0 0 3 34 24 1 0 CONSENSUS 0 1  -   SEGUITED CAPABILITIES  A. Mass data storage of 100 billion bytes:  ***BECESSRY ASSET USEFUL SOME USE NO NEED >10×- 0.K. 10×+ 100×+ >100×+ >1000×	BAFBRI TOTABO		-	_										
GROUP TOTALS 0 0 3 34 24 1 0 CONSENSUS 0 1  -   SEGUITED CAPABILITIES  A. Mass data storage of 100 billion bytes:  ***BECESSRY ASSET USEFUL SOME USE NO NEED >10×- 0.K. 10×+ 100×+ >100×+ >1000×					IMPLE	MENT	TATION	DATE						
GROUP TOTALS  O		1970-71	72-74 7	5-77 78-8					'R					
	CROUR MOMATC	_												
### REPERT TOTALS 0 0 3 23 16 1 0  ### REQUIRED_CAPABILITIES  A. Mass data storage of 100 billion bytes.  ### RECESSRY ASSET USEFUL SOME USE NO NEED >10x- 0.K. 10x+ 100x+ 1000x+ >1000x+ 0.000x+ 0.00		U	v				_	•						
### A. Mass data storage of 100 billion bytes.  #### A. Mass data storage of 100 billion bytes.  ###################################	•	0	0	• •			4	n						
### A. Mass data storage of 100 billion bytes.  ###################################		U	U				•	·						
### A. Mass data storage of 100 billion bytes.  ### A. Mass data storage of 100 billion bytes.  ### A. MECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+ >1000x+ 1000x+	CONSENSUS			1-1-		- ,								
### A. Mass data storage of 100 billion bytes.  ### A. Mass data storage of 100 billion bytes.  ### A. MECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+ >1000x+ 1000x+					RECUTE	rn e	CAPARI	rr.TTT#S	•					
NECESSRY ASSET   USEFUL SOME USE NO NEED > 10x	4 Maga data		100 541	114		K K 1	KOFOZI	FKFFFR	•					
COMP TOTALS   27   21   4   2   0   2   11   29   7   0   0   0   0	A. Mass data	storage or	100 D1.	liion byte	<u>s</u> .									
COMP TOTALS   27   21   4   2   0   2   11   29   7   0   0   0   0														
COMP TOTALS   27   21   4   2   0   2   11   29   7   0   0   0   0		**************************************	A C C 77 M	nemant e	MP 110F	100	מששות	>10v-	10x-	OK	10x+	100x+ 10	nn×+	>1000x+
### 1 0 2 7 17 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	anaun					NU								
### ### ### ### ### ### ### ### ### ##				4	۷.		U	4			,	J	.,	•
### CONSENSUS		•					•	2	•		6	0	0	0
### B. Ten-fold improvement in simulation techniques and available software.  ### NECESSRY ASSET USEFUL SOME USE NO NEED >10x-				ц	1		U	2			ō	U	9	· ·
NECESSRY ASSET   USEFUL SOME USE NO NEED > 10x - 0.K.   10x + 100x + 1000x + > 1000x +   1000x									•					
GROUP TOTALS 37 15 1 3 0 0 2 39 4 0 0 0 CONSENSUS	B. Ten-fold in	mprovement	in simu	ulation te	chnique	s a	nd av	ailable	softwa	re.				
GROUP TOTALS 37 15 1 3 0 0 2 39 4 0 0 0 CONSENSUS														
GROUP TOTALS 37 15 1 3 0 0 2 39 4 0 0 0 CONSENSUS										o "	40	400 40		. 4 0 0 0 4 1
### CONSENSUS						NO								
EXPERT TOTALS 23 10 1 3 0 0 2 25 1 0 0 0 CONSENSUS	GROUP TOTALS			1	3		0	0	2		4	U	()	U
CONSENSUS     C. Advanced data base management system.    NECESSRY ASSET USEFUL SOME USE NO NEED > 10x-	CONSENSUS	11										_	_	_
### CC. Advanced data base management system.  #### NFCESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+ 1000x+ >1000x+ CONSENSUS   -    ##############################	EXPERT TOTALS			1	3		0	0	2		1	0	0	0
NECESSRY ASSET USEFUL SOME USE NO NEED > 10x- 0.K. 10x+ 100x+ 1000x+ > 1000x+   10	CONSENSUS									1-1-1				
NECESSRY ASSET   USEFUL SOME USE NO NEED > 10x-   0.K.   10x+   1000x+	C. Advanced da	ata base m	anagemer	it system.										
GROUP TOTALS			<b>,</b>											
GROUP TOTALS														
CONSENSUS   -  EXPERT TOTALS 34 2 1 0 0 CONSENSUS   -  D. One hundred time increase in search engine capability.  **RECESSRY ASSET USEFUL SOME USE NO NEED > 10x - 0.K. 10x + 100x + 1000x + > 1000x + CONSENSUS   -  EXPERT TOTALS		NECESSRY	ASSET	USEFUL SC	OME USE	NO	NEED	>10×-	10×-	o.x.	10×+	100×+ 10	00×+	>1000×+
EXPERT TOTALS 34 2 1 0 0 CONSENSUS 1 -  D. One hundred time increase in search engine capability.    NECESSRY ASSET USEFUL SOME USE NO NEED > 10x-	GROUP TOTALS	48	5	1	0		0							
### CONSENSUS   -     D. One hundred time increase in search engine capability.    NECESSRY ASSET USEFUL SOME USE NO NEED > 10x - 0.K. 10x + 100x + 1000x + > 1000x + 1000x + > 1000x +	CONSENSUS	11-1												
D. One hundred time increase in search engine capability.    NECESSRY ASSET USEFUL SOME USE NO NEED > 10x-   10x-   0.K.   10x+   100x+   1000x+   > 1000x+	EXPERT TOTALS	34	2	1	0		0							
NECESSRY ASSET   USEFUL SOME USE NO NEED	CONSENSUS	11-1												
NECESSRY ASSET   USEFUL SOME USE NO NEED	D. One hundred	d time inc	rease in	search e	ogine c	anal	hilit							
GROUP TOTALS 15 27 8 2 1 1 30 15 1 1 1 0 0 0 EXPERT TOTALS 9 19 5 2 1 1 1 18 11 1 1 0 0 0 0 0 0 0 0 0 0 0 0				. bearon e.	igane c	apa	<i>D</i> 1110	<b>y</b> •						
GROUP TOTALS 15 27 8 2 1 1 30 15 1 1 1 0 0 0 EXPERT TOTALS 9 19 5 2 1 1 1 18 11 1 1 0 0 0 0 0 0 0 0 0 0 0 0														
CONSENSUS		NECESSRY	ASSET	USEFUL SC	OME USE	NO	NEED	>10×-						
EXPERT TOTALS 9 19 5 2 1 1 18 11 1 0 0 0 CONSENSUS   -	GROUP TOTALS	15	27	8	2		1	1	30	15	1	1	1	0
EXPERT TOTALS	CONSENSUS		1-1						1-1					
### CONSENSUS		· ´ 9	19	5	2		1	1	18	11	1	1	0	0
#. Advanced interactive language.  **NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 10x- 0.K. 10x+ 100x+, 1000x+ >1000x+  **GROUP TOTALS 29 21 1 1 1  **CONSENSUS     EXPERT TOTALS 18 15 1 1 1  **CONSENSUS     F. Automatic generation of information systems.**  **NECESSRY ASSET USEFUL SOME USE NO NEED >10x- 0.K. 10x+ 100x+ >1000x+  **GROUP TOTALS 7 41 3 2 2  **CONSENSUS   -   EXPERT TOTALS 4 28 2 1 2			11-1						1-1	1				
NECESSRY ASSET USEFUL SOME USE NO NEED >10x-				10										
GROUP TOTALS 29 21 1 1 1 1 1			-unquay	,										
GROUP TOTALS 29 21 1 1 1 1 1														
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Nationwide Police Information System -- The availability of a nationwide information system to provide information on unsolved crimes, stolen property, wanted criminals, fingerprint files, modus operandi files, etc. The system would interface to existing state and local police information systems to provide and receive information.

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ONSENSUS

State Health Information Systems -- The implementation of health information by ten states. The system provides the same services as above either directly or by interface to existing local systems.

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#### INFORMATION UTILITIES

Information utilities are characterized as central on-line, realtime facilities serving many subscribers at remote locations. The types of services provided are information storage, retrieval, processing and computation. The beginning of such systems are seen in today's time sharing services and commercial data processing services.

By 1975-77 one percent of the businesses and self-employed professionals who do not have their own computer systems will make use of terminal systems to have their administrative applications processed by Information Utilities.

The concept originated in airline reservation systems of maintaining dynamic inventories which can be queried and updated will be expanded to other areas. Public concern over unemployment and government subsidies will bring about the installation of Job Placement Services by 20 percent of the metropolitan areas in 1975-1977. Initially these will serve local areas but will ultimately be nationally interconnected to help relieve localized pockets of unemployment. At the same time the many reservation systems now being installed will be interconnected into universal reservation systems that will allow a single interface for reservation for most services and events. By 1980-85 this type of service will have been expanded to include considerable logical functions as well as retrieval. For example, systems will be able to suggest vacation travel plans given gross requirements and then make the necessary arrangements and reservations to implement approved plans. Utilization will cover 50 percent of the travel agencies in 1980-85 time frame.

Information retrieval utilities are services providing rapid access to information which is too voluminous and/or volatile for users to economically maintain themselves. These types of services will begin to be implemented in 1978-80 and reach widespread use by the 1981-85 time period. Examples include literature, patent and law searches, freight rates, government activities, nationwide driver and vehicle data banks, and many others.

The advent of such systems will require: data bases in the trillion byte range, interconnection of large numbers of systems, the capability of processing thousands of calls concurrently, and the software to support this including the ability to automatically generate programs and data base organization as the needs change.

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Automated Public Libraries -- The availability in 20 percent of the metropolitan areas of computerized libraries providing terminal searches in the library of abstracts of their documents and automated retrieval and delivery of the selected document or a copy of it.

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Commercial Data Processing Services -- The use by 1 percent of the business and self-employed professionals who do not have their own computer systems of commercial data processing services. These services consist of prewritten (or tailored) applications accessed by the terminal.

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Disease Information Systems -- The evailability in 20 percent of the metropolitan areas of systems to record the diseases diagnosed by physicians in the area. The system would be used to detect epidemics in their early stages, and disease trends such as the rise of new diseases, or effectiveness of preventive measures on old diseases.

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Government Activities Information Utility -- The availability, through profit-making organizations, of continually updated data banks of government activities in legislative, executive and regulatory areas for the federal government and 10 percent of the states. This would include such items as status of legislation, current regulations and administrative directives, commission rulings, etc. Selected access to this information would be by subscription service through terminals at remote locations.

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Information Retrieval Utilities -- The use by 10 percent of the Fortune 500 Companies and 0.1 percent of self-employed professionals of the services provided by information utilities. These utilities would provide rapid access to information compiled, indexed, and maintained in a central data bank primarily by interactive inquiries from remote terminals but also by computer to computer inquiries. The information would be voluminous and/or volatile so that users would find it uneconomical to maintain their own data bank.

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Job Placement Services -- The availability in 20 percent of the metropolitan areas of a data bank of job openings. The data bank could be searched from terminals in government unemployment centers and employment agencies for a match with job applicant capabilities, experience and desires.

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Law Search -- Data banks containing the federal, state and local statutes together with key court decisions available to 20 percent of the lawyers via interactive search from terminals in their offices.

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Nationwide Driver and Vehicle Data Bank -- A national data bank of driver and vehicle licensing information. The system would be used by states to determine eligibility for license of a new resident and to check ownership of vehicles being newly registered in the state. The system would contain consolidated driving records and could be sold to insurance companies for use in determining premium rates.

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Patent Search -- The availability of the first data bank containing the complete files of the U. S. Patent Office for interactive search from terminals located in law firms, corporate law departments, etc.

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A. Automated	or comput	er assis	ted syste	m for c	aptu	ring,	analy	zing and	cross.	-indexi	ng the	existi	ng files.
							_	-					
	NECESSRY	ASSET	USEFUL S	OME USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
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C. Mass stora	age of one	trillio	<u>n</u> bytes										
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EXPERT TOTALS	, 1 <sub>1</sub>	3 '	0	0		0	0	1	3	0	0	0	0
CONSENSUS	11-1								- -				
$^{D}\cdot$ Terminal $^{\circ}$	with digit	al and g	raphical	display	and	hard	І-сору	output.	Price	approx	imately	\$200/	month.
	NECESSRY		USEFUL S	OME USE	NO I	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS	17	31	10	0		0	0	2	50	1.	0	0	0
EXPERT TOTALS	6	6	3	. 0		0	0	0	1-1-1	0	0	0	0
CONSENSUS		1-1	· ·	•			Ü	•	1-1-1	0	V	0	U
$^E oldsymbol{\cdot}$ Graphical	storage a	ind acces	s for 100	millio	n pa	ges.							
	, <b>, , ,</b> ,				F-4	,•							
	NECESSRY	ASSET	USEFUL S	OME USE	MO	תשפיו	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	15	29	8	0		1	1	1	40	6	0	0	0
CONSENSUS		-	^				•	_	1-1-1	_	_	_	
EXPERT TOTALS CONSENSUS	5	5	2	0		1	0	0	7  - -	2	0	0	0
	•								1 - 1 - 1				

Professional Literature Search Systems -- The utilization by 1 percent of research scientists and development engineers of terminal access to data banks of published research and development.

MA GROUP TOTALS TXPERT TOTALS	JOR SIGI	28 :		70 4 0	IMPACT PROFIT VERY 6 2	ABLE (	REAL TO IM	PLEM MARG			HTATIO" FUL TO MODERT 22		יידענ ייחקיי פאד אייר ומאד 4 ?
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. Query rung	uage to e	CCOmmode	1005	ary wc	orded r	equest	LS.						
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D. Network co		•	auests t	o oth	er eve	- -							
			-darmen		icr sys	-cma .							
GROUP TOTALS COUSTIBUS	#30#36#3	7 - A3SE''' <b>2</b> 0	USF PUI, 14	SOMT	<i>USB 110</i> 0	NEMD 1	>10×	-	10×-	О.К.	10×+	100*+ 100	^~+ >1000×+
EXPERT TOTALS	` з	14	2		0	1							

Telephone Directory and Yellow Page Data Banks -- The availability in 20 percent of the metropolitan areas of data banks supplementing the existing telephone directories. The system would use conventional or picturephones and largely replace information operators.

	TWDAG	m on coath	mv	IMPACT.	AND V		C HAD T	ND r midmi	um a m T O W		****	
	IMPAC	T ON SOCIE:	11	PROFI	TABLE	TO IMPLE	S FOR I. M <b>ent</b> or		FUL TO	PUBLIC	WILL NOT BE	<u>z</u>
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A. Installati	on of pict	urepnones	in 20 per	cent or	the n	ecropori	.can con	nually CT	es.			
		POSSIBLE						81-85				
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A. Voice reco	anition sy	stem capab	ole of rec	EQUIRED cognizin	g lett	ers and	numbers	and s	imple w	ords as s	poken by 9	9
percent of	the popul	ation.		- J					-			
	NECESSRY	ASSET U	SEFUL SOM	E USE NO	NEED	>10×-	10×-	O.K.	10×+	100×+ 100	00×+ >1000×	<b>+</b>
GROUP TOTALS CONSENSUS	12	24	16	3	3							
EXPERT TOTALS	3	14	7	1	2							
CONSENSUS				\0								
B. Audio resp	onse capan	ore or nanc	iling I,uc	O VOICE	respo	nses sin	nurcanec	Justy.				
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C. Alphabetic	: input ter	minal inco	orporated	in the	teleph	one.						
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CONSENSUS		1-1			•							
EXPERT TOTALS CONSENSUS	7	15  -	5	0	0 7							
D. Data base	of 100 bil	llion bytes	3.									
				ė								
GROUP TOTALS	NECESSRY 13	ASSET US	SEFUL SOM				10×-	0.K.			00×+ >1000×	+
CONSENSUS	13			3	1	5	32  -	17	0	.0	0 0	
EXPERT TOTALS CONSENSUS	4	13	8	2	0	. 0	12	12	0	0	0 0	
E. Search eng	jine 100 ti			day's sy	stems		,					
TRAUR MAMARA	NECESSRY		SEFUL SOM			>10×-	10×-	0.K.	1.0×+	100×+ 100	)0×+ >1000×	+
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ONSENSUS Updateable	e image fil	 les.					1	1-1-1				
	<b></b>	•										
	NECESSRY	ASSET US	SEFUL SOM	E USE NO	NEED	>10×-	10×-	O.K.	10×+	100×+ 100	)0×+ >1000×	+
ROUP TOTALS ONSENSUS	10	22	6	9	7				- <del>-</del> •			•
XPERT TOTALS	4	10	3	 5	3							
ONSENSUS		11		1	•							

Universal Reservation Systems -- The availability of systems in 20 percent of the metropolitan areas that provide the ability to make reservations for most services and events. i.e., transportation, lodging, sporting events, restaurants, etc., through one terminal interface. The service provides an interface to existing reservation systems or provides a reservation system for services and events desiring the service.

GROUP TOTALS EXPERT TOTALS GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	MAJOR SIG 8 11 1970-71 0	41 11 1 72-74 1 0	75-77 35  -  16  -	78-80 28   8   ZELERA dard f	PROF	ERY MO 26 8 MENTAT. 35 LAS	E TO DERT 41 9 PER 1 1 0 PER 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	EASON IMPLE MAR AIE VEVER 1 0	6 <u>4<i>CTORS</i></u> en syst	USEI VERY 37 11	FUL TO	PUBLIC		WILL NOT BE MPLEMENTED 3 0
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EXPERT TOTALS		3 1	1	2	0	•	8	4	4	0	3		0	
A. Network o	control.			RE	<u>QUIRE</u>	ID_CAPA	BILIT	<u>IES</u>				ť		
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS B. Mass stor	41    16 		5	SOME	0	<b>NO</b> NEB 0	?D >10	)×-	10×-	O.K.	10×+	100×+	1000×+	- >1000×+ :
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS C. Advanced	16	Y ASSET 34 -  15   -  e managem	0		1			2 0	10×- 12 5	36 [-[ 12	10×+ 0	100×+ 0 0	1000×+ 0	>1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS D. Massive c	39 	Y ASSET 15 	1		0	0	D >10	x -	10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS E. Unschedul	15		12   5		1	0	,	3 0	12 5	0.K. 37  -  12  -  15 minu	10×+ 0 0	100×+ 0	1000×+ 0	>1000×+ 0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESSRI 20   9 	28	USEFUL 5	SOME	USE A	<b>V</b> O NEE. O	(	×- )	6 1	0.K. 44 - -  15 - -	10×+ 1	100×+ 0	1000×+ 0	>1000×+ 0

Vacation and Travel Planning Systems -- Access from 50 percent of the travel agencies to systems containing recreational and travel itenerary information. The system would interactively accept gross travel plans, provide suggested accommodations, activities, side trips, etc. from which the client would make his selections. When the final itenerary is selected, the system would provide detailed routings, make all necessary reservations, and do the agency accounting and filing applications.

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A. Availabili	ty of gene	ral tra	vel res	ervat:	ions	svs	stems	from v	which to	expand	to pla	nning s	vstems		
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GROUP TOTALS	<b>1</b> C	. 25		7	(	,	5	1 2		3					
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A. Mass stora	ge 100 bil	lion by	tes.												
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COMSTRSUS	11		3		-		**	-	J	1-1-1	-	·			
SXPERT TOTALS	7	ď	2		0		0	. 0	2	12	0	. 0	ņ	n	
CONSTRUCUS	1		,,							1-1-1					
B. Network co	ntrol for	interco	nnection	n to i	ın i w	rc:	al rec	ervati	on systa	am.					
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	HECESSRY	ASSNT	USEFUL	SOME	USS	MO	MFED	>10×-	10×-	$o.\kappa.$	10×+	100×+	1000×+	>1001×+	
GROUP TOTALS	49	2	2		0		1								
COMSTUSUS	-														
RXPRRT TOTALS	15	0	1		0		0								
CONSTRUCTS	11-1														
C. Low cost t	erminals Ş	20-\$30	per mon	th.											
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	DECESSRY	ASSET	USPFUL	SOME	110.7	MO	רז יד דו זו	>10×=	10×-	о.к.	10×+	100x+	1000x+	>100°×+	
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∴ Massive co	mmunicatio	n inter	face 10	.000	lines	٠.									
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## JUDICIAL AND LEGISLATIVE

Judicial and legislative areas of government have heretofore not made extensive use of data processing, but the next 15 years will find initial moves into this area. The crowded court schedules will be addressed through systems to schedule court appearances and handle routine appeals such as continuance without necessity of scheduling sessions. This application will be used by 20 percent of the courts by 1978-80.

Congress is presently considering a system to track the progress of bills through the legislative process. By 1980 Congress and 20 percent of the state legislatures will be served by versions of this system extended to provide information retrieval and other tracking capabilities.

Twenty percent of the federal and state penal insitutions in 1985 will use data processing to maintain complete information files on prisoners and parolees. The systems would maintain personality profiles, skills, background, prison performance, parole performance, etc., and would be used in planning and executing rehabilitation programs.

APPLICATION TITLE		1970-71	72-74	<b>7</b> 5-77	78-80	81-85	LATER	NEVER		PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
AUTOMATED COURT SCHEDULING	100- 75- 50- 25- 0-			<b></b>	1-1-1		L		2.70	2.22	3.14	-0.33
	P.C.		0.0	17.5	66.7	12.3	1.8	1.8				
LEGISLATIVE SYSTEMS	100- 75- 50- 25- 0-				1-1				2.02	2.13	2.67	0.33
	P.C.		1.9	3.7	64.8	24.1	5.6	0.0				
PENAL AND PAROLE INFORMATION SYSTEMS	100- 75- 50- 25- 0-		,		1	-		<b>L</b>	2.35	2.08	2.48	0.29
•	D.C.	0 0	0 0	3 6	21 8	65 5	73	1 9				

Automated Court Scheduling -- The use by 20 percent of federal, state and municipal courts of computerized systems to schedule courts.

					IMPACT_							
	IM	(PACT ON	SOCIETY				REASON	S FOR II	MPLEMEN	TATION		WILL
					PROFIT.	ABLE TO	IMPLE	MENTOR	USEF	UL TO P	UBLIC	NOT BE
MA	JOR S	SIGNIF.	LITTLE	NO	VERY	MODER	T MAR	GINAL	VERY I	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS	15	26	20	2	7	29		20	26	19	14	7
EXPERT TOTALS	4	4	5	ō	3	6		3	7	2	4	1
				1	MPLEMEN.	TATION	DATE					
	1970-	71 72-7	4 75-77	-	81-85	LATER	NEVER					
GROUP TOTALS	0	0	10	38	7	1	1					
CONSENSUS				1-1-1		-	-					
EXPERT TOTALS	0	0	0	9	2	0	0					
CONSENSUS	-	-		1-1-1	_	*	•					
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A. Legislative	or ju	dicial	interpret	tation o	of "the	<b>s</b> peedy	triai	to ror	ce sche	auring	OI Cases	WITHIH A MAXI
time.	ABSOL	UTE POS	SIBLE NO	EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	
GROUP TOTALS		11	28	6	1	13	19	4	2	0	0	
EXPERT TOTALS		1	8	0	1	3	4	0	0	. 0	0	
				pr	. משמ <i>דוו</i> יי	~4D4DTT	TMTEC					
A					<u> </u>				¢200	/ a du la		
A• Availabilit	y or t	he appi	ication p	program	from a	service	organ	ızatıon	· \$200	/month.		

APPLICATION DESCRIPTION

Legislative Systems -- The availability of legislative support systems for Congress and 20 percent of the state legislatures. Services provided would include:

Tracking of progress of bills through legislative process.

Tracking the usage of programs under existing legislation.

Financial analysis of proposed bills.

Tracking of services to constituencies.

						IMPACT .	AND VALU	<u> </u>					
		IMPA	CT ON	SOCIETY			R	EASONS FOR I	<i>TMPLEME</i>	NTATION		WILL	
						PROFIT	ABLE TO .	IMPLEMENTOR	USE	FUL TO F	PUBLIC	NOT BE	
M	<i>AJOR</i>	SIGI	VIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED	
GROUP TOTALS	5	:	20	24	2	6	22	19	15	18	15	6	
EXPERT TOTALS	1		5	4	0	2	7	, <b>ò</b>	4	5	1	1	
					<u></u>	MPLEMEN	TATION D	4 <i>TE</i>					
	197	70-71	72-74	75-77	78-80	81-85	LATER I	VE VER					
GROUP TOTALS		0	1	2	35	13	3	0					
CONSENSUS					1-1								
EXPERT TOTALS	3	0	1	0	9	3	0	0					
CONSENSUS	,				1-1-1								

### REQUIRED CAPABILITIES

# A. Mass storage of 100 billion bytes.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	$O \cdot K$ .	10×+	100×+	1000×+	·>1000×+
GROUP TOTALS	12	30	2		2		0	1	12	28	1	0	0	0
CONSENSUS		-							.	1-1				
EXPERT TOTALS	2	8	0		0		.0	0	2	5	0	0	0	0
CONSENSUS		11-1								1-1				

Penal and Parole Information Systems -- The use of information systems by 20 percent of the federal and state penal institutions. The systems would maintain personality profiles, skills, background, prison performance, parole performance, etc., files on all prisoners and parolees. The system would be used to plan rehabilitation programs and to track the success or failure of such programs.

IMPACT AND VALUE

REASONS FOR IMPLEMENTATION

0.K.

3

26

10×+ 100×+ 1000×+ >1000×+

10×-

12

WILL

IMPACT ON SOCIETY

GROUP TOTALS

EXPERT TOTALS

CONSENSUS

CONSENSUS

		IMPACT (	IN SUCLETY			H	EASUNS F	OR IMPLEME	SNTATION		$w \perp L L L$
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MA	JOR	SIGNIF	LITTLE	NO	VERY	MODERT	MARGIN	AL VERY	MODERT	MARGINAL	IMPLEMENT
GROUP TOTALS	6	31	25	0	3	32	20	12	27	15	6
EXPERT TOTALS	2	3	3	0	2	5	1	1	6	1	0
				j	<u>IMPLEMEN</u>	TATION_D	<u>ATE</u>				
	197	0-71 72-	74 75 <b>-7</b> 7			LATER	NEVER				
GROUP TOTALS		0	0 2	1.2	36	4	1				
CONSENSUS											
EXPERT TOTALS		0.	0 0	3	4	0	0				
CONSENSUS											
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Concern abo	ABS	OLUTE PO	SSIBLE NO	EFFECT	1970-71	72-74	75-77 7	8-80 81-8	5 LATER	NEVER	
ROUP TOTALS		13	24	5	3	4	10	13 4	2	2	
EXPERT TOTALS		3	2	0	1	2	1	1 0	0	0	
×				RI	EQUIRED_	<u>CAPABILI</u>	<u>TIES</u>				
1 · Automatic g	ener	ation of	informati	ion syst	ems.						
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	NEC					NEED >1	0×- 10	×- 0.K.	10×+	100×+ 1000	0×+ >1000×
ROUP TOTALS		6 .	30	7	0	4					
CONSENSUS		1.									
EXPERT TOTALS											
CONSENSUS											
<sup>3</sup> · Mass storag	e of	100 bil	lion bytes	з.							
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## MANUFACTURING AND PROCESS

The thrust of future computer applications in manufacturing and process is toward increased automation. Labor's historic resistance to automation may be somewhat offset by the advent of guaranteed annual wages in 1975-1980.

Increased automation will lead ultimately to the establishment in the 1980's of fully automated manufacturing plants in 1 percent of the major companies. These plants would be able to operate essentially unattended, manufacturing a wide variety of products concurrently and capable of changing the variety dynamically in response to forecasted demands or actual orders. Computers will control the actual manufacturing and provide the necessary product and manufacturing design as well as accomplishing the administrative tasks of scheduling, purchasing, inventory control, accounts receivable and payable, etc.

In route to the automated plant, 1 percent of the warehouses in major companies will be automated by 1977. By 1980 systems will be capable of producing new engineering designs based on engineering standards and practices and previous designs given functional requirements as input. In a similar fashion manufacturing procedures and machine control instructions will be automatically generated from engineering designs. Special and general purpose robots will come into widespread use. By 1985 robots will be used to test drive 5 percent of the U. S. automobile production, and 20 percent of the Fortune 500 Companies will have robots capable of performing, sensing, and manipulating functions similar to those performed by people.

In 1980 it will be possible to simulate most new products and test the simulation rather than actual engineering models as is now done in aerospace. By 1985 computer controlled 100 percent quality assurance of 20 percent of the consumer products may be forced by consumer demand or legislative action.

MAA MITIT	ACTURING	ARTO	DDOCECC
- MARITIE	ACTURING	AND	PROCESS

IMPACT PROFITABLE USEFUL

WILL

	APPLICATION TITLE		1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	ON	TO IMPLEMENTOR	TO PUBLIC	NOT BE IMPLEMENTED
	AUTOMATED WAREHOUSES	100- 75- 50- 25- 0- P.C.	0.0	1.7	-  58.3	 35.0	5.0	0.0	0.0	1.48	3.35	1.74	70.19
	AUTOMATED DESIGN ENGINEERING	100- 75- 50- 25- 0- P.C.	0.0	0.0	10.7	- -  78.6	8.9	1.8	0.0	1.63	3.49	1.85	¯0.29
	AUTOMATED MANUFACTURING ENGINEERIN	VG100- 75- 50- 25- 0- P.C.	0.0	0.0	6.8	- -  78.0	13.6	1.7	0.0	1.63	3.19	1.75	<b>-0.</b> 56
III.132	AUTOMATED PROCESS MANUFACTURING PLANT	100- 75- 50- 25- 0- P.C.	0.0	0.0	5.6	1	-  66.7	0.0	0.0	2.15	3.42	2.25	¯0.45
	PRODUCT DEVELOPMENT SIMULATION SISTEM	100- 75- 50- 25- 0-	•••	•••			-		0.0	1.60	3.22	2.09	-0.36
	AUTOMATED MANUFACTURING PLANT	P.C. 100- 75- 50- 25- 0-	0.0	0.0	1.8	30.9	61.8	3.6	1.8	2.44	2.39	1.57	1.56
	ROBOT-CONTROLLED AUTOMOBILE CHECKOUT	P.C. 100- 75- 50- 25- 0-	0.0	0.0	0.0	13.6	71.2	13.6	1.7	1.57	2.36	2.29	0.78
	CUSTOMER QUALITY ASSURANCE	P.C.  100- 75- 50- 25- 0-	0.0	0.0	0.0	6.0	52.0	30.0	12,0	2.64 1	2.08	3.31	<sup>-</sup> 0.66
		P.C.	0.0	0.9	0.0	1.9	57.7	26.9	13.5				

MANUFACTURING AND PROCESS CONT.

APPLICATION TITLE	1970-71 72-74	75-77 78-80	81-85 <i>LATER</i>	MEVER	MPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	TO	NOT BE
AUTOMATED ROBOTS	100- 75- 50- 25- 0-	1.7 5.1	-	3.4	2.72	1.86	1.37	-1.70

Automated Design Engineering -- The development of systems capable of producing new engineering designs fro functional requirements based on engineering standards and practices and on prior solutions. Output is a computerized description of the part.

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	TOTALS	JOR SIC	NIF	SOCIETY LITTLE 49	<i>NO</i> 5	PRO I	FITI ERY 35	MOD	REAS TO IMP ERT M 35	LEMENTO ARGINAL 6	VER Y 6	FUL TO MODERT 30	PUBLIC MARG 3	2	WILL NOT BE PLEMENTED 8	
EXPERT	TOTALS	0	7	14	1		12		9	1	11	9	11		1	
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t		nere and	how th	ed design ey fit in	langu	ages	th	at al	low th	e selec						ca-
CONSEN EXPERT CONSEN	T TOTALS NSUS	10	1	3 0 -1 6 0		USE 1	NO	NEED 1	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+	
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CONSEN		<b>.</b> ,		1		_				1-1-1				_		
D. Co	oncise, o ttributes	complete	and ma	chine pro	cessab	le r	epr	esent	ation	of thre	e dimen	sional o	objecti	ves and	their	
GROUP CONSEN	TOTALS NSUS	NECESSE 40   -	1		SOME	USE O	NO	NEED O	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+	
CONSEN	TOTALS VSUS iscovery	, ,		5 O - I		0		0								
GROUP CONSEN	TOTALS NSUS	NECESSI 7	2Y ASS.	9 11		USE 1	NO	NEED 3	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+	
EXPERT CONSEN	T TOTALS NSUS	1		9 4		0		3								

Automated Manufacturing Engineering -- The development of systems capable of taking a machine processable description of a part, breaking its manufacture into elementary manufacturing operations (cutting, forming, assembling, weaving, electroplating, etc.) and then making up a manufacturing procedure from the elementary operations available in the particular plant.

		IMPACI	ON SOC	IETY		מידית מקק	ARTE		ONS FOR I LEMENTOR		NTATION FUL TO E	PUBLIC		WILL NOT BE
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GROUP TOTALS	5	20		5	7	28		37	4	7	25	30		15
EXPERT TOTALS	1		·	7	1	4		6	2	1	5	6		1
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	197	70-71 7	72-74 7	5-77 7	8-80	81-85	LATE	RNEVI	ER					
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EXPERT TOTALS CONSENSUS		0	0	1	-   -	1	0	(	0					
					RE	QUIRED	CAPAB.	<i>LLTTES</i>	<u>.</u>					
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CONSENSUS			111	•		·	-	_	1	1-1				
EXPERT TOTALS		3	2	2		0	0 .	0	1	4	1	0	0	0
CONSENSUS	1.									1-1-1				
B. Search end	gine	of 100	0 times	today's	capa	bilitie	es.							
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EXPERT TOTALS		2	3	2		0	0	0	0	5	0	0	0	0
CONSENSUS	-									1-1-1				
C. Concise, of attributes	compi	lete, a	and mach	ine pro	cessa	ble rep	resen	tation	of three	dimen	sional o	objects ar	nd th	neir
	NE	CESSRY	ASSET	USEF <b>U</b> I	SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	00×+	>1000×
GROUP TOTALS		38	11	.0		0	0							
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EXPERT TOTALS		. 5	2	0		0	0							
CONSENSUS	•													
D. Application manufactur	n de ing	evelopm operat	ment of tions an	a syste d then	m cap combi	able of ne the	analy opera	yzing a	a part de into manu	script factur	ion for ing rout	its funda tings and	ment inst	al ruction
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GROUP TOTALS		44	6	1		0	0			•				

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CONSENSUS

CONSENSUS

EXPERT TOTALS

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Automated Manufacturing Plant -- The establishment in 1 percent of the Fortune 500 companies of a fully automated manufacturing plant designed to carry out some subset of the possible elementary manufacturing operations for discrete rather than continuous products. The plant would be capable of manufacturing a wide variety of products concurrently and of changing the variety dynamically. Automated Design Engineering and Automated Manufacturing Engineering would be included in the system. The plant would schedule itself on the basis of orders and forecasts, make its own purchases and control its inventory.

itself on the	Dasis Of	Orders	and 10	recast				nases a	na conc.	TOT TES	THACHE	OLY.		
	IMPAC	cr on so	CIETY		IMPACT	AND Y		IS FOR :	<i>TMPLEMEN</i>	ITATTON			12 T T. T.	
74	1970-71 72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71 72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   77-80   81-85   LATER   MEYER   1970-71   72-7%   75-77   78-80   81-85   LATER   MEYER   1970-71   1970													
GROUP TOTALS						MOD								1
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CDOUD MOMATC				78-80	81-85	LATE	R NEVER	?						
CONSENSUS	U	U	U	8.		8	1							
EXPERT TOTALS	0	0	0		4	0	1							
CONSENSUS					1-1									
A Fatabliah			44	CELERA	TING AL	ID RET	ARDING_E	ACTORS						
A. Establish								on.						
CDOUD MOMATC														
EXPERT TOTALS					-				•					
B. Establish	ment of a	guarant	eed an	nual i	ncome r	emovir	ng most	of labo	r's obje			omati	on.	
	ABSOLUTE	POSSIB	LE NO E	FFFECT	1970-71	72-7	4 75-77	78-80	81-85	LATE	R NEVE	†?		
GROUP TOTALS	8	2	5	15	0	2	10	10	5	6	2			
				2	0	0	1	2	0	1	1			
					4070 74									
GROUP TOTALS												?		
EXPERT TOTALS	5	:	2	0	0	0								
		4		RE	QUIRED	CAPAB.	ILITIES							
A. Network co	ontrol to	coordin	ate the	e centi	cal plan	nt sys	tem and	the sm	all cont	trol co	mputers	moni	toring	(
the proce	5565.													
GROUP TOTALS							>10×-	10×-	0.K.	10×+	100×+ 3	L000×+	>1000×+	
CONSENSUS		J	,	,	<b>.</b>	U								
EXPERT TOTALS CONSENSUS		0	0	1	0	0								
		ity <u>one</u>	plant o	down ti	ime inc	ident	per year	<b>.</b> .						
								_						
CDOUD MOMATO	1970-71 72-7% 75-77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77-77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77-77 77-77 77-77 77-77 77-7													
CONSENSUS	1970-71 72-7% 75-77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77-77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77 78-80 81-85 LATER MEYER   1970-71 72-7% 75-77 77-77 77-77 77-77 77-77 77-7													
EXPERT TOTALS	1	<u>`</u> 3	2		0	0	0	0		1	0	0	0	
	nt of beti	۱۱ ter reso	urce ba	 alancir	ng and s	schedu	ling alo	orithm	- -  8.					
								,01101	•					
	NECESSRY	ASSET	USEFU	L SOME	USE NO	NEED	>10x-	10x-	0 K	1044	1000+ 1	000**	×1000×1	
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EXPERT TOTALS	•		0		0	0								
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** Mass stor	age of 100	) p11110	n byte:	<u>s</u> .										
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GROUP TOTALS														
CONSENSUS EXPERT TOTALS	4						-		1-1-1		-	J	U	
CONSENSUS		11-1			U	U	0	_		1	0	0	0	
E. Advanced	data base	managem	ent sys	stem.										
														,
GROUP TOTALS	### 1707ALS   1-1-1   ### 1707ALS   2													
CONSENSUS	11		1		J	2								
TXPERT TOTALS	4	3	0		0	0								

CONSENSUS

Automated Process Manufacturing Plant -- The establishment in 1 percent of the Fortune 500 Companies of a fully automated continuous process manufacturing plant designed to control, analyze, and process large systems of complex machinery producing paper, chemical, etc. The plant would schedule itself on the basis of orders and forecasts, make its own ups, and control its inventories.

	TMDAC	T ON SOC	TUMV	<u>IMPA</u>	CT AND		COMC TOD	THOTBUT				
	IMPAU	T UN SUC	IETI	PRO	FITABLE		SONS FOR PLEMENTOR		SNTATION SFUL TO	PUBLIC		WILL NOT BE
MA	JOR SIGN	IIF. LIT	TLE NO				MARGINAL	VERY	MODERT		INAL IM	PLEMENTED
GROUP TOTALS					25	25	5	7	27	19	9	9
EXPERT TOTALS	3 1	. 1	3 1	l	7	9	1	2	11	;	3	3
				IMPLE	MENTATI	ON DAT	'E					
	1970-71	72 - 74 7	5-77 78-	-80 81-			VER					
GROUP TOTALS	0	0	- · -	15 3	-	0	0					
CONSENSOS	_		•		•							
EXPERT TOTALS CONSENSUS	0	0	3	3 1	o - I	0	0					
				REQUIR	ED CAPA	BILITI	ES					
$^{A}\cdot$ Ten-fold in	provemen	t in sens	sing equi		~		<b></b>					
	NECESSRY	ASSET	USEFUL S	SOME USE	איאו מנו	η >10×	- 10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	37	8	1	0	1	0		35	6	0	0	0
CONSENSUS	11-1							1-1-1		-	-	•
EXPERT TOTALS	12	2	0	0	0	0	1	8	2	0	0	0
CONSENSUS	11-1		_					1-1-1				
B. Mass storage	e of 100	billion	bytes.									
	NECESSRY	ASSET	USEFUL S	SOME USE	NO NEE	D >10×	- 10×-	O.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	13	29	4	0	1	2	14	26	1	0	0	0
CONSENSUS	1							-				
EXPERT TOTALS CONSENSUS	. 4	, 9 ,	1	0	0	1	•	6	0	0	0	. 0
	•	-	000				11					
C. Capability	or monito	oring Too	,000 sen	sors.								
	NECESSRY	ASSET	USEFUL S	OME USE	NO NEE	D >10×	- 10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	30	13	3	0	1	0	14	26	1	0	0	0
CONSENSUS	11							1-1				
EXPERT TOTALS	10	3,	1	0	0	0	. 4	7	0	0	0	0
CONSENSUS								-				

<u>Automated Robots</u> -- The utilization of general purpose robots in 20 percent of the Fortune 500 companies. These robots would be capable of performing, sensing and manipulatory operations similar to those performed by people. Programming the robots might be accomplished by manually moving them through the required motions.

	IMPA	CT ON	SOCIETY				E EASONS FOR IMPLEMENTOR		NTATION FUL TO P	UPTTC	WILL NOT BE
MA	JOR SIC	NIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODERT	MARGINAL	
GROUP TOTALS	24	28	16	0	15	23	7	9	17	15	46
EXPERT TOTALS	4	6	5	0	4	6	3	1	6	5	5
	1970-71	72-74	75-7 <b>7</b>	78-80	<u>MPLEMEN</u> <b>81-8</b> 5	TATION D	<u>ATE</u> NEVER				
GROUP TOTALS CONSENSUS	0	0	1	3	33	20	2				
EXPERT TOTALS CONSENSUS	Ó	0	0	1	7	6 ' l	0				

A. The institution of a guaranteed annual income removing some union resistance to automation.

	ABSOLUTE	POSSIBLE	NO EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER
GROUP TOTALS	5.	26	17			9		3		2
EXPERT TOTALS	3	7	3	0	1	5	2	1	2	ō
B. The establi	ishment of	tax ince	entives for	rinvestr	ment in	automa	tion.	_	-	•

	ABSOLUTE	POSSIBLE .	NO EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER
GROUP TOTALS	14	24	11	0	3	11	4	6	8	3
EXPERT TOTALS	6	6	1	0	0	3 .	1	3	1	2

REQUIRED CAPABILITIES

A. Development in heuristic programming to make possible the generation of programs through manually stepping of the motions.

GROUP TOTALS CONSENSUS	NECESSRY 19	26	USEFUL SO	OME USE 1	NO NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+ >10	)00×+
EXPERT TOTALS	2	8	1	0	0							
CONSENSUS		11-1										

B. Sensors capable of making visual distinguishments approaching the capability of the human eye.

GROUP TOTALS CONSENSUS	NECESSRY 15	28	USEFUL 3	SOME US	E NO	<i>NEED</i> >10×-	10×-	O.K.	10×+	100×+ 1000×+	>1000×+
EXPERT TOTALS CONSENSUS	2	8	1	0		0					

Automated Warehouses -- The conversion of 1 percent of the warehouses in Fortune 500 companies to computerized control of stacking and picking, and movement to and from docks and/or manufacturing floor.

IMPACT AND VALUE

REASONS FOR IMPLEMENTATION

0.K.

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1-1-1

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WILL

IMPACT ON SOCIETY

		IMPACT O	N SUCIETI					FUR IN				WILL
						ABLE TO				FUL TO P		NOT BE
	<b>IAJ</b> OR	SIGNIF.		NO	VER Y		MARG	INAL		MODERT		IMPLEMENT.
ROUP TOTALS	4	18	46	12	31	37		5	8	23	32	5
XPERT TOTALS	7 2	9	16	5	14	14		2	4	10	12	2
					IMPLEMEN!	TATION D.	ATE					
	197	0-71 72-	74 75-77			LATER						
ROUP TOTALS		0	1 35	21	3	0	0					
ONSENSUS			1-1									
XPERT TOTALS	3	0	0 17	11	1	0	0					
ONSENSUS			1-1									
				A CCELER	ATING AND	ת אניים א	TUG FA	CTORS				
Twenty fi		. waant wa	duction i									
iwency i.	rve be	srcent re	eduction I	n cost	or brokr	ng and s	Cackii	ig unite	•			
	ABS	OLUTE PO	SSIBLE NO	EFFECT	1970-71	72-74	75-7 <b>7</b>	78-80	81-85	5 LATER	NEVER	
ROUP TOTALS		10	29	10	0	5	17	7	2	3	3	
PERT TOTALS	3	7	14	5	0	2	8	3	0	3	2	
Establish		of tax i	ncentives	for in	vestment	in auto	mation	equip	nent.			
Docustro.		or can r		202 211	veo allene	± uuco		. cquip				
	ABS	COLUTE PO	SSIBLE NO	EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER	
ROUP TOTALS		19	22	9	0	5	10	5	3	5	8	
KPERT TOTALS	7	12	12	2	0	2	5	2	2	3	4	
<ul> <li>Establish</li> </ul>	nment	of guara	inteed ann	ual inc	ome remo	ving mos	t labo	or's obj	jection	ns to au	tomation.	
	ABS	OLUTE PO	SSIBLE NO	EFFECT	1970-71	<b>7</b> 2 - 74	75-77	78-80	81-85	5 LATER	NEVER	
OUP TOTALS		9	27	14	0	3	12	9	5	5	1	
PERT TOTALS	3	6	14	6	0	1	8	2	3	2	1	
				<u>R 1</u>	<u>EQUIRED (</u>	<u> ZAPABILI</u>	TIES					
<ul> <li>Advanced</li> </ul>	d <b>a</b> ta	base man	agement.									
			-									
	nner	10000 40		ur cour	HOT NO	nnn		٥	77	404		4 6 6 6
DAUD MAMATA	NECE	SSRY AS			USE NO 1		×- 1	0×- 0	K.	10×+ 1	υυ×+ 1000:	×+ >1000×+
ROUP TOTALS		30	10	4	6	2						
ONSENSUS	•	-	•	•	_							
XPERT TOTALS		13	3	3	5	1						
ONSENSUS	1 -	-		1								

Relatively high reliability. No outages of greater than 1 hour.

6

GROUP TOTALS

EXPERT TOTALS CONSENSUS

CONSENSUS

27

9

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17

10

NECESSRY ASSET USEFUL SOME USE NO NEED >10x-

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1

1

Customer Quality Assurance -- The installation of computer supported or controlled 100 percent quality assurance tests systems for 20 percent of the consumer products. The need for such systems will be brought about by massive consumer pressure forcing government regulations requiring long-term warranties of quality and safety. The warranties will be enforced with significant penalties for products that fail to meet their warranty.

					IMPACT_	AND YALU	<u>E</u>				
	IM	PACT ON	SOCIETY			R	EASONS FOR .	<i>IMPLEME</i>	NTATION		WILL
					PROFIT	ABLE TO	IMPLEMENTOR	USE	FUL TO P	UBLIC	NOT $BE$
MA	JOR S	IGNIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS	13	25	16	• 1	4	29	16	31	11	7	13
EXPERT TOTALS	3	4	2	0 -	0	. 8	1	5	3	0	0
				<u> 1</u>	MPLEMEN	TATION D	ATE				
	1970-	71 72-7	4 75-77	78-80	81-85	LATER	NEVER				
GROUP TOTALS	0	0	0	1 .	.30	14	7				
CONSENSUS					1-1						
EXPERT TOTALS	0	0	0	1	5	2	. 0				
CONSENSUS					1-11						

#### ACCELERATING AND RETARDING FACTORS

A. Legislation establishing and enforcing warranty requirements.

	ABSOLUTE	POSSIBLE	NO EFFECT	1970-71	72-74	75-77	78-80	81-85	LATER	NEVER
GROUP TOTALS	14	17	7	1	3	10	10	6	3	1
EXPERT TOTALS	5	3	0	1	1	3	2	0	1	0

### REQUIRED CAPABILITIES

A. Ten-times improvement in test monitoring and sensing equipment.

anoun mamara	NECESSRY	ASSET	USEFUL	SOME	USE A	O NEED	>10×-	10×-	0.K. 32	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS	35   -	8			U	1		1	1-1-1	3	U		U
EXPERT TOTALS	. 5	1.	1		0	0	0	1	, 6,	0	0	0	0
CONSENSUS			,						1-1-1				

B. Network control to coordinate monitor and test computers located throughout the plant.

	NECESSRY	ASSET	USEFUL SOME	USE NO	NEED >10×-	10×-	O.K.	10×+	100×+ 1000×+ >1000×+
GROUP TOTALS	32	9	. 2	1	1	*			
CONSENSUS									
EXPERT TOTALS	6	1	1	0	0				
CONSENSUS	111								

Product Development Simulation System -- The utilization by 20 percent of the Fortune 500 Companies of computer systems that simulates the construction of basic components at the lowest level, connecting these into larger sub-assemblies up to final product level. This system will not only predict the parts usage required, but also predicts the comparative cost/performance of substitutions as well as providing detailed manufacturing instructions.

	,	MDAC	77 (2.117	SOCIETY		<u>IMPA</u>	CT_4	AND_V		NS FOR 1	MDTFMF	T A で T へ X			WILL
	L	MPACI	C ON .	SUCIELL		PRA	PTT.	ADTE		EMENTOR		FUL TO	PURTTC		NOT BE
14.4	JOR	SIGNI	<i>r</i> 10	LITTLE	NO		ERY			RGINAL	VERY	MODERT		MAT. TM	PLEMENTED
GROUP TOTALS	2 2	17		32	5	•	19		28	8	5	24	24		7
	0		/ R	14	2		9		11	4	5	-8	10		14
EXPERT TOTALS	U	,	5	14	2		9	•	11	7	3		10		<del>.,</del>
						TMDIF	MPN	TATTO	N DATE						
	1070	_71 '	72-74	75 <b>-77</b>	78-80			LATE		'P					
GROUP TOTALS		0	0	1	17		4	2	1 1/2/1						
CONSENSUS		U	U	-				4	•						
EXPERT TOTALS		0	0	1	9	,	2	1	0						
CONSENSUS		U	U	1		_	_	1	U						
CONSCNSS					1	,	- 1								
									LITIES						
A. Interactive	term	inal	syst	em with	comple	x sea	rch	and :	interac	tive pat	tern m	atching	for us	e in b	uilding
evaluating	and o	ptimi	izing	the mo	dels.										
	NECE	SSRY	ASS	ET USE	FUL SOM	E USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS		37		7	4	0		0							
CONSENSUS		1-1													
EXPERT TOTALS		15		3	3	0		0							
CONSENSUS	1	1		- 1											
B. Service to	assis	t in	mode	i devel	opment.										
					•										
	NECE	SSRY	ASS	ET USE	FUL SOM	E USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS		3		7	9	2		0			- • •				
CONSENSUS		-	11		•	*-		· ·							
EXPERT TOTALS		2		2	5	2		0							
CONSENSUS		-				-		•							
C. Mass storag	e of	100 F			•										
77 71455 5 CO149	G 0		· * * * * * * * * * * * * * * * * * * *	on by te											
	NECE	SSRY	ASS	ET USE	FUL SOM	E USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS		11	2	4	10	2		0	1	15	25	1	0	0	0
CONSENSUS					1					1					
EXPERT TOTALS		11		9	7	1		0	1	5	12	0	0	0	0
CONSENSUS			11		1	_		•	-	1		•	v	•	ū
D. Advanced da	ta ba	se ma	nagei	ment sv	stem					•					
				c.i.c by											
	NECE	SSRY	ASS	ET USE	FUL SOM	E USE	NO	NEED	>10×-	10×-	о.к.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS		33	1	1	2	0		1							
CONSENSUS	1	.		-				-							
EXPERT TOTALS	•	15		4	2	0		0							
CONSFISUS	1		<b></b>	•	-	•		-							
	1	•		•											

Robot-Controlled Automobile Checkout -- The checking of 5 percent of the U. S. auto production by robots test driving on test tracks for safety, performance and repeatability of all functions. Results are recorded on-line and a profile of the vehicle characteristics produced immediately.

					IMPACT.	AND_V	<u>ALUE</u>					
	IMPAC:	T ON SOC	IETY	•			REASO	ONS FOR	IMPLEME	NTATION		W.I.L.L
					PROFIS	CABLE		LEMENTOR		FUL TO	PUBLIC	NOT BE
MA	JOR SIGN.	IF. LIT	TLE	<b>V</b> O	VER	Y MOD.	ERT MA	ARGINAL	VER Y	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS	6	8 3	7	3	8		29	10	12	20	13	15
EXPERT TOTALS	2	0	5	0	1		3	3	3	1	2	2
·				I	MPLEMEI	TATIO	V DATE					
	1970-71	72-74 7	5-77 7	8-80	81-85	LATE	REVE	ER				
GROUP TOTALS CONSENSUS	0	0	0	3	26	15	ľ	5				*
EXPERT TOTALS CONSENSUS	0.	0	0	1	5	2		) ·				
GROUP TOTALS	NECESSRY 33	ASSET 6	USEFUL 2					10×-	0.K.	10×+ 6	100×+ 1000	0×+ >1000×+ 0 0
EXPERT TOTALS CONSENSUS	3	3 	0		0	0			1-1-1			
B. Multi-attri	ibute patt	ern mato	ching.									
GROUP TOTALS CONSENSUS	NECESSRY 36   -	ASSET 2	<i>USEFUL</i> 0	SOME	USE NO	NEED 0	>10×-	10×-	O.K.	10×+	100×+ 1000	)×+ >1000×+
EXPERT TOTALS CONSENSUS	7   -	0	0		0	0						

### MEDIA

The media industry has recently begun to move its use of data processing into the main stream of the businesses. A Japanese television network uses a system for production scheduling and control of all of its programming. Many newspapers and periodicals employ computerized typesetting. These trends will continue. By 1980 twenty percent of the national and international periodicals will use computer systems for editing, layout, proofread and printing. This will include customization for regional, sectional, and even smaller groupings of their subscribers.

The advent of the home terminal in the 1980's will provide an increased opportunity for customized delivery to the public. In 1985 one percent of the homes in the United States will use the home terminal to request desired programs and to request more in-depth coverage for items of particular interest. By the end of the 1980's use of home terminals will have substantially increased and 5 percent of them will be equipped for hard copy printout of individualized newspapers, periodicals, articles, etc.

By 1985 a centralized automated subscription service will be offered to publishers removing from them the necessity of maintaining their own subscription lists.

MEDIA

APPLICATION TITLE	1970-7	71 72-74	75-77	78-80	81-85	LATER	NEVER		PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED	
AUTOMATED PERIODICAL PUBLISHING 10	0 <b>-</b> 5 <b>-</b>		!		ı			1.46	3.21	2.00	-0.10	
5 2	0 <b>-</b> 5 <b>-</b>							-	,			
Р.	o- c. o.o	0.0	3.5	86.0	8.8	1.8	0.0					
AUTOMATED SUBSCRIPTION SERVICE 10	0 5 <b>-</b> -							1.15	2.73	1.66	0.39	
5 2	0 <b>-</b> 5 <b>-</b>			<u> </u>				_				
<i>P</i> .	o- c. o.o	0.0	1.8	27.3	54.5	10.9	5.5	•				
INTERACTIVE NEWS AND ENTERTAINMENT 10	0 <b>-</b> 5 <b>-</b>							2.22	1.95	2.11	1.35	,
5 2	0 - <b>5 -</b>			_								
р.	o- c. o.o	1.5	1.5	7.5	61.2	25.4	3.0					
H ELECTRONIC DELIVERY OF HARD COPY 10	0 <b>-</b> 5 <b>-</b>				*			2.08	2.00	2:35	-0.83	
5	0 - 5 -										•	
<i>P</i> .	0. 0. 0.0	0.0	0.0	8.2	-  45.9	39.3	6.6	1				

Automated Periodical Publishing -- The utilization of computer by 20 percent of the national and international publications to edit, layout, proofread, and print periodicals with customized regional and sectional editions.

	I	MPACT	ON S	OCIETY		PROFIT	ABLE T	REASO. O IMPL			NTATION FUL TO			WILL NOT BE
MA	JOR	SIGNI	F. $L$	ITTLE	NO	VERY	MODE	ERT MA	RGINAL	VERY	MODERT	MARG	TNAL IN	<i>IPLEMENTE</i>
GROUP TOTALS	3	12	!	41	6	16	3	8 8	8	5	24	29	9	2
EXPERT TOTALS	2	5		16	1	8	1		2	2	11	Ġ	9	0
					<u>I</u>	<u>MPLEMEN</u>	TATION	L_DATE						
	1970	-71 7	2-74	75-77	78-80	81-85	LATER	NEVE	R					
ROUP TOTALS		0	0	2	49  - -	5	1	0						
CONSENSUS		^	^		18	3	0	. 0						
XPERT TOTALS ONSENSUS		0	0	1	1-1-1	3	U	U						
	oto o	amnaa	ition	sustom	RE	QUIRED_	<u>CAPABI</u>	LITIES						
. Advanced ph	NECE	ompos SSRY 40 1-1	ition  ASSE 10	T USEF	RE				10×-	O.K.	10×+	100×+	1000×+	- >1000×
. Advanced ph ROUP TOTALS ONSENSUS XPERT TOTALS	NECE 	SSRY 40  -  14	ASSE	T USEF	R <u>E</u> S.	USE NO	NEED		10×-	O.K.	10×+	100×+	1000×+	- >1000×
. Advanced ph ROUP TOTALS ONSENSUS EXPERT TOTALS ONSENSUS	NECE 	SSRY 40  -  14 	ASSE 10 6	T USEF	RE UL SOME 0	<i>use No</i> 7	<b>N</b> <i>EFD</i> 0	>10×-	10×-	O.K.	10×+	100×+	1000×+	· >1000×
. Advanced ph ROUP TOTALS ONSENSUS XPERT TOTALS ONSENSUS . Availabilit	NECE 	SSRY 40  -  14   the a	ASSE 10	T USEF    ation s	RE OUL SOME O Oftware	<i>USE NO</i> 7 0 \$1,000	NEED 0 0 /month	>10×-	10×-	O.K.	10×+ 10×+			- >1000× - >1000×
Advanced pherometric consensus consensus consensus consensus consensus consensus consensus consensus consensus	NECE 	SSRY 40 1-1 14 1 the a	ASSE 10 6	T USEF ation s T USEF	RE OUL SOME O O oftware	<i>USE NO</i> 7 0 \$1,000	NEED 0 0 /month	>10×-						

Automated Subscription Service -- The availability of a fully automated subscription system for processing 20 percent of the top 200 periodic publications. Information and data will be handled by one general subscription house clearing applications and processing renewals and cancellations. The system will permit terminal inquiry for all member publishers to gather data of particular concern, e.g., circulation, advertising lineage, and other marketing indicies.

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GROUP TOTALS	0	12			11		14		29		12	5	16	3			8
EXPERT TOTALS	0	4		7	3		4		9		0	2	6		4		3
					I	MPLE	MEN:	TATIO	V DAT	"E							
	1970	71 7	2-74	75-77 7	8-80	81-	85	LATE	? NE	VER							
GROUP TOTALS CONSENSUS		0	0	1	15	. 3 · I ·	0 - I	6		3							
EXPERT TOTALS		0	0	1	5	Ċ	4	4	_	2							
CONSENSUS				1					1								
					ישם	מדודם	מיק	CAPABI	T T T T T T T	r er cr							
A. Mass data s	torag	e of	one tri	illion b		SOTU	<u> </u>	FACAD:	10111	<u> </u>							
	-	•															
	NECE	ESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×	·-	10×-	0.K.	10×+	100×+	1000	×+	>1000×+
GROUP TOTALS		10	33	5		0		0	0	)	31	12	0	. 0		0	n
CONSENSUS			11-1							•	-						
EXPERT TOTALS CONSENSUS		3	10   -	1		0		0	0		8  - -	2	0	0		0	0
B. Network con	trol																
networn to	CLO1.																
	NECE	SSRY	ASSET	USEFUL	SOME	USE	ŊО	NEED	>10×	:-	10×-	0.K.	10×+	100×+	1000	×+	>1000×+
GROUP TOTALS		29	16	3		0		1				• • • • • •			- 0 0 0	•	2000.
CONSENSUS	1	.															
EXPERT TOTALS		11	2	1		0		0									
CONSENSUS	1	-1-1															
$^{C}\cdot$ Massive com	munic	ation	interf	Eace <u>10,</u>	000 1:	ines	_										
	NI TO CO	acany	40077		a												
TRAUR MAMATA	NECE	SSRY	ASSET	USEFUL	SOME		NO		>10×		10×-	0.K.	10×+				>1000×+
GROUP TOTALS CONSENSUS		9	35   -	1		1		2	2	: !	17	21 l-l	1	0		0	0
EXPERT TOTALS		3	10	1		0		0	0	,	5	5	0	O.		0	0

CONSENSUS

Electronic Delivery of Hard Copy -- The availability of the electronic delivery of a wide variety of hard copy items via the home terminal to 5 percent of the homes. Items could be viewed, and hard copy selected or rejected. Items might include newspapers, periodicals, mail, etc.

( <sub>1,11</sub>														
	IMPAC	CT ON SOC	CIETY	7	<u>IMPACT</u>	. <u>AND_V</u> /		NS FOR	IMPLEME.	'NTATTON	,		WILL	
					PROFIT	'ABLE	TO IMPL	EMENTOF	R USE	FUL TO			NOT BE	
M/	AJOR SIGN.	IIF. LIT	TTLE 1	NO	VERY			RGINAL		MODERT		TNAL IM	APLEMENTED	
GROUP TOTALS		23 2	26	2	6		27	19	13	24	16		18	
EXPERT TOTALS	3	6	4	1	2		9	2	6	6		1	2	
	1970-71	70-711	75-77 78	1 <u>7</u> 18-80	<u>MPLEMEN</u> 81-85	Y <u>TATION</u> LATER								
GROUP TOTALS	19/0-/1	0	75 <b>-</b> 77 78	78-80 5	81-85 28	<i>LATE</i> 6								
CONSENSUS	•	J	U	J		24 1								
EXPERT TOTALS	0	0	0	1	8	6	0							
CONSENSUS	•	•	J	•	1-1	_	_							
					' '	•	1							
			_	REC	QUIRED	CAPAB.	<i>ILITIES</i>							
A. Low cost (	\$5-40/mon	<u>ith)</u> term	ainal wi	th bo	ch hard	copy	and vi	deo dis	splay ca	pabilit	y (cou)	ld be v	ideo casse	ett€
	NECESSRY	ASSET	गट क क्यार	COMP	USE NO	רו הוו ווו וו	- 4 A u	404	2 7	40	* 2 2			
GROUP TOTALS	WECESSK1 43	ADDET 5	05 EF 0 L	DUME	OSE NO			10×-	0.K.	10×+			- >1000×+	
CONSENSUS	11-1	J	4		U	0	. 0	1	39 ! - ! - !	1	0	0	0	
EXPERT TOTALS	13	0	. 1		0	0	0	0	- -  8	0	0	0	0	
CONSENSUS	11-1	-	•		U	U	J	v	1-1-1	U	U	U	U	
B. Mass stora		billior	a bytes.						1"1 1					
	J													
	NECESSRY	ASSET	गट कक्षार	COME	USE NO	ממייי י		· A.,	2 7	·				
GROUP TOTALS	NECESSAI 31	12	05EF0L 5	DUME	USE NO	NEED O		10×-	0.K.	10×+			· >1000×+	
CONSENSUS		1	3		1	U	0	4	31  - -	8	0	0	0	
EXPERT TOTALS	9	2	1		1	0	0	1	6	3	o	0	0	
CONSENSUS			-		•	v	J	-	1-1	1	U	U	U	
C. High capac		av commi	micatio	n cha	nnels.				1 = 1					
1	<b></b>	<b>~</b> 3 <b>~</b> 2			111020									
<b>(</b> .														
	NECESSRY		$\mathit{USEFUL}$	SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+	
GROUP TOTALS	37	10	4		0	1						1000	, , , , , , , , , , , , , , , , , , , ,	
CONSENSUS														
EXPERT TOTALS	12	0	1		0	1								
CONSENSUS	11-1													

Interactive News and Entertainment -- The availability in 1 percent of homes of media service that allows the subscriber to choose at his home terminal from a wide variety of offerings. His selection is individually transmitted to him. If he desires, he may request more in-depth coverage of particular items of interest.

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					<u>IMPAC</u>	I_	AND VA	<u>LUE</u>								
	IMPAC	T ON SOC	IETY						NS FOR 1						LL	
***			mr =	NO.					EMENTOR		FUL TO		F NT A F 3		BE	
MA GROUP TOTALS	JOR SIGN		7 <i>1.1.1</i> 8	<i>NO</i> 6		<i>R I</i> 4	MODE	RT MAI 4	RGINAL 18	19	MODERT 22	MARGI 12		MPLEM 37	ENTED	
EXPERT TOTALS			8	1		5			7	7	8		<u>.</u> !	12		
EXIENT TOTADS	•	. •		•		•		•	•	•	· ·		•			
		•		I	MPLEM	EN!	TATION	DATE								
	1970-71							NEVE								
GROUP TOTALS	0	1	1	5	41		17	2								
CONSENSUS EXPERT TOTALS	0		0	2	17		 5	1								
CONSENSUS	U	U	U	2	1-1-		3	1								
00110111000					, ,	•										
			ACC	ELERA	TING_	AN	2_RETA	RDING :	FACTORS							
A. The availa	bility of	CATV in	1% of	the h	omes.											
	-						70 74									
GROUP TOTALS	ABSOLUTE 14	<i>POSSIBL</i> 28		12	1970-			75-7		) 81-8; 7	5 LATEI 0		::H )			
EXPERT TOTALS		9		5	0		2	7		1	0	(	•			
B. FCC author	_	_		-	-			-	•	-	J		,			
ree auchor	izacion i	or new s	W <b>1</b> CO11CC				J <b>J</b>									
		POSSIBL														
GROUP TOTALS	12	27		8	0		- 8	8	18	3						
EXPERT TOTALS	6	8		3	0		3	4	7	0	0	C	)			
				RE	OUTRE	י מי	CAPABI	LITIES								
A. Inexpensiv	e televis	sion like	termin						ation S	i-25 nei	month					
						•	,		1010 <u>1</u>			<b>-</b>				
	nnana an v			aoun		***	ween		4.0	o "	40	400	4000			
GROUP TOTALS	NECESSRY 50	ASSET 6	USEFUL 1	SOME	0 <i>SE</i> 0	NO	<i>NEED</i> 2	>10×- 0	10×- 1	0.K. 49	10×+ 1	100×+ 1	1000×		00×+	
CONSENSUS	11-1	0	-		v		2	U	•	1-1-1	1	1			0	/
EXPERT TOTALS	20	2	0		0		1	0	0	16	1	0	c		0	
CONSENSUS	11-1									1-1-1						
$B \cdot Massive co$	mmunicati	on inter	face.													
•	NECESSRY	ASSET	USEFUL	SOME	USE	N/O	מיזימוא	>10x-	10×-	0 K	10×+	100x+	1000	± >1∩	00×+	
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EXPERT TOTALS	18	2	0		0		0									
CONSENSUS	11-1			•												
C. High capac	ity two-w	ay commu	nicatio	on cha	nnels	•										
	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×	+ >10	00×+	
GROUP TOTALS	35	18	1		1		4									
 CONSENSUS		,														
EXPERT TOTALS CONSENSUS	11		0		0		0									
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D. High relia	DITICA -	no more	tnan <u>I</u>	unsch	eaule	<b>a</b> :	interr	uption	per mon	th not	to exce	ed <u>15</u>	minut	es.		
anaun comine	NECESSRY		USEFUL	SOME		NO		A CONTRACTOR OF THE PARTY OF TH	10×-	0.K.	10×+	100×+	1000×	+ >10	00×+	
GROUP TOTALS	6	30	16		2		14	3	9	40	0	0	O		0	
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### MEDICAL

One of the more interesting areas of future use of data processing is in the area of providing assistance in the improved delivery of health care. Already pilot efforts are under way to provide computerized analysis of medical tests such as EKG, EEG, etc.

By 1980 twenty percent of the physicians will have such service available to them via a terminal located in their office. In the same time frame twenty percent of the hospitals will provide computerized multi-phasic screening as part of their admittance procedure. The system collects personal data, general health statements, specific complaints, etc. on arrival, schedules a series of tests, conducts many of them, monitors the results of the tests and schedules additional tests where indicated. The results are presented to the physician for medical evaluation.

Possibly by 1980 and certainly no later than 1985 twenty percent of the larger hospitals will have computerized systems for medical diagnosis. Input into these systems may come directly from multiphasic screening systems. Computerized patient monitoring is becoming more common today. This trend will continue into the future culminating in 1985 with the availability in 20 percent of the metropolitan areas of the ability to monitor ambulatory out-patients who are suspected of having or have a history of medical disorders.

The form of health care delivery itself will change in the future. In the 1980-85 time frame 20 percent of the metropolitan areas will have available computer coordinated vertically integrated health facilities. These facilities will include physician offices, neighborhood health care centers, hospitals, university medical centers, nursing homes, rehabilitation centers and home health care. A patient entering the system is moved to the proper level to treat his health problem and as his problem progresses, either positively or negatively, he may be shifted to a different level. Coordination of the use of facilities is done by a computer which tracks the patient while he is in the system recording and maintaining his medical and administrative data.

New types of health facilities will be introduced. In 1980-85 five percent of the population will have access to Preventive Medicine Diagnostic centers which combine the characteristics of multiphasic screening and clinical decision systems but are directed toward periodic physical checkups. These centers may be operated by health insurance companies who will encourage utilization by providing insurance premiums incentives.

					MEDICA	L						
TTL OR TON TIME		1 ^ 7 <b>0 . 7 1</b>	72-74	<b>7</b> 5 <b>-</b> 77	78-99	31-85	LATER	NEVER	IMPACT ON SOCIETY	PROPITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
COMPUTERIZED MEDICAL TEST ANALYSIS	75 - 50 -								2.50	3.12	3.62	-0.10
	25- 0- P.C.	0.0	1.8	5.4	- -  71.4	21.4	0.0	0.0				
	100- 75- 50-		•			Name and party and the Control of th			2.95	2.37	3.54	0.25
	25- 0- P.C.	0.0	0.0	0.0	-  68.6	31.4	0.0	0.0				
CLINCAL DECISION SUPPORT SYSTEMS	100- 75- 50- 25-	•		ĺ					2.96	2.55	3.41	-0.40
•	0 - P. C.	0.0	1.7	1.7	-  51.7	40.0	5.0	0.0				
	100- 75- 50- 25- 0- P.C.	0.0	0.0	3.2	-  54.8	37.1	ft * 8	0.0	2.76	2.61	3.37	-0.33
	100- 75- 50- 25-			•					2.68	2.13	3.35	-0.40
	0- P.C.	0.0	0.0	0.0	26.0	68.0	6.0	0.0				
VERTICALLY INTEGRATED HEALTH CARE DELIVERY SYSTEM	100- 75- 50- 25- 0-						and the latter of the latter o	L	2.85	2.12	2.81	-0.61
	P.C.	0.0	2.0	2.0	19.6	52.9	21.6	2.0				•
PREVENTIVE MEDICINE DIAGNOSTIC CENTERS	100- 75- 50- 25- 0-					]  - -		<b>1</b>	2.85	2.40	3.18	-0.62
	P.C.	0.0	0.0	1.7	16.7		16.7	1.7				
OUT-PATIENT MONITORING	100- 75- 50- 25-					<u></u>		]	2.51	1.22	1.71	<sup>~</sup> 1.90
	0- P.C.	0.0	0.0	1.6	3.2	54.0	39.7	1.6	<del></del>			

Clinical Decision Support Systems -- The availability of a clinical decision support system in 20 percent of the hospitals of over 500 beds. The system assists the physician in making diagnoses and prescribing treatment by evaluating symptoms and test results (perhaps, collected in a multi-phasic screening system) recommending additional tests and/or giving a list of possible diagnoses with the associated medical reasonng. When a diagnosis is reached, the system recommends treatment again with the medical reasoning.

MA GROUP TOTALS EXPERT TOTALS	IMPACT ON 1 1JOR SIGNIF. 1 20 43 6 6	LITTLE NO 14 4 1 0	PROFITA VERY 17 4	BLE TO IMP	LEMENTOR	PLEMENTATION USEFUL TO VERY MODERT 43 20 10 1	PUBLIC	WILL NOT BE MPLEMENTED 11 1
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Computer Coordinated Testing of Medical Drugs -- The implementation of a mandatory comprehensive testing program for drugs and food products prior to their release to general use. The program would be administered and/or coordinated by the government and would be aimed at detecting long-range adverse side effects as well as determining drug effectiveness. The coordination and analysis would be computer assisted.

MA GROUP TOTALS EXPERT TOTALS	IMPACT  4JOR SIGNIF 15 30 4 7	ON SOCIETY LITTLE 9 3	PRO	VERY MOD	REASONS TO IMPLEME	NAL VERY	FUL TO PUE		WILL NOT BE MPLEMENTED 5 2
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	1970-71 <b>72</b> 0	-74 75-77 0 0	78-80 81-	16 0   4 0	R NEVER 0				
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GROUP TOTALS CONSENSUS EXPERT TOTALS			L SOME USE 1			0×- 0.K.	10×+ 100	)×+ 1000×+	>1000×+

CONSENSUS

Computerized Medical Test Analysis -- Computer-assisted interpretation of quantifiable medical tests, e.g. EKG, EEG, etc., for 20 percent of the physicians. The service would accept input from the conventional recording equipment doctors now have in their offices and would provide results through a terminal in the doctor's office or via telephone voice response.

	I!	MPACT ON	SOCIETY				<u>E</u> EASONS FOR . IMPLEMENTOR		NTATION SFUL TO P	UBLI C	WILL NOT BE
MA	JOR S	SIGNIF.	LITTLE	NO	VER Y	MODERT	MARGINAL	VERY	MODERT		IMPLEMENTED
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EXPERT TOTALS	4	13	2	0	8	8	1	11	7 -	0	1
	1970	-71 72-74	75-7 <b>7</b>	78-80	<u>MPLEMEN</u> 81-85	TATION D	<u>4 TE</u> Never				
GROUP TOTALS CONSENSUS	(	1	3	40  - -	12	0	0				
EXPERT TOTALS CONSENSUS	(	1	3	14	2	. 0	0				

REQUIRED CAPABILITIES

A. Availability of the application programs from a service organization. \$100 per month.

	NECESSRY	ASSET	USEFUL	SOME U	SE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	10	34	4	0		2	0	0	39	5	0	0	0
CONSENSUS		11-1							1-1-1				
EXPERT TOTALS	3	11	2	0		1	0	. 0	12	1	0	0	0
CONSENSUS		11-1							1-1-1				
D Mislad makend	h.,,4.a4.4.a		1										

B. Multi-attribute pattern matching.

GROUP TOTALS CONSENSUS	NECESSRY 33 	11	USEFUL 1	SOME USE 2	e no i	NEED >10×- 1	10×-	0.K.	10×+	100×+	1000×+	>1000×+
EXPERT TOTALS	10	4	0	2		1						
CONSENSUS	11											

Disease Information Systems -- The availability in 20 percent of the metropolitan areas of systems to record the diseases diagnosed by physicians in the area. The system would be used to detect epidemics in their early stages, and disease trends such as the rise of new diseases, or effectiveness of preventive measures on old diseases.

					IMPACT A	ND VALU	<u>E</u>				
		IMPACT ON	SOCIETY			R	EASONS FOR .	IMPLEME	INTATION		WILL
					PROFITA	BLE TO	IMPLEMENTOR	USE	FUL TO F	UBLIC	NOT BE
MA	AJOR	SIGNIF.	LITTLE	NO	VERY	MODERT	MARGINAL	VERY	MODERT	MARGINAL	IMPLEMENTED
GROUP TOTALS	9	35	11	1	10	19	21	29	16	8	8
EXPERT TOTALS	2	8	3	1	3	5	4	8	4	1	2
				2	<u>MPLEMENT</u>						
	197	0-71 72-7	4 75-77	78-80	81-85	LATER	NEVER				
GROUP TOTALS		0 0	0	13	34	3	0				
CONSENSUS					-						
EXPERT TOTALS		0 0	0	4	7	0	0 ′				
CONSENSUS					-						

### REQUIRED\_CAPABILITIES

# A. Automatic generation of information systems.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	5	27	7		0		6							
CONSENSUS		11												
EXPERT TOTALS	0	6	1		0		3							
CONSENSUS		11					1							
p							•							

# B. Mass storage of 100 billion bytes.

	NECESSRY	ASSET	USEFUL	SOME	USE	NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	8	26	8		1		2	2	10	26	1	0 -	0	0
CONSENSUS		11-1								-				
EXPERT TOTALS	. 1	6	1		0		2	1	2	3	0	0	0	0
CONSENSUS		11							1					

Multi-Phasic Screening -- The use of computerized multi-phasic screening prior to admittance to 20 percent of the hospitals of over 500 beds. The system collects personal data, general health statements, specific complaints, etc., on arrival, schedules a series of tests, conducts many of them, monitors the results of the tests and schedules additional tests where indicated, and presents the results of the screening to a physician for medical evaluation.

	IMPAC	T ON SOCI	ETY	מבים מפס	יא פראי	REASON TO IMPLE		MPLEMEN USER		PUBLIC		WILL NOT BE
MA	JOR SIGN.	IF. LITT	LE NO		MODE		RGINAL	VERY			TNAT. TM	PLEMENTE
GROUP TOTALS				14		14	12	41	21		3	9
EXPERT TOTALS	4 1:	-		4		9	1	10	2		2	4
				IMPLEMEN	TATION	V DATE						
	1970-71	72-74 75	-77 78-80	81-85			?					
ROUP TOTALS	0	0	2 34	23	3	0						
CONSENSUS						_						
EXPERT TOTALS CONSENSUS	0	0	1 6	-11	1	0						
				RATING AN								
4. Pas <b>s</b> age of	a Nation	alized H	ealth Insu	rance Ac	t simi	lar to	Great B	ritain.				
			NO EFFECS						LATE			
GROUP TOTALS	19	29	2	0	5	17	14	4	4		3	
EXPERT TOTALS	5	6	1	0	1	3	3	1	2	:	l	
			Į	REQUIRED	CAPABI	LITIES						
. Mass stora	ge of 100	billion	bytes.									
	NECESSRY	ASSET	USEFUL SON	ME USE NO	משפעו	>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	7	26	15	1	4	4	20	22	0	0	0	0
CONSENSUS		11					1-1	1				
EXPERT TOTALS	0	5	5	0	1	2	. 4	4	0	0	0	0
CONSENSUS			• •				1-1					
Ten-fold i	ncrease i	n sensor	technolog	у.								
	NECESSRY		USEFUL SOI		NEED	>10×-	10×-	0.K.	10×+	_		>1000×+
GROUP TOTALS	29	15	7	0	1	1	6	36	2	0	1	0
CONSENSUS	11	•		_		_	•	1-1-1		•	•	•
EXPERT TOTALS CONSENSUS	5	4 1-1	2	0	0	0	2	8 1-1-1	0	0	0	0
C. Developmen	t of the	applicat:	ion progra	ms by a	servic	e having	gacces		ical p	ersonn	el trai	ned
in data pr	,						4.5		44	400	4000	. 4000
GROUP TOTALS	NECESSRY 30	ASSET 17	USEFUL SOI	ME USE NO 1	NEED 1	>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
CONSENSUS	11		4	1	1							
EXPERT TOTALS	6	4	1	0	1							
CONSENSUS	1	•	•	Ŭ	-							
• Advanced d	ata base	managemer	nt.									
	NHARAGAY	40000	uannur aa	'n 1100 w			4.0	0 %	4.0	400	4000:	. 1000
GROUP TOTALS	NECESSRY 28	ASSET 17	USEFUL SON	1E USE NO 2	NEED 1	>1U×-	10×-	$o.\kappa.$	10×+	100×+	1000×+	>1000×+
	11	-	4	2	7							
31 1 N 25 E N 25 1 L 28												
CONSENSUS EXPERT TOTALS	. 6	5	0	. 0	1						•	

Out-Patient Monitoring -- The availability of out-pathent monitoring in 20 percent of the metropolitan areas. Ambulatory patients with a history or suspected medical disorder are fitted with sensors and telemetry equipment to be monitored by the central system. In the event of the detection of a problem, the system could request a hospital visit via the telemetry equipment or sound a loud request for assistance depending on the severity.

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				T1/77 71/71								
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anoun momate	1970-71	/2-/4 /: 0	5-77 78-8 1 2		<i>LATE!</i> 25	? NEVER 1						
GROUP TOTALS CONSENSUS	U	U	1 2	1-1		_						
EXPERT TOTALS	0	0	0 0		6	1						
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A. FCC making	available	the nec						c trans	missio	n.		
and I do manifely												
	ABSOLUTE	POSSIBLE	NO EFFEC	T 1970-71	72-71	<b>→ 75-</b> 77	78-80	81-85	LATER	NEVE	'R	
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EXPERT TOTALS	3	7	1	0	1	3	2	2	0	0		
B. Federal sub	osidy.											
	_											
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GROUP TOTALS	18	26	5	0	2	10	15	7	14			
EXPERT TOTALS	5	4	1	0	0	4	2	. 1	1	0		
C. Establishme	ent of a N	ational	Health Ins	urance Ad	ct sim	ilar to	Great B	ritain.				
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anoun momata			E NO EFFEC						LATER			
GROUP TOTALS	11 3	29 6	10	0	6	7	11	8	2	2		
EXPERT TOTALS	3	6	2	0	1	4	1	1	0	1		
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A. Inexpensive	miniatur	ler beri	ishle cens	ore and t	raleme	try equi	inment	\$500				
Incapcing ive	- manadour	ILCU ICI	rante peri	ors and t	CLONE	cry cqu	.pmc.r.c.	7300				
	NECESSRY	ASSET	USEFUL SO	ME USE NO	NEED	>10×-	10×-	o.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	49	3	0	0	0	0	10	37	1	0	1	0
CONSENSUS	11-1							1-1-1				
EXPERT TOTALS	10	0	0	0	0	0	4	4	0	0	0	0
CONSENSUS	-						-	•				
$B \cdot$ High availa	ability ce	ntral sy	stems - or	e failure	of m	ore than	n one ho	ur in a	year.			
			-									
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EXPERT TOTALS		•	•				1		_			
CONSENSUS	6	4	0	0	0	0	1-1	3	0	0	0	0
C. Massive cor	, ,	,	10 000		_		1-1					
. massive cor	www.iiTCatlo	n Interi	ace 10,000	channels	2.							
	NECESSRY	ASSET	USEFUL SO	ME USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+	1000×+	671000×+
GROUP TOTALS	31	12	4	2	3	4	8	31	2	0	0	0/1000x+
CONSENSUS	11		•	•-	•	,		1-1	4	•	U	J
EXPERT TOTALS	5	3	1	0	1	0	2	่ 5 ่	0	0	0	0

CONSENSUS

Preventive Medicine Diagnostic Centers -- The availability to 5 percent of the population of computerized medical diagnostic centers. This application is similar to multi-phasic screening but not associated with a scheduled hospital admittance.

	TWDAGE	4 33 TO TEAT 11 TT				
IMPACT ON SOCIETY	IMPACT A	<u>AND_VALUE</u> R <b>EA</b> SO	NS FOR IMP	LEMENTATIO	y	WILL
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EXPERT TOTALS / 8 1 0	3		U	9 2	• 0	6
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		LATER NEVE				
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ACCULUM	477WG 4W		7407070			
A. Passage of a Nationalized Health Insur		RETARDING				
A. Passage of a Nationalized Health insur	ance Act	similar to	Great Brit	ain.		
ABSOLUTE POSSIBLE NO EFFECT				81-85 <i>LAT</i>		
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b. rederal substdy.						
ABSOLUTE POSSIBLE NO EFFECT					ER NEVER	
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EXPERT TOTALS 11 4 1	0	2 5	2	2 :	1 1	
<u>R</u>	EQUIRED C	CAPABILITIES				
A. <u>Ten-fold</u> increase in sensor technology	7 •					
NECESSRY ASSET USEFUL SOM	E USE NO	NEED >10×-	10×- 0	.K. 10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS 16 24 7	4	1 1		31 3	0	0 0
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B. Mass storage of 100 billion bytes.			, ,	•		
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NECESSRY ASSET USEFUL SOM	יה ווכור אור.	NEED >10×-	10×- 0	.K. 10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS 8 25 11	2	6 4		24 0	0	0 0
CONSENSUS			1			
EXPERT TOTALS 1 6 4	1	2 1	, 3	, 6, 0	0	0 0
CONSENSUS    C. Advanced data base management system.				1-1		
. Mavanced data base management system.						
<b></b>						
NECESSRY ASSET USEFUL SOM GROUP TOTALS 30 13 4	E USE NO	NEED >10×-	10×- 0	.K. 10×+	100×+ 100	0×+ >1000×+
CONSENSUS	1	3				
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CONSENSUS   -						
Development of application programs by processing.	a servi	ce having a	cess to me	dical pers	onnel train	ed in data
Processing.						
	E USE NO	<i>NEED</i> >10×-	10×- 0	.K. 10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS 32 16 1	2	1				
CONSENSUS                   EXPERT TOTALS       6       7       0	2	0				
	۲.	<b>J</b>				

CONSENSUS

APPLICATION DESCRIPTION

Vertically Integrated Health Care Delivery System -- The implementation in 20 percent of the metropolitan areas of computer coordinated health care facilities. These would include physician's offices, neighborhood health centers, hospitals, university, medical centers, nursing homes, rehabilitation centers, and home health care. A patient is admitted to the system and moved through the facilities as his medical problem progresses. Coordination of the use of the facilities is done by computer which tracks the patients while they are in the system, recording and retaining their medical and administrative information.

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	IMPA	CT ON SO	CIETY						MPLEMEN.			WILL
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EXPERT TOTALS	5	4	•		THE		4	•	v	· ·	-	-
				IN	<u> </u>	TATION	DATE					
	1970-71	72-74	75-77 7	8-80	81-85	LATER	NEVER					
GROUP TOTALS	0	1	1	10		11	1					
CONSENSUS					1-1-1							
EXPERT TOTALS	0	0	1 .	3	. 5 .	1	. 0					
CONSENSUS					-							
			100	777777777777777777777777777777777777777	71 7 77 A 37	יות יית מי	מ אוור מו	1 CT O D C				
							RDING F					
· Overcome of	legal	restricti	ons as	to wha	t const	titute	s proof	of owne	ership.			
	ABSOLUT	E POSSIB	LE NO E	FECT :	1970-71	72-74	75-77	78-80	81-85	LATER	R NEVER	
ROUP TOTALS		2 1		13	0	1	4	4	4	2	2	
XPERT TOTALS	·	)	1	4	0	0	1	0	0	0	1	
				REG	<u>QUIRED</u>	<u>CAPABI</u>	<u>LITIES</u>					
<ol> <li>Network cor</li> </ol>	itrol.											
	NECESSE	RY ASSET	USEFUI	SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×
GROUP TOTALS	30	12	2		1	1						
CONSENSUS	11											
EXPERT TOTALS	5	3	1		1	0						
CONSENSUS	•											
· Advanced da	ta base	manageme	nt syste	em.								
				*								
	NECESSE	RY ASSET	USEFIII	SOME	USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×
GROUP TOTALS	33	10	1		0	1	- 20		• • • • •			
CONSENSUS			•									
EXPERT TOTALS	8	1	1		0	0						
CONSENSUS	11-1	!										
. Mass storag	e of 10	0 billion	bytes.									
•	•											
	unanca	ny 40000	71 (77 77 77 77 77		uge vo	מי פון היו זו	. 1 0 2	400	O.K.	1001	10044 100	044 >1000
TOOUD TOTALS		RY ASSET 26		SUMB	USE NO		>10×- 2	10×- 14	23	10×+ 2	1	0×+ >1000× 0 0
GROUP TOTALS CONSENSUS	13	26  -	4		0	1	. 4	14		2	1	0
, U N S E N S U S	1							1	1-1			

EXPERT TOTALS CONSENSUS

#### OFFICE ASSISTANCE

In the later 1970's the computer will move into the routine operations of the business office. One percent of the secretaries and typists will use a computer-assisted typing station. station will provide test editing, hyphenation and justification, dictionary look up, etc. Completed typing could be electronically filed or provided as direct input into electronic mail delivery service which would be available in the same time frame between businesses and other organization. The businessman or his secretary would use a terminal for file retrievals and access to operational information. The system might also provide personalized information services such as appointment schedules, tickler files, etc. In the 1980's home terminals coupled with the above systems could make it possible for the businessman to remain at home and still conduct most aspects of his business using his terminal for access to his correspondence, files, business data, etc., and for input of his directives, decisions, memos, letters, etc. Most business meetings could be conducted via the terminal, all others requiring on-site presence would be scheduled much as business trips are now.

APPLICATION TITLE		1970-71	72-74	75-77	78-80	81-85	LATER	NEVER		PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
COPUTERIZED TYPING STATIONS	100- 75-								1.43	2.78	2.41	-0.33
	50- 25-					L	) .					•*
	0- P.C.		1.7	15.5	-  53.4	22.4	3.4	3.4	•			
OFFICE ELECTRONIC MAIL SERVICE	100- 75-								2.84	3.40	3.56	-0.33
	50 - 25 -		_			<b>L</b>						
	0- P.C.		0.0	3.2	55.6	36.5	3.2	1.6	•			

Computerized Typing Stations -- The availability to 1 percent of the secretaries and typists of a computer-assisted typing station. The station would include text editing, hyphenization and justification, dictionary look-up, and tie into an Electronic Mail Service.

<b>1</b>				<b>714</b> 70 4 <b>44</b> 7					-		
	TMPAC	T ON SOC.	TET <b>Y</b>	IMPACT_	.AND_V		NS FOR T	TMPLEMEN	TATTON		WILL
	2			PROFI1	ABLE 1		EMENTOR		UL TO F	PUBLIC	MOT BE
MA	JOR SIGN			VERY			RGINAL		MODERT		IMPLEMENTED
GROUP TOTALS		16 4:		12		35	10	12	24	20	7
EXPERT TOTALS	0 1	13 2	2 1	10	1	9	5	10	15	8	2 '
				IMPLEMEN	TATION	DATE					
	1970-71	72-74 7	5-77 78-80		LATER		R				
GROUP TOTALS	0	1	9 31	13	2	2					
CONSENSUS	_										
EXPERT TOTALS CONSENSUS	0	1	6 17	6	0	1			1		
CONSTRIBUS			1-1-1								
			ACCELE	RATING_AN	D_RETA	RDING	FACTORS				
A. Development	of a pr	actical d	ictionary	look-up	cheme	•					
•	400000	n Doggan							* 4007		
GROUP TOTALS	ABSULUTE 7	. POSSIBLI <b>24</b>	E NO EFFECT 12	0 . 1470-11	. 72-74 8	75-71 13	7 78-80 8	91-85 3	LATER 1	? NEVER O	
EXPERT TOTALS	4	13	8	0	. 5	- 6	. 4	1	1	0	
			_	•	•	•	,	_	-	•	
_			Į.	REQUIRED	<u>CAPAB</u> 1	LITIES					
A. Mass data s	storage o	f 10 bill	ion bytes.								
			,								
	NECESSRY	ASSET	USEFUL SON	ME USE NO	NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
GROUP TOTALS	8	27	8	3	3	3	30	9	0	0	0 0
CONSENSUS		11					1-1-1				
EXPERT TOTALS	4	12	5	2	2	2	11	6	0	0	0 0
CONSENSUS			•				-				
B. Massive con	munication	on interi	ace 1,000	lines.							
(	NECESSRY		USEFUL SON		NEED	>10×-	10×-	0.K.	10×+	100×+ 100	0×+ >1000×+
IP TOTALS	28	18	1	0	2	0	5	39	0	0	0 0
SENSUS EXPERT TOTALS	13	9	1	0	2	•	•	1-1-1	^	•	•
CONSENSUS	11		1	U	2	0	2	18  - -	0	0	0 0
CONDUNDOD	1 1	1						1-1-1			

And the second of Application Description that the trans with an perturbed on the second second

Office Electronic Mail Service -- The availability of electronic mail service to organizations and enterprises. The service would provide transmission of most materials now sent by first class mail.

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					IMPACT	<u>and v</u>							
	IMPAC	CT ON A	SOCIETY		DD 477				IMPLEMEN				WILL
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GROUP TOTALS		71 39	21	1	35	1 1100	33	5 5	44	22		1 M M D 1 M	9
EXPERT TOTALS	4	8	1	ō	8		4	Ŏ	6	- 4		Õ	1
										•			
					MPLEME								
anaun mamara	1970-71						R NEVE		* .				
GROUP TOTALS	. 0	0	2	35	23	2	. 1		,				
CONSENSUS EXPERT TOTALS	. 0	0	. 0	1-1	3	0						• •	
CONSENSUS	,		Ū	1-11	_								
									100				
			A	<u>CCELERA</u>	TING A	ND_REI	ARDING	<u>FACTORS</u>					
A. Increase o	f first o	class i	mail rat	e to 20	cents	per 1	etter.						
	ARCOTUM	7 7000	TREE NO		1070 7	4 70 7	. 75 7	<b>7 70</b> 0	0 04 05		יוו מו	70 TO	
GROUP TOTALS	15	PUSS.	IBLE NO 33	9	19/0-/		21			LATE 3		Δ.π 0	* .
EXPERT TOTALS	3		6	1	0				ó	. 0		0	
B. FCC regulat		ving n				ommuni	cation	network					
•		-		-									
GROUP TOTALS		POSS.	IBLE NO		1970-7								
EXPERT TOTALS	13		27 3	. 5 1	0	8 1			3 1	2		1	
DAIBHI TOTABB	<b>.</b>		3	*	U				_			•	
				RE	QUIRED	CAPAB	ILITIES						
A. Mass storag	e trillic	on byte	es.										, in the second
	N TO COT CO	, ,,,,,	70 110 FF	717 GAL-					ó <b>"</b>	40	400	4000	. 4005
GROUP TOTALS	NECESSRI 13	( ASS)		UL SOME 7	USE NO 1	) NEED 3	>10×- 2	10×-	0.K. 33	10×+		1000×+	>1000×+ 0
CONSENSUS	13	11		,	1	3	2	0	1-1-1	1	0	Ų	U
EXPERT TOTALS	4		•	1	0	1	1	1	17171	1	'n		0
CONSENSUS	1			•	·	•	•	1	1-1		v		
B. Network con	trol with	stor	e and fo	rward.					• •				
anaun mamusa	NECESSRI						>10×-	1.0×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS CONSENSUS	36 	1	-	4	0	0			• "				
EXPERT TOTALS	6			1	0	0							
CONSENSUS	11			•	. •								
C. High reliab			•	r deliv	ery.								*
-													
47.0 UD . MOM	NECESSRY			UL SOME				10×-	0.K.	10×+			>1000×+
GROUP TOTALS CONSENSUS	31	19		3	0	1	. 0	1	43	1	0	0	0
EXPERT TOTALS	11		•	1	0	1	0	0	1-1-1	•	_	^	•
CONSENSUS	1				U .	1	U	U	1-1-1	. 0	U	0	0
D. Positive us				tion.					·L · L · · ·				
			*										
anoun momera			ET USEF				>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS	42 		3	1	0	0							
TXPERT TOTALS	7		3	0	0	0							
CONSENSUS	11				•	•							
7. Inexpensive	hard-co	y tra	nsmissio	n (facs	imile.	)							
			· ·										
ים א אחמת מווי מווי	NECESSRY						>10×-	10×-	0.K.	10×+	100×+	1000×+	>1000×+
ROUP TOTALS	39 	1!		1	0	0							
XPERT TOTALS	5		•	0	0	0							
ONSENSUS	1			•	v	. •							
. Massive com				00,000	lines.								
DOUD MOMATO	NECESSRY							10×-					>1000*+
ROUP TOTALS ONSENSUS	35	15		1	1	2	2	2	40	2	0	0	0
XPERT TOTALS	5		•	0	0 .				1-1-1	4			
ONSENSUS			•	U	<b>U</b> .	1	1	0	5  - -	1	0	0	.0
· Scramble tr				for sec	urity.				E = 3 = 3 -				
) OUD	NECESSRY						>10×-	10×-	O.K.	10×+	100×+	1000×+	>1000×+
OUP TOTALS	35	16	-	4.	0	0							
PERT TOTALS	5			3	0	. 0					, ,		
NSENSUS			د 	- I	-	II.162	•						
							•						

## PUBLIC AND PRIVATE TRANSIT

The importance of the problems of moving people in and about the megalopolises of the future were recognized by the panel and several applications were suggested to help combat the problems.

By 1978 to 1980 today's traffic control applications will have come into widespread use in 20 percent of the metropolitan areas but with extended capabilities to control traffic with variable traffic speeds and routings, and controlled access and egress based on sensing traffic flows and volumes.

In 1981-85 five percent of the city mass transit systems will be computer scheduled to respond dynamically to predicted or sensed demands. Both of these applications will be brought about by public recognition of the need and subsequent Federal subsidy.

American historic preference for individual transportation coupled with increasing concern about traffic fatalities will in 1980-85 bring about the equipping of 20 percent of the automobiles with computerized collision avoidance systems. These systems will detect collision courses, slow and, if necessary, stop the car in time to prevent a collision with any object. At some point after 1985 roadways will be automated to take over control of vehicles while on the roadway.

PUBLIC AND PRIVATE TRANSIT

APPLICATION TITLE		1970-71	72-74	75-77	78-80.	81-85	LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
AUTOMATED TRAFFIC CONTROL	100- 75- 50- 25- 0-				1-1				2.85	2.63	3.84	-0.29
	P.C.		0.0	5.1	57.6	32.2	5.1	0.0				
AUTOMATED MASS TRANSIT SYSTEMS	100- 75- 50- 25-								3.17	2.79	3.87	0.38
	0- P.C.		0.0	0.0	23.2	- -  67.9	7.1	1.8				
AUTOMOBILE COLLISION AVOIDANCE SYSTEMS	100- 75- 50-				,				3.15	1.98	2.58	<b>-1.56</b>
	25-						. l					
	0- P.C.	0.0	0.0	0.0	3.1	40.6	40.6	15.6				
AUTOMATED ROADWAYS	100- 75-			*				. *	3.28	1.74	2.56	-1.44
	50- 25- 0-				٠.		- -	1				
	P.C.	1.5	0.0	0.0	0.0	19.7	68.2	10.6				

Automated Mass Transit Systems -- Implementation by 5 percent of the metropolitan areas of computerized mass transit systems. The system will be designed to eliminate congestion in the movement of people and good by dynamically analyzing and balancing such factors as location of people and businesses, work schedules, scheduled events, historic traffic patterns, weather, etc., and then optimally deploying the transit facilities.

		IMPAC:	r on s	OCIETY		<u>I</u> !	MPACT_	AND_Y		<b>ASONS</b>	FOR I	MPLEME.	NTATION			WILL
						1	PROFIT	ABLE 1	"O II	MPLEN	IENTOR	USE	FUL TO			$oldsymbol{NOT}$ , $oldsymbol{BF}$
М	AJOR	SIGNI	TF. I	ITTLE	NO		VERY	MODE	ERT	MARC	FINAL	VERY	MODERT	MARG.	TNAL IM	PLEMENTED.
GROUP TOTALS	20	30	0	10	0		17	2	27	1	10	43	. 8		5	8
EXPERT TOTALS	6		8	1	0		5		5		4	12	. 0	:	2	2
						<u>IM</u> 1	PLEMEN:	<u> CATIO</u>	V_DA	T E						
	197	0-71	72-74	<b>7</b> 5-77	78-8	30	81-85	LATER	R 102	EVER						
GROUP TOTALS CONSENSUS		0	0	0	13		38  - -	4		1	.•					
EXPERT TOTALS CONSENSUS		0	0	0	2	_	9	1		0						
					ACCELE	RAT	ING_AN	D_RETA	RDI	NG_E	ACTORS					
A. Federal re	egula	tion a	ind su	bsidy.						,						
	ABS	COLUTE	POSS1	BLE NO	EFFEC	T 1	970-71	72-74	+ 7	5-77	78-80	81-8	5 LATE	R NEV	ER	
GROUP TOTALS		21		20	4		0	3		14	11	.7	. 2		1	
EXPERT TOTALS		6		4	1		0	2		5	2	0	0		0	
						REQ	UIRED_	CAPARI	T.T.T	TES						
A. Mass data	stor	age of	10 b	illion	bytes		KİLLEK.	saras:	****							
		,			.,											
	NEC	CESSRY	ASSE	T USE	FUL SO	OME	USE NO	NEED	>10	x	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS		29	14	)	3	(	0	1	1	0	3	38	3	0	0	0
CONSENSUS	1-			-			•					1-1-1				
EXPERT TOTALS		7	3	3	0		0	0	1	0	0	7	1	0	0	0
CONSENSUS												1-1-1				
B. One hundre	ed ti	mes im	prove	ment in	sche	duli	ng alg	orith	ms.							
						0145							4.4		4000	. 4 0 0 0
anoun momera	NEC	CESSRY					USE NO				10×-	0.K.	10×+			>1000×+
GROUP TOTALS		29 	15		2		1	0		1	8	33  - -	1	0	0	0
CONSENSUS EXPERT TOTALS	,	7		•	^		^	0		0	1	7	. 0	0	0	0
CONSENSUS		I ·			0		0	U	'	U	7	1-1-1	. 0	U		U
C. Model deve	lopm	ent as	sista	nce fro	mas	ervi	ce org	aniza	tion	١.		1-1-1				
	NEC	CESSRY	ASSI	T USE	FUL SO	OME	USE NO	MEED	>10	x -	10×-	0.K.	10×+	100×+	1000×+	>1000×+
GROUP TOTALS		12	. 24	ļ	10		1	2								
CONSENSUS			11-													
EXPERT TOTALS	!	3		ŧ.	2	1	0	1								
CONSENSUS	-															

<u>Automated Roadways</u> — The availability to the general public of the first computer controlled roadway for specially equipped automobiles. The automobile is under complete control of the roadway from entry to exit but may be driven normally when off the roadway. The system would allow high speed, high density traffic with maximum safety yet retain the convenience of individual transportation.

	IMPACT	ON SOCIETY				EASON	S FOR II				WILL
			***		ABLE TO				UL TO P		NOT BE
MAJ		r. LITTLE 7	NO	VERY	MODER1		<i>GINAL</i> 13	<i>VER Y</i> 34	MODERT -	MARGINAL 7	IMPLEMENT.
ROUP TOTALS 3	32 33	,	1	13	21	•	1	2	2	. 0	2
XPERT TOTALS	3		U	U	2		-	2	2	. 0	2
					TATION L						
	1970-71 72		78-80	81-85		NEVER					
ROUP TOTALS	1	0 0	·U	13	45  - -	7					
CONSENSUS EXPERT TOTALS	0	0 0	0	1	1-1-1	1					
ONSENSUS	,	0 0	v	-	1-1-1	**					
. Passage of	federal ap	propriatio	ACCELERA n for th			PING_F	<u>ACTORS</u>				
		OCCUPATION NO		4050 54			<b>70.00</b>	04.05			
DAUD MAMATC	ABSOLUTE P	OSSIBLE NO 18	EFFECT 2	1970-71	72 - 74	75-77 10	78-80 9	81-85 16	LATER 8	NEVER 1	
ROUP TOTALS XPERT TOTALS	31	18	0	0	0	2	1	16	8 1	0	
• Utilization	-	_	ectronic	•	-	_	biles 1	to faci	litate	_	a the
special equ	ipment.										9 00
		POSSIBLE NO				75-77	78-80	81-85			
ROUP TOTALS	16	30	2 0	0	1	6	12	10	10	0	
XPERT TOTALS	1	3	U	O.	1	1	1	0	. 0	0	
			RE	QUTRED	<u>CAPABIL</u> 1	TTES					
The special the automob	equipment ile under	for the a	utomobil	e would	have to	be a	compute	er for	control	and steer	ing of
	NECESSRY	ASSET USE	FUL SOME	USE NO	NEED >1	.0×-	10×-	0.K.	10×+	100×+ 1000	×+ >1000>
ROUP TOTALS	38	8	2	0	5						
ONSENSUS											
XPERT TOTALS											
ONSENSUS	-11-1-11-1										
<ul> <li>Very high r and either</li> </ul>	ellability continuing	control o	stem with r bringi	h back i ng all	up <b>syste</b> tr <b>affic</b>	ms cap to a h	oable of nalt.	f being	dynami	cally swit	ched in
	NECESSRY	ASSET USE	FUL SOME	USE NO	NEED >1	0×-	10×-	0.K.	10×+	100×+ 1000	×+ >1000
ROUP TOTALS	51	2	1	0	0				-		
ONSENSUS	11-1										
XPERT TOTALS											
ONSENSUS											
· The capabil	ity to mon	itor in ex	cess of	l millio	on senso	rs to	follow	the pr	ogress	of all tra	ffic.
	NECESSRY	ASSET USI	FUL SOME	מנו שפוו	רושיש זו	0 × -	10×-	0.K.	10×+	100×+ 1000	
ROUP TOTALS	36	11	1	2	3	4	10x-	30	10×+ 7		0 0
ONSENSUS	11		•	_	J	7	J	1-1-1	, .		0
XPERT TOTALS	•	•									
ONSENSUS											

Automated Traffic Control -- Installation on the main throughfares of 20 percent of the metropolitan areas of sophisticated traffic control systems. The system would sense traffic volumes and speeds, set speed indicators and route destination indicators to optimize traffic flows and to prevent bottlenecks at major arterial entry points or accident sites.

						IMPACT .	AND VAL	L <u>ue</u>						
		IMPACT	r on so	OCIETY					S FOR I	MPLEMEN				WILL
								) IMPLE			UL TO P			NOT BE
			TF. L		NO			RT MAR					NAL IMI	
GROUP TOTALS		36 11		9	2 0 :	14	21	5 9	15 2	37 12	16 4	· 5		6 1
EXPERT TOTALS	, 4	1.1	Ĺ	2	U ·	4	:	9	2	12	4		L	1
					_	MPLEMEN								
	197			75-77		81-85								
GROUP TOTALS		0	0	3	34	19	3	0						
CONSENSUS	,	^	0	^			^	0						
EXPERT TOTALS CONSENSUS	i	0	U	0	1	10	0	U						
,01101111000					•	. '.								
1 madamal av	1	-4		A	CCELERA	TING_AN	D_RETA	RDING F	<u>ACTORS</u>					
4. Federal su	psiai	zing.						,						
	ABS				EFFECT	1970-71	72-74	75-77	78-80	81-85				
GROUP TOTALS		14		25	. 4	0	2	12	17	6	1		)	
EXPERT TOTALS	;	4		9	0	0	0	. 5	8	0	0		)	
A						EQUIRED_	<u>CAPABI</u> .	LITIES						
4. Ten-times		vement CESSRY			ng algo				10×-	o.K.	10×+	100×+	1000×+	>1000×
GROUP TOTALS			<i>ASSE</i> :	T USEF	ng algo	rithms.			10×-	37	10×+ 2	100×+ 0	1000×+ 0	>1000×
GROUP TOTALS CONSENSUS	NEC	CESSRY 11	ASSE:	T USEF	ng algo FUL SOME 9	rithms.  USE NO	NEED O	>10×- 0	2	37  - -	2	0	0	0
GROUP TOTALS CONSENSUS EXPERT TOTALS	NEC	CESSRY	ASSE:	T USEF	ng algo FUL SOME 9	rithms.  USE NO	NEED	>10×-	_	37  - -  7				
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NEC	CESSRY 11	ASSE:	T USEF	ng algo FUL SOME 9 3	rithms.  USE NO  1	NEED O	>10×- 0 0	2	37  - -	2	0	0	0
A. Ten-times  GROUP TOTALS  CONSENSUS  EXPERT TOTALS  CONSENSUS  B. Heuristic	NEC	CESSRY 11	ASSE:	T USEF	ng algo FUL SOME 9 3	rithms.  USE NO  1	NEED O	>10×- 0 0	2	37  - -  7	2	0	0	0
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Automobile Collision Avoidance Systems -- The equipping of 20% of the automobiles with radar like sensing devices and computer systems to first slow, then bring to a halt the automobile when a collision course with any object is detected.

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#### UTILITIES

Utilities are relatively highly automated--most new power plants are process controlled, as are power distribution networks and gas lines. There are, however, new areas for the application of computers in the utility industries.

Most utilities have only a limited picture of their load profiles as they appear at major distribution points (central offices, power stations, etc.) What is missing is the load profiles over time for individual users or users in a limited area. By 1980 ten percent of the utilities will have installed remote data recorders to record such profiles. These profiles will be used to better predict changing service needs.

In the same time frame the existing systems of regional power grids will be joined into a nationwide grid. The grid will be computer controlled to prevent power failures by drawing on power reserves all over the nation to absorb the loss of one or more plants.

The advent of widespread use of the picturephone in 1975-85 will lead to computerized services being made available using the picturephone as a terminal. The telephone companies will lead the way. In 1980 twenty percent of the metropolitan areas will be serviced by automated telephone directory and yellow page data banks. Inquiries would be handled automatically from the picturephone.

APPLICATION TITLE	19 <b>7</b> 0-71	72-74	75-77	78-80	81-85	LATER	NEVER	IMPACT ON SOCIETY	PROFITABLE TO IMPLEMENTOR	USEFUL TO PUBLIC	WILL NOT BE IMPLEMENTED
UTILITY USAGE RECORDING SYSTEM 100-								1.68	3.00	2.66	<b>-</b> 0.36
50	-										
25· 0·				- -	<u> </u>						
P.C.		1.8	3.6	74.5	16.4	1.8	1.8				
NATION-WIDE POWER GRID 100.	•							2.75	3.27	3.42	-0.44
75-			1								
50- 25-											
0.		-		1-11	·						
P.C.		0.0	1.7	73.3	23.3	1.7	0.0				
TELEPHONE DIRECTORY AND YELLOW 100-	•							2.00	2.62	2.80	-0.29
PAGE DATA BANKS 75-	-				·						
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0- P. C.		0.0	4.6	58.5	23.1	12.3	1.5				

Nationwide Power Grid -- The establishment of a nationwide power grid to balance power loads. The system would predict loads on the basis of historical records and weather forecasts. Power plant usage would be scheduled giving major consideration to utilization of plants in weather locations most favorable for pollution avoidance.

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EXPERT TOTALS	)	7	8		7	2	6	5	2	1	0	0	
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Telephone Directory and Yellow Page Data Banks -- The availability in 20 percent of the metropolitan areas of data banks supplementing the existing telephone directories. The system would use conventional or picture phones and largely replace information operators.

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EXPERT TOTALS	3	14	7		1	2							
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B. Audio resp	onse capal	ole of h	andling	1,000	oice voice	respe	onses	simultan	eously.				
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	NECESSRY	ASSET	USEFUL	SOME	USE NO	MEED	>10×	- 10×-	0.K.	10×+	100×+ 100	0×+	>1000×+
GROUP TOTALS	19	31	8		0	0							
CONSENSUS EXPERT TOTALS	7	15	5		0	ο							
CONSENSUS			_		•	Ĭ							
Do Data base	of 100 bil	llion by	tes.										
	NECESSRY	ASSET	USEFUL,	SOME		NEED	>10×	- 10×-	o.r.	10×+	100×+ 100	0×+	>1000×+
GROUP TOTALS	13	23	17		3	1	5	32	17.	0	0	0	0
CONSENSUS EXPERT TOTALS	14	13	8		2	0	0	12	12	0	0	0	0
CONSENSUS		11				. •	•			. •	v		Ü
E. Search eng.	ine <u>100 ti</u>	imes fas	ter than	toda	ay's sy	stems.	•						
				•									
	NECESSRY	ASSET	USEFUL	SOME	USE NO	NEED	>10×	- 10×-	0.K.	10×+	100×+ 100	0×+	>1000×+
GROUP TOTALS	10	27	11		3	2	4	7	36	2	0	0	0
CONSENSUS EXPERT TOTALS	4	12	5		-2	1.	1	4	1- -	1	0	^	^
CONSENSUS	·	11	•		•••	٠		7	1-1-1	1	U ,	0	0
$^{F}$ · Updateable	image fil	les.											
	NECESSRY	ASSET	USEFUL	SOME	USE NO	NEED	>10×	- 1.0×-	0.K.	10×+	100×+ 100	0×+	>1000×+
GROUP TOTALS	10	22	6		9	7						•	•
CONSENSUS EXPERT TOTALS	4	10	3		I 5	3							
CONSENSUS	•				O .	3							

Utility Usage Recording System -- The installation in 10 percent of the utilities (gas, electric and telephone) of a system of remote data recorders to record service profiles over time. The system would make it possible for utilities to determine the distribution of their loads by time and location. The recorders need not be on-line to the central facility but would be accessed periodically to pick up the accumulated readings.

			IMPA	CT ON	SOCIETY				ASONS FOR		NTATION FUL TO P	UBLIC	WILL NOT BE
GROUP TOTAL	MAS S	<i>OR</i> 5	SIG	V <i>IF</i> . 14	LITTLE 32	<i>NO</i> 5	VERY 17	MODERT 27	MARGINAL 11	VERY	MODERT 19		IMPLEMENTED 7
EXPERT TOTA	LS	2		5	9	0	4	11	. 0	4	9	1	2
						1		TATION DA					
		197	0-71	72-71	<b>∔ 75-77</b>	78-80	81-85	LATER I	IEVER				
GROUP TOTAL	S		0	1	2	41  - -	9	1	. 1				
EXPERT TOTAL CONSENSUS	LS		0	0	0	14	2	0	0				
						RE	QUIRED	CAPABILI	ries				
A. Mass da	ta s	tora	age c	f 100	billion	bytes.							

GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS B. Inexpensive	NECESSRY 14 13 reliable	29  -  8   -  <b>c</b> ollect	USEFUL 2 1	:	0 i 0		NEED 2 1 purch	1	10×- 9   1	0.K. 31  -  9  - -	10×+ 0 0	100×+ 0	1000×+ 0 0	>1000×+ 0 0
GROUP TOTALS CONSENSUS EXPERT TOTALS CONSENSUS	NECESSRY 37   -  9	ASSET 8	USEFUL 1	SOME	<i>USE</i> 0 0	NO	NEED 1	>10×- 0 0	10×- 1 0	0.K. 39  - -  9  - -	10×+ 2 1	100×+ 0	1000×+ 0	>1000×+ 0

## IV. DETAILED CAPABILITIES RESULTS

The panel of respondents was asked to associate with each of the applications those data processing capabilities which were critical to the implementation of the application. In this section, the detailed data relating to the capabilities is presented and discussions are provided identifying trends and conclusions.

The study organization has produced four indications of relative importance of the capabilities. These are:

1. The number of applications requiring a capability.

This count is indicative of the breadth of the need for the capability.

2. The importance of the associated applications.

Respondents were asked to rank the applications as to their importance to the general public, to the implementors, and to the ultimate users. Capabilities required by the more important applications are more important themselves.

3. The date the application is required.

Capabilities associated with early implementation dates deserve immediate attention.

4. The value of the capability to the application.

Respondents were lead to a consensus as to whether a capability was a "Necessity", a "Definite Asset", "Useful", "Some Use", or "No Use" to the application.

The relative importance of the four ranking factors is a subjective judgment. This report will present data on all four measures and leave it to the reader to form his own ultimate ranking based on his weighings of the categories, the actual applications involved, and any other pertinent factors available to him.

The remainder of this section is divided into eight subsections by grouping the identified capabilities into convenient areas:

Communications Requirements
Terminal Capabilities
Data Base Requirements
Capacity and Availability
Advanced Capabilities
Application Software Requirements
Data Processing Services
Special Products

Each subsection will start with a discussion of the capabilities, and where merited, possible trends and conclusions. Following the discussion are two sets of detailed presentations upon which the discussion is based. The first detailed presentation names the capabilities and lists the applications requiring each capability. The applications are cross-referenced by page number to the detailed printouts contained in Section III.

The second presentation contains data relating to the value of the capability. Figure 4.1 is a sample page from these presentations. Part 1 is the capability name. Part 2 presents the average of the values assigned to the applications requiring the capability. The derivation of these values is described in detail on pages III 2 and III 3. Briefly, they resulted from applying weights from 1 to 5 to the respondent's judgments of the applications effect on society, the implementors, and the public. "Will Not be Implemented" had a weight of 3. Thus, the maximum possible values would be 5, 5, 5, and 3 respectively. Part 3 is a count of the number of applications specifying the requirement for this capability. Part 4 provides histograms illustrating the distribution of capability values over time.

For example, 20.7 percent of the respondents judged the capability to be "Necessary." The 20.7 percent were distributed: 11.7 percent in 1978-80; 7.2 percent in 1981-85;.9 percent in LATER; and .9 percent in NEVER. The TOTAL category says that 98.2 percent of the respondents thought the capability had some value with 59.5 percent concentrated in 1978-80. From this part, it is possible to tell when and how strongly a capability is needed.

Capabilities which have magnitudes associated with them are treated by providing a separate page for each of the orders of magnitude requested. For example, Figure 4.1 is one of four "Search Engine" pages i.e., Search Engine 10,000 times more powerful, 1,000 times, 100 times and 10 times. This makes it possible to relate the specific magnitude to time.

- SEARCH ENGINE 10,000 TIMES MORE POWERFUL
- ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.05 2.62 2.52 0.29
- NUMBER OF REQUIRING APPLICATIONS 2

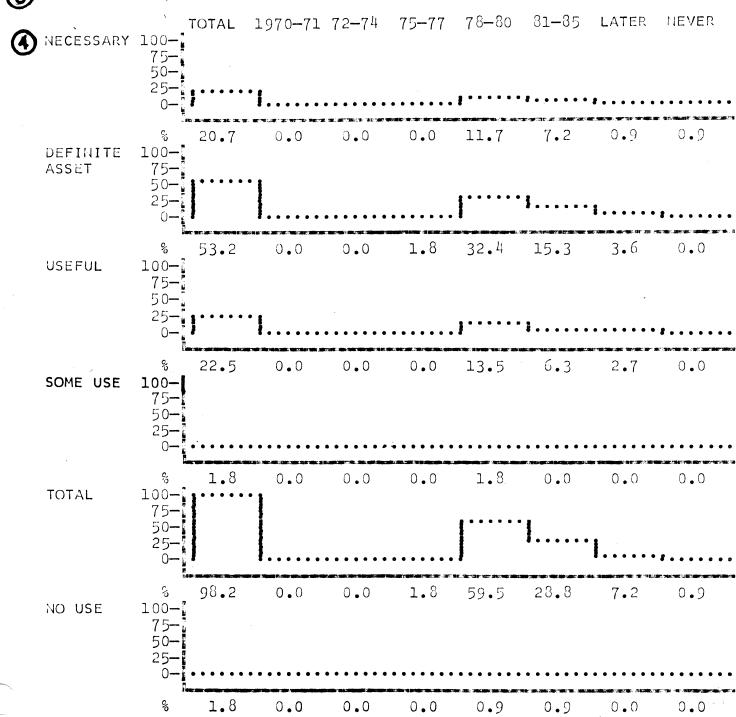


Figure 4.1

## COMMUNICATIONS REQUIREMENTS

The single, most important conclusion to be drawn from the study is the reinforcement of the belief in the dependence of future applications on data communications. Approximately 70 percent of the identified advanced applications (74 out of 198) involved transmission of digital or analogue data to or from remote locations. Also, many of the remaining applications were associated with planning models which would probably be embedded in communication oriented information systems. The method and extent of use of data communications varies widely. Some applications involve interconnection between computer systems; others need large numbers of terminals for input and output; still others are composed of networks of remote sensors and controllers; and, of course, any combination of these.

Thirty-three applications specified the interconnection of remote processors to form computer networks. These networks would provide for remote access to data bases, the interchange of information, passage of control (as in a nationwide air traffic control system), load leveling, and distribution of load to specialized processors (process control, communication processors, general purpose, etc.).

The need for a hardware/software system for control of interconnected networks of computers was identified in 29 applications. This requirement was rated as "Necessary" by 70 percent of the respondents and as a "Definite Asset" by 20 percent with the need becoming widespread in the 1978-1980 time period. This system addresses the complexities of interconnecting computer systems. It must resolve which processor is in control of the network and be able to shift that control to other processors in the event of malfunction. Interchange standards must be provided to enable remote data base access, remote execution, and remote output of results. Translation may be necessary to accommodate heterogeneous processors. Switching, and store and forward may be required in networks where all processors are not directly connected to each other.

High capacity, two-way switched data channels was another specific requirement. This need was primarily associated with the advent of multiple application home terminals. The data channels were considered to be extensions of the one-way, non-switched capabilities provided by Cable Area Television (CATV). Because of the outgrowth from CATV the channels would probably be analogue rather than digital to accommodate television-like signals.

This requirement was rated as "Necessary" or a "Definite Asset" by 90 percent of the respondents with the need materializing in 1980 to 1985 in conjunction with home terminals. Five home terminal applications specified this need. There were ten other home terminal applications identified but not investigated which

would also require the capability. In addition, many of the other widespread communication applications such as Intra-Office Electronic Mail, Patent Searches, Universal Reservation Systems, etc. would also benefit although the need was not specifically identified for them.

The dilemma mitigating against early advent of home terminals as described by the respondents in their comments consisted of:

- The 1980-85 justification of relatively expensive home terminals rests on the availability of multiple applications.
- . Multiple applications will not be available unless there is high capacity, two-way switched channels.
- . High capacity, two-way switched channels depend upon there being multiple applications sources.

The conclusion suggested by the respondents is that home terminals will either wait until terminal and communication costs are substantially reduced or until the government provides incentives through subsidy or regulation.

An effort was made by the respondents to give a broad indication of the magnitude of the traffic requirements associated with 30 of the data communications oriented applications. The traffic was expressed in terms of the number of logical lines needed to handle the application. This can be interpreted as the number of simultaneous transactions in process during peak periods.

For 90 percent of the high traffic applications, orders of magnitudes for the number of lines were identified. Figure 4.2 illustrates the distribution of applications and required dates over line magnitudes.

#### REQUIRED NUMBER OF LINES

	1,000	10,000	100,000	Unspecified
Requesting Applications	6	17	4	3
Date Required	1975-77	1978-80	1981-85	1978-80
	Figure 4	• 2		

There is an apparent growth of one order of magnitude about every three years starting in 1976. A look at the four applications citing 100,000 lines shows that they are made up of applications having a very widespread usage, such as Checkless Society or Home CAI. Therefore, it is reasonable to conclude that 10,000 lines

will handle most applications with a relatively few applications going to the order of 100,000 lines.

Networks for monitoring sensors and providing closed-loop control are another important aspect of communication requirements. Eight applications specifically identified sensor networks. Figure 4.3 lists the applications in sequence of descending breadth of coverage, worldwide, nationwide, city-wide and plant-wide.

	Date	Breadth	Sensors	Lines	Control
Automated Weather Fore- casting	78-80	MA	-	-	Мо
Air Pollution Prediction	81-85	MM	-	10,000	Мо
Railroad Car Tracking	<b>78-8</b> 0	$11N_1$	-	-	No
Computer Controlled Trains	78-80	31.14	-	10,000	Yes
Air Pollution Monitor- ing	75 <b>-</b> 77	CW	-	10,000	Мо
Automated Traffic Control	78-80	CW	100,000	-	Yes
Out Patient Monitor	81-85	CM	esso	10,000	Ио
Automated Process Plant	81-85	PW	100,000	-	Yes

Figure 4.3

Figure 4.3 also identifies the required date, the number of sensors or lines, when cited, and whether the application includes closed-loop control. The distribution of these various parameters form no discernible trend, but does clearly recognize the need for such networks beginning in 1978.

# COMMUNICATION REQUIREMENTS

# Pages Capabilities and Applications

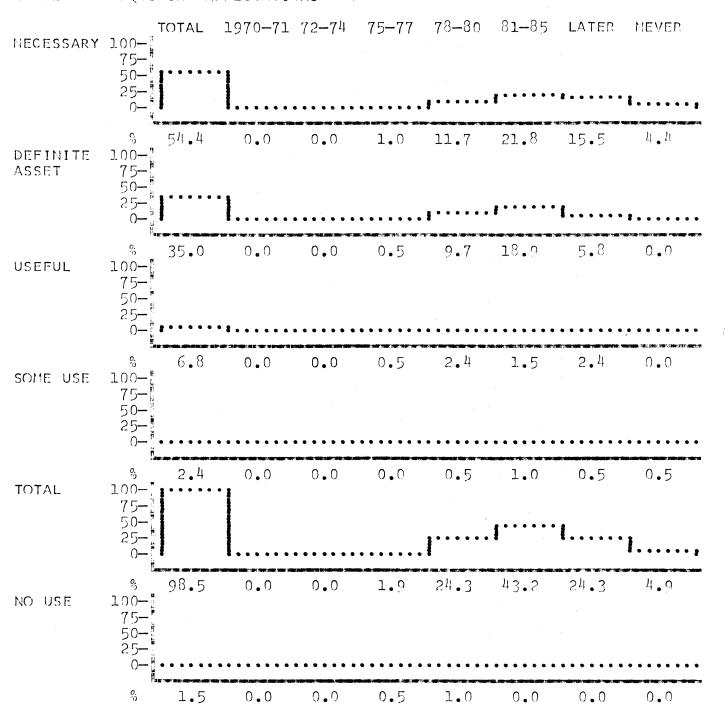
	MASSIVE COMMUNICATIONS INTERFACE - 100,000 LINES
III.49	III.94 HOME COMPUTER ASSISTED INSTRUCTION
III.57	CHECKLESS SOCIETY
III.91	
<i>III</i> .162	
111.102	OTTION DEBOTIONIO MAIN DERIVION
	MASSIVE COMMUNICATIONS INTERFACE - 10,000 LINES
III.8	AGRICULTURE INFORMATION AND ADMINISTRATION SYSTEM
III.36	AIR POLLUTION PREDICTION
III.40	POLLUTION MONITORING SYSTEMS
III.45	COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS
III.60	FINANCIAL UTILITY
III.62	INTEGRATED FINANCIAL SERVICE SYSTEM
III.67	COMPUTER CONTROL OF FREIGHT AND PASSENGER TRAINS
III.71	RAILROAD CAR TRACING, TRACKING AND ALLOCATION
<i>III</i> .82	GOVERNMENT OPERATING LOTTERIES AND PARI-MUTUAL BETTING
III.95	HOME SHOPPING SERVICES
<i>III</i> .103	AUTOMATED PLANT INFORMATION SYSTEMS
<i>III</i> .116	GOVERNMENT ACTIVITIES INFORMATION UTILITY
<i>III</i> .119	LAW SEARCH
<i>III</i> .124	
<i>III</i> .125	
III.146	
III.146 III.156	
111.130	OUI-PAILENI MONIIONING
	MASSIVE COMMUNICATIONS INTERFACE - 1,000 LINES
III.54	AUTOMATED STOCK TRANSFER
III.61	
III.69	INTERCONNECTED SHIPPERS AND CARRIER SYSTEMS
III.114	
III.118	JOB PLACEMENT SERVICES
III.161	COMPUTERIZED TYPING STATIONS
	WARREND GOVERNMENT ON A TRANSPORT OF THE TRANSPORTED
TTT 50	MASSIVE COMMUNICATIONS INTERFACE - UNSPECIFIED
III.79	AUTOMATED WEATHER FORECASTING
	III.148 INTERACTIVE NEWS AND ENTERTAINMENT
III.117	INFORMATION RETRIEVAL UTILITIES
	MASSIVE SENSOR NETWORK
III.71	RAILROAD CAR TRACING, TRACKING AND ALLOCATION
III.137	· · · · · · · · · · · · · · · · · · ·
III.166	
III.167	

# Pages Capabilities and Applications

		NETWORK $CONTROL$
<i>III</i> .30	<i>III</i> .65	AUTOMATED FREIGHT TERMINALS
III.54		AUTOMATED STOCK TRANSFER
III.57		CHECKLESS SOCIETY
<i>III</i> .59		CREDIT TRANSFER (GIRO) SYSTEM
III.60		FINANCIAL UTILITY
III.67		COMPUTER CONTROL OF FREIGHT AND PASSENGER TRAINS
<i>III</i> .69		INTERCONNECTED SHIPPERS AND CARRIER SYSTEMS
<i>III</i> .70		NATIONWIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS
III.71		RAILROAD CAR TRACING, TRACKING AND ALLOCATION
	<i>TTT</i> .113	AUTOMATED PUBLIC LIBRARIES
III.81		DEFENSE AGAINST A 100 MISSILE SALVO ATTACK
III.84		HUMAN RESOURCE SYSTEMS
<i>III</i> .86		NATIONWIDE AIR TRAFFIC CONTROL
	<i>III</i> .120	NATIONWIDE DRIVER AND VEHICLE DATA BANK
<i>III</i> .88		NATIONAL HEALTH INSURANCE SYSTEMS
III.90		NATIONWIDE VOTER REGISTRATION
III.91		PERSONAL DATA BANKS
<i>III</i> .105		HEALTH INFORMATION SYSTEMS
<i>III</i> .108		NATIONWIDE POLICE INFORMATION SYSTEM
III.109		STATE HEALTH INFORMATION SYSTEMS
<i>III</i> .118		JOB PLACEMENT SERVICES
III.122		PROFESSIONAL LITERATURE SEARCH SYSTEMS
<i>III</i> .124		UNIVERSAL RESERVATION SYSTEMS
III.125		VACATION AND TRAVEL PLANNING SYSTEMS
III.136		AUTOMATED MANUFACTURING PLANT
<i>III</i> .140		CUSTOMER QUALITY ASSURANCE
III.146		AUTOMATED SUBSCRIPTION SERVICE
III.158		VERTICALLY INTEGRATED HEALTH CARE DELIVERY SYSTEM
III.162		OFFICE ELECTRONIC MAIL SERVICE
		TWO WAY, HIGH CAPACITY, DATA CHANNELS
<i>TTT</i> . <b>u</b> 9	<i>TTT</i> . 94	HOME COMPUTER ASSISTED INSTRUCTION
III.95		HOME SHOPPING SERVICES
	<i>III</i> .148	INTERACTIVE NEWS AND ENTERTAINMENT
III.97	,,0	MULTIPLE USE HOME TERMINAL
<i>III</i> .98		ELECTRONIC DELIVERY OF HARD COPY

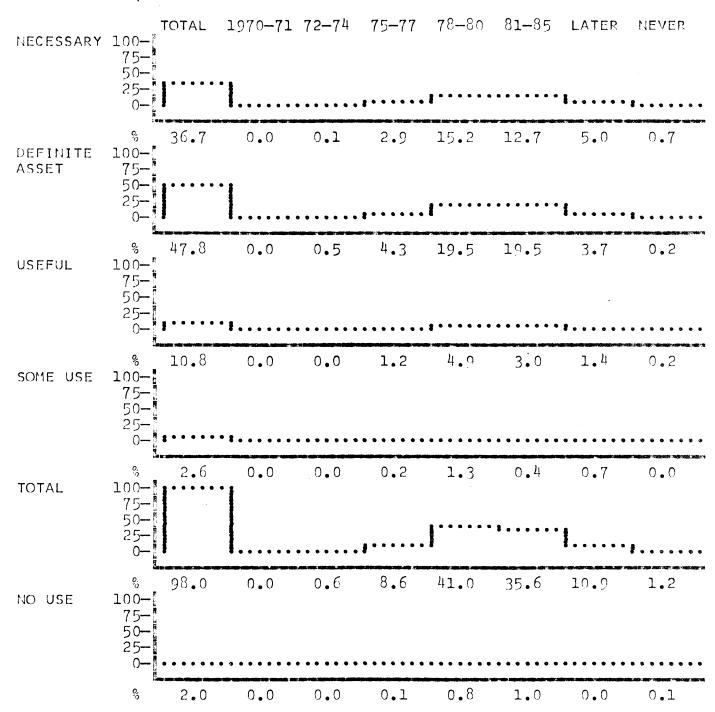
# MASSIVE COMMUNICATIONS INTERFACE - 100,000 LINES

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 3.24 2.54 2.85 0.92



# MASSIVE COMMUNICATIONS INTERFACE - 10,000 LINES

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.26 2.66 2.63 0.46



# MASSIVE COMMUNICATIONS INTERFACE - 1,000 LINES

TO

WILL

NOT BE

PROFITABLE SUSEFUL

TO

2.4

0.0

0.0

IMPACT

NO

SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 1.87 3.02 2.75 NUMBER OF REQUIRING APPLICATIONS - 6 TOTAL 1970-71 72-74 75-77 78-80 81-85 LATER NECESSARY 100-50-56.9 0.3 0.0 1.0 15.5 9.7 30.0 DEFINITE 100-**ASSET** 75 50-4.1 4.8 1.0 21.7 0.0 1.0 10.7 0.0 USEFUL 100-75-50-5.2 0.3 17.2 0.0 0.3 9.7 1.7 0.0 SOME USE 100-75-50-0.3 1.7 0.0 0.3 1.0 0.0 0.0 0.0 TOTAL 100-75-50-97.6 2.8 46.2 16.2 1.4 0.0 30.3 0.7 NO USE 100-75-50-25-

1.7

0.3

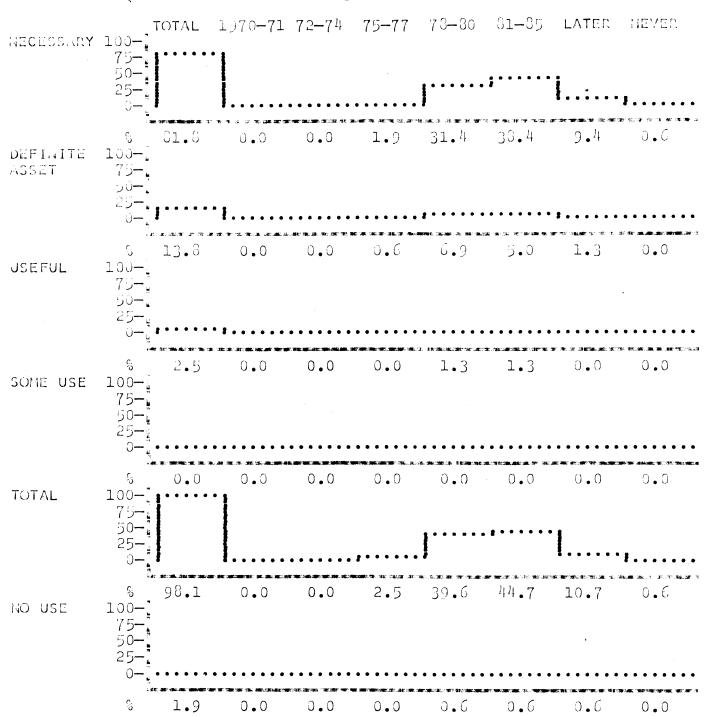
0.3

0.0

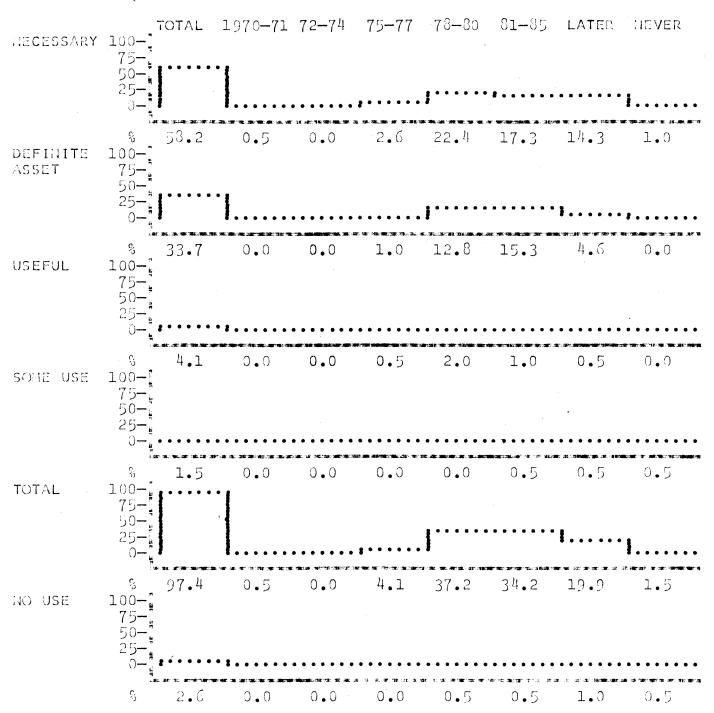
0.0

# MASSIVE COMMUNICATIONS INTERFACE - UNSPECIFIED

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.34 2.27 2.66 0.76

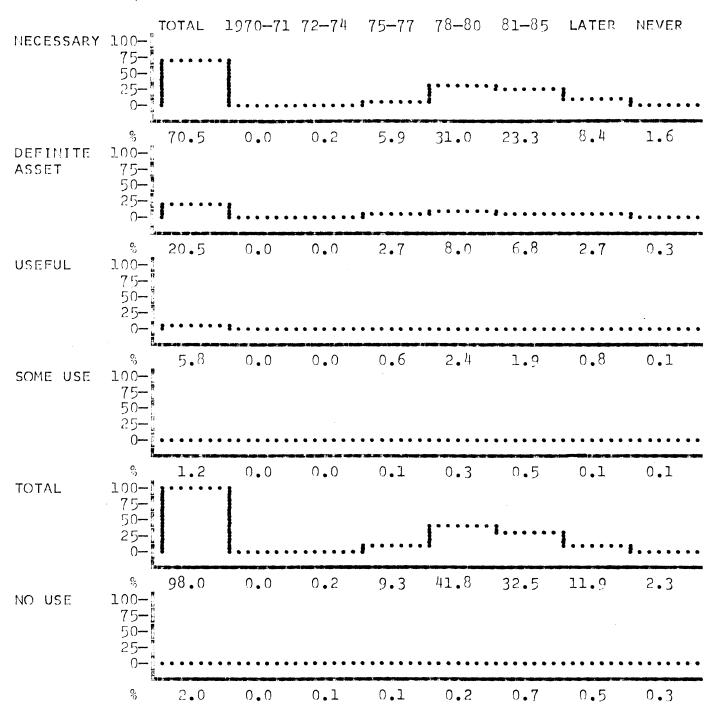


IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.51 2.64 2.78 0.66



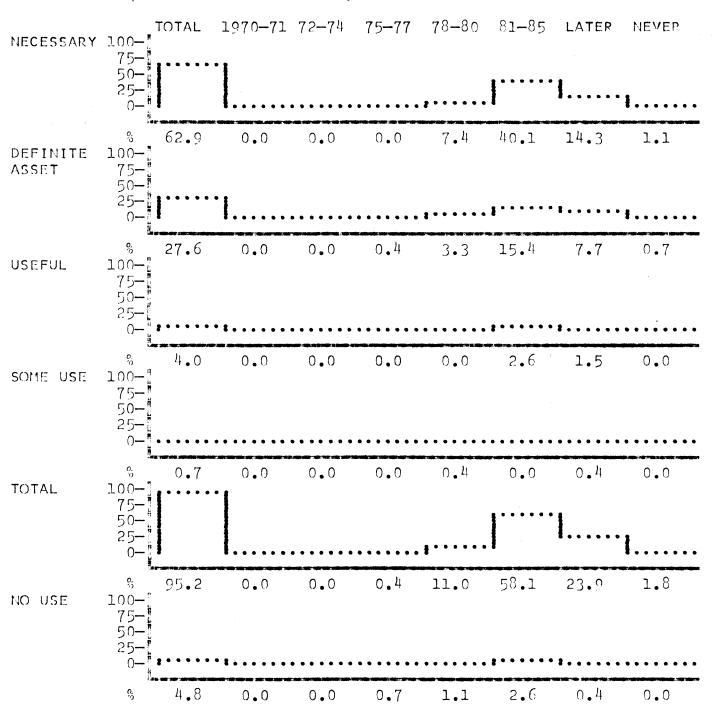
#### METWORK CONTROL

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.52 2.54 2.71 0.58



# TWO WAY, HIGH CAPACITY, DATA CHANNELS

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.55 2.36 2.73 0.75



## TERMINAL CAPABILITIES

Associated with the widespread use of data communications will be a multitude of terminals. Many of these terminals will be special purpose or will have special features required to accomplish specific applications. The respondents identified a number of these requirements.

For example, two types of terminals were specified to automate airline passenger services. The first would be designed to provide fare and schedule quotations, make reservations, and sell tickets and is capable of being operated by the general public. The second terminal would aid in automating passenger check-in and boarding control. It would read and accept previously purchased tickets and control access to the airplane. The terminals were judged to be "Necessary" by 1975-77 when at least one airline will have automated its passenger services.

The advent of store level retail systems will create a demand for point-of-sale terminals starting in 1975-77 and peaking in 1978-80. From these terminals, purchases will be recorded and perhaps priced, credit checks will be made, and eventually payment via the Checkless/Cashless Society may be initiated. To accomplish this, the terminals will require a method for reading price tags and/or package labels. There may also be input from scales such as might be used in weighing produce. A positive method of identification will be required if the terminal is to also be the payment vehicle. Initially, present visual verification of signatures and/or photographs may suffice; but ultimately, the system via the terminal must be capable of making the identification. The respondents have suggested voice prints, fingerprints, and even retina prints as a means of identification.

For air traffic control the respondents suggested that it would be a "Definite Asset" to have a three-dimensional display capability with which the system could interact, available by 1978-80.

There is a clear need for Computer Assisted Instruction (CAI) not only in the academic environment but also for industrial, business and military training and even for home education. To accomplish this in the 1978-30 time period, a special CAI terminal was rated as either "Necessary" or as a "Definite Asset" by 90 percent of the respondents. Such a terminal would have the ability to display printed, graphical and pictorial (television-like) data and to provide optional audio output. Interaction would be via functional and/or typewriter keyboards, and light pen or other pointer sensors.

The 1980-85 home terminal requires multiple functions to accomplish the range of applications foreseen. The applications suggested ranged over such ones as the relatively simple Home Shopping,

Voluminous output Customized Periodicals, heavily interactive Home CAI, and remotely controlled appliances. The terminal would be modular to fit the varying consumer needs. Since the primary impetus will have been generated by CATV, the terminal will be basically a television-like display. User interaction will be primarily via light pen or other pointer devices and functional keyboards because of their ease of use. Some applications such as Home Work Centers and CAI will require a full keyboard. Hard copy output will be required for electronic mail delivery and customized periodicals. Control of appliances requires input and output of analogue signals. Interactive News and Entertainment requires customized broadcasts. To accomplish this, the individually addressed transmissions would have to be at high speed with the terminal recording the transmission for later playback at normal speed.

The terminal requirements identified in the study indicated a need for specialized terminals and/or modular terminals that can be customized to accommodate future communication oriented applications.

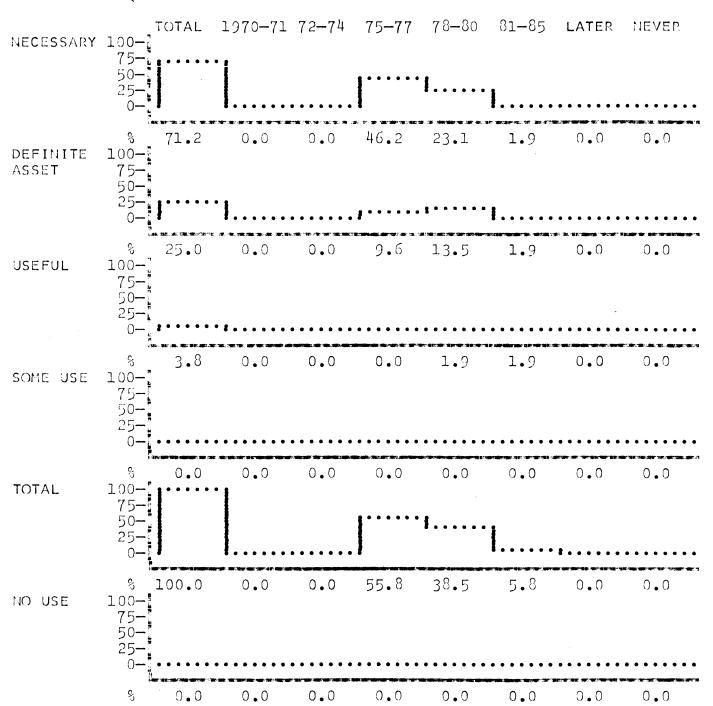
# TERMINAL CAPABILITIES

Pages		Capabilities and Applications
III.12		AIRLINE CHECK IN TERMINAL AUTOMATED AIRLINE PASSENGER SERVICES SYSTEM
<i>III</i> .12		AIRLINE TICKET TERMINAL AUTOMATED AIRLINE PASSENGER SERVICES SYSTEM
III.95	<i>III</i> .94 <i>III</i> .148	CATV TERMINAL  AGRICULTURE INFORMATION AND ADMINISTRATION SYSTEM  HOME COMPUTER ASSISTED INSTRUCTION  HOME SHOPPING SERVICES  INTERACTIVE NEWS AND ENTERTAINMENT  MULTIPLE USE HOME TERMINAL
III.18 III.45 III.46		CAI TERMINAL  COMPUTER ASSISTED INSTRUCTION - ON THE JOB TRAINING  COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS  COMPUTER ASSISTED TESTING AND GUIDANCE COUNSELING
III.76 III.108	<i>III</i> .102	FINGERPRINT SCANNER AUTOMATED FINGERPRINT ANALYSIS NATIONWIDE POLICE INFORMATION SYSTEM
<i>III</i> .125		LOW COST TERMINALS S20-30/MONTH VACATION AND TRAVEL PLANNING SYSTEMS
III.78 III.98 III.121 III.162		HARD COPY GRAPHICAL OUTPUT AUTOMATED PUBLIC LIBRARIES ELECTRONIC DELIVERY OF HARD COPY PATENT SEARCH OFFICE ELECTRONIC MAIL SERVICE
<i>III</i> .86	•	INTERACTIVE 3-DIMENSIONAL DISPLAY NATIONWIDE AIR TRAFFIC CONTROL
<i>III</i> .114		MEDIUM SPEED TERMINAL \$200/MONTH COMMERCIAL DATA PROCESSING SERVICES

Pages	Capabilities and Applications
	PACKAGE LABEL READERS
<i>III</i> .32	RETAIL TERMINAL SYSTEMS
<i>III</i> .33	SUPERMARKET CHECKOUT SYSTEMS
III.70	NATIONWIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS
	POINT OF SALE TERMINAL
<i>III</i> .32	RETAIL TERMINAL SYSTEMS
<i>III</i> .33	SUPERMARKET CHECKOUT SYSTEMS
III.57	CHECKLESS SOCIETY
	POSITIVE USER IDENTIFICATION
<i>III</i> .32	RETAIL TERMINAL SYSTEMS
<i>III</i> .57	CHECKLESS SOCIETY
III.59	CREDIT TRANSFER (GIRO) SYSTEM
III.95	HOME SHOPPING SERVICES
<i>III</i> .162	OFFICE ELECTRONIC MAIL SERVICE
	CODAMDIE MDANGMICION
	SCRAMBLE TRANSMISION
III.162	OFFICE ELECTRONIC MAIL SERVICE

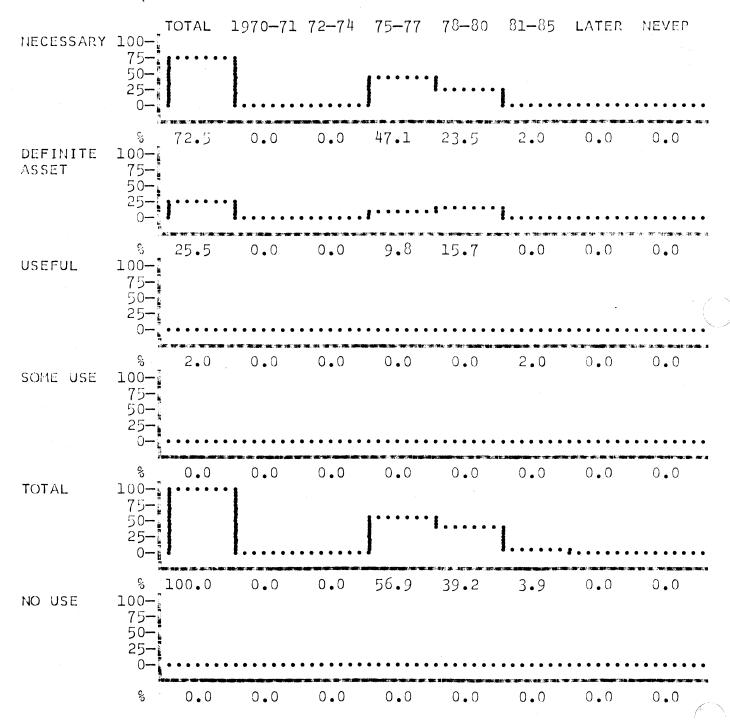
### AIRLINE CHECK IN TERMINAL

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 1.58 2.98 2.97 0.14



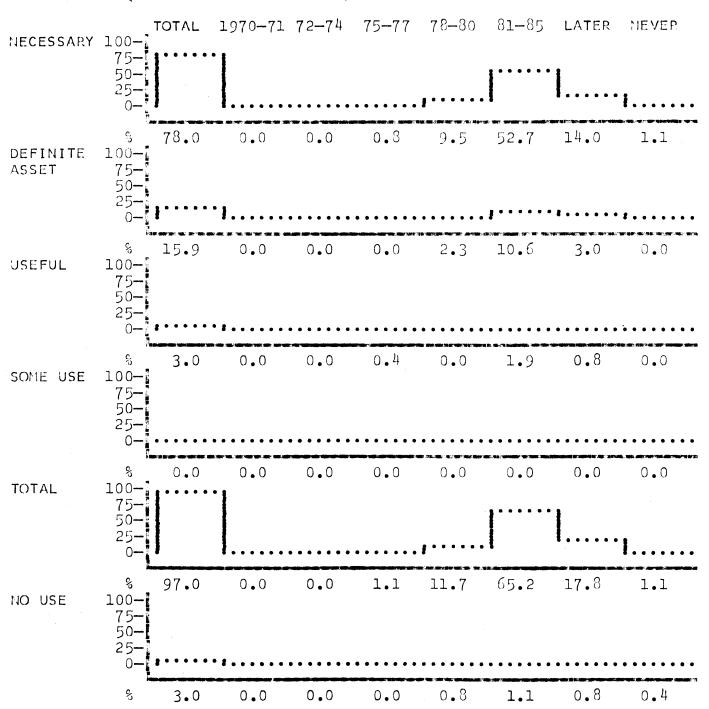
### AIRLINE TICKET TERMINAL

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
1.58 2.98 2.97 0.14



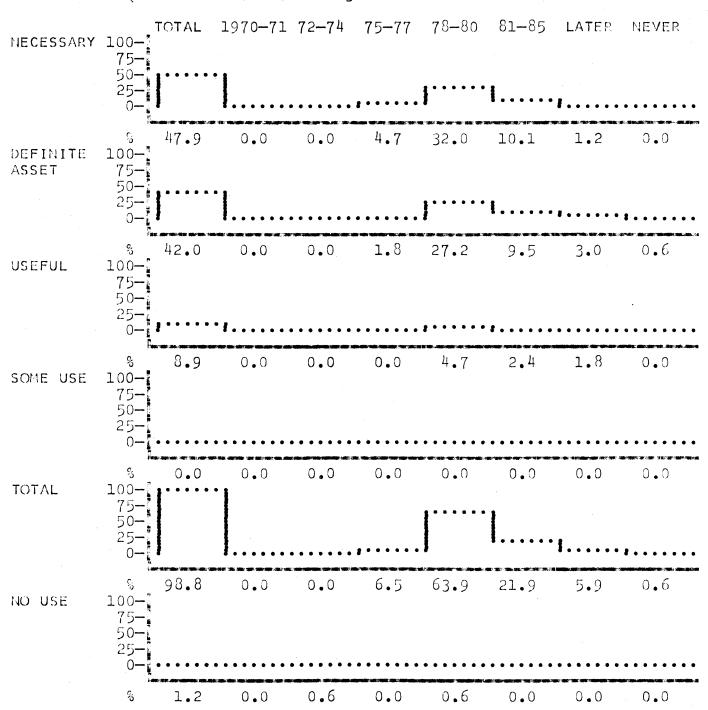
# CATV TERMINAL

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.50 2.47 2.70 0.69



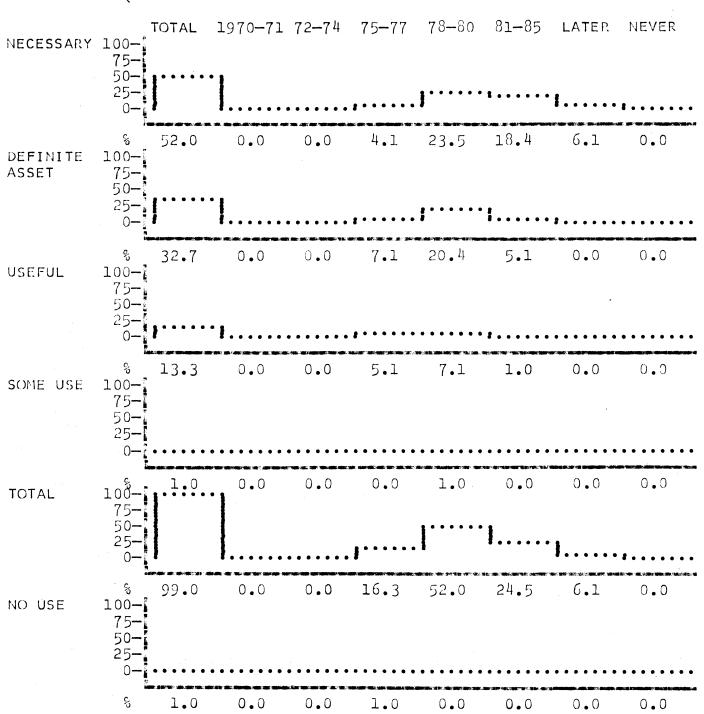
### CAI TERMINAL

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
3.07 2.77 3.22 0.22

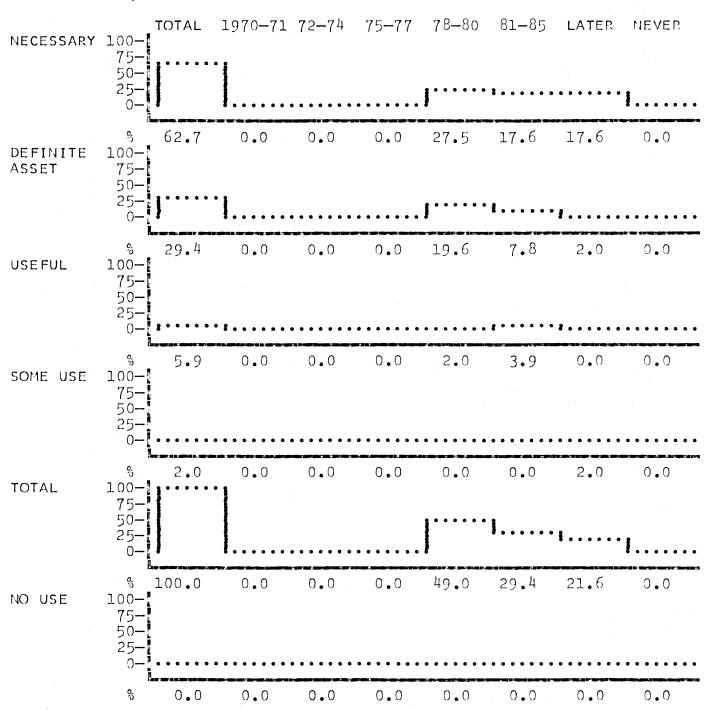


# FINGERPRINT SCANNER

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.99 2.41 3.20 0.23

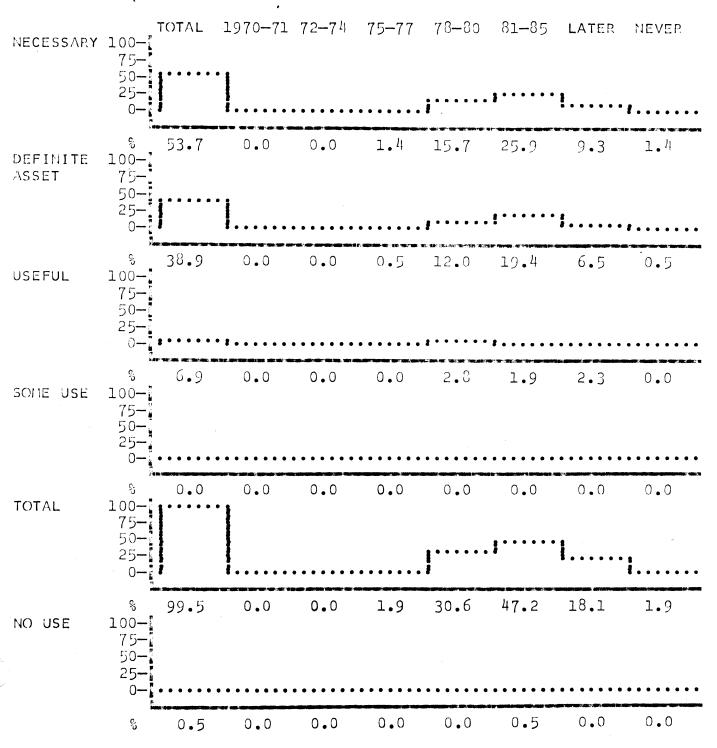


IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
1.52 2.52 2.76 0.32



# HARD COPY GRAPHICAL OUTPUT

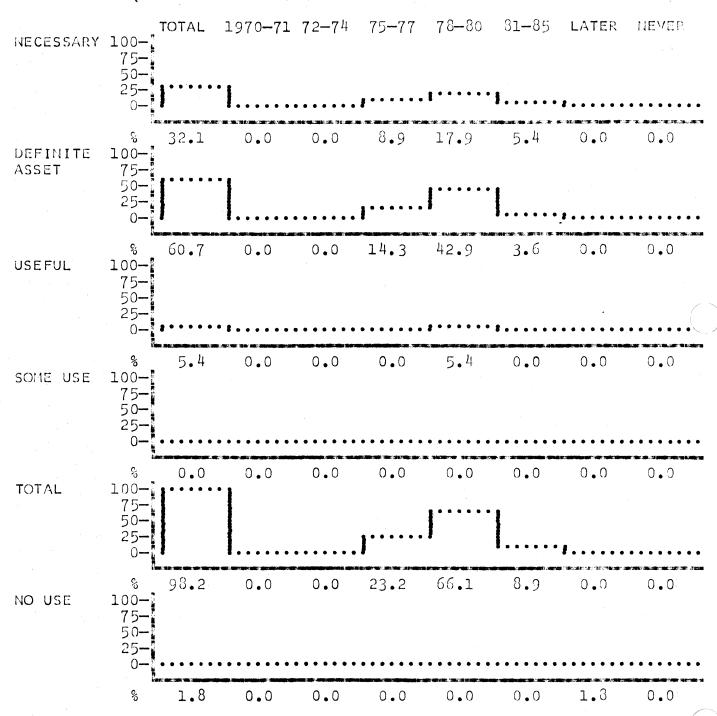
IMPACT PROFITABLE USEFUL WILL
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2.14 2.41 2.67 0.53



IV.26

### INTERACTIVE 3-DIMENSIONAL DISPLAY

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 3.41 3.14 4.38 0.07



### MEDIUM SPEED TERMINAL \$200/MONTH

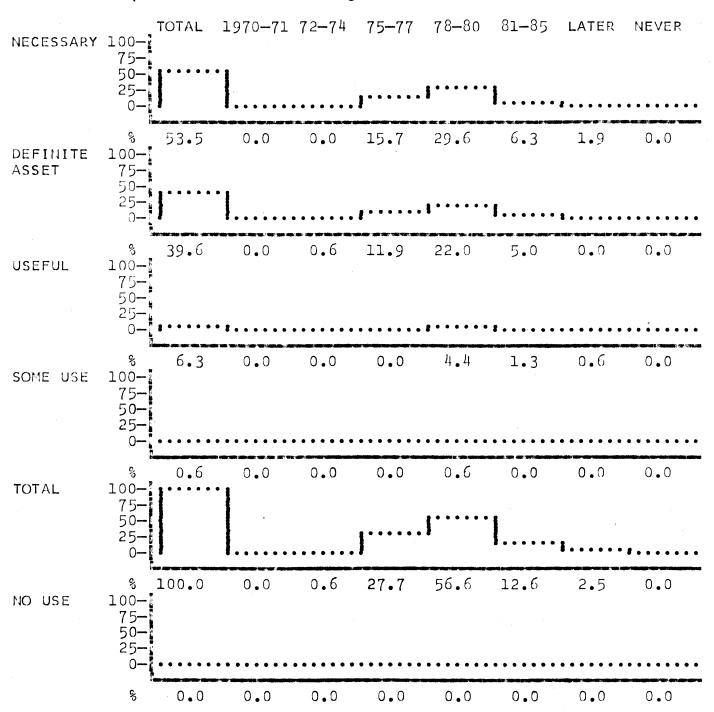
USEFUL

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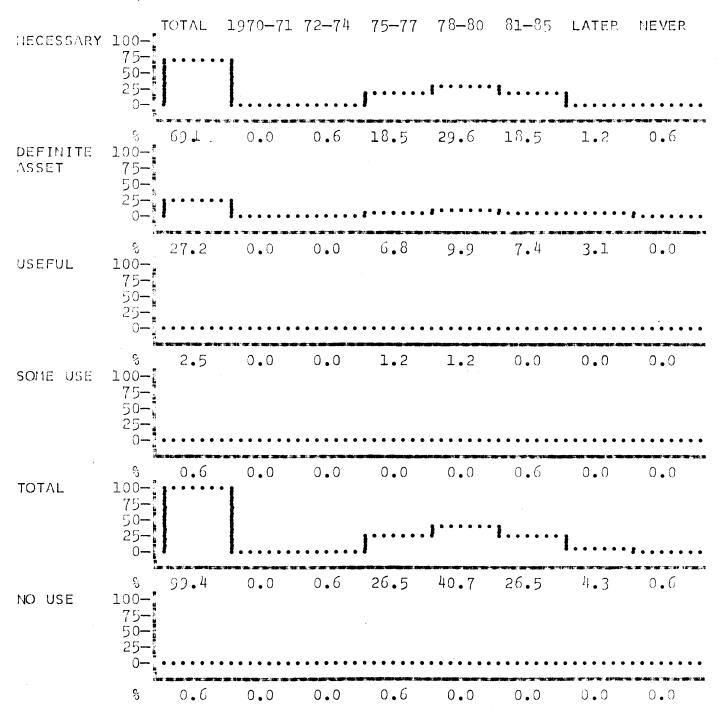
### PACKAGE LABEL READERS

IMPACT PROFITABLE USEFUL WILL
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2.01 3.35 2.55 0.37

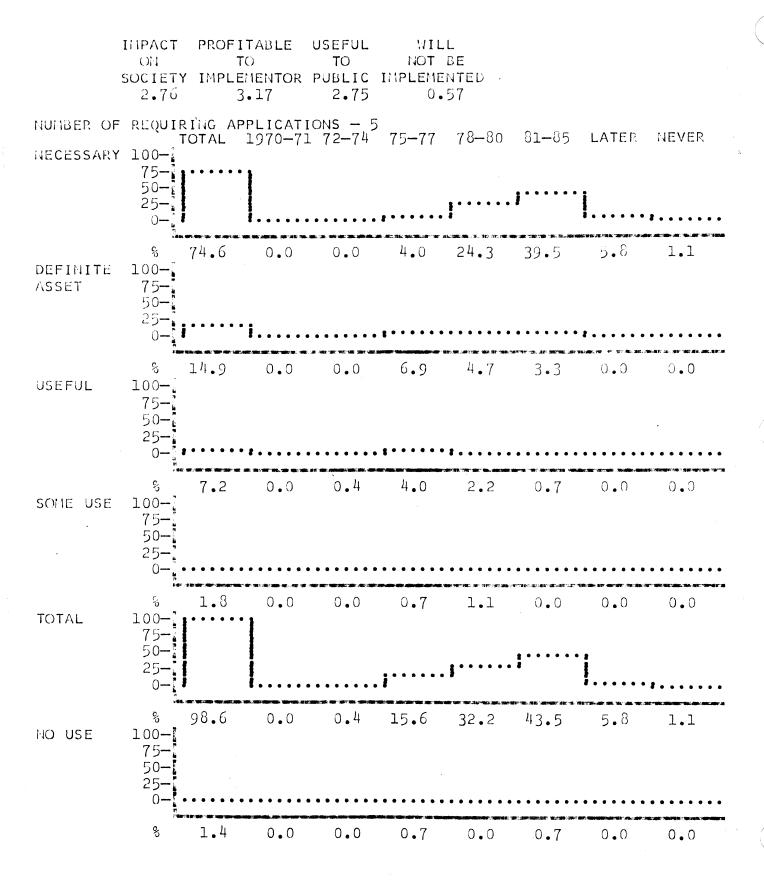


### POINT OF SALE TERMINAL

IMPACT PROFITABLE USEFUL WILL NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.43 3.14 2.37 0.64



#### POSITIVE USER IDENTIFICATION



### SCRAMBLE TRANSMISION

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WILL

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IMPACT PROFITABLE USEFUL

TO

SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.84 3.40 3.56 NUMBER OF REQUIRING APPLICATIONS - 1 TOTAL 1970-71 72-74 75-77 78-80 81-85 LATER NEVER NECESSARY 100-75-50-Ç, 63.0 0.0 0.0 1.9 29.6 25.9 3.7 1.9 DEFINITE 100-75-**ASSET** 50-25-0,0 29.6 0.0 18.5 9.3 0.0 1.9 0.0 0.0 **USEFUL** 100-75-1 50-25-95 7.4 7.4 0.0 0.0 0.0 0.0 0.0 0.0 100-E 75-E SOME USE 50-1 25-1 ć 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 TOTAL 100-75-50-25-6 100.0 0.0 0.0 3.7 55.6 35.2 3.7 1.9 NO USE 100-75-50-25-0o S 0.0 0.0 0.0 0.0 0.0 0.0 0.0

#### DATA BASE REQUIREMENTS

Requirements associated with data bases were the most pervasive need of all the required capabilities. This reflects the fact that 66 out of the 108 applications specified very large data bases, ranging from 10 billion bytes to 1 trillion bytes with one case calling for 100 trillion bytes.

The need for 10 billion to 1 trillion byte sizes becomes wide-spread in the 1978 to 1980 time period. There was a pronounced trend for the larger data base sizes to be assigned a higher degree of necessity. This suggests that for applications requiring 100 billion to 1 trillion bytes that data storage is the key requirement. Applications using 10 billion bytes or less appear to use large storage as an implementation convenience.

The 100 trillion byte data base was required for the "Personal Data Bank" application and must contain complete information files for the entire U.S. population. Twenty-five percent of the respondents judged this application to be in the "Never" category indicating some doubt as to whether it would ever be implemented.

The ability to search large data bases rapidly was also identified. As expected, the need occurred in the same time frame as for large data bases, 1978 and beyond. The degree of necessity was concentrated in the "Definite Asset" category. The speed requirements were cited in terms of search engines capable of performances ranging from 10 to 10,000 times as fast as today's capabilities. Only one application required a "Search Engine" of 1,000 times today's power and only two, Patent Search and Law Search asked for 10,000 times. The conclusion is that a hundred-fold increase will accommodate most applications.

Thirty-six applications cited the need for advanced data base management capabilities to better control data bases. Included in the criteria were:

- Data Independence making it possible to change the data base organization without changing the programs.
- Dynamic Reorganization the ability for the system to reorganize all or part of the data base dynamically, thus providing better overall responses to sensed demands or to provide preferential service for designated applications.
- Data Base Protection protection of the data base against inadvertent or malicious alteration or destruction.

- Dynamic Recovery the ability to dynamically correct errors or loss of the data base with little or no operator intervention.
- . Data Base Security the ability to monitor and control access to the data base so as to permit only authorized access to the data.

The need for these capabilities was judged by 71 percent of the respondents to be "Necessary." This need starts in 1975 and carries through 1985 in conjunction with the need for very large data bases. Only 11 out of the 36 applications requiring advanced data base facilities also required data bases of 100 billion or more. This fact coupled with the 1975 need for data base management, leads to the conclusion that data base management facilities have wide use and are not limited to massive data bases.

An advanced capability associated with data base requirements is the need for a system to automatically generate and reorganize information systems. This includes the programs and data base organizations needed to provide optimum implementation. Input to the system would be descriptions and timing of known and anticipated inputs and outputs together with expected usage statistics. Logical relationships between fields would be part of the descriptions. Data base organizations and program generation would be done on the basis of the relationships between known inputs and outputs. The system must maintain statistics on actual relationship usage. Periodically the system would re-optimize, generating new programs and data base organizations to reflect the latest statistics.

This capability was judged to be a "Definite Asset" with the need concentrated toward the later part of the 1978-1985 time period. This late date reflects the obvious difficulties in creating such a system as well as the sheer size and complexity of the advanced applications.

In summary, the need for advanced data base management facilities is required in 1975 which is before the widespread use of large, trillion byte data bases. The next step after 1978, to large, complex, dynamic information systems, may have to await the creation of automatic programming systems and very fast search engines.

# DATA BASE REQUIREMENTS

# Pages Capabilities and Applications

	ADVANCED DATA BASE MANAGEMENT
<i>III</i> .21	ENTERPRISE SIMULATION
	AUTOMATED WAREHOUSES
<i>III</i> .32	RETAIL TERMINAL SYSTEMS
III.47	COMPUTER MANAGED INSTRUCTION
<i>III</i> .55	BANK RESERVE REQUIREMENTS MODEL
III.56	BANKING SERVICE SYSTEM
III.57	CHECKLESS SOCIETY
III.58	COMMERCIAL LOAN CREDIT SCORING
III.59	CREDIT TRANSFER (GIRO) SYSTEM
III.60	FINANCIAL UTILITY
III.62	INTEGRATED FINANCIAL SERVICE SYSTEM
III.67	COMPUTER CONTROL OF FREIGHT AND PASSENGER TRAINS
III.68	FREIGHT RATE SERVICE
III.69	INTERCONNECTED SHIPPERS AND CARRIER SYSTEMS
III.70	NATIONWIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS
III.70 III.79	AUTOMATED WEATHER FORECASTING
	NATIONWIDE DRIVER AND VEHICLE DATA BANK
III.88	NATIONAL HEALTH INSURANCE SYSTEMS
<i>III</i> .89	NATIONAL LAND INVENTORY
III.91	PERSONAL DATA BANKS
III.103	
III.105 III.105	HEALTH INFORMATION SYSTEMS
III.103	MANAGEMENT INFORMATION SYSTEMS
	NATIONWIDE POLICE INFORMATION SYSTEM
III.100 III.109	STATE HEALTH INFORMATION SYSTEMS
III.114	COMMERCIAL DATA PROCESSING SERVICES
III.117	INFORMATION RETRIEVAL UTILITIES
III.118	JOB PLACEMENT SERVICES
III.119	LAW SEARCH
III.124	UNIVERSAL RESERVATION SYSTEMS
III.125	VACATION AND TRAVEL PLANNING SYSTEMS
III.136	AUTOMATED MANUFACTURING PLANT
III.141	PRODUCT DEVELOPMENT SIMULATION SYSTEM
<i>III</i> .155	MULTI-PHASIC SCREENING
<i>III</i> .157	PREVENTIVE MEDICINE DIAGNOSTIC CENTERS
III.158	VERTICALLY INTEGRATED HEALTH CARE DELIVERY SYSTEM
111.130	VERTICALE INTEGRALED HEREIN ORRE DESERVERT SISTER
	AUTOMATED GENERATION OF INFORMATION SYSTEMS
III.80 III.104	CONSOLIDATED PUBLIC WELFARE SYSTEMS
<i>III</i> .84	HUMAN RESOURCE SYSTEMS
<i>III</i> .103	AUTOMATED PLANT INFORMATION SYSTEMS
<i>III</i> .107	MANAGEMENT INFORMATION SYSTEMS
<i>III</i> .109	STATE HEALTH INFORMATION SYSTEMS
	DISEASE INFORMATION SYSTEMS
III.117	INFORMATION RETRIEVAL UTILITIES
III.130	PENAL AND PAROLE INFORMATION SYSTEMS

# Pages Capabilities and Applications

<i>III</i> .91		MASS DATA STORAGE - 100 TRILLION BYTES PERSONAL DATA BANKS
III.78 III.79 III.86 III.108 III.117 III.119 III.121 III.122 III.122		MASS STORAGE - 1 TRILLION BYTES AUTOMATED PUBLIC LIBRARIES AUTOMATED WEATHER FORECASTING NATIONWIDE AIR TRAFFIC CONTROL NATIONWIDE POLICE INFORMATION SYSTEM STATE HEALTH INFORMATION SYSTEMS INFORMATION RETRIEVAL UTILITIES LAW SEARCH PATENT SEARCH PROFESSIONAL LITERATURE SEARCH SYSTEMS OFFICE ELECTRONIC MAIL SERVICE
III.25 III.26 III.27 III.30 III.36 III.38 III.38 III.39 III.54 III.57		MASS STORAGE - 100 BILLION BYTES  COMPUTER ASSISTED OCEANOGRAPHY  COMPUTER COORDINATED TESTING OF MEDICAL DRUGS  RESEARCH MONITORING FOR ECOLOGICAL EFFECTS  AUTOMATED FREIGHT TERMINALS  AIR POLLUTION PREDICTION  ECOLOGICAL BALANCE CALCULATIONS  ECOLOGICAL BALANCE CALCULATIONS  ECOLOGICAL PLANT SCHEDULING  AUTOMATED STOCK TRANSFER  CHECKLESS SOCIETY
III.59 III.60 III.61 III.62 III.70 III.71		CREDIT TRANSFER (GIRO) SYSTEM  FINANCIAL UTILITY  INSURANCE SUPPORT SYSTEM  INTEGRATED FINANCIAL SERVICE SYSTEM  NATIONWIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS  RAILROAD CAR TRACING, TRACKING AND ALLOCATION
III.80 III.83 III.87 III.88		CONSOLIDATED PUBLIC WELFARE SYSTEMS GOVERNMENTAL PLANNING SYSTEMS FOR DEVELOPING COUNTRIES NATIONWIDE DRIVER AND VEHICLE DATA BANK NATIONAL HEALTH INSURANCE SYSTEMS
III.89 III.90 III.98 III.103		NATIONAL LAND INVENTORY NATIONWIDE VOTER REGISTRATION ELECTRONIC DELIVERY OF HARD COPY AUTOMATED PLANT INFORMATION SYSTEMS HEALTH INFORMATION SYSTEMS
<i>III</i> .107	<i>III</i> .154	LEGISLATIVE SYSTEMS MANAGEMENT INFORMATION SYSTEMS DISEASE INFORMATION SYSTEMS GOVERNMENT ACTIVITIES INFORMATION UTILITY UNIVERSAL RESERVATION SYSTEMS VACATION AND TRAVEL PLANNING SYSTEMS

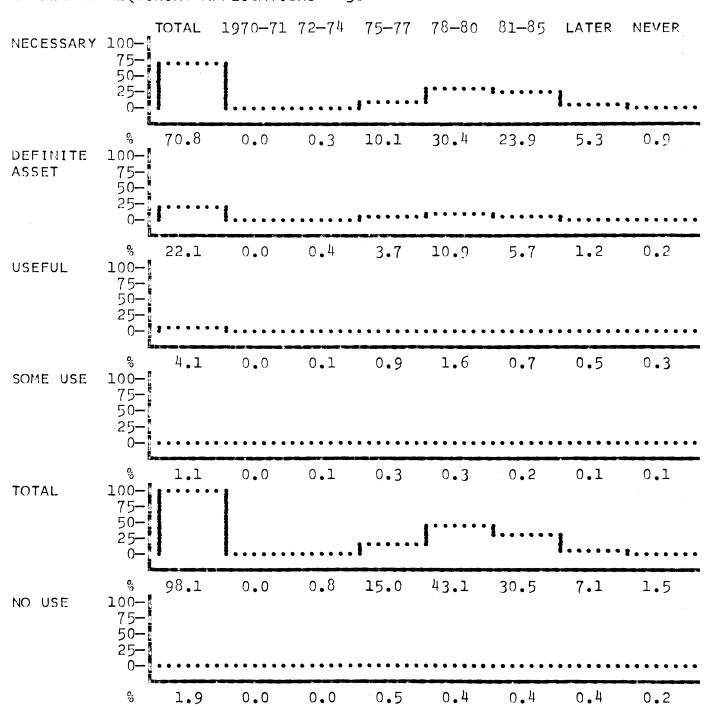
Pages	Capabilities and Applications
III.130 III.134 III.135 III.136 III.137 III.141 III.146 III.157 III.158 III.171 III.173	MASS STORAGE - 100 BILLION BYTES CONT.  PENAL AND PAROLE INFORMATION SYSTEMS AUTOMATED DESIGN ENGINEERING AUTOMATED MANUFACTURING ENGINEERING AUTOMATED MANUFACTURING PLANT AUTOMATED PROCESS MANUFACTURING PLANT PRODUCT DEVELOPMENT SIMULATION SYSTEM AUTOMATED SUBSCRIPTION SERVICE PREVENTIVE MEDICINE DIAGNOSTIC CENTERS VERTICALLY INTEGRATED HEALTH CARE DELIVERY SYSTEM NATIONWIDE POWER GRID) UTILITY USAGE RECORDING SYSTEM
III.85 III.118 III.123 III.1 III.151 III.151	MASS STORAGE - 10 BILLION BYTES AUTOMATED AIRLINE PASSENGER SERVICES SYSTEM COMPUTER-ASSISTED LABOR/MANAGEMENT NEGOTIATIONS COMPUTER-ASSISTED TESTING AND GUIDANCE COUNSELING BANKING SERVICE SYSTEM COMMERCIAL LOAN CREDIT SCORING COMMERCIAL LOAN CREDIT SCORING 02 AUTOMATED FINGERPRINT ANALYSIS METROPOLITAN PLANNING MODELS JOB PLACEMENT SERVICES 72 TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS CLINICAL DECISION SUPPORT SYSTEMS CLINICAL DECISION SUPPORT SYSTEMS MULTI-PHASIC SCREENING AUTOMATED MASS TRANSIT SYSTEMS
<i>III</i> .161	MASS DATA STORAGE - 1 BILLION BYTES COMPUTERIZED TYPING STATIONS
<i>III</i> .119 <i>III</i> .121	SEARCH ENGINE - 10,000 TIMES MORE POWERFUL LAW SEARCH PATENT SEARCH
III.117	SEARCH ENGINE - 1,000 TIMES MORE POWERFUL INFORMATION RETRIEVAL UTILITIES

# Pages Capabilities and Applications

		SEARCH ENGINE - 100 TIMES MORE POWERFUL
III.78	<i>III</i> .113	AUTOMATED PUBLIC LIBRARIES
III.80	<i>III</i> .104	CONSOLIDATED PUBLIC WELFARE SYSTEMS
III.98		ELECTRONIC DELIVERY OF HARD COPY
<i>III</i> .108		NATIONWIDE POLICE INFORMATION SYSTEM
III.109		STATE HEALTH INFORMATION SYSTEMS
III.118		JOB PLACEMENT SERVICES
III.122		PROFESSIONAL LITERATURE SEARCH SYSTEMS
III.123	<i>III</i> .172	TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS
III.134		AUTOMATED DESIGN ENGINEERING
III.135		AUTOMATED MANUFACTURING ENGINEERING
		SEARCH ENGINE - 10 TIMES MORE POWERFUL
III.19		COMPUTER-ASSISTED LABOR/MANAGEMENT NEGOTIATIONS
III.38		ECOLOGICAL BALANCE CALCULATIONS
III.58		COMMERCIAL LOAN CREDIT SCORING
III.107		MANAGEMENT INFORMATION SYSTEMS
III.116		GOVERNMENT ACTIVITIES INFORMATION UTILITY

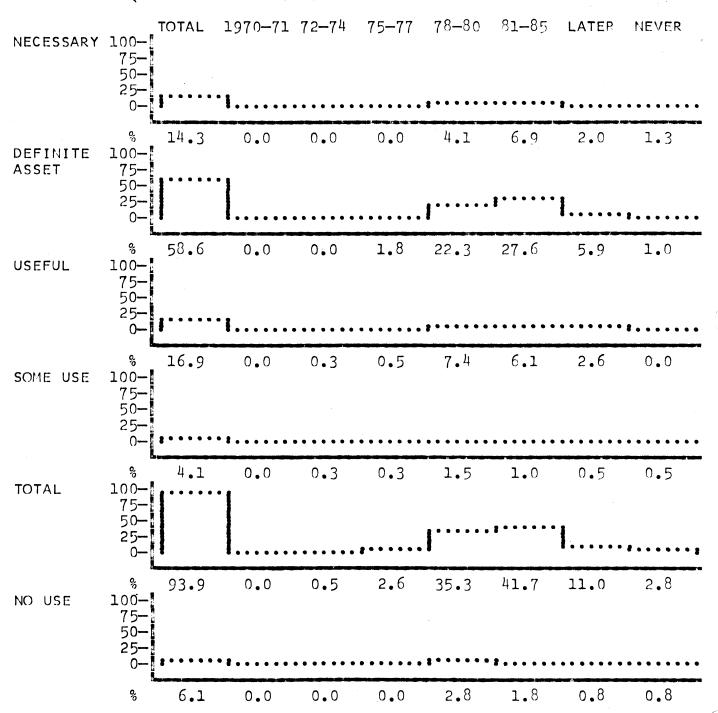
# ADVANCED DATA BASE MANAGEMENT

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2.37 2.75 2.59 0.47



### AUTOMATED GENERATION OF INFORMATION SYSTEMS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.43 2.42 2.51 0.54



# MASS DATA STORAGE - 100 TRILLION BYTES

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SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 3.19 1.56 1.83 NUMBER OF REQUIRING APPLICATIONS - 1 TOTAL 1970-71 72-74 75-77 78-80 81-85 LATER NECESSARY 100-50-6.3 64.6 87.5 0.0 14.6 0.0 0.0 2.1 DEFINITE 100-**ASSET** 75-50-0.0 2.1 0.0 0.0 0.0 0.0 USEFUL 100-75-50-6.3 2.1 0.0 0.0 2.1 SOME USE 100-75-50-2.1 0.0 0.0 0.0 0.0 0.0 2.1 TOTAL 100-75-50-25 8.3 68.8 0.0 0.0 2.1 2.1 16.7 97.9

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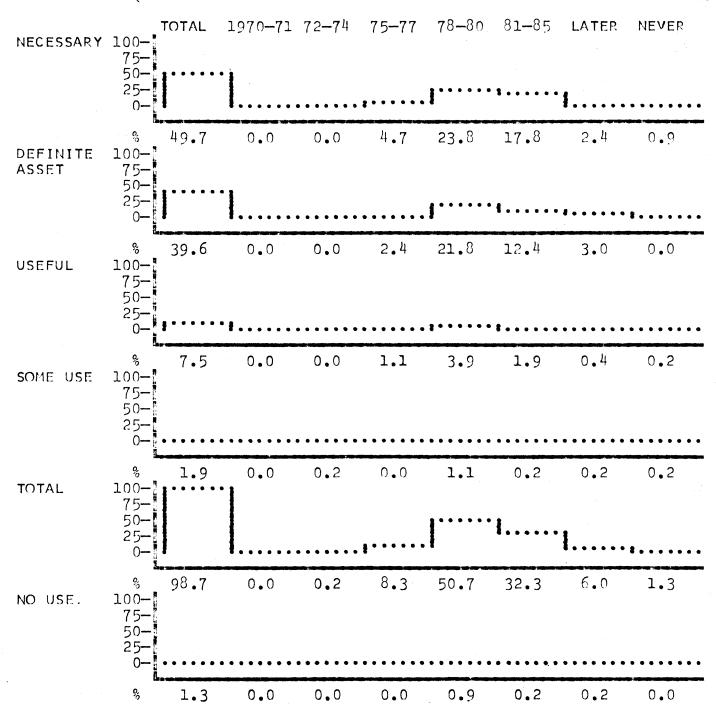
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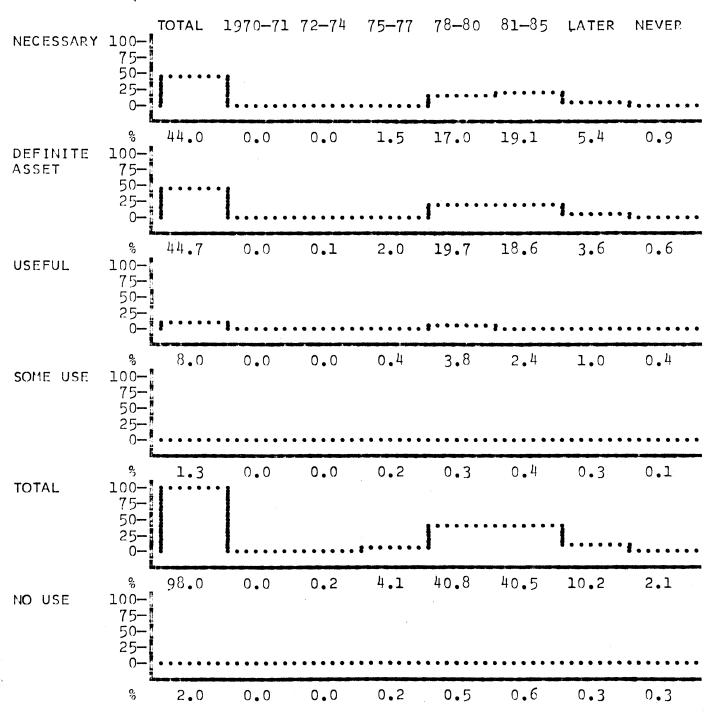
### MASS STORAGE - 1 TRILLION BYTES

IMPACT PROFITABLE USEFUL WILL
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2.58 2.49 3.03 0.40



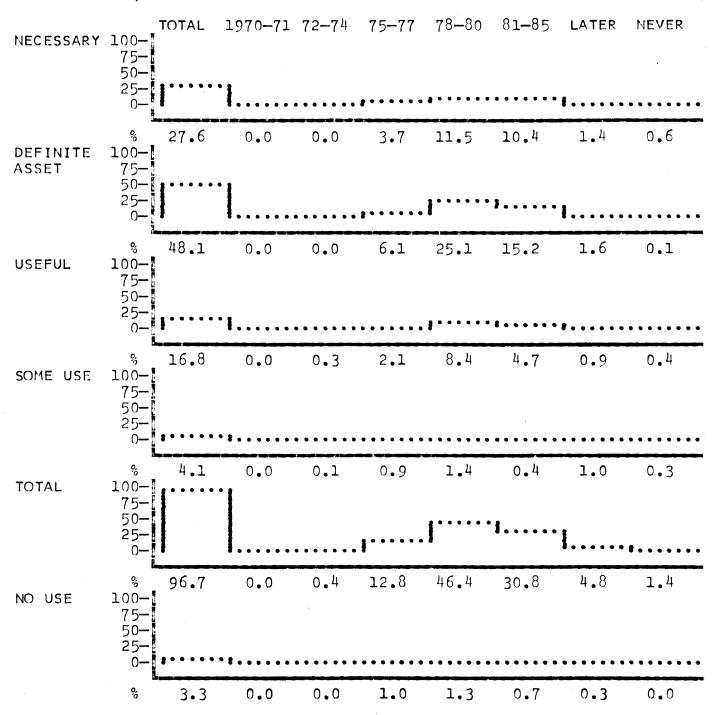
### MASS STORAGE - 100 BILLION BYTES

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2.40 2.61 2.59 0.59



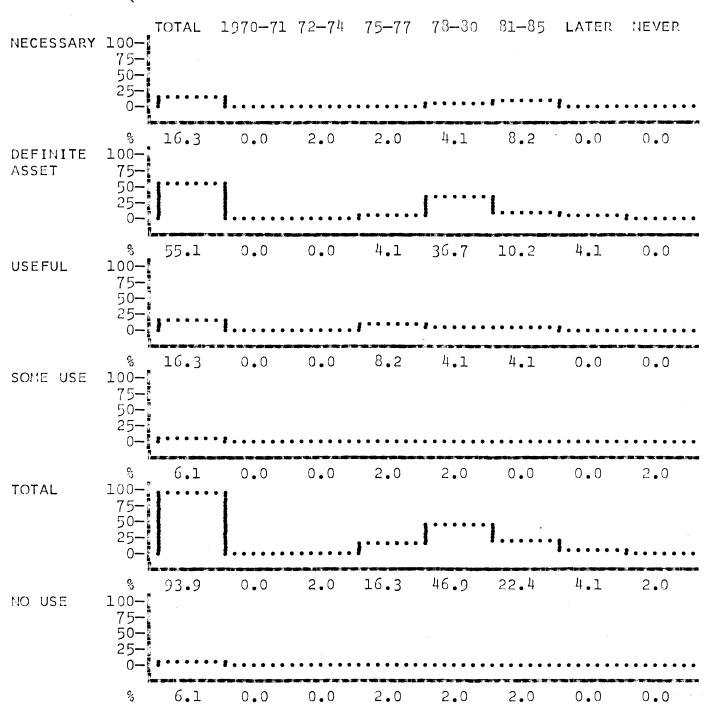
# MASS STORAGE - 10 BILLION BYTES

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2.44 2.56 2.92 0.33



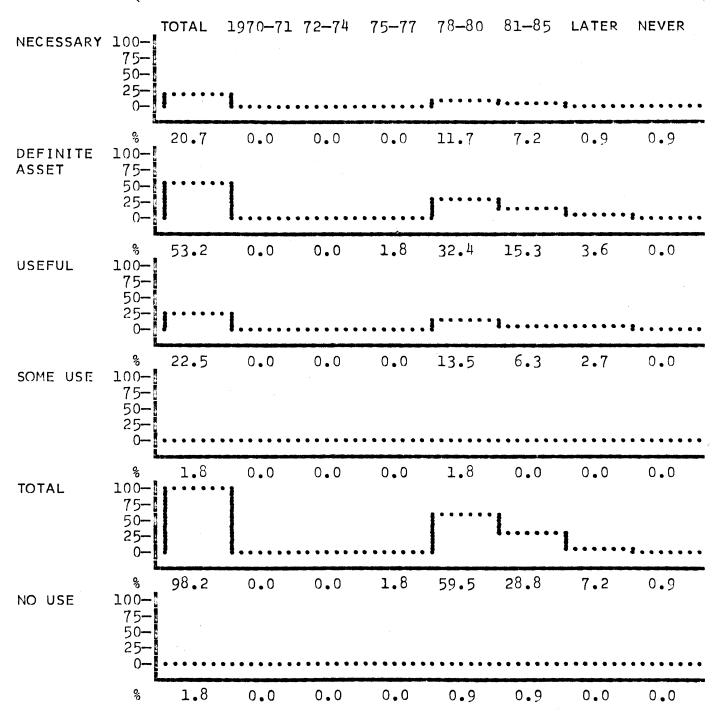
# MASS DATA STORAGE - 1 BILLION BYTES

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
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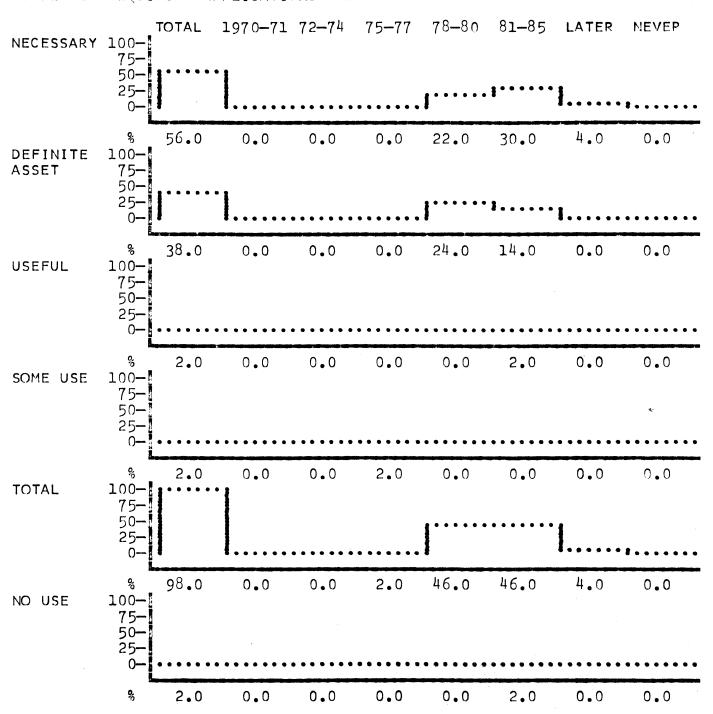
# SEARCH ENGINE - 10,000 TIMES MORE POWERFUL

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.05 2.62 2.52 0.29



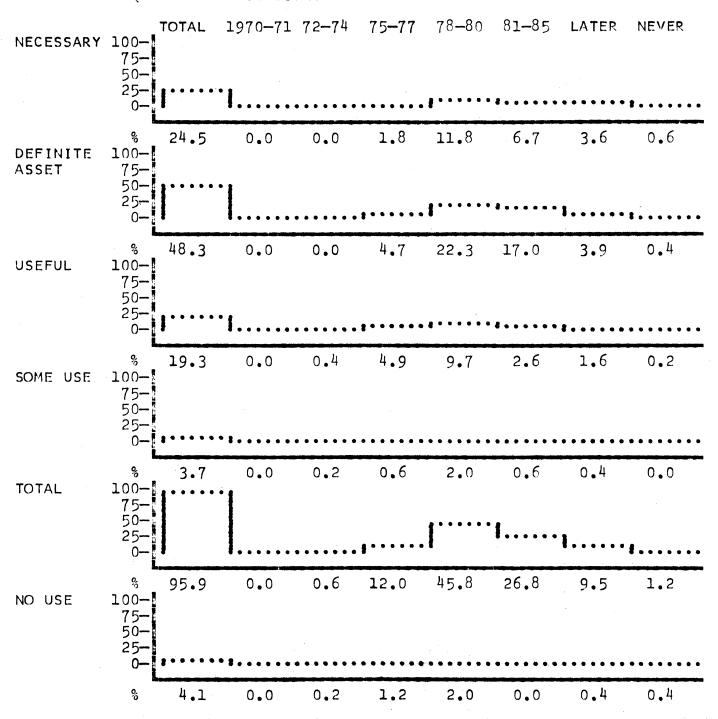
# SEARCH ENGINE - 1,000 TIMES MORE POWERFUL

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
1.82 2.65 2.17 0.42



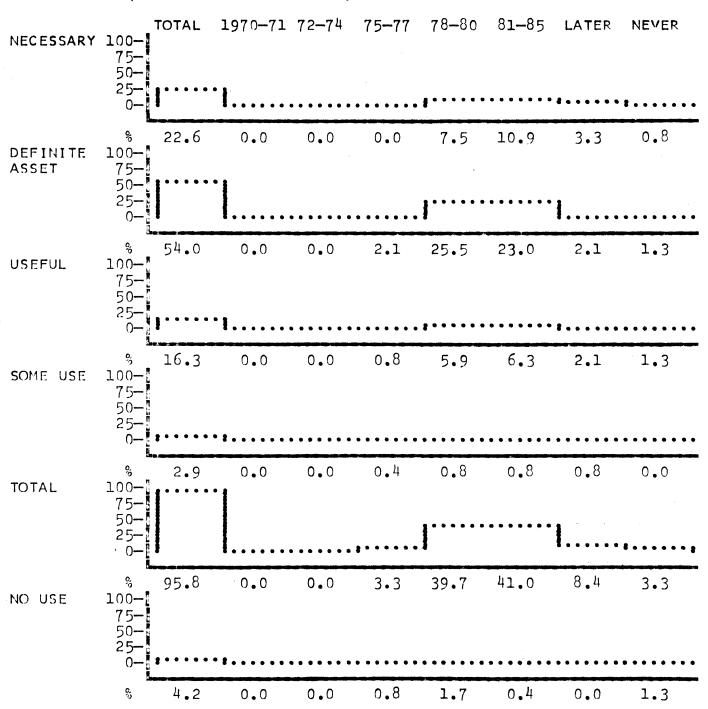
### SEARCH ENGINE - 100 TIMES MORE POWERFUL

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SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.38 2.42 2.67 0.46



# SEARCH ENGINE - 10 TIMES MORE POWERFUL

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SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.25 2.46 2.34 0.53



#### CAPACITY AND AVAILABILITY

The study was designed to predict future data processing needs independent of technological constraints. To accomplish this the respondents were given a set of future price/performance curves derived from published articles. (Figure 5.6 page V.8). They were asked to use the curves to determine the implementation dates where price/performance was the determining factor. These price/performance sensitive applications are listed in Appendix D.

For any of the applications listed in Appendix D, its required levels of price/performance are by definition found at the intersection of the forecasted date and the curves. Furthermore, if different price/performance curves are available, they may be used to adjust the implementation dates for these applications. However, the price/performance curves represent only the requirements for stand-alone implementation of any of these applications. It should be recognized that there are very few one application shops. Therefore, the total systems performance requirement will be greater because it will reflect the aggregation of conventional and advanced applications to be run on the system.

For applications which were not price/performance sensitive, the respondents identified the major requirements explicitly. Three applications: Missile Defense, Long Range Weather Forecasting, and Air Pollution Prediction are large Federal applications and had leading-edge performance requirements. Internal performance for the three ranged from 30 to 1000 MIPS (Millions of Instructions Per Second.) Missile Defense needed response times in microseconds and Weather Forecasting required 10 million bytes of internal storage. These needs were rated as "Necessary" or a "Definite Asset" for the 1978-85 time frame.

High availability was of paramount concern in those applications where there was risk of death or injury, or where substantial financial risks exist, as in the controlling of entire plants, or where great numbers of terminal users would be disrupted by outages. Availability ranged from "no outages of more than I hour" for automated warehouses and freight terminals to essentially "no-fail systems" for air traffic control and automated landings and take-offs.

The applications had varying requirements when considering frequencies of outage and duration. Automated plants were more concerned about avoiding any interruption requiring plant shutdown than they were in the duration of down time. On the other hand, terminal systems concentrated on concern about duration of outage. Those dealing with customers at the terminal required no interruptions with more than one minute discernible at the terminal. Others with more controlled users, i.e., employees, could tolerate up to 15 minutes duration.

Many of the advanced applications will require significantly better availability before they will be implemented. Furthermore, systems must include both longer mean time to failure and reduced duration of outage.

## CAPACITY AND AVAILABILITY

## Pages Capabilities and Applications

AUDIO RESPONSE - 1000 VOICE RESPONSES
III.123 III.172 TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS

		CORE STORAGE - 10 BILLION BYTES
<i>III</i> .79		AUTOMATED WEATHER FORECASTING
		HIGH $AVAILABILITY$
<i>III</i> .30	III.65	AUTOMATED FREIGHT TERMINALS
<i>III</i> .31		AUTOMATED WAREHOUSES
<i>III</i> .49		HOME COMPUTER ASSISTED INSTRUCTION
<i>III</i> .57		CHECKLESS SOCIETY
<i>III</i> .77		AUTOMATED LANDINGS AND TAKEOFFS
III.86		NATIONWIDE AIR TRAFFIC CONTROL
III.96	<i>III</i> .148	INTERACTIVE NEWS AND ENTERTAINMENT
<i>III</i> .124		UNIVERSAL RESERVATION SYSTEMS
<i>III</i> .136		AUTOMATED MANUFACTURING PLANT
<i>III</i> .156		OUT-PATIENT MONITORING
<i>III</i> .162		OFFICE ELECTRONIC MAIL SERVICE
<i>III</i> .166		AUTOMATED ROADWAYS
<i>III</i> .168		AUTOMOBILE COLLISION AVOIDANCE SYSTEMS
		HIGH PERFORMACE - 1000 MIPS
<i>III</i> .81		DEFENSE AGAINST A 100 MISSILE SALVO ATTACK
111,01		
		HIGH PERFORMACE - 100 MIPS
III.79		AUTOMATED WEATHER FORECASTING
		HIGH PERFORMANCE - 30 MIPS
III.36		AIR POLLUTION PREDICTION
		HIGH RESPONSE
<i>III</i> .81		DEFENSE AGAINST A 100 MISSILE SALVO ATTACK
TTT.01		Market to the first first first and the first fi

#### AUDIO RESPONSE - 1000 VOICE RESPONSES

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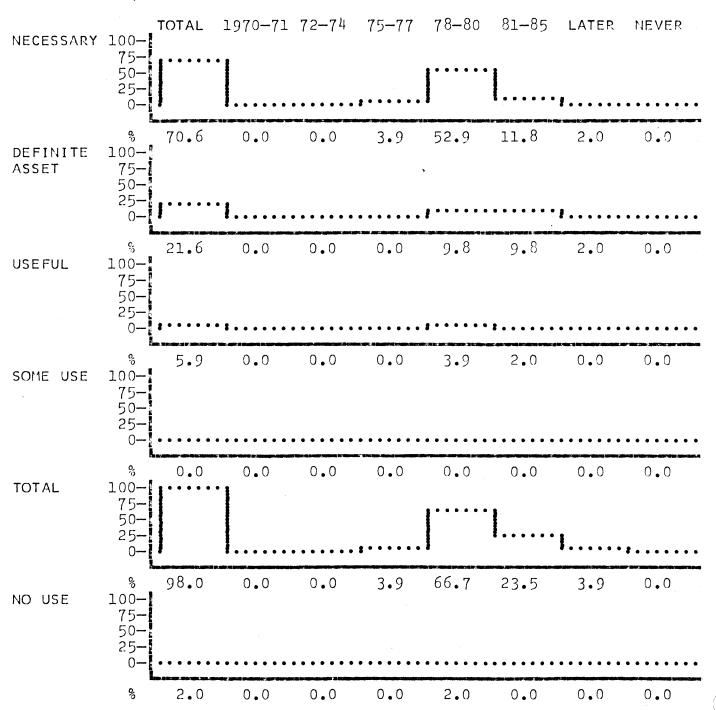
IMPACT PROFITABLE USEFUL

TO

2.62 2.80 2.00 NUMBER OF REQUIRING APPLICATIONS - 1 TOTAL 1970-71 72-74 75-77 73-80 81-85 LATER NEVER NECESSARY 100-1 75-50-61.8 0.0 0.0 5.5 38.2 12.7 5.5 100-DEFINITE ASSET 75-50-0.0 0.0 14.5 10.9 **3.**6 29.1 0.0 USEFUL 100-75-50-0.0 0.0 0.0 1.8 5.5 0.0 **3.**6 100-SOME USE 75-1 50-1 0.0 1.8 0.0 1.0 3.6 0.0 0.0 100-TOTAL 75-50-100.0 0.0 5.5 54.5 25.5 14.5 0.0 NO USE 100-1 75-50-0.0 0.0 0.0 0.0 0.0 0.0 0.0

#### CORE STORAGE - 10 BILLION BYTES

IMPACT PROFITABLE USEFUL WILL
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SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.89 2.28 3.61 0.44



#### HIGH AVAILABILITY

PROFITABLE USEFUL

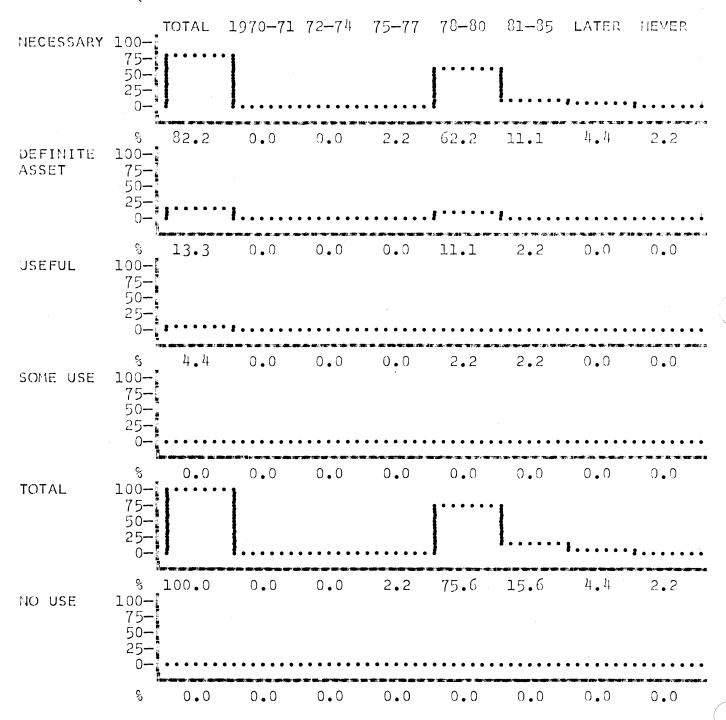
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NOT BE TO SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 2.54 2.68 2.65 0.88 NUMBER OF REQUIRING APPLICATIONS - 13 TOTAL 1970-71 72-74 75-77 78-80 81-85 LATER NEVEP NECESSARY 100-75-50-18.3 15.4 0.1 0.3 7.0 9.6 52.2 100-75-50-**ASSET** 4.6 0.0 0.0 8.3 17.9 37.3 **USEFUL** 100-75**-**50-6.7 2.0 2.4 0.0 0.0 1.0 1.1 SOME USE 100-75-50-0.0 0.3 0.4 0.4 1.3 0.1 0.0 100-[ TOTAL 75 50-97.6 0.1 0.3 12.8 29.4 36.2 17.4 1.4 NO USE 100-75-50-25-0.6 0.6 2.4 0.0 0.3 0.0 0.9 0.1

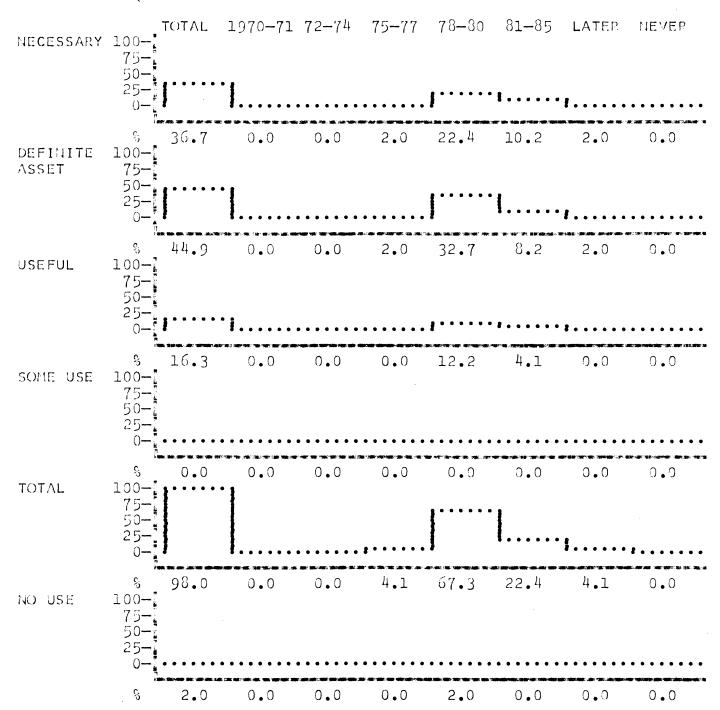
#### HIGH PERFORMACE - 1000 MIPS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.74 2.29 2.77 0.55



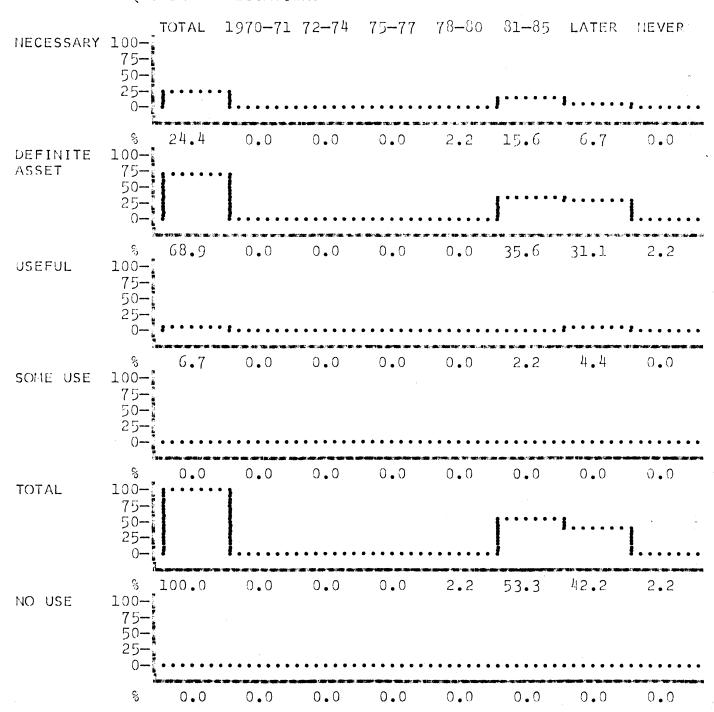
#### HIGH PERFORMACE - 100 MIPS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.39 2.28 3.61 0.44



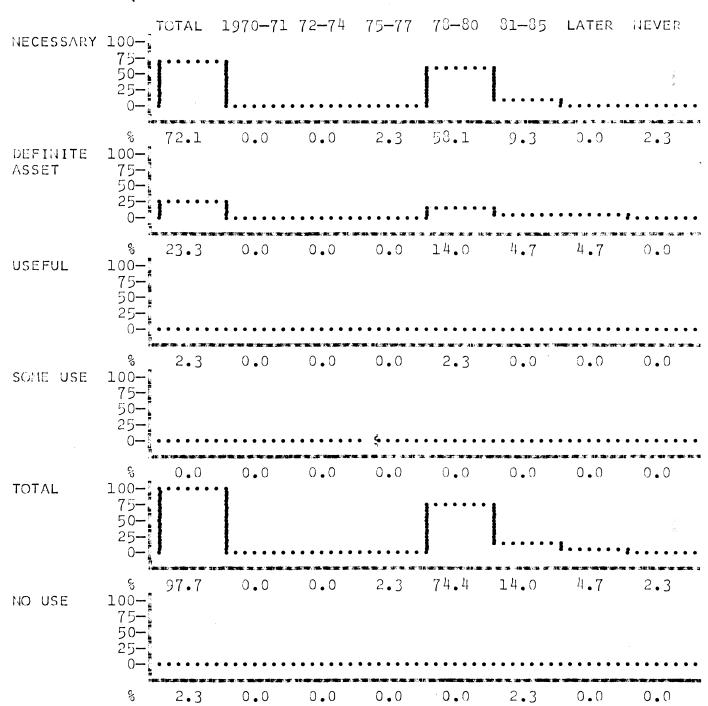
#### HIGH PERFORMANCE - 30 MIPS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
3.22 1.98 3.25 0.66



#### HIGH RESPONSE

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#### ADVANCED CAPABILITIES

A number of applications were dependent on capabilities which do not exist or exist in only rudimentary form in today's systems. These ranged from a security and privacy mechanism needed by some applications today to systems capable of making respectable scores on standard I.Q. tests.

The need for a security and privacy mechanism was found to be associated primarily with data base systems containing personal or proprietary information and with applications which would be attractive targets for fraud. This need becomes pronounced in 1975-77 and is an increasing requirement from 1978 on, as more of these types of applications are implemented.

Storage and manipulation of graphical data was identified by four applications. The need ranged up to one billion graphical pages for a Nationwide Police Information System. It was rated as a "Definite Asset" for the 1978-80 period.

Automated design and automated manufacturing engineering specified a need to have concise internal representations of three-dimensional objects. This permits capture and manipulation of information conventionally retained in blueprint files. The related capability for improved image processing was identified by two applications. These requirements are needed in 1978-80 and beyond.

Voice or handwriting input was requested by two applications and was rated as an "Asset" or "Useful." This would seem to indicate either that these capabilities are not needed or that the respondents did not believe they would come about in the 1975-85 time frame.

Three capabilities: Multi-Attribute Pattern Matching, Discovery Systems, and Heuristic Programming, contribute to the programming of applications typically thought to be in the exclusive domain of human intelligence. Multi-Attribute Pattern Matching permits a system to compare lists of attributes to determine similarities and best matches.

For example, human beings find it relatively easy to make near optimal layouts of dress patterns on a bolt of cloth; whereas, this is a very difficult operation to program on today's system. The reason is that people look at the whole pattern while computers are limited to serial element-by-element comparisons.

This example is one from a large class of problems occurring in most areas of present and future use of computers. Multi-Attribute Pattern Matching can be used wherever there is a need to make decisions based on applying patterns of experience and criteria to similar situations looking for best matches.

Discovery systems are extensions of Multi-Attribute Pattern Matching which would allow the system to selectively browse through data files looking for similar patterns. The system would then form

hypothesis of the underlying principles and relationships causing the similarities. Further selective browsing would serve to confirm or reject the hypothesis. Such systems would probably operate interactively so that an investigator could monitor and control the direction of search. Carried to the ultimate, Multi-Attribute Pattern Matching and Discovery Systems could enable systems to address typical I.O. test questions such as: "Wake is to Ship as Path is to ? A. Forest, B. Man, C. Boat, D. Automobile."

Heuristic Programming would provide the ability to create programs capable of learning on the basis of experience. In a sense, this is an extension of discovery systems. By storing workable patterns, a discovery system can form hypothesis of successful patterns and then select the best ones to match the situations. The application requesting Heuristic Programming envisions using this capability to train general purpose robots by manually cycling them through the necessary motions.

These capabilities were rated as "Necessary" or a "Definite Asset" starting in 1975-77 for the first two and 1978-80 for Heuristic Programming. The list of applications requiring these capabilities, as a group, could be classed as visionary and will require system breakthroughs to be implemented.

## ADVANCED CAPABILITIES

Pages		es	Capabilities and Applications	
	III.22 III.25 III.26 III.27 III.37 III.38 III.34	III.152 III.41	DISCOVERY SYSTEMS INVESTMENT MODELS COMPUTER ASSISTED OCEANOGRAPHY COMPUTER COORDINATED TESTING OF MEDICAL DRUGS RESEARCH MONITORING FOR ECOLOGICAL EFFECTS COMPUTERIZED WASTE DISPOSAL PLANTS ECOLOGICAL BALANCE CALCULATIONS AUTOMATED DESIGN ENGINEERING	
	<i>III</i> .47		HANDWRITING INPUT COMPUTER MANAGED INSTRUCTION	
	III.138 III.167		HEURISTIC PROGRAMMING AUTOMATED ROBOTS AUTOMATED TRAFFIC CONTROL	
	<i>III</i> .76 <i>III</i> .116	<i>III</i> .102	IMPROVED IMAGE PROCESSING CAPABILITIES AUTOMATED FINGERPRINT ANALYSIS GOVERNMENT ACTIVITIES INFORMATION UTILITY	
	<i>III</i> .134 <i>III</i> .135		INTERNAL 3-DIMENSIONAL REPRESENTATION AUTOMATED DESIGN ENGINEERING AUTOMATED MANUFACTURING ENGINEERING	
	III.58 III.66	<i>III</i> .102	MULTI-ATTRIBUTE MATCHING CAREER PATH PLANNING COMPUTER COORDINATED TESTING OF MEDICAL DRUGS COMMERCIAL LOAN CREDIT SCORING AUTOMATED VEHICLE DIAGNOSTIC CENTERS AUTOMATED FINGERPRINT ANALYSIS ROBOT-CONTROLLED AUTOMOBILE CHECKOUT CLINICAL DECISION SUPPORT SYSTEMS COMPUTERIZED MEDICAL TEST ANALYSIS	
	III.54 III.57 III.82 III.87 III.90 III.91		SECURITY AND PRIVACY AUTOMATED STOCK TRANSFER CHECKLESS SOCIETY GOVERNMENT OPERATING LOTTERIES AND PARI-MUTUAL NATIONWIDE DRIVER AND VEHICLE DATA BANK NATIONWIDE VOTER REGISTRATION PERSONAL DATA BANKS	BETTING

## Pages Capabilities and Applications

UPDATABLE GRAPHICAL STORAGE - 1 BILLION PAGES
III.76 III.102 AUTOMATED FINGERPRINT ANALYSIS
III.108 NATIONWIDE POLICE INFORMATION SYSTEM!

UPDATABLE GRAPHICAL STORAGE - 100 MILLION PAGES
III.121 PATENT SEARCH

UPDATABLE GRAPHICAL STORAGE - UNSPECIFIED PAGES
III.123 III.172 TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS

#### VOICE INPUT

III.8 AGRICULTURE INFORMATION AND ADMINISTRATION SYSTEM III.123 III.172 TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS

#### DISCOVERY SYSTEMS

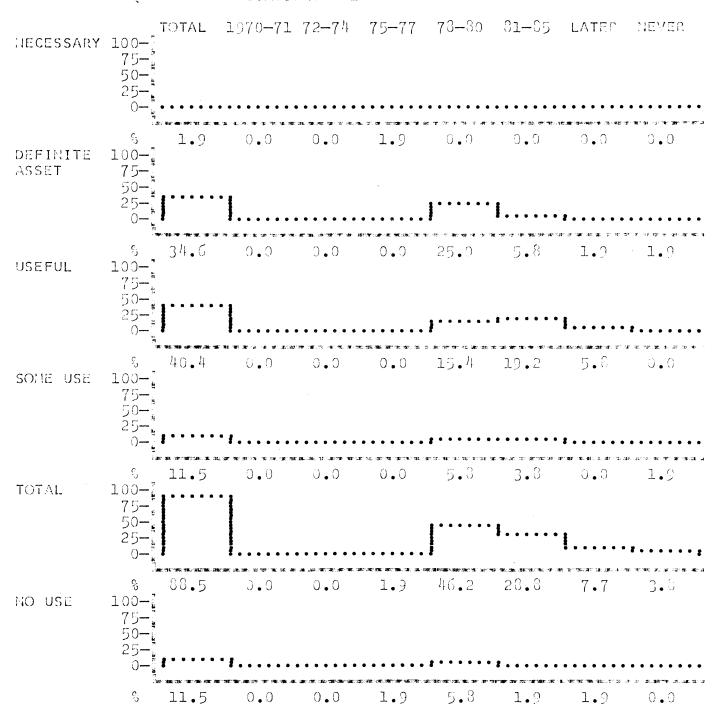
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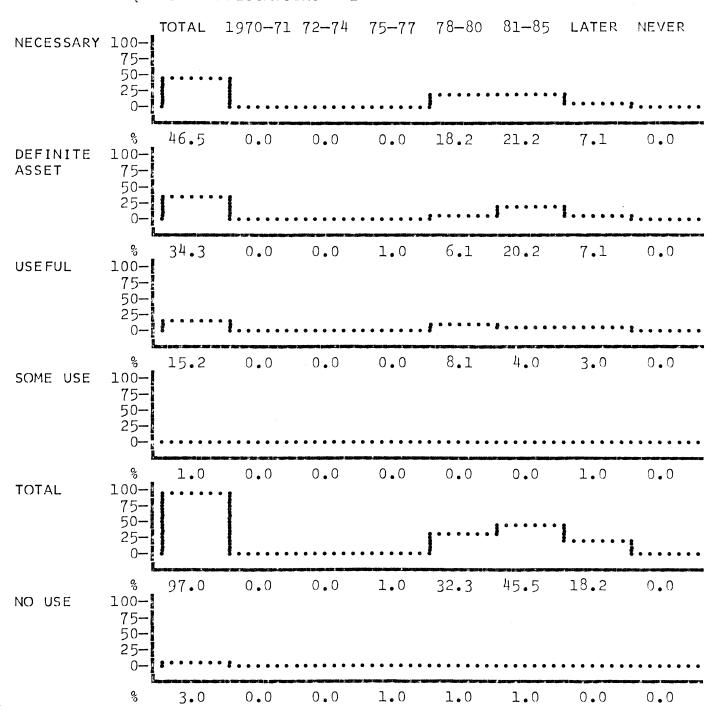
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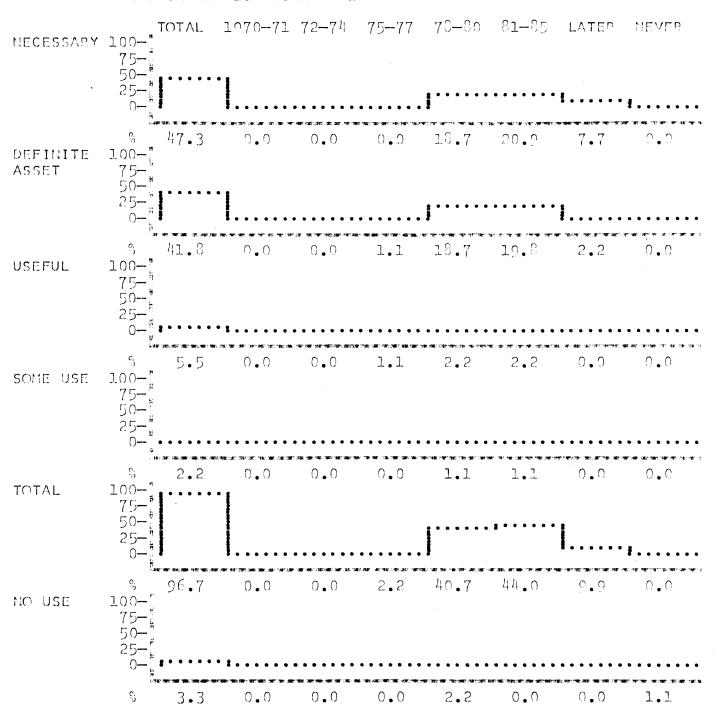
#### HEURISTIC PROGRAMMING

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#### IMPROVED IMAGE PROCESSING CAPABILITIES

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## INTERNAL 3-DIMENSIONAL REPRESENTATION:

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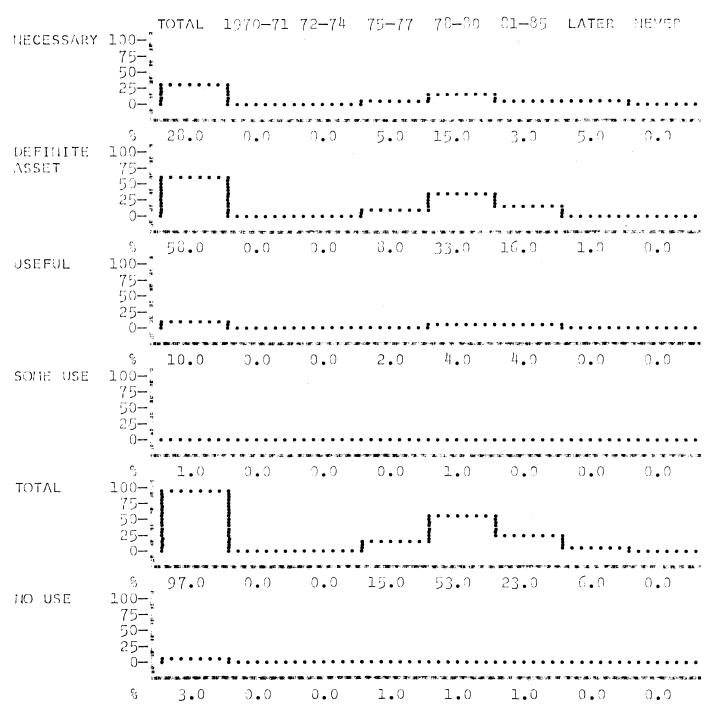
TOTAL 1970-71 72-74 75-77 78-80 81-85 LATER NEMER NECESSARY 100-75-62.6 0.0 0.0 4.5 26.7 22.5 -6.8 100-DEFINITE 75-**ASSET** 25.7 0.0 0.3 5.8 13.9 5.0 0.5 100-USEFUL 75-7.3 0.0 0.0 2.1 4.2 0.0 0.0 0.3 100-SOME USE 50-0.0 0.3 0.3 0.8 0.0 0.3 0.0 1.6 100-TOTAL 75-50-7.6 97.1 0.0 0.5 12.6 45.5 28.3 NO USE 100-\* 2.9 0.0 0.0 0.5 1.3 0.0 0.3 0.0

#### SECURITY AND PRIVACY

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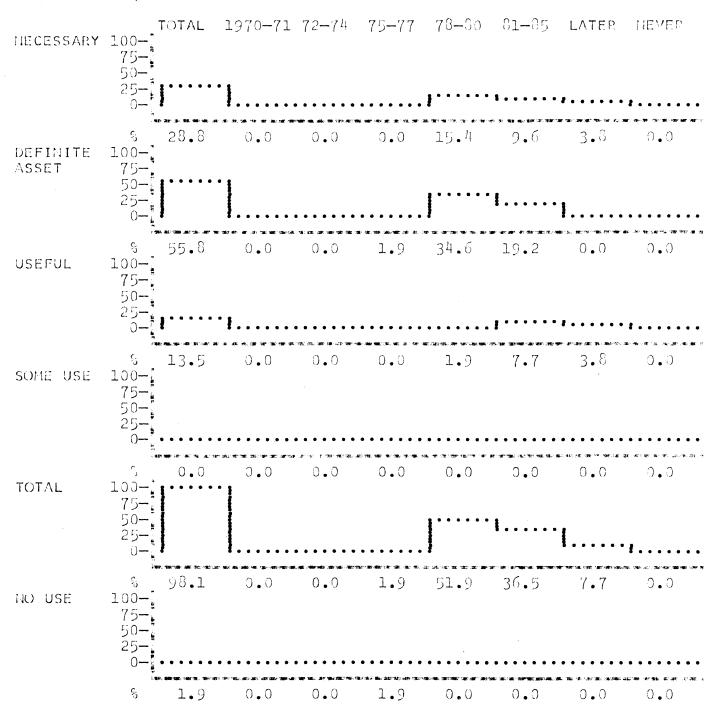
### UPDATABLE GRAPHICAL STORAGE - 1 BILLION PAGES

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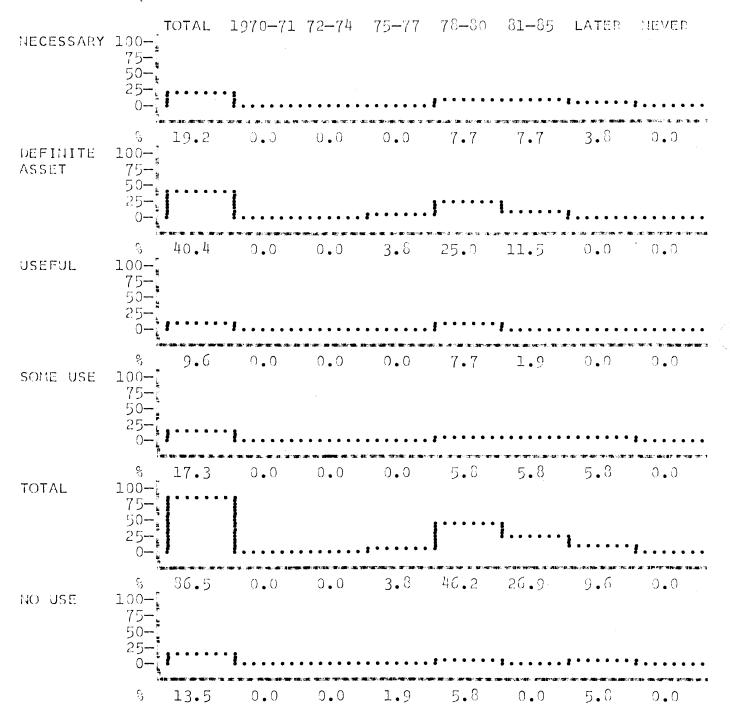


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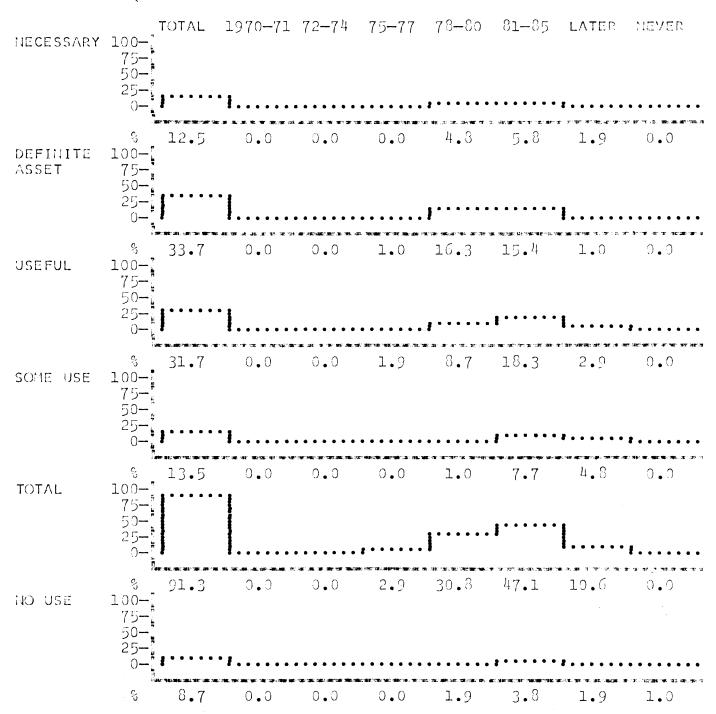


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#### VOICE INPUT

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#### APPLICATION SOFTWARE REQUIREMENTS

Assistance in the utilizing of general purpose data processing equipment and software systems was identified in 51 specific applications. Two classes of assistance were requested: systems and techniques to aid in the preparation of application programs and an outside vendor to offer the application program as a package.

Movement to tactical and strategic planning systems utilizing simulation and modeling techniques is a growing trend. To support these types of applications, an interactive terminal system utilizing complex search and interactive pattern matching was required by seven applications. The system would be used to build, evaluate, optimize, and operate models. For three applications, the problem of model development was addressed by designating the availability of the models from a vendor as a "Definite Asset." Another solution to the problem was to utilize the services of professional simulation and modeling experts. The demonstrated interest in planning systems coupled with the user's concern about his ability to accomplish the simulation and modeling work offers a marketing opportunity.

The Computer Assisted Instruction (CAI) applications also required both classes of requirements. The panel requested the availability of a library of courses for purchase and for an improved, easier to use course preparation language.

Specialized languages for specific application areas were requested. Query languages, either generalized or special purpose such as law research, were specified three times. A language for use with career path planning and another to facilitate automated design engineering were also needed. This represents a possible need for a wide variety of specialized commercial languages.

The problem of data capture involved in automating existing large files such as Patent Search was stated. The need for software systems capable of automatically capturing, analyzing, and cross-referencing data was rated as a "Necessity" for the three applications. A similar capability to provide automated abstracts for large libraries was rated as a "Definite Asset."

Many of the advanced applications involved scheduling, routing or allocation. Eight of these applications asked for better algorithms in this area.

The remaining application software requirements were for specific vendor-supplied application programs. The medical application programs had the additional requirement for programs to be prepared by or under the supervision of trained medical personnel to aid in overcoming physician reluctance to depend on non-professional solutions. Figure 4.4 below lists the applications and the degree of necessity assigned to them.

#### APPLICATION PROGRAMS

Application Programs for Commercial
Data Processing Services
Necessary

Automated Court Scheduling Definite Asset

Automated Manufacturing Engineering Necessary

Automated Photo Composition Necessary

Clinical Decision Support System Necessary

Freight Car Tracing, Tracking and
Allocation Program
Necessary

Freight Rate Application Program Definite Asset

Medical Test Analysis Definite Asset

Multi-Phasic Screening Necessary

Preventive Medicine Diagnostic
Center Necessary

Figure 4.4

## APPLICATION SOFTWARE REQUIREMENTS

Pages	Capabilities and Applications
<i>III</i> .145	ADVANCED PHOTO COMPOSITION AUTOMATED PERIODICAL PUBLISHING
<i>III</i> .78 <i>III</i> .113	AUTOMATED ABSTRACTING AUTOMATED PUBLIC LIBRARIES
III.128	AUTOMATED COURT SCHEDULING AUTOMATED COURT SCHEDULING
III.119	AUTOMATED FILE CAPTURE AUTOMATED PUBLIC LIBRARIES LAW SEARCH PATENT SEARCH
	AUTOMATED MANUFACTURING ENGINEERING PROGRAM AUTOMATED MANUFACTURING ENGINEERING
III.145	AUTOMATED PERIODICAL PUBLISHING AUTOMATED PERIODICAL PUBLISHING
<i>III</i> .45	CAI COURSE PREPARATION LANGUAGE COMPUTER ASSISTED INSTRUCTION - ON THE JOB TRAINING COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS HOME COMPUTER ASSISTED INSTRUCTION
III.46	CAI COURSES  COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS COMPUTER ASSISTED TESTING AND GUIDANCE COUNSELING COMPUTER MANAGED INSTRUCTION
<i>III</i> .16	CAREER PLANNING LANGUAGE CAREER PATH PLANNING

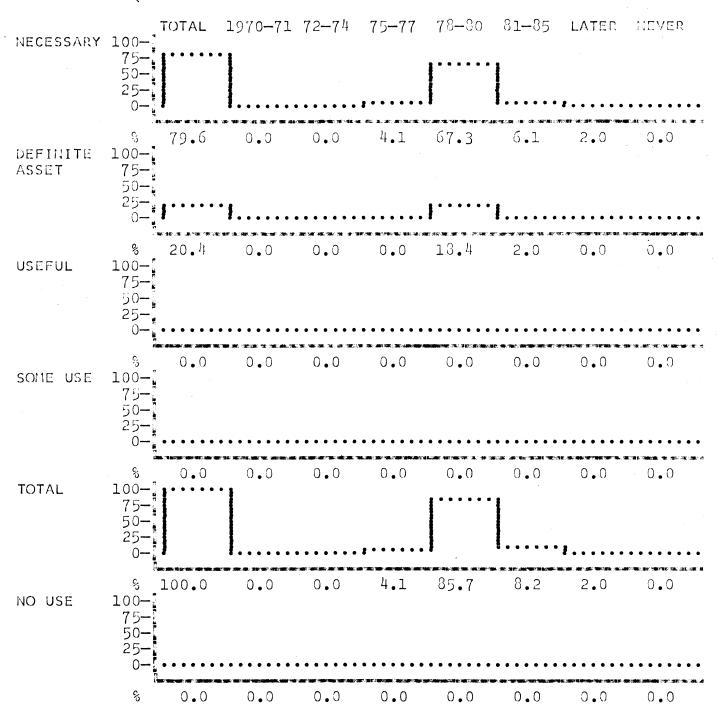
# Capabilities and Applications

<i>III</i> .114	COMMERCIAL DATA PROCESSING APPLICATION PROGRAMS COMMERCIAL DATA PROCESSING SERVICES
III.89	COMPLEX LAND USAGE MODEL NATIONAL LAND INVENTORY
III.30 III.65 III.48 III.70 III.71 III.136 III.165 III.167 III.171	COMPLEX SCHEDULING AND ALLOCATION ALGORITHMS AUTOMATED FREIGHT TERMINALS DYNAMIC SCHEDULING OF EDUCATIONAL FACILITIES NATIONWIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS; RAILROAD CAR TRACING, TRACKING AND ALLOCATION AUTOMATED MANUFACTURING PLANT AUTOMATED MASS TRANSIT SYSTEMS AUTOMATED TRAFFIC CONTROL NATIONWIDE POWER GRID
<i>III</i> .134	DESIGN LANGUAGE AUTOMATED DESIGN ENGINEERING
<i>III</i> .20	DETERMINISTIC MODELS ECONOMETRIC MODELS OF THE ECONOMY
III.48	DYNAMIC SCHEDULING OF EDUCATIONAL FACILITIES DYNAMIC SCHEDULING OF EDUCATIONAL FACILITIES
III.84	HUMAN RESOURCES SIMULATION MODEL HUMAN RESOURCE SYSTEMS
III.17 III.85 III.107	IMPROVED SIMULATION TECHNIQUES CASH FLOW SIMULATION METROPOLITAN PLANNING MODELS MANAGEMENT INFORMATION SYSTEMS
III.17 III.20 III.21 III.22 III.55 III.85 III.141	INTERACTIVE MODELING AND SIMULATION SYSTEM CASH FLOW SIMULATION ECONOMETRIC MODELS OF THE ECONOMY ENTERPRISE SIMULATION INVESTMENT MODELS BANK RESERVE REQUIREMENTS MODEL METROPOLITAN PLANNING MODELS PRODUCT DEVELOPMENT SIMULATION SYSTEM

Pages	Capabilities and Applications
<i>III</i> .153	MEDICAL TEST ANALYSIS PROGRAMS
111.100	COMPUTERIZED MEDICAL TEST ANALYSIS
<i>I Ⅲ</i> .7	MOISTURE DEMAND MODEL AUTOMATIC IRRIGATION CONTROL
1.11.1	AUTOMATIC TRRIGATION CONTROL
	MULTI-NATIONAL LANGUAGE INTERFACE
<i>III</i> .84	HUMAN RESOURCE SYSTEMS
TTT -	NATIONWIDE FREIGHT CAR TRACKING
III.71	RAILROAD CAR TRACING, TRACKING AND ALLOCATION
	NATIONWIDE POWER DISTRIBUTION MODEL
III.171	NATIONWIDE POWER GRID
	PHYSCIAN DEVELOPED MEDICAL APPLICATION PROGRAMS
<i>III</i> .151	CLINICAL DECISION SUPPORT SYSTEMS
<i>III</i> .155	MULTI-PHASIC SCREENING
III.157	PREVENTIVE MEDICINE DIAGNOSTIC CENTERS
	SPECIAL PURPOSE QUERY LANGUAGES
<i>III</i> .107	MANAGEMENT INFORMATION SYSTEMS
III.119	LAW SEARCH PROFESSIONAL LITERATURE SEARCH SYSTEMS
III.122	PROFESSIONAL HITMATORE SHARON 2232 SAS

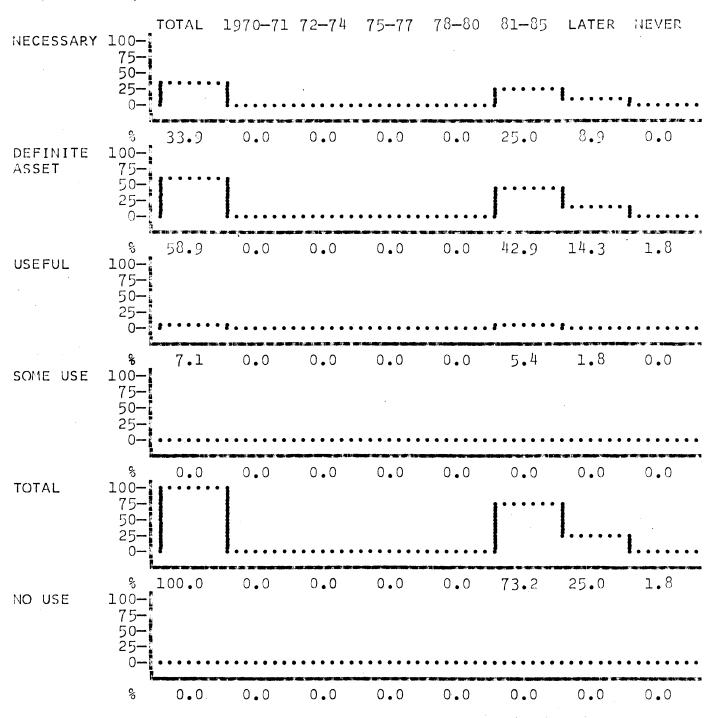
#### ADVANCED PHOTO COMPOSITION

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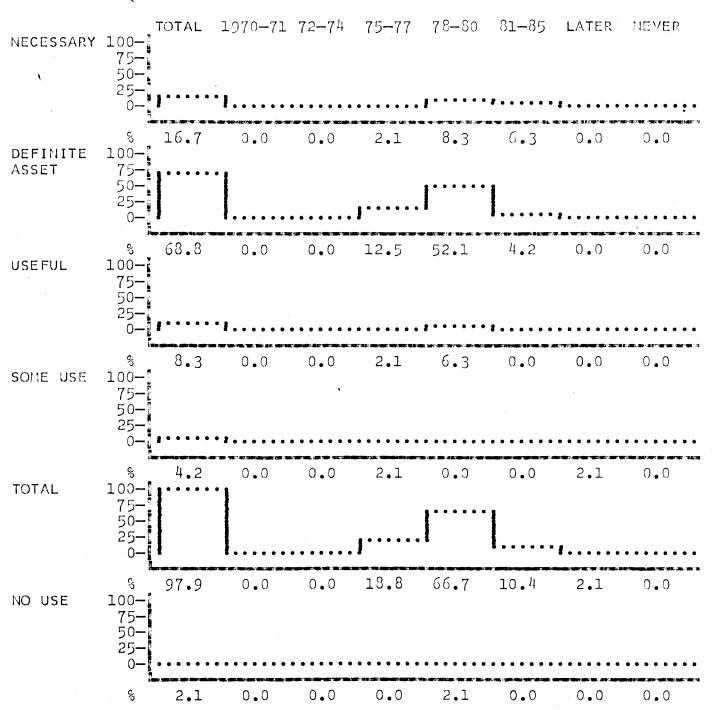
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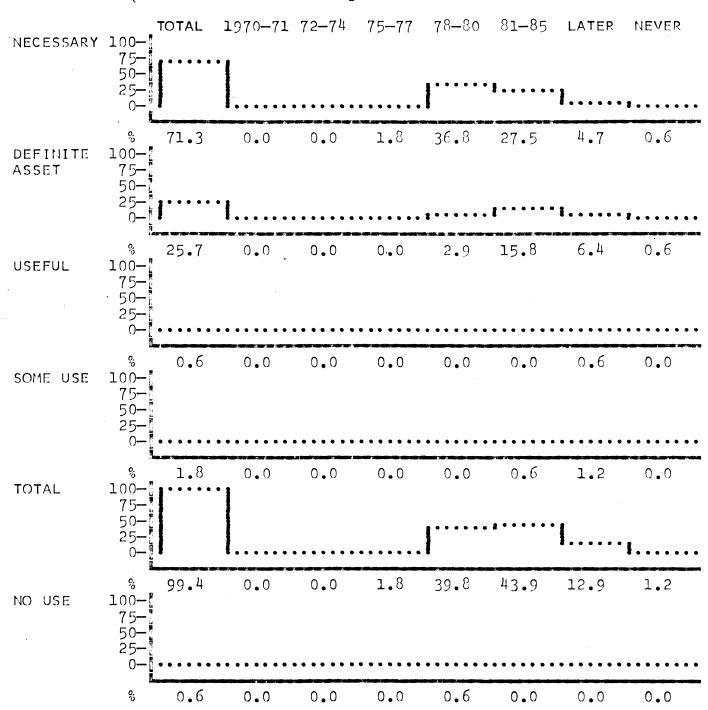
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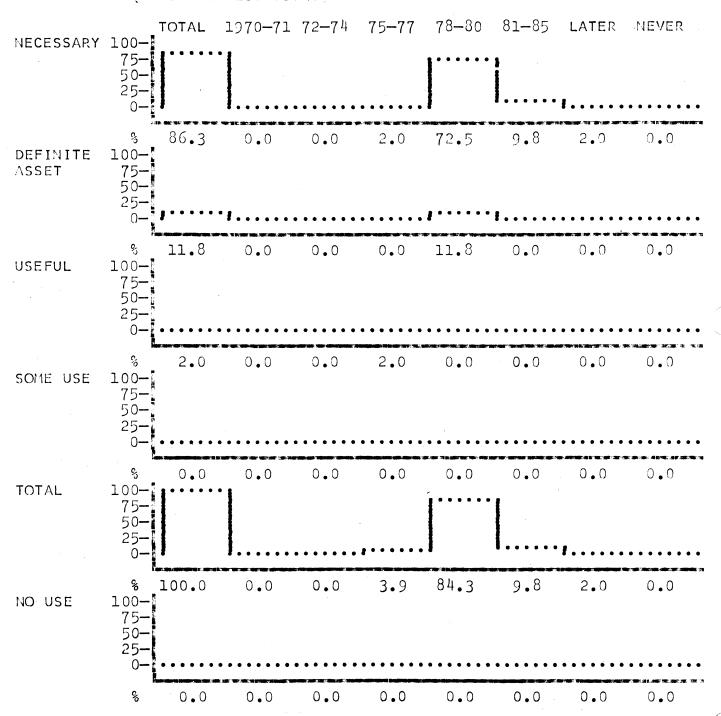
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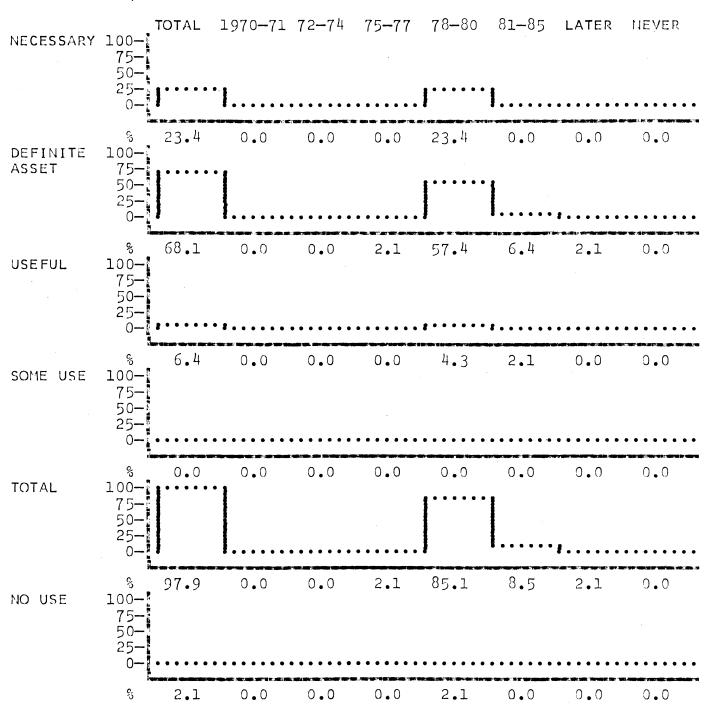
#### AUTOMATED MANUFACTURING ENGINEERING PROGRAM

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#### AUTOMATED PERIODICAL PUBLISHING

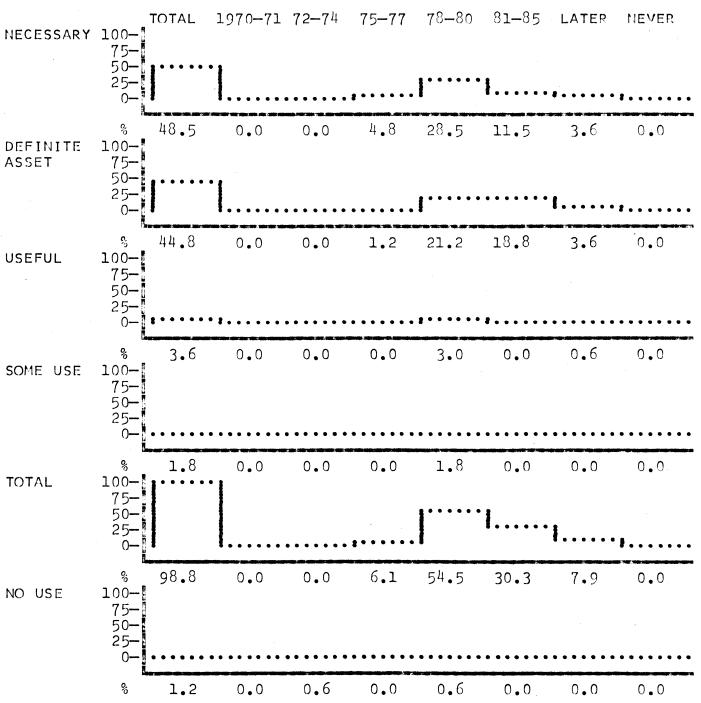
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### CAI COURSE PREPARATION LANGUAGE

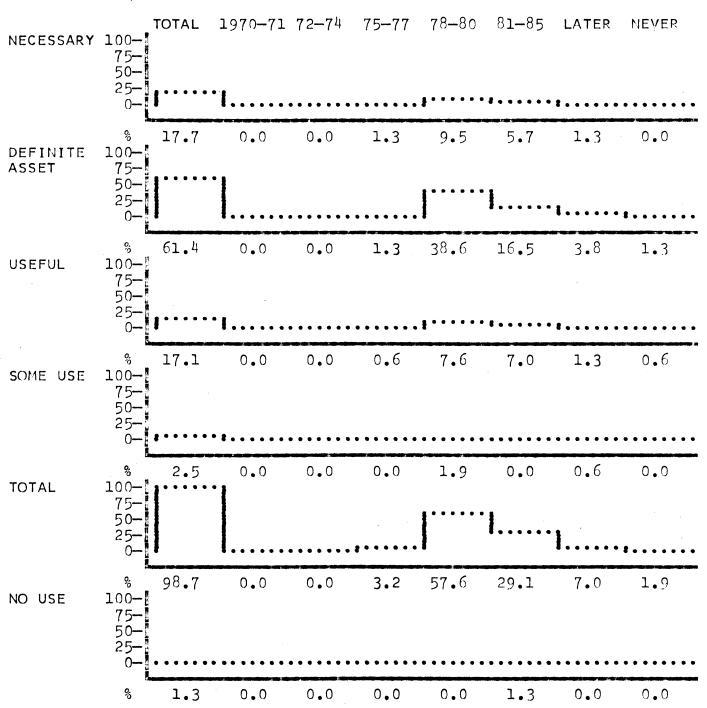
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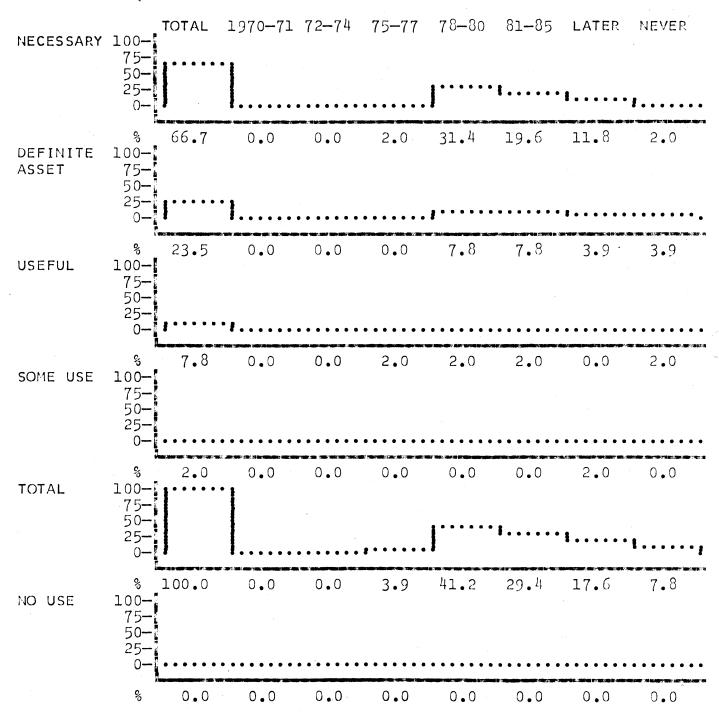
### CAI COURSES

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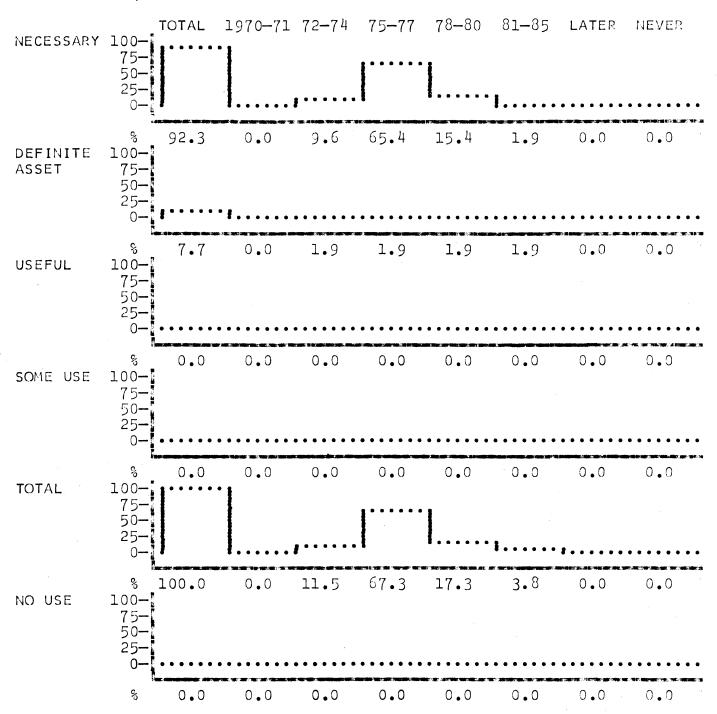
#### CAREER PLANNING LANGUAGE

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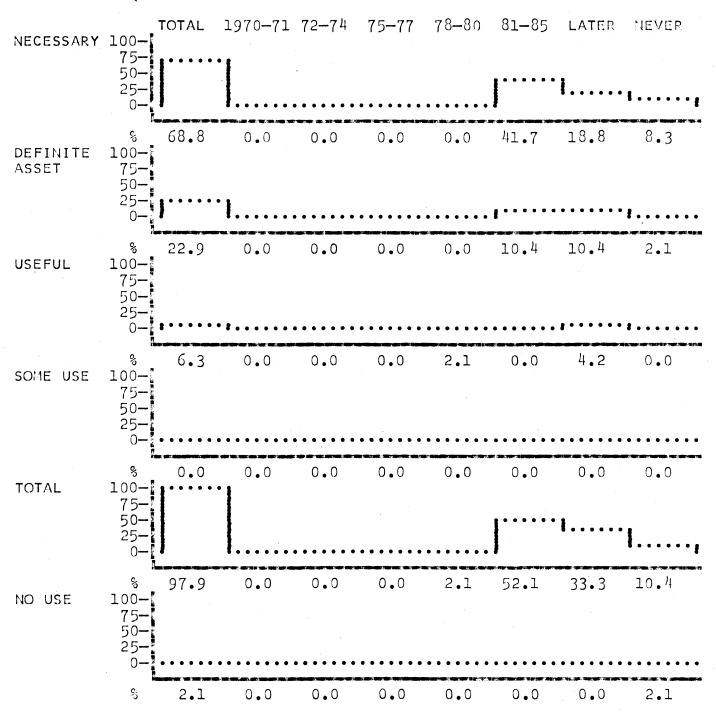
### COMMERCIAL DATA PROCESSING APPLICATION PROGRAMS

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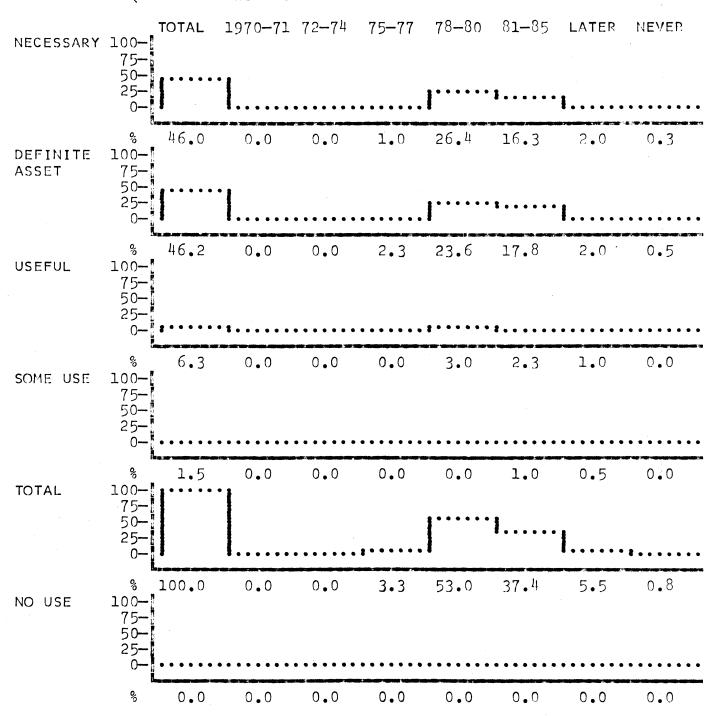
### COMPLEX LAND USAGE MODEL

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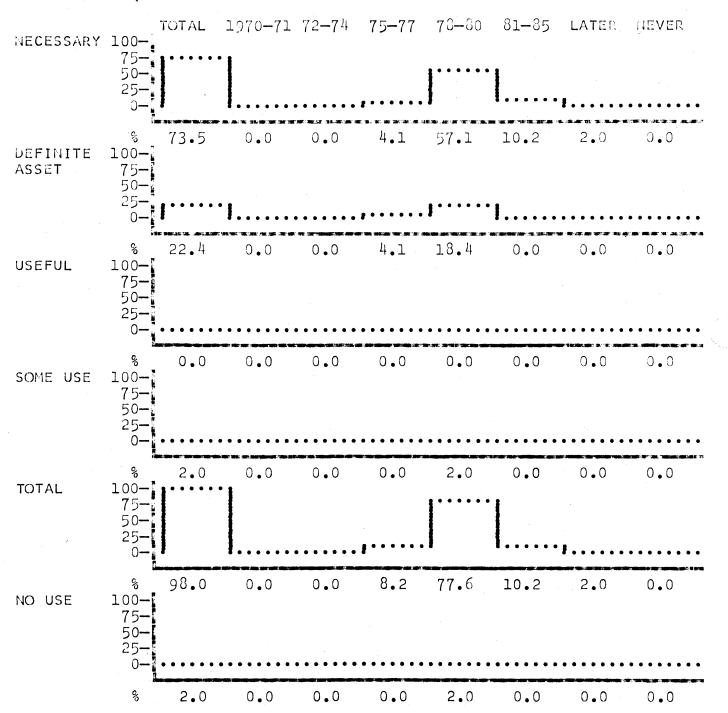
### COMPLEX SCHEDULING AND ALLOCATION ALGORITHMS

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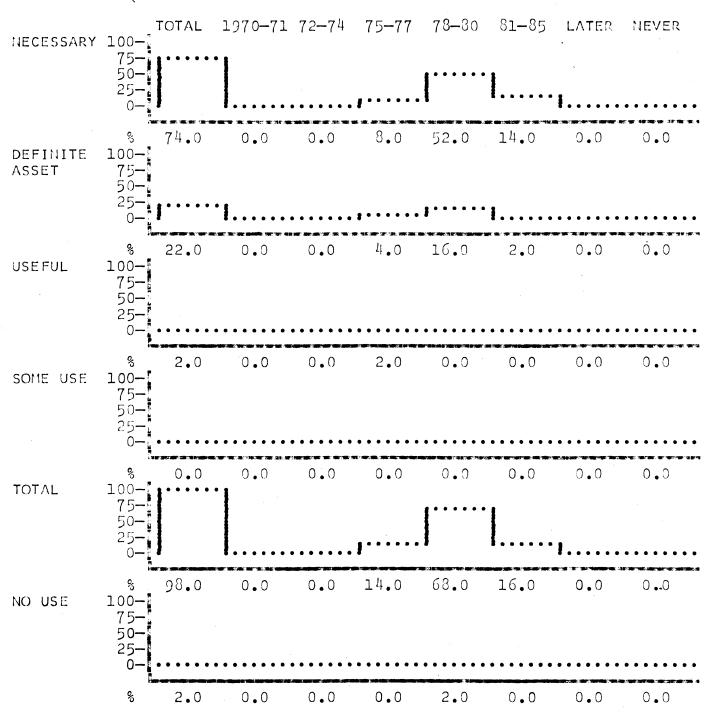
### DESIGN LANGUAGE

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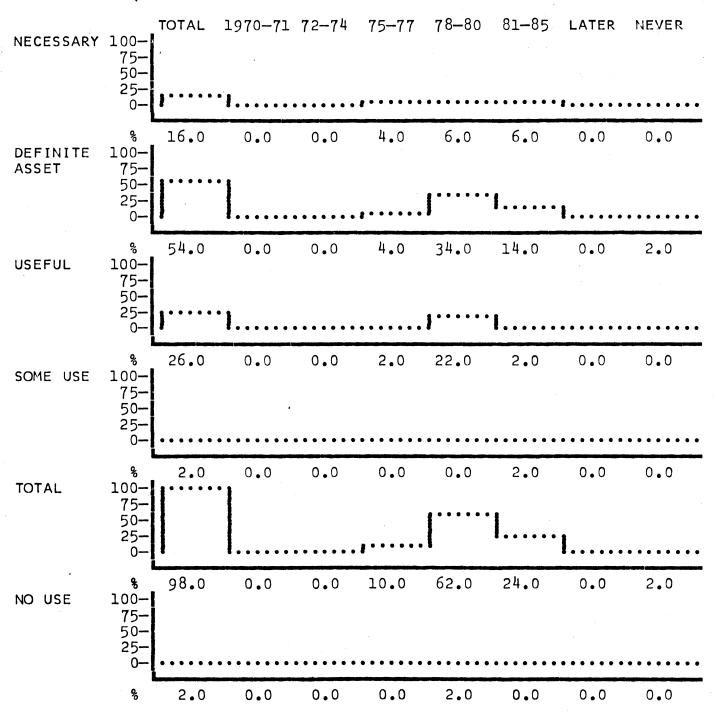
### DETERMINISTIC MODELS

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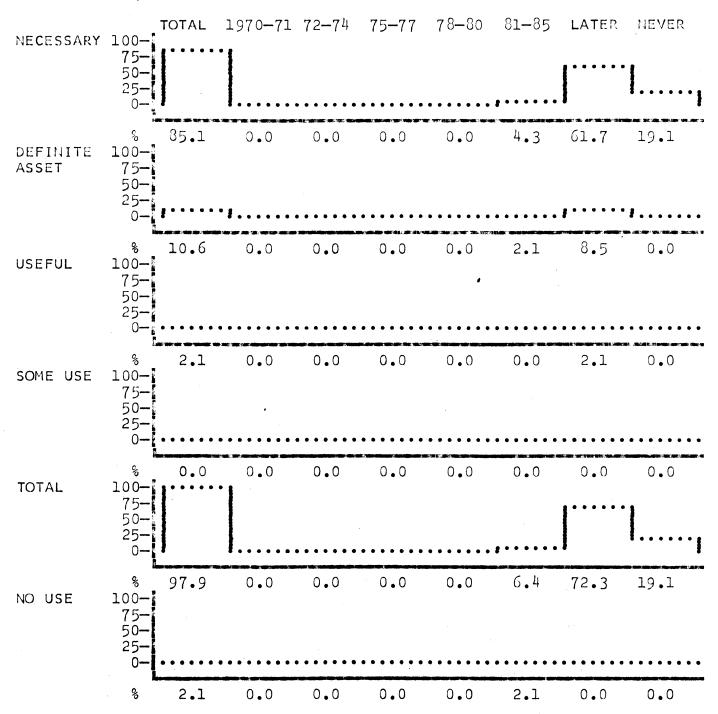
### DYNAMIC SCHEDULING OF EDUCATIONAL FACILITIES

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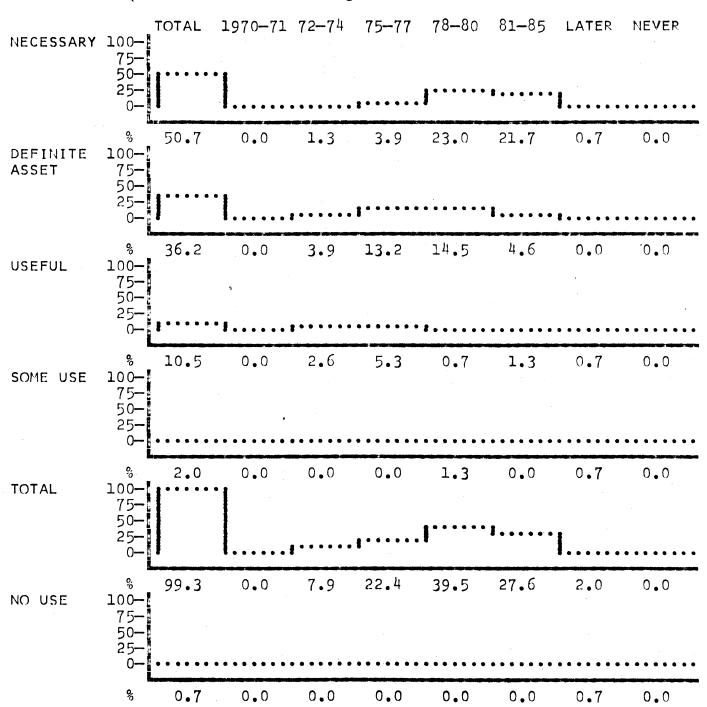
### HUMAN RESOURCES SIMULATION MODEL

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### IMPROVED SIMULATION TECHNIQUES

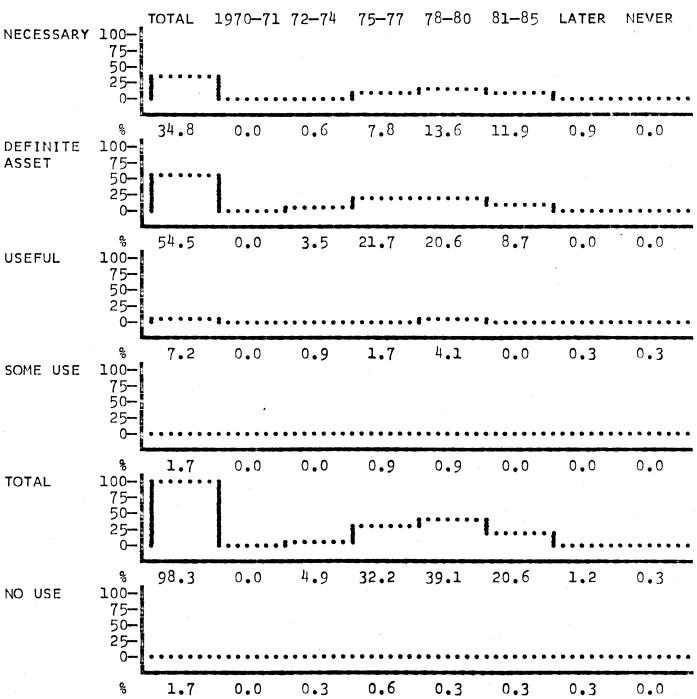
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### INTERACTIVE MODELING AND SIMULATION SYSTEM

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1.93 3.24 2.18 0.16

NUMBER OF REQUIRING APPLICATIONS — 7

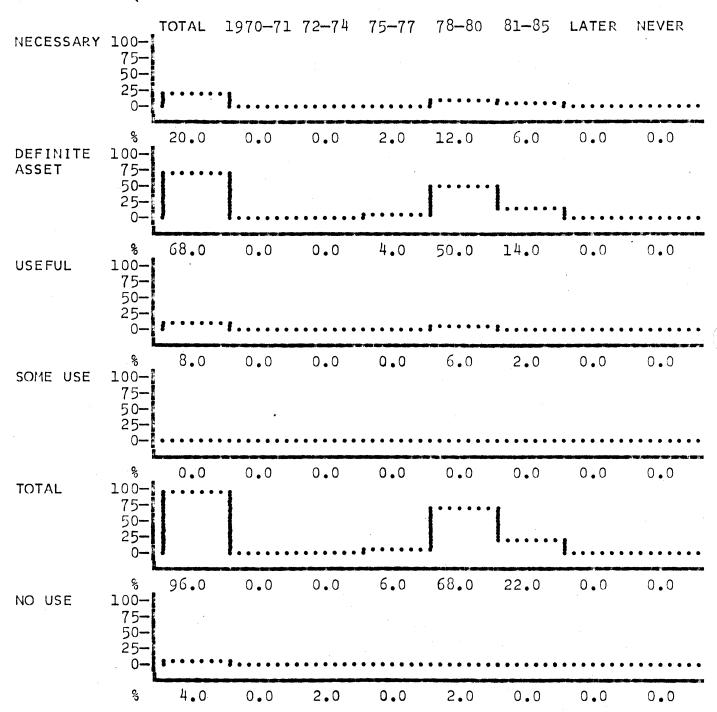


### MEDICAL TEST ANALYSIS PROGRAMS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.50 3.12 3.62 0.10

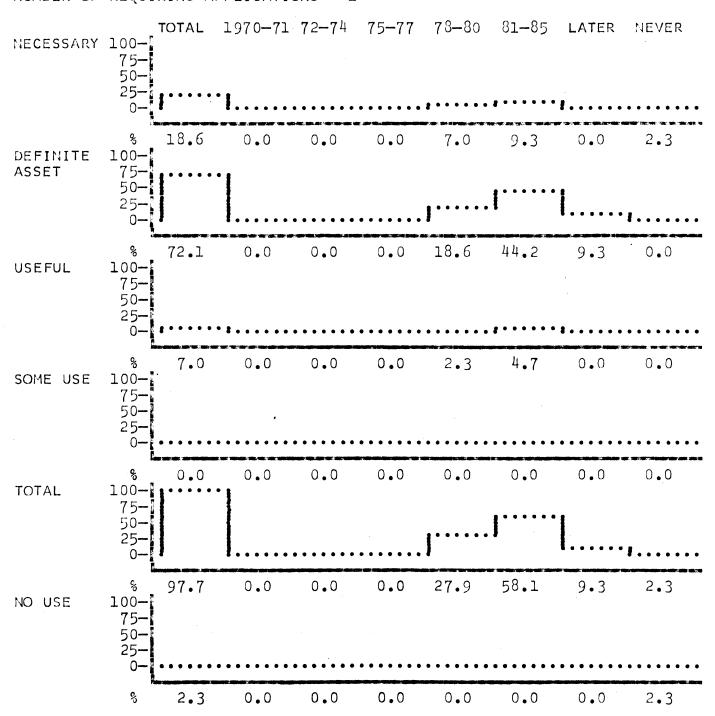
NUMBER OF REQUIRING APPLICATIONS - 1

1. 6



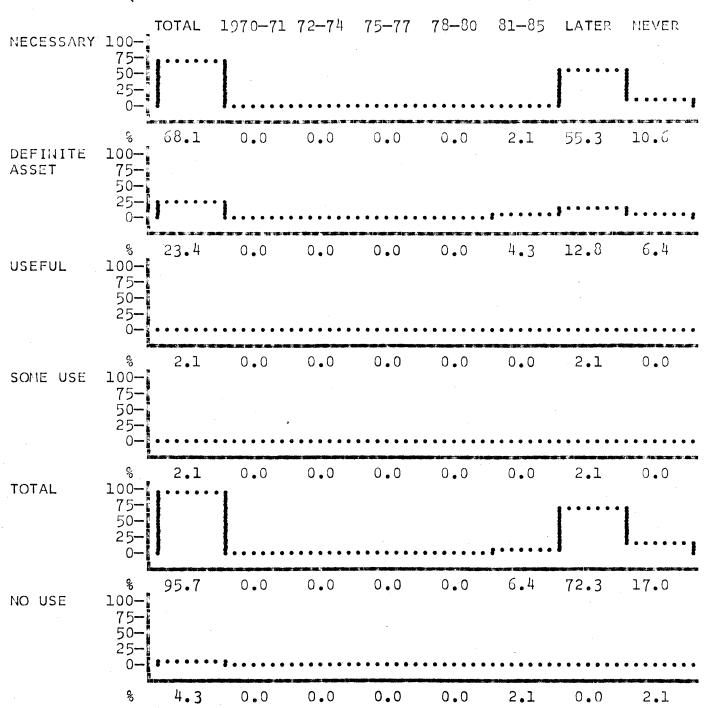
# NOISTUNE BEHAND MEDEL

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 1.51 2.68 1.98 0.53

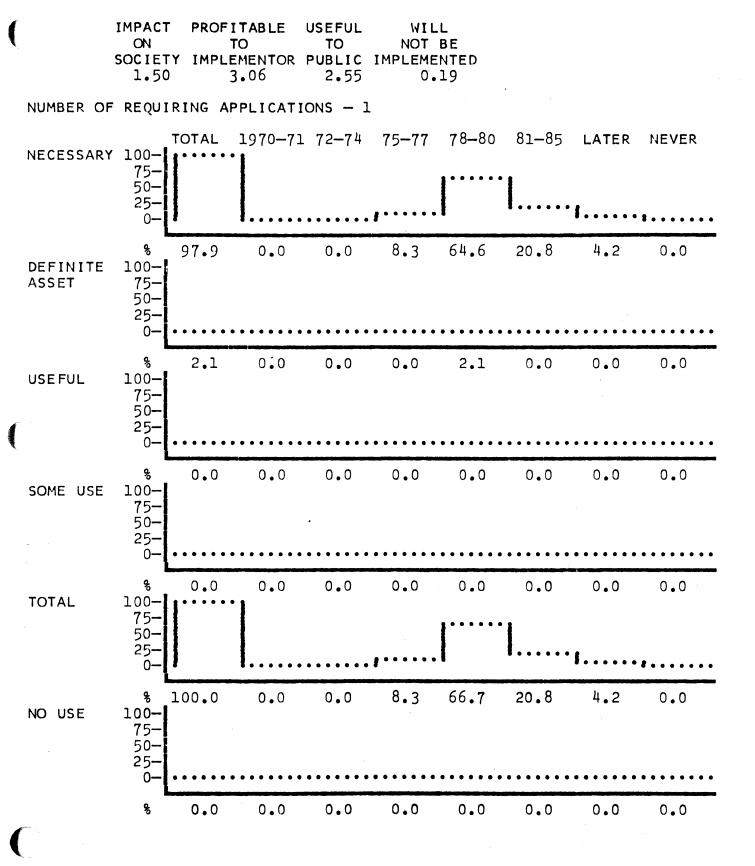


### MULTI-NATIONAL LANGUAGE INTERFACE

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.95 1.50 2.18 1.26

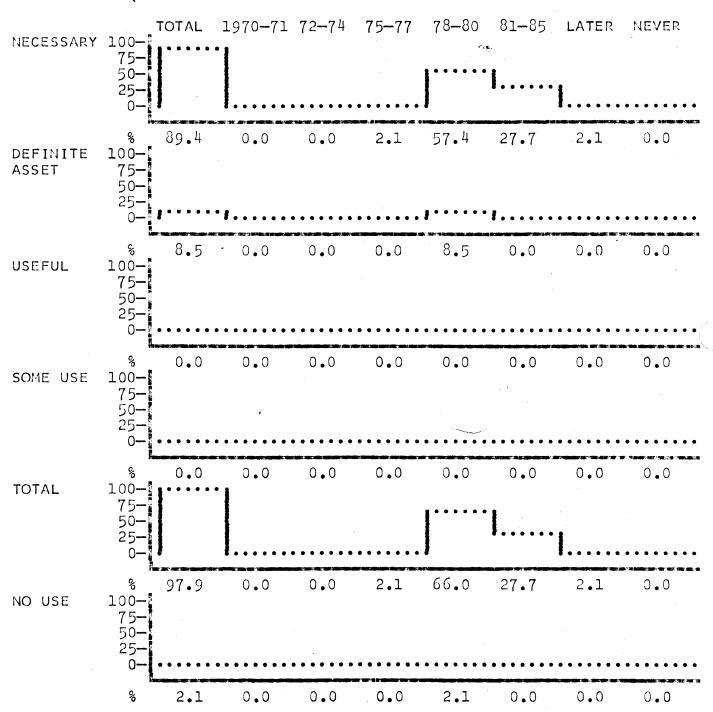


### NATIONWIDE FREIGHT CAR TRACKING



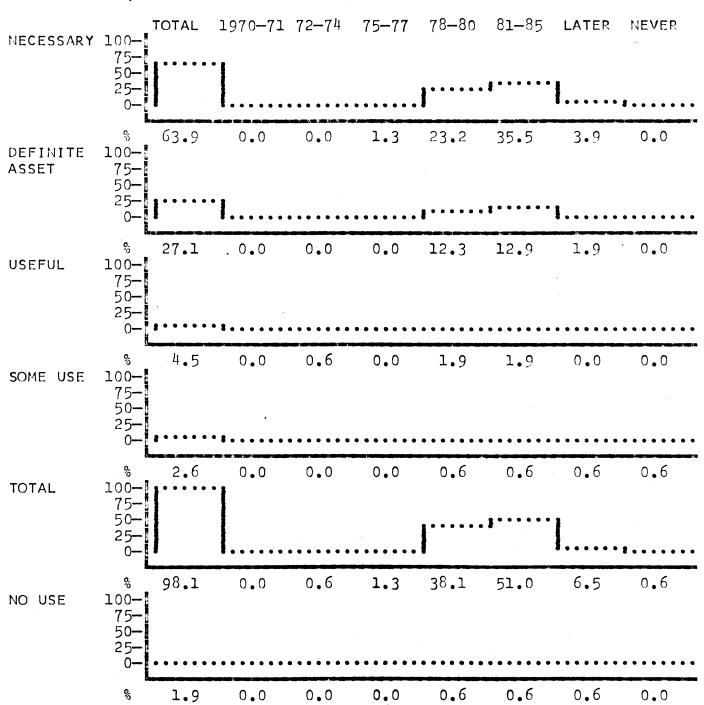
# NATIONWIDE POWER DISTRIBUTION MODEL

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.75 3.27 3.42 0.44



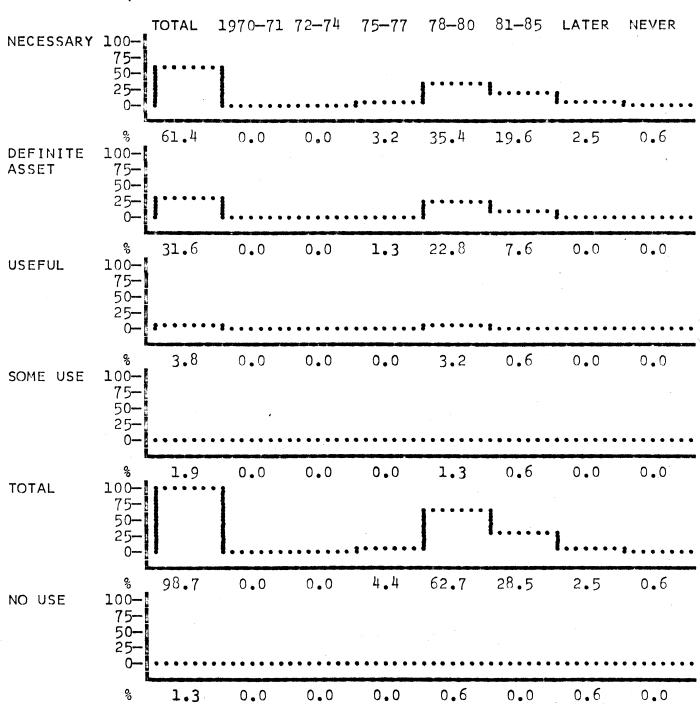
### PHYSICIAN DEVELOPED MEDICAL APPLICATION PROGRAMS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.86 2.52 3.32 0.45



### SPECIAL PURPOSE QUERY LANGUAGES

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.32 2.87 2.57 0.23



### DATA PROCESSING SERVICES

Two types of data processing services which are not generally available today were identified: Model Building Services and Information Data Banks.

Seven control and planning type of applications specifically asked for professional services in developing and programming of simulations and models. This need was rated as a "Definite Asset" starting in 1975. This specific need coupled with the previously mentioned trend to planning systems, indicates a potential marketing area.

The second service was that of providing access to data banks of information which is either too voluminous or too volatile for an organization to maintain itself. The service would maintain the data banks and defray their expenses by selling remote access to large numbers of users. Two specific examples were cited:

- A data bank containing economic, census, and other consumer and market data which would serve to describe the external business environment. Users would use the data as input into strategic planning systems.
- A data bank of aircraft performance expectations and potential malfunctions. The data bank would probably be maintained by aircraft mainframe and engine manufacturers. It would be used for preventive maintenance diagnostics of telemetered in-flight aircraft data.

Data Bank services become increasingly more economically attractive as computer networks and the associated communication capabilities become widespread in 1975.

### DATA PROCESSING SERVICES

Pages	Capabilities and Applications	(
<i>III</i> .11	AIRCRAFT PERFORMANCE AND MALFUNCTION DATA BANK AUTOMATED AIRCRAFT DIAGNOSTICS	
III.20 III.21	EXTERNAL ENVIRONMENT DATA BANK ECONOMETRIC MODELS OF THE ECONOMY ENTERPRISE SIMULATION	
III.17 III.20 III.21 III.22 III.83 III.141 III.165	MODEL DEVELOPMENT CASH FLOW SIMULATION ECONOMETRIC MODELS OF THE ECONOMY ENTERPRISE SIMULATION INVESTMENT MODELS GOVERNMENTAL PLANNING SYSTEMS FOR DEVELOPING COUNTRY PRODUCT DEVELOPMENT SIMULATION SYSTEM AUTOMATED MASS TRANSIT SYSTEMS	IES

### AIRCRAFT PERFORMANCE AND MALFUNCTION DATA BANK

TO

WILL NOT BE

PROFITABLE USEFUL

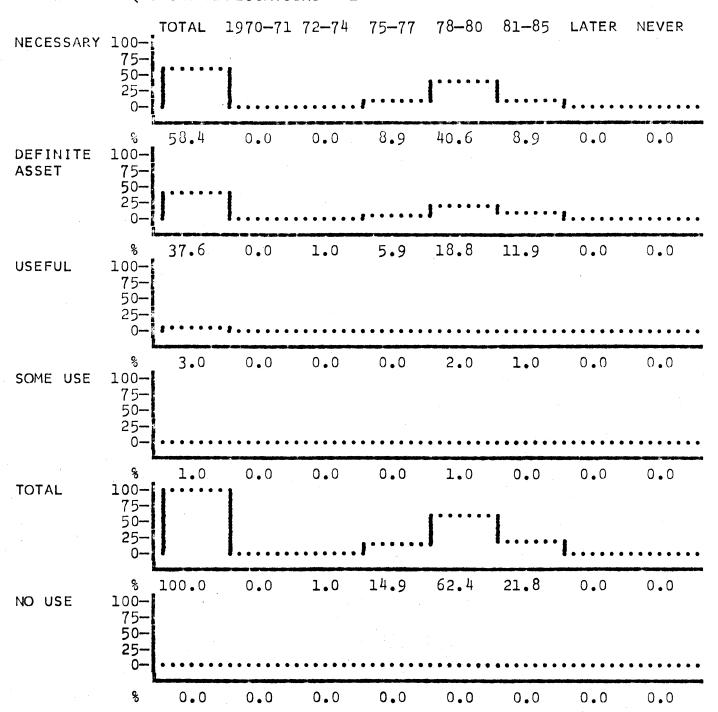
TO

IMPACT

SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 3.38 2.76 NUMBER OF REQUIRING APPLICATIONS - 1 TOTAL 1970-71 72-74 75-77 78-80 81-85 NECESSARY 100-75-50-0.0 0.0 17.3 51.9 1.9 0.0 71.2 DEFINITE 100-**ASSET** 75-50-25.0 0.0 0.0 3.8 21.2 0.0 0.0 100-USEFUL 75-1 50-3.8 3.8 0.0 0.0 0.0 0.0 0.0 0.0 SOME USE 100-75-50-25-0.0 0.0 0.0 0.0 0.0 0.0 0.0 TOTAL 100-75-50-% 100.0 7.0 0.0 25.0 1.9 73.1 0.0 0.0 NO USE 100-75-50-25-0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

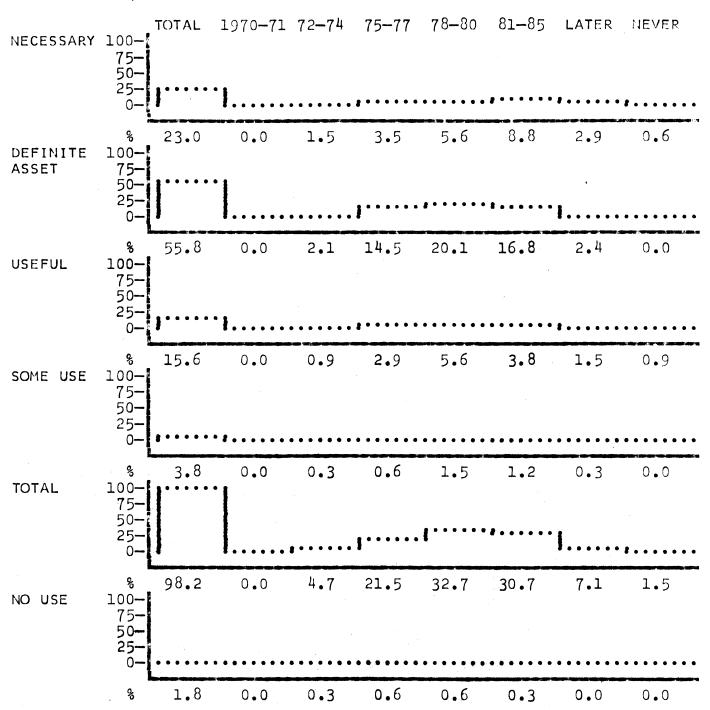
### EXTERNAL ENVIRONMENT DATA BANK

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.17 3.17 1.94 0.23



### MODEL DEVELOPMENT

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.16 3.07 2.39 0.31



4.5.

### SPECIAL PRODUCTS

There was a class of requests for specific products associated with specific applications which were highly specialized or distantly related to data processing. These are listed below without comment.

- Aircraft position altitude speed and course transponders
- . Alphanumeric input from standard telephones
- . Automobile computers for collision avoidance
- Baggage tag readers
- . Commercial airborne computers
- Computerized baggage handling equipment
- Computerized baggage sorters
- . Computerized chemical analytical equipment
- Improved sensor technology
- Improved telemetry
- Low cost computer systems for automotive diagnostic
- . Low cost sensors for pollution monitoring
- . Remote utility usage monitors
- . Sensors with eye-like capabilities for general purpose robots
- Wide-angle collision sensing device

## SPECIAL PRODUCTS

Pages

Capabilities and Applications

SYSTEMS

<i>III</i> .37	ADVANCED COMPUTER CONTROLLED CHEMICAL ANALYTIC EQUIPMENTS COMPUTERIZED WASTE DISPOSAL PLANTS
AIRBORN III.14 III.77	
<i>III</i> .123	ALPHANUMERIC INPUT FROM STANDARD TELEPHONES III.172 TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS
<i>III</i> .166	AUTOMOBILE COMPUTER AUTOMATED ROADWAYS
<i>III</i> .13	BAGGAGE TAG READERS AUTOMATED BAGGAGE CONTROL
<i>III</i> .13	COMPUTER CONTROLLED BAGGAGE SORTERS AUTOMATED BAGGAGE CONTROL
<i>III</i> .13	IMPROVED BAGGAGE HANDLING EQUIPMENT AUTOMATED BAGGAGE CONTROL
III.7 III.40 III.137 III.140 III.151 III.155 III.156 III.157	POLLUTION MONITORING SYSTEMS
<i>III</i> .14 <i>III</i> .156	IMPROVED TELEMETRY IN-FLIGHT MONITORING AND DIAGNOSTICS OF AIRCRAFT OUT-PATIENT MONITORING

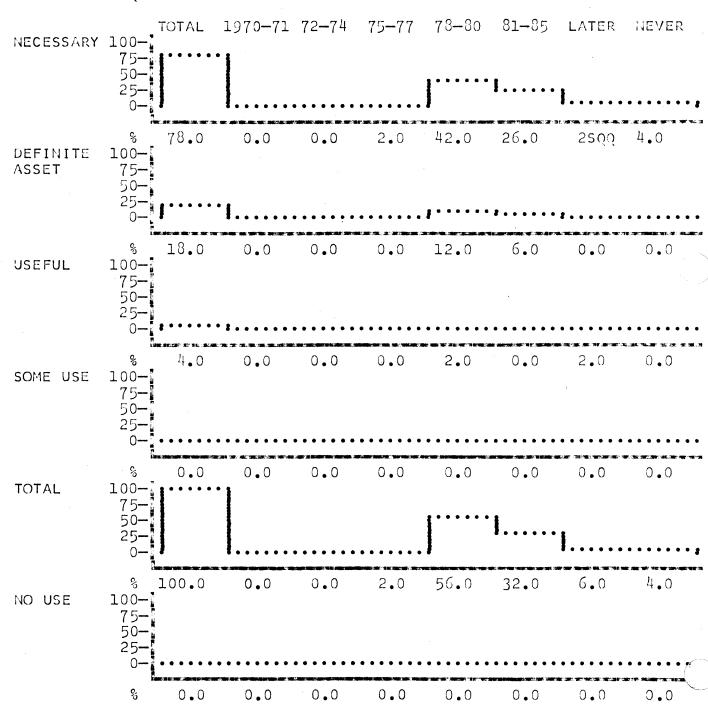
## Pages Capabilities and Applications

	•	
<i>III</i> .86	INEXPENSIVE AIRCRAFT POSITION AND IDENTIFICATION TRANSPONDERS NATIONWIDE AIR TRAFFIC CONTROL	
<i>III</i> .66	LOW COST COMPUTER SYSTEMS <\$500/MONTH AUTOMATED VEHICLE DIAGNOSTIC CENTERS	
<i>III</i> .40	LOW COST SENSORS POLLUTION MONITORING SYSTEMS	
<i>III</i> .138	SENSORS WITH EYE-LIKE CAPABILITIES  AUTOMATED ROBOTS	
<i>III</i> .173	UTILITY REMOTE USAGE RECORDING DEVICE UTILITY USAGE RECORDING SYSTEM	

WIDE-ANGLE SENSING DEVICE FOR AUTOMOBILE COLLISION AVOIDANCE III.168 AUTOMOBILE COLLISION AVOIDANCE SYSTEMS

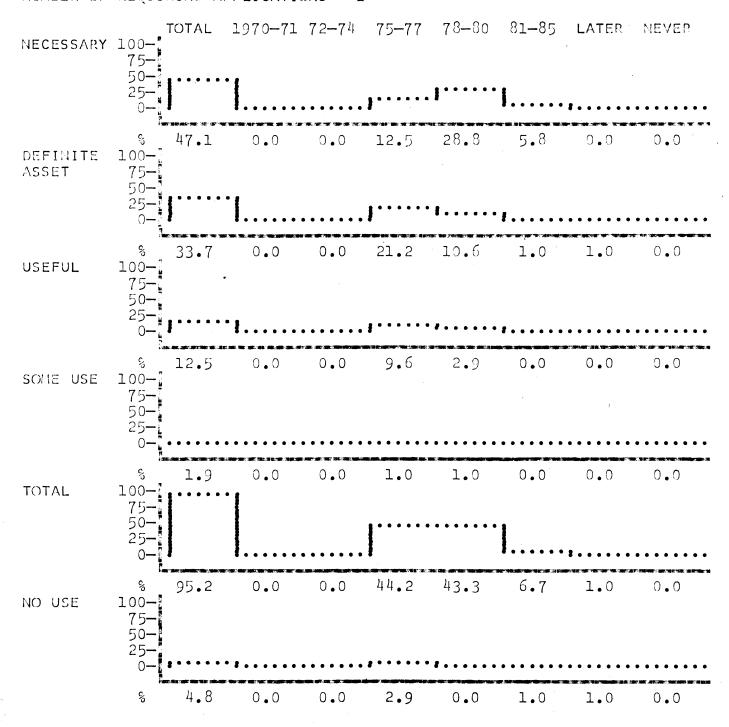
# ADVANCED COMPUTER CONTROLLED CHEMICAL ANALYTIC EQUIPMENT

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.84 2.40 2.98 0.90



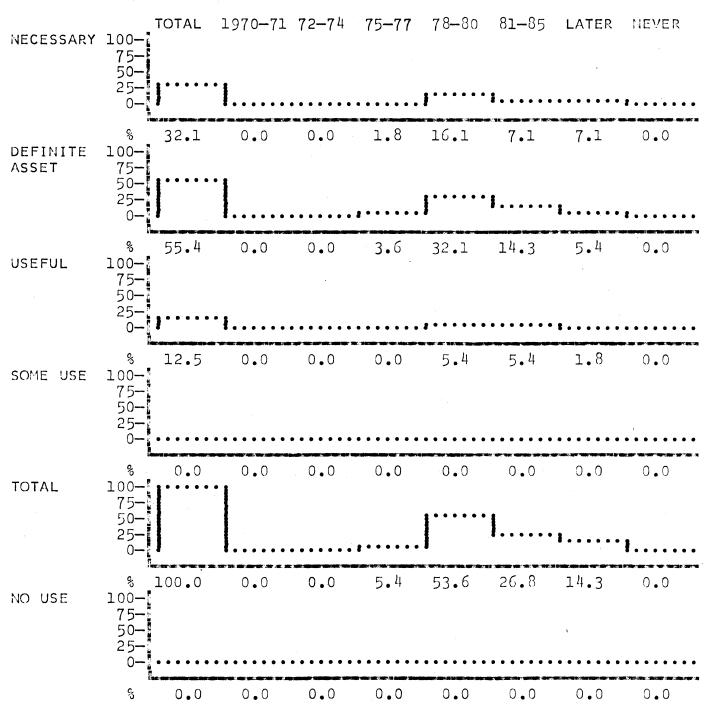
### AIRBORNE COMPUTERS FOR INTERFACE AND BACKUP TO AUTOMATED CONTROL SYSTEMS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.38 2.90 2.91 0.31



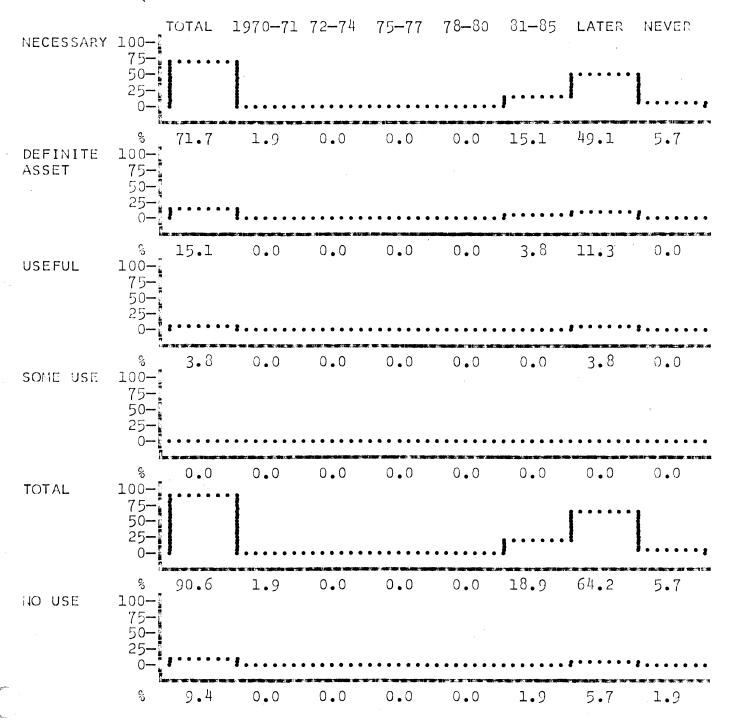
### ALPHANUMERIC INPUT FROM STANDARD TELEPHONES

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.00 2.62 2.80 0.29



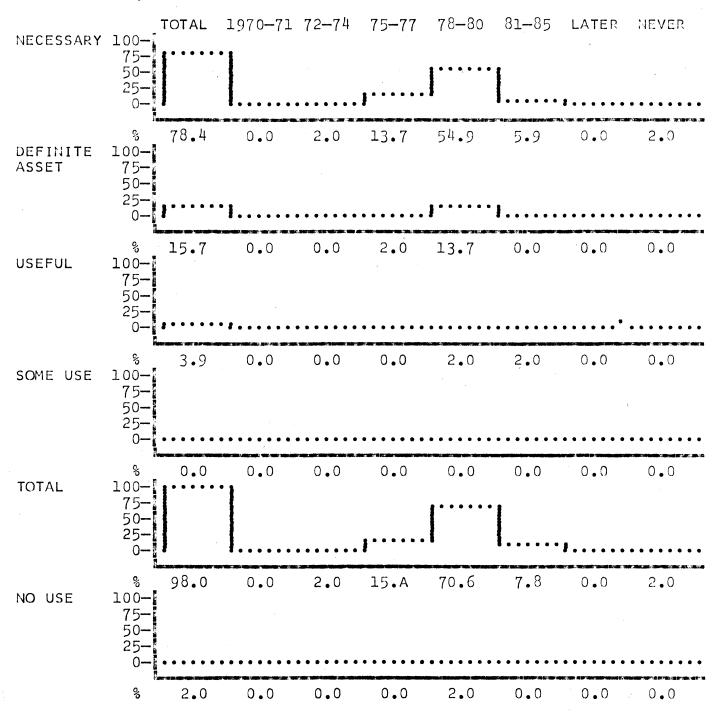
### AUTOMOBILE COMPUTER

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
3.28 1.74 2.56 1.44



### BAGGAGE TAG READERS

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
1.54 2.95 3.13 0.20



## COMPUTER CONTROLLED BAGGAGE SORTERS

WILL

USEFUL

IMPACT

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2.0

PROFITABLE

NOT BE TO SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 1.54 2.95 3.13 NUMBER OF REQUIRING APPLICATIONS - 1 TOTAL 1970-71 72-74 75-77 78-80 81-85 LATER NECESSARY 100-75-1 50-25. 46.0 58.0 0.0 2.0 8.0 2.0 0.0 0.0 DEFINITE 100-**ASSET** 75-50-l જ 32.0 8.0 2.0 0.0 0.0 0.0 0.0 22.0 100-USEFUL 75-50-25-S 8.0 0.0 0.0 0.0 2.0 4.0 0.0 2.0 SOME USE 100-75-50-25-ુ 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 100-TOTAL 75-1 50-1 25-98.0 8.0 0.0 2.0 16.0 70.0 0.0 2.0 100-NO USE 75-1 50-25-

0.0

0.0

2.0

0.0

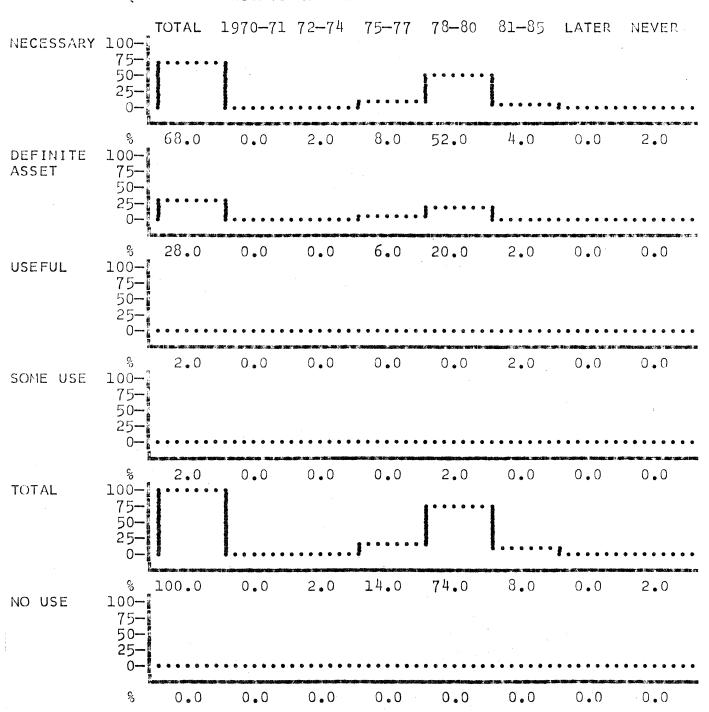
0.0

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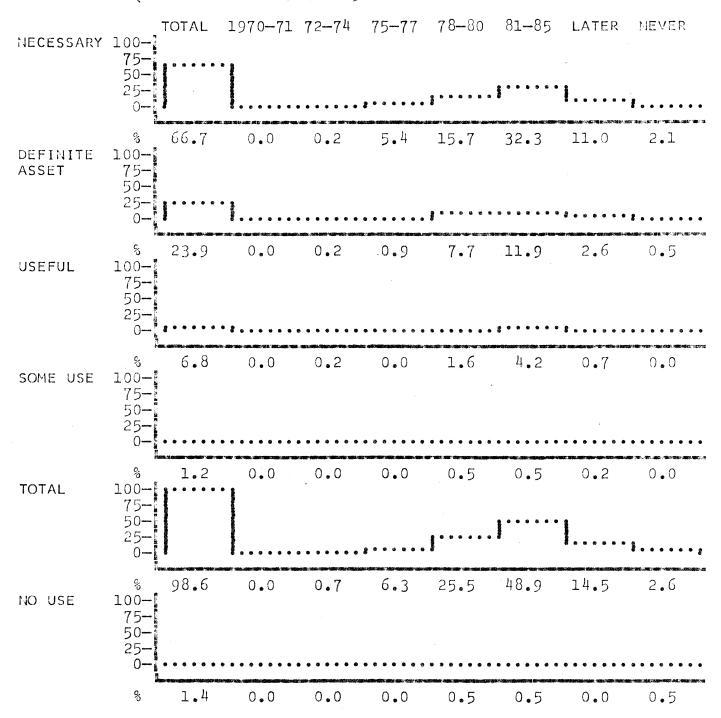
### IMPROVED BAGGAGE HANDLING EQUIPMENT

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
1.54 2.95 3.13 0.20



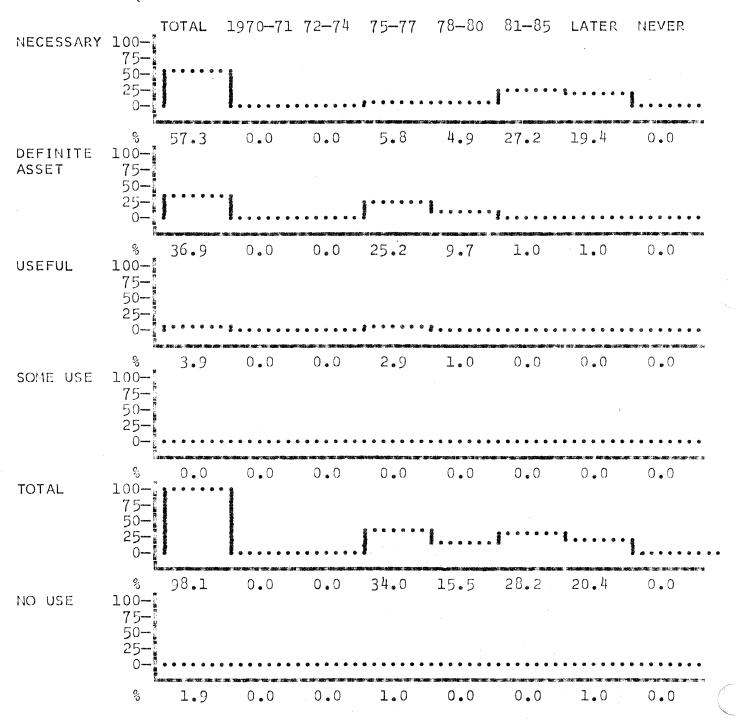
#### IMPROVED SENSOR TECHNOLOGY

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.54 2.38 2.82 0.67

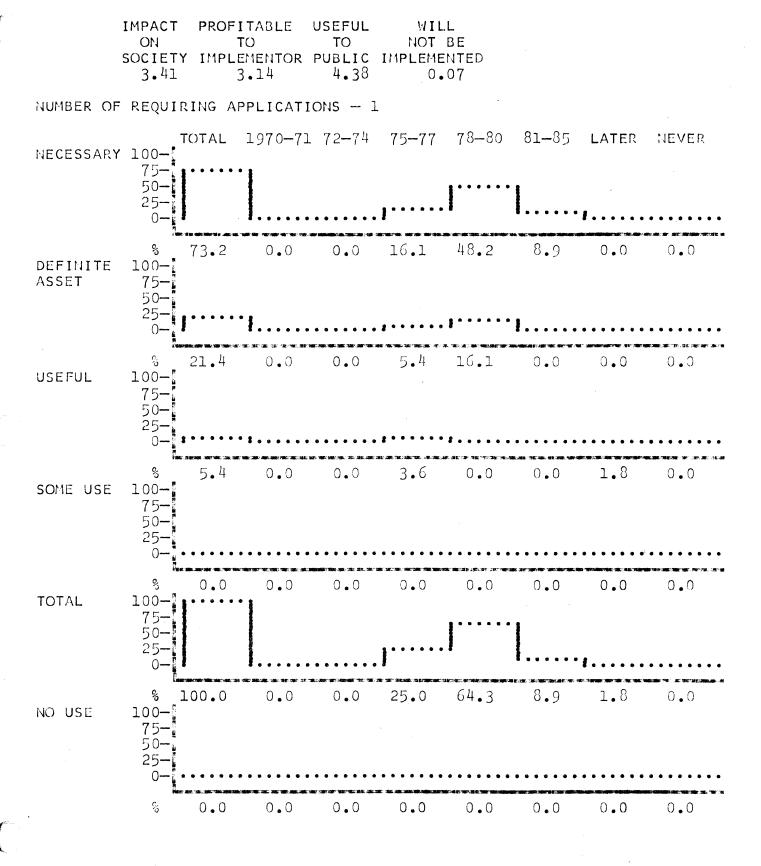


# IMPROVED TELEMETRY

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.25 2.14 2.16 1.05

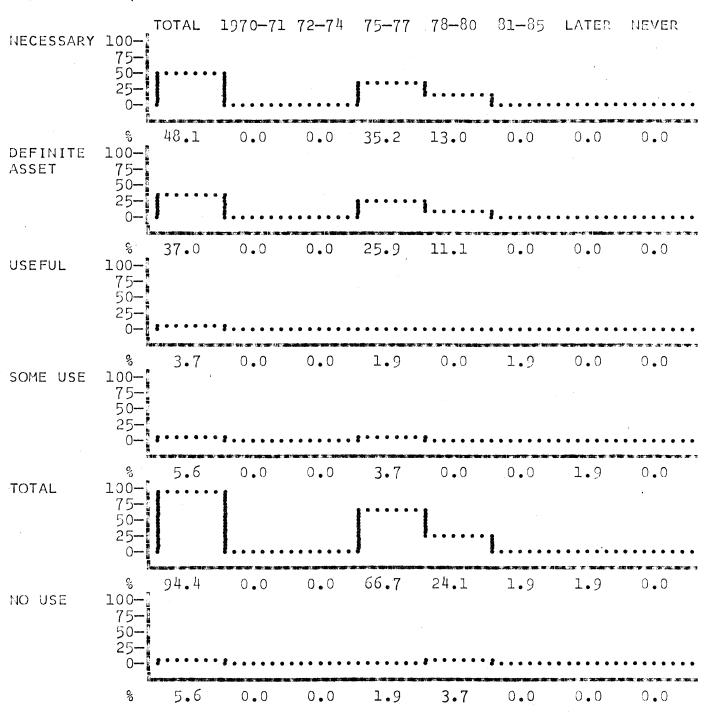


#### INEXPENSIVE AIRCRAFT POSITION AND IDENTIFICATION TRANSPONDERS



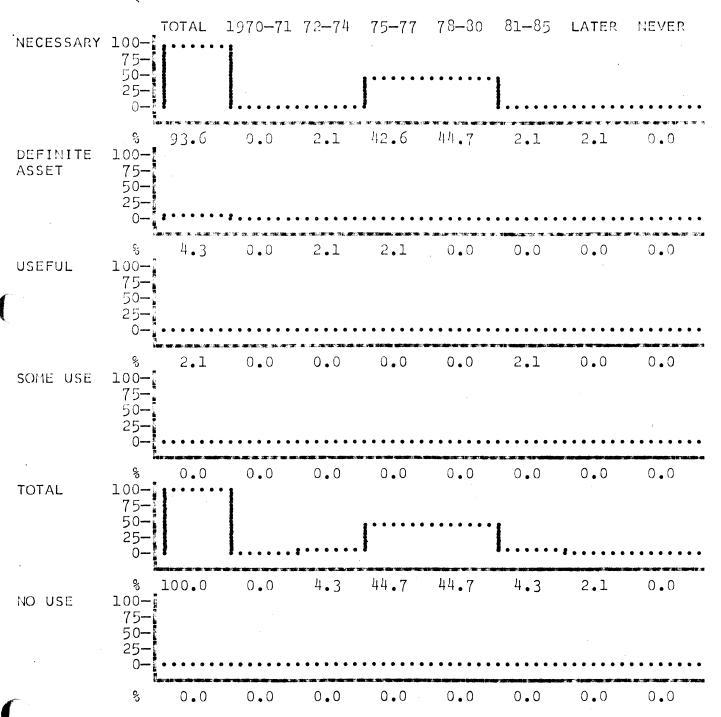
#### LOW COST COMPUTER SYSTEMS LESS THAN \$500/MONTH

IMPACT PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.10 3.13 3.46 0.26



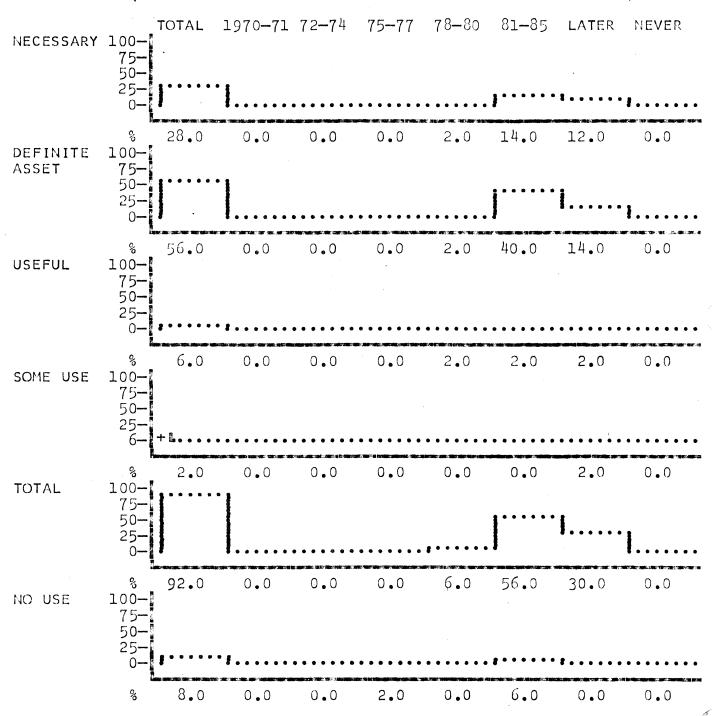
#### LOW COST SENSORS

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 3.46 2.36 3.75 0.15



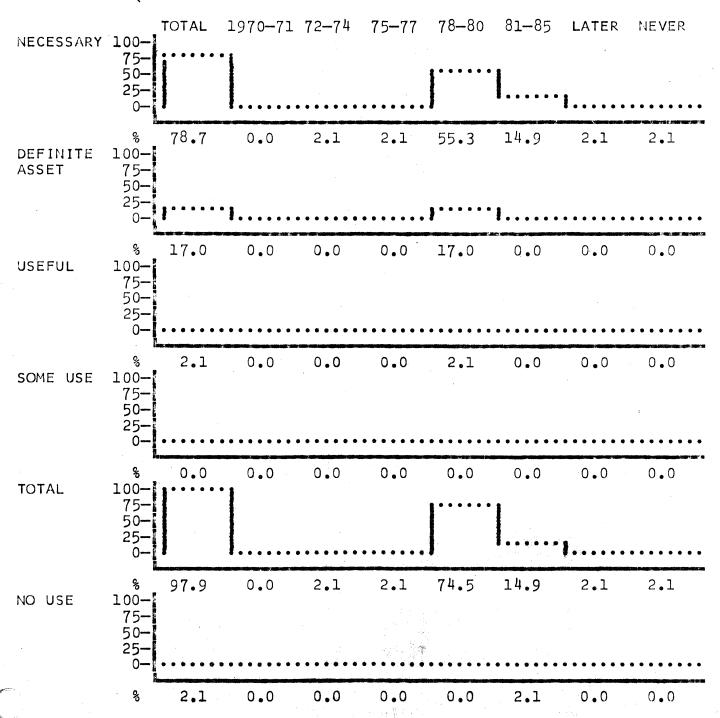
#### SENSORS WITH EYE-LIKE CAPABILITIES

IMK3T PROFITABLE USEFUL WILL
ON TO TO NOT BE
SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED
2.72 1.86 1.37 1.70



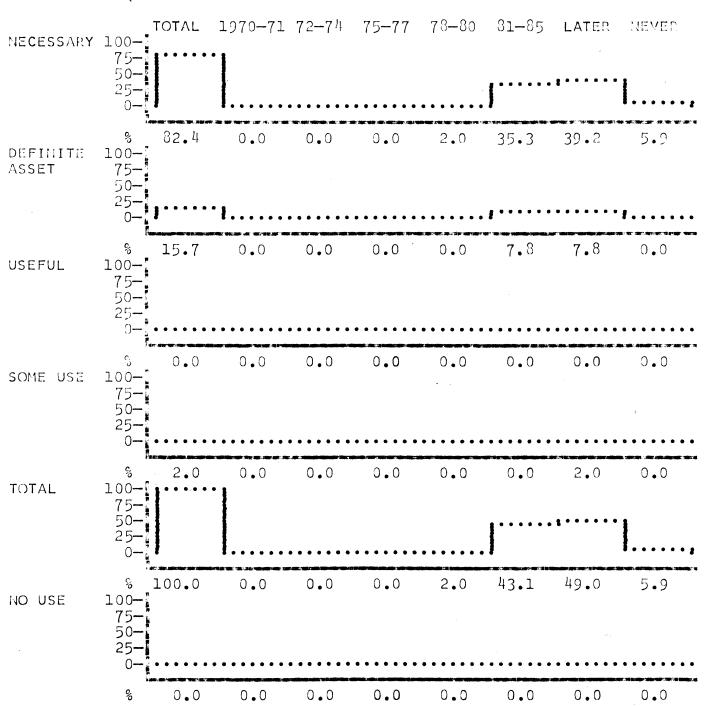
#### UTILITY REMOTE USAGE RECORDING DEVICE

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 1.68 3.00 2.66 0.36



#### WIDE-ANGLE SENSING DEVICE FOR AUTOMOBILE COLLISION AVOIDANCE

IMPACT PROFITABLE USEFUL WILL ON TO TO NOT BE SOCIETY IMPLEMENTOR PUBLIC IMPLEMENTED 3.15 1.98 2.58 1.56



#### V. OUTLINE OF THE STUDY

Four questionnaires were used in this study to pursue the line of inquiry outlined in Figure 5.1. Examples of the questionnaires are given in Figures 5.2-5.5. The first questionnaire (Figure 5.2) presented a list of 57 new applications of data processing and asked that the respondents judge their value in terms of "Impact on Society," "Profitability to the Implementor," "Usefulness to the Public," "Other Reasons" and "Will Not be Implemented." "Impact on Society" was defined as "the effect of the life styles of people, their relationships with each other, their perceptions of themselves, or the structure of their institutions." The respondents were also asked to provide additional significant applications which would occur before 1985 and which were not simple extensions of existing applications. The responses to this questionnaire were collated and 77 new applications were added. Ten of the original applications were dropped because the panel judged them to be of low value.

Questionnaire two (Figure 5.3) presented the composite list of applications and asked the respondents to provide estimates of the dates by which they judged the applications would have a 10 percent, 50 percent, and 90 percent probability of implementation. The degree of implementation to be judged was indicated in the description of each application, for example "in 20 percent of the metropolitan areas." It was desired that the estimates be technologically independent, but also recognized that the price/performance implications of technological development might be the overriding consideration in determining an implementation date. For this reason an arbitrary set of price/performance curves were included. If price/performance was the governing concern, it was suggested that the respondent pick his date by relating to the desired price/ performance on the curves. In this way if better price/performance projections become available later, the estimated dates can be adjusted accordingly. Figure 5.6 shows the curves used.

Respondents were also asked to evaluate their own degree of expertise by selecting from among the following options:

- . Expert working in the area
- . Generally familiar with aspects
- . Casually acquainted
- Unacquainted

A second part of this questionnaire asked the respondents to identify for each application critical data processing capabilities required to make the application viable. The third part repeated questionnaire one questions for the added applications. The collated responses resulted in dropping 11 of the added applications because they were judged to have low values or were more properly included as requirements. Included were 368 capabilities; but because many capabilities were suggested for multiple applications, the net was 75 unique capabilities.

The third questionnaire (Figure 5.4) listed the composite list of applications and their associated capabilities. Also, for each application a representation of the consensus to date of the implementation date and the respondent's previous 50 percent probability estimates were included. The respondents were asked to re-estimate their 50 percent dates in view of the consensus and to provide reasons for their responses if they were still outside the consensus or held strong feelings supporting the consensus. In addition, they were asked to list for each application factors outside of the data processing area whose occurrence or non-occurrence would cause their estimates to be either accelerated or retarded.

For the capabilities, respondents were asked to evaluate the importance of the capability and for those capabilities which were quantified to indicate the true magnitude of the quantity relative to the given value. The latter was done by providing columns with multiples of ten which could be used to indicate how many times ten the values should be larger or smaller. For each response the respondent was asked to indicate the thinking that had lead to his answer.

The final questionnaire (Figure 5.5) included the applications and capabilities as before with consensuses to date, reasons and their previous responses. Respondents were asked to reestimate their responses in light of the consensus and reasons. From the third questionnaire 93 accelerating and retarding factors were identified of which 71 were unique. These factors were listed in the fourth questionnaire and the panel was asked to determine how casually related each was to the associated application and to estimate when the factor would occur.

# STUDY FLOW

ACTION	QUESTIONNAIRE 1	QUESTIONNAIRE 2	QUESTIONNAIRE 3	QUESTIONNAIRE 4
Data Provided	.Suggested new applications	.Added applica- tions	.Composite list of applications .Consensuses of date of imple-mentation	.Composite list of applications .Consensuses of date of implementation .Reasons
Inquiry	.Estimate value	.Estimate value	.Re-estimate date .Give reasons .Identify accelera- ting and retarding factors	.Re-estimate date of implementation
Data Provided		.Composite list of applications	.Composite list of applications with capabilities	.Composite list of applications .Accelerating and retarding factors
Inquiry	.What new appli- cations would you add?	.When might these be implemented? .What is your level of expert-ise?	.Evaluate the im- portance of the capabilities .What is the true relative magnitude of any quantities?	.Determine the degree of casual relationship .When will the factor occur?
Pata Provided		.Composite list of applications		.Composite list of applications with capabilities .Consensuses .Reasons
Inquiry		.What data process- ing capabilities are required?		.Re-evaluate import- ance of the capabi- lities .What is the true relative magnitude of any quantities?

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	Respondent No	B. I	MPACT			C. R	EASON	S FOR	IMPL	EMENT	ATION		D.
	GUIDE/IBM STUDY OF ADVANCED APPLICATIONS QUESTIONNAIRE 1 PART 1	ON SOCIETY		PROF	ITABL TO EMENT	E	บ	SEFUL TO UBLIC	•	BELOW)			
	Impact Of The Applications On Society And The Reasons For Implementation		ANT				ΙΓΥ	LY.		LY	ΓΥ	IN BE	BE
	A. Suggested future data processing applications are listed below. Evaluate their impact on society and the reasons for implementation. Indicate your judgment by checking the appropriate column.	MAJOR	SIGNIFICANT	LITTE	ON	VERY	MODERATELY	MARGINALLY	VERY	MODERATELY	MARGINALLY	OTHER (WRITE I	WILL NOT BE
Figure 5.2	O. Checkless Society The establishment of point of transaction debiting in 20 percent of the metropolitan areas. This application is an extension of the Financial Utility to include terminals at the point of sale so that at the time of sale, transactions can be recorded and authorized or rejected. Other services such as automatic budget control are possible by allowing the system to reject expenditures for items that would overrun the previously established budget.									•			
1	1. Home Banking The utilization of the home terminal in 1 percent of the homes to accomplish banking transactions. Credit transfer authorizations, changes in preauthorizations, changes in savings and investment plans, the establishment of credit lines, changes in automatic budget control, etc., could be made from the home terminal after suitable identification of the individual and/or terminal.											-	
4	2. Automated Banking Teller The installation in 20 percent of the banks of an unattended station to accomplish the transactions now processed by a bank teller including the receipt and delignery of cash.		7 N						,				

5.2

V.4

Re	sponde No	inarc	ate w	he fo hen y	ou th			, pli-	C. Ho you w	w f ith c	liar ne ar	arc ea?
GUI	DE/IBM DELPHI STUDY OF ADVANCED APPLICATIONS  QUESTIONNAIRE 2 PART 1 Chronology And Expertise	cation will occur. A=Earliest Possible (10% prob.) B=Most likely (50% prob.) C=Almost Certainly Before (90% prob.)			Working Area	lly Famil- th Aspects	ly ited	ainted				
	A. Applications	Before 1972	1972 -74	1975	1978 - 80	1981 -85	After 1985	Never	Expert in the	Genera iar wi	Casually Acquain	Unacqua
39. <b>Figure 5:3</b>	Financial Utility The establishment of an integrated financial service in 20 percent of the metropolitan areas. The utility (a regulated monopoly?) would primarily provide electronic transfer of funds between demand accounts in subscriber banks making possible such services as automatic deposit of salaries, automatic preauthorized debits and automatic activation of credit lines from various banks or financial institutions. Centralized credit checks could be made taking into account balance on hand, salaries, outstanding loans, and established credit lines.		·									
V.5	Checkless Society The establishment of point of transaction debiting in 20 percent of the metropolitan areas. This application is an extension of the Financial Utility to include terminals at the point of sale so that at the time of sale, transactions can be recorded and authorized or rejected. Other services such as automatic budget control are possible by allowing the system to reject expenditures for items that would overrun the previously established budget.		The communication of the									

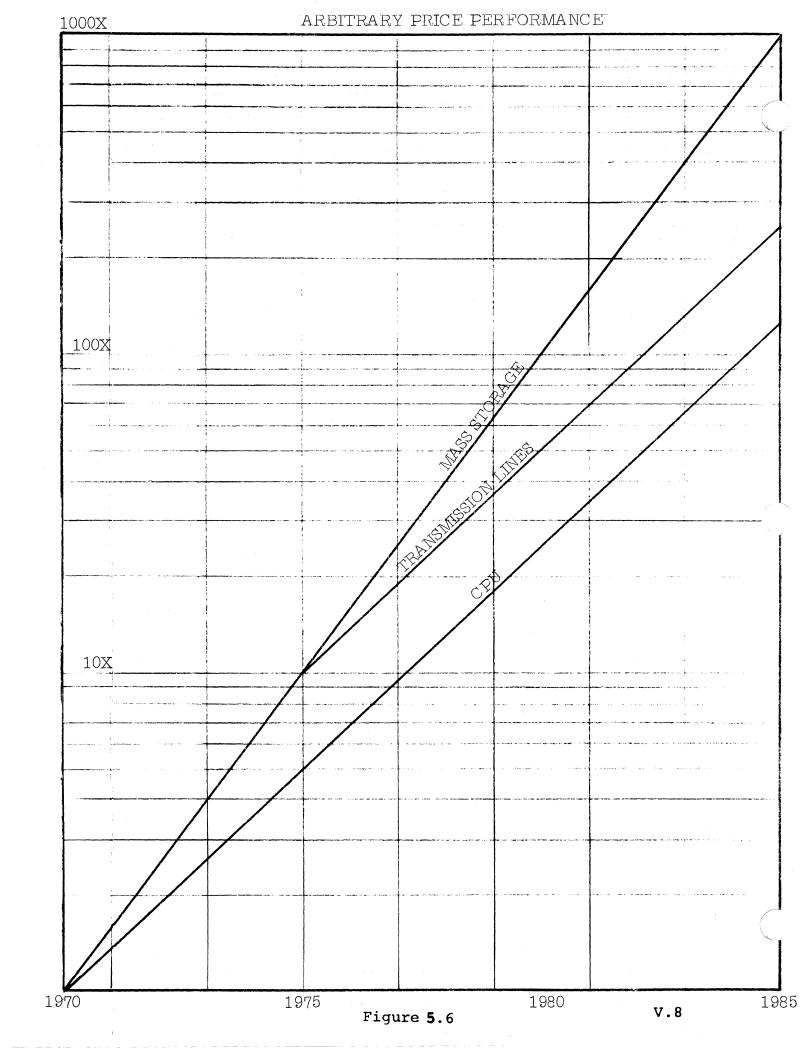
.

APPLICATION DESCRIPTION						
40. Checkless Society The establish of point of transaction debiting in percent of the metropolitan areas. application is an extension of the Financial Utility to include termina at the point of sale so that at the of sale, transactions can be recorde authorized or rejected. Other servi such as automatic budget control are	20 reject expenditures for items that would overrun the previously established budget.  1s time d and					
PART 1. M	OST LIKELY DATE OF IMPLEMENTATION					
Shown at the right is the group consensus date with your previous most likely (50% circled. In light of this consensus indicates estimate of the most likely date by check appropriate dates.	Prob.) date L MU te your re-					
If your new estimate is outside the consensus or if you have strong reasons supporting your position, list on the right the reasons why the group should accept your viewpoints.						
Chack the box to the right if a change in the arbitrary price performance curves would cause your estimate to change. There hay be other technological, business, political, or social factors whose concerned or non-occurrence would cause your estimate to change. List those factors to the right.	A change in the price performance curves. List other factors:					
PART 2. DATA PROCESSI	NG CANADAY YEAR ON THE STATE OF					
Estimate the importance of each capability by checking a column in group 1. For capabilities which are quantified below, check a column in group 2 to indicate your judgment of the true magnitude relative to stated quantity.	Group 1 Group 2 If you have strong reasons supporting your estimates of importance, (group 1) of and/or magnitude (group 2), list the reasons why the group should accept your strong reasons supporting reasons					
Positive user identification at the terminal (e.g. fingerprint, credit card, retina-print, voice-print, etc.						
Mass storage of 100 billion bytes.						
Low cost terminal for point of sale entry and inquiries \$200-\$300 purchase.						
Network control.						
Massive communication interface 100,000 lines.						
Advanced data base management with parti- cular emphasis on security.						
High reliability and availability. No discernible downtime at the terminals of longer than <u>l minute</u> .						

# QUESTIONNAIRE 4

# APPLICATION DESCRIPTION

ANT 1. DATA PROCESSING CAPABILITIES REQUIRED FOR INPLEMENTATION In view of the consensus at the right and the reasons below re-estimate the innor- checking the annormitate columns.  **REAGOIS**  **PROUNDED CAPABILITIES**  **PROSITIVE user identification at the ter- minal (e.g. fingerwrint, credit card, retinan-rint, voice-wrint, etc.  **Wass storage of 100 billion bytes.*  Low cost terminal for point of sale entry and inquiries \$200-\$300 purchase.  **Natwork control.**  **Massive communication interface 100,000 Ilinea.**  **Mayanced data base management with narticular embhasis on security.  **High reliability and availability. No discernible downtine at the terminals of longer than 1 minute.  **PAPT 2. IMPLEMENTATION AAFE **TRANSPORT OF THE PROPERTY OF TH	rejected. Other services such as auto	ent of noint of transaction debiting in 20 is an extension of the Financial Utility ime of sale, transactions can be recorded omatic budget control are nossible by alludd overrun the previously established budget.	to and	ind	clu +h	ide	te	rm	in		5
In view of the consensus at the right and the reasons below re-estimate the importance and relative magnitude of the canabilities. Indicate your responses by checking the annronizate columns.  **TENNIRED CAPABILITIES**  **Positive user identification at the terminal (e.g., fingerprint, credit card, retina-orint, voice-print, etc.  **Mass storage of Ind billion bytes.**  Low cost terminal for moint of sale entry and inquiries \$200-\$300 purchase.**  **Natwork control.**  **Natwork	PART 1. DATA PROCESSING CAPABILITI	ES REQUIRED FOR IMPLEMENTATION	T	T+	П	$\overline{\Box}$	$\prod$	Ŧ	$\overline{\sqcap}$	$\prod_{i}$	<u></u>
Positive user identification at the terminal (e.g., fingerprint, credit card, retina-print, voice-print, etc.  Wass storage of 100 billion bytes.  Low cost terminal for point of sale entry and inquiries \$200-\$300 purchase.  Natwork control.  Nassive communication interface 100,000  lines.  Advanced data base management with particular emhasis on security.  High reliability and availability. No discernible downtime at the terminals of longer than 1 minute.  FART 2. IMPLEMENTATION DATE  Transport of the consecutive of the control of the property of the p	In view of the consensus at the right and tance and relative magnitude of the capab	the reasons helow re-estimate the immen		115		7504 7504	1	~	X nore	9 X more	000 X 110
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	No accelerating or retarding factors were you may include below any that now occur t	Submitted If you doging									



#### VI. DATA ANALYSIS

# The Respondent Panel Distribution

An effort was made to insure that all areas of data processing applications were represented in the panel. Figure 6.1 lists the area groupings that emerged and two measures of the distribution of experts among those who responded to the last questionnaire. The first column enumerates those who would appear to be experts based on their company or organization affiliation and/or job title. The second column shows the counts of experts based on the respondent's self-evaluation. As was to be expected, there are more experts identified in the second column than in the first. This is because many of the respondents felt confident in areas which they were not immediately associated.

#### RESPONDENT ANALYSIS

	OCCUPATION	SELF-ANALYSIS
AGRICULTURE	0	14
AIRLINES	2	24
BUSINESS ASSISTANCE	0	29
COMPUTER ASSISTED RESEARCH	2	17
DISTRIBUTION AND RETAIL	3	31
ECOLOGY	1	12
EDUCATION	2	20
FINANCIAL AND INSURANCE	6	21
FREIGHT TRANSPORTATION	2	21
GOVERNMENT SERVICES	4	11
HOME TERMINALS	0	31
INFORMATION SYSTEMS	3	16
INFORMATION UTILITIES	5	26
JUDICIAL AND LEGISLATIVE	1	18
MANUFACTURING AND PROCESS	18	19
MEDIA	4	24
MEDICAL	8	15
OFFICE ASSISTANCE	0	37
PUBLIC AND PRIVATE TRANSIT	0	14
UTILITIES	4	26

Figure 6.1

#### Consensus Analysis

One of the principles of the Delphi Technique is that the process should cause a convergence of the consensuses. Figure 6.2 represents the results of iterating the questions on the implementation date and the necessity and magnitude of the capabilities.

#### CONSENSUSES

	Implementation Date	Capabilities
Converged	85	230
Initially One Period Wide	0	103
No Change	23	218
Diverged	0	4
Median Shift	7	10
Three-period Consensus	1	6

#### Figure 6.2

In both cases the majority either converged or started at one period width and, therefore, couldn't converge. Only a very few actually diverged or remained as wide as three periods.

Experience with Delphi Studies in the past has indicated that in general the width of date projection consensuses is approximately equal to the median date of the projection, i.e., a projection with a median of 1980 can be expected to have a width of ten years. Figure 6.3 graphs the median implementation date of the consensuses against their width (the numbers represent the number of consensuses falling at a point.) If the results followed the expectation, they would fall approximately on the diagonal line. In fact, they, with the exception of one, either fall close to the line or in the lower right hand side. This indicates that most consensuses were as good or better than could be expected.

# IMPLEMENTATION DATE CONSENSUS WIDTH

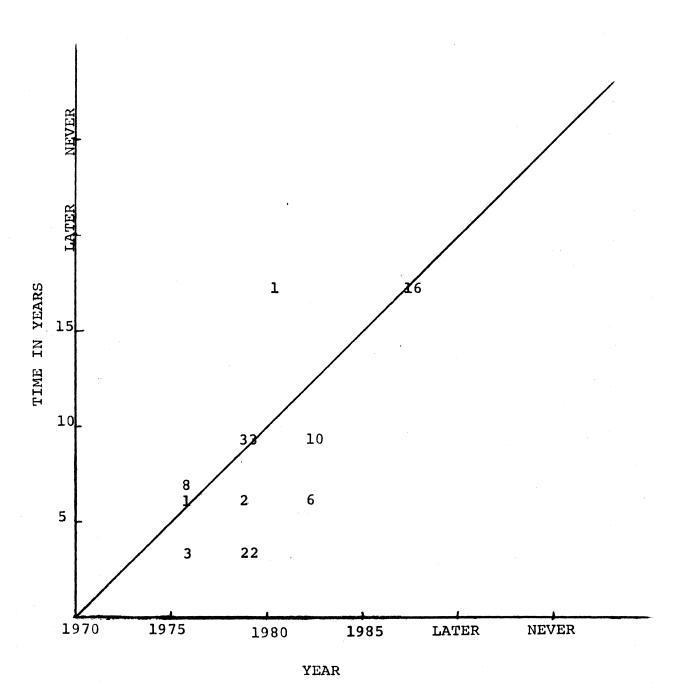


Figure 6.3
VI.3

Respondents were asked to evaluate their own degree of expertise. In the detailed printouts of Section 3, the consensuses of the experts are compared to the group as a whole. The results of that comparison are shown in Figure 6.4.

#### Expert Consensus vs. Group Consensus

Expert Consensus Was:	Same Median Response	Different Median Response
Narrower	76	6
The Same Width	389	70
Same but Offset	8	2
Wider	82	19

#### Figure 6.4

In addition, no expert median was more than one period away from the group median. From this we conclude that there is little difference between expert and group opinions. Therefore, group opinions are used in all of the results.

#### IBM versus Customer Consensus

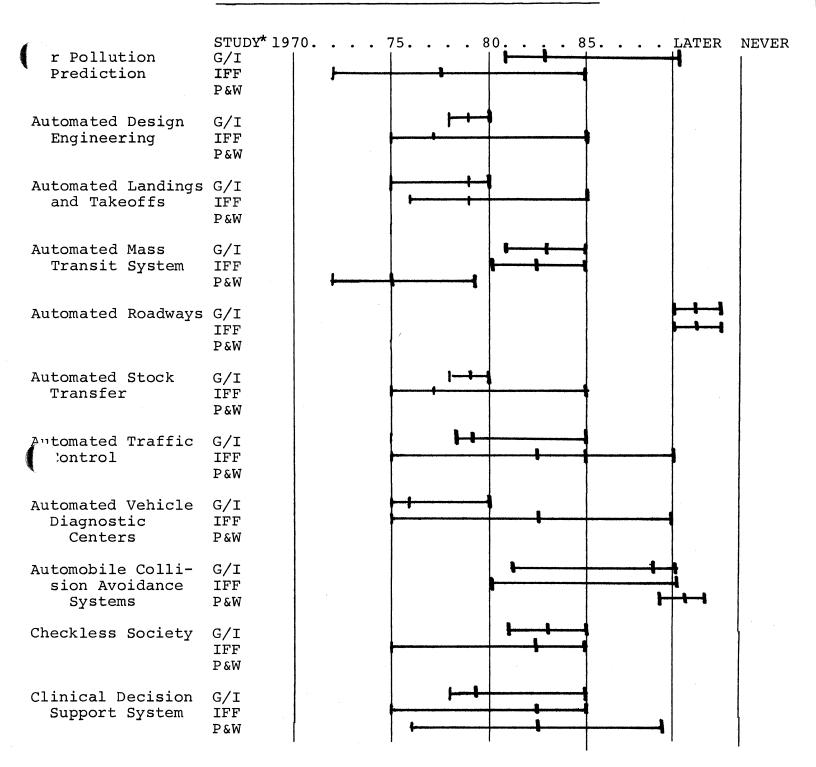
During the study IBM and Customer responses were processed without distinction between the two. The analysis consensuses were recalculated separately for the two groups. Comparison of the two showed almost identical results for date and capability value consensuses.

#### Comparison With Other Studies and Published Articles

It is possible to evaluate the results of the study by comparing them to those obtained in other similar but independent studies. The author knows of two other efforts which closely parallel this study: In 1968, Parsons & Williams Incorporated conducted a study using participants in FILE 68, an international seminar on file organization held in Denmark; and The Institute fFor the Future (IFF) of Middletown, Connecticut is conducting a study of future risks associated with computer based systems for Skandia Insurance Company. Ltd., of Stockholm, Sweden.

Both studies use the Delphi Technique; however, the Parsons & Williams study had only two iterations, and the IFF study results are only available through the third iteration as of this date.

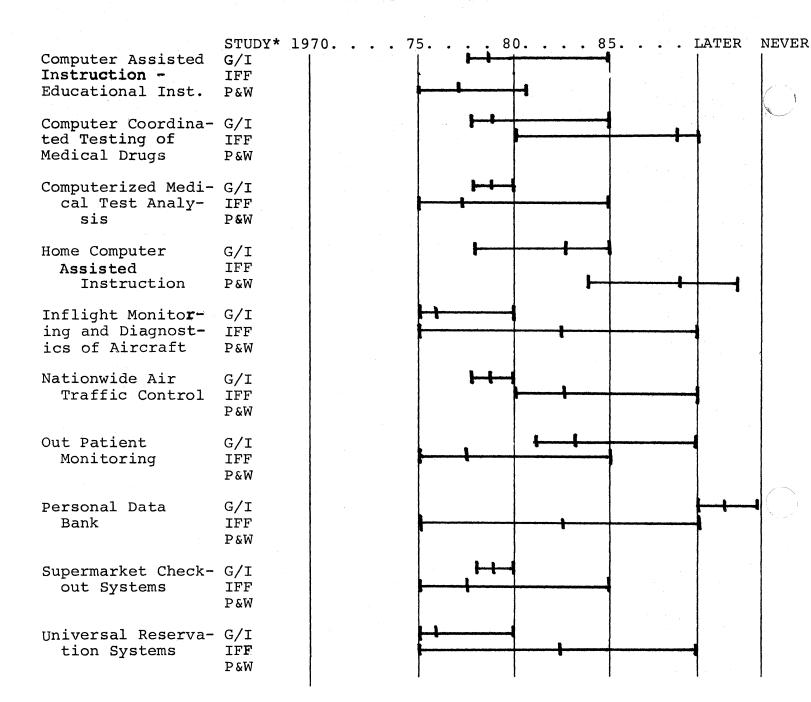
#### PARALLEL STUDIES OF FUTURE APPLICATIONS



<sup>\*</sup> G/I GUIDE/IBM-Study of Advanced Applications.

IFF Institute for the Future Study - A Delphi inquiry into the future risks of computer-based systems.

P&W Parsons & Williams-Forecast 1968-2000 of computer developments and applications.



<sup>\*</sup> G/I GUIDE/IBM-Study of Advanced Applications.

IFF Institute for the Future Study - A Delphi inquiry into the future risks of computer-based systems.

P&W Parsons & Williams-Forecast 1968-2000 of computer developments and applications.

Figure 6.5 (con't)

Consequently, the width of consensus in both results is relatively wide. Nevertheless, the results of the three studies are compared in Figure 6.5 for those applications which are common. The results show considerable agreement, particularly, in view of different descriptions of the applications which could lead to differing interpretations as to when an application would be implemented. Therefore, we conclude that the panel selection and study organization is valid since it produced results comparable to other independent studies with similar objections.

Another way to validate results is to compare them to published articles relating to the applications. Two types of articles are applicable: those reporting pilot applications efforts underway and those containing predictions of future applications. Below is a partial list of articles considered by the investigators:

	Subsistence and Reference	Study Result
•	Home Printout of Newspapers by 1979 Saturday Review, October 10, 1970	1981-85
•	Computer Assisted Publishing - 1980 Saturday Review, October 10, 1970	1978-80
•	Computerized Job Banks in 42 Cities - Now U. S. News & World Report, July 27, 1970	19 <b>75-77</b>
•	Automatic Ticket Vendor Pilot Tested EDP Weekly, October 12, 1970	1975-77
•	Supermarket Checkout Pilot System Wall Street Journal, August 7, 1970	1978-80
•	Study Contract for Legislative Information	
	System Forbes, October 1, 1970	1978-80
•	Assembly Line Robots for GM's Vega Business Week, August 8, 1970	1981-85
•	Two Airlines Announce Baggage Handling Systems New York Times, November 8, 1970	1978-80

On the basis of this limited sample it appears that the estimates of future dates generally match other predictions, whereas, successful pilot efforts of many of the applications make the above dates appear conservative.

#### APPENDIX A Applications Deleted from the Original List

The following applications were dropped from the study because the panel judged them to be of relatively low value. Their elimination from the study does not mean they may not occur and in fact some of the applications have been incorporated in the scenarios. They are listed alphabetically within area groupings and the value printout is shown.

#### AIRLINES

#### Automated Ground Control of Airplanes

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	$ extit{NOT}$ BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.86	2.15	2.09	0.89

The utilization of automated dockings, undocking, and taxiing of commercial aircraft at the ten largest metropolitan airports.

#### EDUCATION

#### Automated Student ID/Credit System

IMPACT	PROFITABLE	$\mathit{USEFUL}$	WILL
on	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.31	2.25	1.86	<b>-</b> 0.33

The implementation in 1 percent of the nation's colleges of a system to capture billing, attendance, and security data at the point of transaction (cafeteria, library, bookstore, athletic events, etc.) and maintain updated files in appropriate portions of students' records.

#### Classroom Response System

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	${\tt NOTBE}$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.75	1.77		0.52

The installation of small desk terminals in 1 percent of the secondary and college lecture halls. The system would provide instantaneous monitoring of class comprehension by summarizing and displaying the responses to questions at the teacher's console.

#### Universal University Enrollment and Scheduling System

IMPACT	PROFITABLE	USEFUL	WILL
ON	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR		
1.73	2.17	2.28	0.28

A system in 20 percent of the metropolitan areas for the processing of college enrollment and scheduling. The system will interrogate college openings and requirements, accept students' applications, select courses, and issue class schedules.

#### FINANCIAL

#### Automated Banking Teller

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.30	2.36	1.79	<sup>-</sup> 0.74

The installation in 20 percent of the banks of an unattended station to accomplish the transactions now processed by a bank teller including the receipt and delivery of cash.

#### Automated Currency Arbitrage System

IMPACT	PROFITABLE	USEFUL	WILL
on	TO	TO	NOT $BE$
SOCIETY	<i>IMPLEMENTOR</i>	PUBLIC	IMPLEMENTED
1.28	2.37	1.56	¯0 <b>.</b> 53

The establishment of a system that would provide realtime, worldwide, money market rates and provide links to financial institutions from multiple nations so that money "buy" and "sell" orders could be processed expeditiously.

#### GOVERNMENT SERVICES

#### Centralized Selective Service Administration

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	$ extit{NOT}$ BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.93	1.47	1.73	<b>-</b> 0.86

The creation of a computer-assisted centralized selective service system to replace the function of local boards and insure equitable administration of the draft.

#### Precomputed Income Tax System

IMPACT	PROFITABLE	USEFUL	WILL
ON	TO	TO	$ extit{NOT}$ BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.85	2.21	2.67	-0. <b>3</b> 9

The Internal Revenue Service will mail a completed tax return to the taxpayer based on income reports and standard deductions. The taxpayer would have the option of signing and returning it or of recomputing his own taxes.

#### State Information Systems

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
on	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
2.55	1.88	2.21	~0.70

The consolidation by ten states of the various information systems that support state governments into an integrated information system. Common data between various support systems would be logically shared, but not necessarily centralized, and the system would interface to local information systems to provide and receive information.

#### HOME TERMINAL

#### Automated Meal Preparation

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1 26	0.80	0.74	<sup>-</sup> 2.11

The availability of automated meal preparation in 1 percent of the homes. Specially packaged food products would be automatically prepared in accordance with a stored menu. The system would maintain its own inventory and either order automatically via the Home Shopping Service or provide a shopping list.

#### Automated Plebiscite and Polls

IMPACT	PROFITABLE	$\mathit{USEFUL}$	WILL
ON	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
2.21	1.39	1.73	<b>-</b> 1.45

The utilization of home terminals in 75 percent of the homes to conduct public opinion polls, surveys, plebiscites, and elections.

#### Classified Advertising System

IMPACT	PROFITABLE	USEFUL	WILL
ON	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.48	2.06	2.16	-0.48

The availability via the home terminal in 1 percent of the homes of a data bank containing classified advertising. Both input and selective retrieval would be featured.

#### Computerized Participatory Games

IMPACT	PROFITABLE	USEFUL	WILL
on	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.17	1.35	1.02	1.37

The availability via the home terminal in 1 percent of the homes of such participatory games as bridge, chess, etc. The system would connect those desiring to play, conduct the game and, if desired, participate as a player.

#### Do-It-Yourself Diagnostic Services

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
on	TO	TO	NOTBE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.39	1.42	1.80	<sup>-</sup> 1.27

The availability via the home terminal of 1 percent of the households of a service to interactively diagnose appliances malfunction or other household problems, provide instructions for repair, provide lists of parts, recommend local sources of parts, and/or recommend local repair services.

#### Home Banking

IMPACT	PROFITABLE TO	USEFUL TO	$egin{array}{c} WILL \ NOT & BE \end{array}$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.89	1.31	1.37	1.74

The utilization of the home terminal in 1 percent of the homes to accomplish banking transactions. Credit transfer authorizations, changes in pre-authorizations, changes in savings and investment plans, the establishment of credit lines, changes in automatic budget control, etc., could be made from the home terminal after suitable identification of the individual and/or terminal.

#### Home Electronic Mail Service

IMPACT	PROFITABLE	USEFUL	WILL
on	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.95	1.59	1.74	<sup>-</sup> 1.65

The availability of electronic mail service via the home terminal to 5 percent of the homes.

#### Home Terminal Financial and Computational Services

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.62	2.08	2.17	<sup>-</sup> 0.67

Availability via the home terminal in 1 percent of the homes of services to assist in such financial areas as budgeting, tax accounting, insurance and investment planning, as well as general computational requirements.

#### Home Work Centers

IMPACT	PROFITABLE	USEFUL	WILL
oN	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
2.20	2.13	2.38	0.84

Use by 0.1 percent of the non-production work force of home terminals as at least part-time home work centers. The system would provide all or most of the resources the employee needs to accomplish his job such as: secretarial service, internal mail service, filing, information retrieval and inquiry, computer access, etc. Face-to-face meetings and other needs to be at a physical location would be scheduled as business trips are now.

#### Menu Preparation Service

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1 22	1.10	1.16	1.44

The availability via a terminal to 1 percent of the homes of menu preparation service. The housewife controls the menu preparation by listing groundrules as to price, favorite and/or undesired food items, and special occasions. The menu provided can be adjusted by substitutions and additions. The system also provides recipes and shopping lists.

#### INFORMATION UTILITIES

#### Automated Patent Search

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	NOTBE
SOCIETY	IMPLEMENTOR	PUBLI C	<i>IMPLEMENTED</i>
1.46	2.20	1.59	<sup>-</sup> 1.15

The availability of a system capable of accepting a patent application, analyzing it and searching the complete files of the U. S. Patent Office automatically. The search would be from terminals located in law firms, corporate law departments, etc.

#### National Directory

IMPACT	PROFITABLE	USEFUL	WILL
on	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.45	1.58	2.13	<b>-</b> 0.80

Existence of a computerized national directory for locating addresses and telephone numbers of individuals given their names. Inquiry is by mail or home terminal.

#### Professional Buyer Service

IMPACT	PROFITABLE	USEFUL	WILL
ON	TO	TO	NOT $BE$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.57	2.23	2.14	0.69

The utilization by 1 percent of the consumers of the services of a professional buyer who would utilize his data banks of product prices, availability, vendors, vendor performance, etc., to make the most advantageous purchases for the consumer much as an industrial buyer functions today.

#### MANUFACTURING & PROCESS

#### Automated Service Stations

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.42	2.20	1.90	1.07

The conversion of 20 percent of the service stations to dispense automatically gasoline and oil for automobiles. The station is activated via credit card with credit checks and control of the station directed from a central computer.

#### OFFICE ASSISTANCE

# Electronic Filing Systems

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	$ extbf{NOT}$ BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.45	2.65	1.94	0.29

The use of 0.1 percent of clerical personnel of systems that file documents in electronic and/or image form. Indexing could be automatic or as directed by the clerk. Retrieval and printout is computer controlled.

#### Personal Information Services

IMPACT	PROFITABLE	${\it USEFUL}$	WILL
ON	TO	TO	$oldsymbol{\mathit{NOT}}$ B $oldsymbol{\mathit{E}}$
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
1.19	1.98	1.43	<sup>-</sup> 0.67

The availability to 1 percent of the executives of a personalized information system. The system would assist the executive by providing an auxiliary memory for names and descriptions of people and organizations he deals with, personal appointment calendar, correspondence files, current activity file, etc., by providing computational and analysis services and by providing skills and procedure support.

#### CAPABILITIES

The following application was dropped because it was belatedly judged to be more properly included as a required capability.

#### Discovery Systems

TMPACT	PROFITABLE	USEFUL	WILL
ON	TO	TO	NOT BE
SOCIETY	IMPLEMENTOR	PUBLIC	IMPLEMENTED
2.57	1.94	2.32	1.21

The existence of a computer system that will, with human interaction, be capable of discovering underlying properties and principles that govern the behavior of complex systems and natural phenomenon.

#### APPENDIX B RESPONDENTS

The list below identifies those respondents who have allowed us to use their names.

- Mr. S. O. Albert
- Mr. Donald H. Bein
- Mr. R. D. Bernhard
- Mr. Roger W. Borneman
- Dr. Ronald Brady
- Mr. Allen J. Burris
- Mr. J. E. Chapman
- Mr. C. L. Charles
- Mr. Albert F. Collard
- Mr. Roger Creel
- Mr. D. F. Daubenspeck
- Dr. Robert DeBaun
- Mr. P. A. Dolan
- Mr. G. J. Evans, Jr.
- Mr. John Filchak
- Mr. Ralph A. Hawkins
- Mr. Robert V. Head
- Mr. Willian Herbert
- Mr. James A. Hodskins
- Mr. J. A. Hoede
- Dr. S. L. Jamison
- Mr. R. B. Johnson
- Mr. A. Katz
- Mr. Robert C. King

- IBM Corporation DPD
- A. O. Smith Corporation
- Continental Can Company, Inc.
- Atlantic Richfield Company
- Syracuse University
- The Northern Trust Co.
- IBM Corporation DPD
- IBM Corporation DPD
- Eastern Air Lines, Inc. Information Systems Dept.
- Employers Insurance Co.
- IBM Corporation DPD
- America Cynamid
- IBM Corporation FE Division
- IBM Corporation DPD
- Southern New England Telephone Co.
- IBM Corporation DPD
- Consultant
- CNA Insurance, Programming Systems
- AT&T Management Sciences
- IBM World Trade Corporation
- IBM Corporation DPD
- IBM Corporation ASDD
- IBM Corporation FSD
- International Div. Mobil Oil

- Mr. Carl Klein
- Dr. R. G. Kokat
- Mr. George J. Kost
- Mr. E. F. Krieg
- Mr. Nick Landin
- Mr. Bork Lee
- Mr. Gordon H. Lossing
- Mr. G. K. Magnuson
- Mr. Charles Mairet
- Mr. Richard McCoy
- Mr. Joseph M. Mehlmann
- Mr. Robert Milne
- Mr. G. E. Nace
- Mr. Robert E. Nelson
- Mr. Arthur Nesse
- Mr. Willard Olsen
- Dr. D. G. Osborn
- Mr. J. W. Padian
- Mr. J. H. Pomerene
- Mr. Norman J. Ream
- Mr. Ronald Richards
- Mr. S. E. Rifkin
- Mr. Rudy L. Ruggles, Jr.
- Mr. Walter J. Schroeder
- Mr. A. E. Scott
- Mr. Robert Seawright

- Bristol Myers Company
- IB'I Corporation ASDD
- Eastern Data Center Kennecott Copper Co.
- IBM Corporation CHO
- Union Pacific Railroad
- Royal Globe Insurance Companies
- The Dow Chemical Company
- IBM World Trade Corporation
- Deere & Company
- University of Wisconsin
- Pennsalt Chemical Company
- Atlantic Richfield
- IBM World Trade Corporation
- Readers Digest
- Ford Motor Company
- North American Pockwell Corporation
- IBM Corporation DPD
- IBM Corporation DPD
- IBM Corporation CHO
- S. D. Leidesdorf & Co.
- Technical Support Associated Hospital Services, Inc.
- IBM World Trade Corporation
- IBM Corporation CMO
- A.T. Kerney & Company, Inc.
- IBM Corporation SDD
- Interactive Data Corporation

Mr. K. N. Shroff

Mr. Stanley E. Sinclair

Mr. Irwin J. Sitkin

Mr. Donald Stanford

Mr. T. B. Steel, Jr.

Mr. P. A. Tattersall

Mr. L. R. Walters

Mr. William F. Ward

Mr. Ray Wiles

Mr. Allen P. Willis, Jr.

Mr. Robert A. Windish

Mr. F. V. Wolford

- IBM Corporation ASDD
- Cincinnati Gas & Electric Co.
- Aetna Life & Casualty
- Doubleday & Company
- Private Consultant
- IBM Corporation DPD
- IBM Corporation ASDD
  - Dunn & Bradstreet, Inc.
    - Aerospace Corporation
  - Insurance Company of North America
  - First National Bank of Chicago
  - IBM Corporation DPD

# APPENDIX C Alphabetic List of Applications

Pages	Applications
III.8	AGRICULTURE INFORMATION AND ADMINISTRATION SYSTEM
III.36	AGRICULIORE INFORMATION AND ADMINISTRATION SISTEM AIR POLLUTION PREDICTION
III.11	AUTOMATED AIRCRAFT DIAGNOSTICS
III.12	AUTOMATED AIRCHAFT DIAGNOSTICS AUTOMATED AIRLINE PASSENGER SERVICES SYSTEM
<i>III</i> .13	AUTOMATED AIRLINE PASSENGER SERVICES SISIEM AUTOMATED BAGGAGE CONTROL
III.128	AUTOMATED COURT SCHEDULING
III.134	AUTOMATED DESIGN ENGINEERING
	D2 AUTOMATED FINGERPRINT ANALYSIS
	AUTOMATED FREIGHT TERMINALS
III.77	NOTOMITED BRIDGINGS HIND TRIBUTED
III.135	AUTOMATED MANUFACTURING ENGINEERING
<i>III</i> .136	AUTOMATED MANUFACTURING PLANT
<i>III</i> .165	AUTOMATED MASS TRANSIT SYSTEMS
III.145	AUTOMATED PERIODICAL PUBLISHING
III.103	AUTOMATED PLANT INFORMATION SYSTEMS
III.137	AUTOMATED PROCESS MANUFACTURING PLANT
	.3 AUTOMATED PUBLIC LIBRARIES
III.166	AUTOMATED ROADWAYS
III.138	AUTOMATED ROBOTS
III.54	AUTOMATED STOCK TRANSFER
III.146	AUTOMATED SUBSCRIPTION SERVICE
III.167	AUTOMATED TRAFFIC CONTROL
III.66	AUTOMATED VEHICLE DIAGNOSTIC CENTERS
III.31 III.13	B9 AUTOMATED WAREHOUSES
<i>III</i> .79	AUTOMATED WEATHER FORECASTING
III.7	AUTOMATIC IRRIGATION CONTROL
<i>III</i> .168	AUTOMOBILE COLLISION AVOIDANCE SYSTEMS
III.55	BANK RESERVE REQUIREMENTS MODEL
III.56	BANKING SERVICE SYSTEM
III.16	CAREER PATH PLANNING
III.17	CASH FLOW SIMULATION
III.57	CHECKLESS SOCIETY
III.151	CLINICAL DECISION SUPPORT SYSTEMS
<i>III</i> .114	COMMERCIAL DATA PROCESSING SERVICES
III.58	COMMERCIAL LOAN CREDIT SCORING
III.45	COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS
III.18 III.4	+ COMPUTER ASSISTED INSTRUCTION - ON THE JOB TRAINING
<i>III</i> .25	COMPUTER ASSISTED OCEANOGRAPHY
III.46	· COMPUTER ASSISTED TESTING AND GUIDANCE CONSELING
III.67	COMPUTER CONTROL OF FREIGHT AND PASSENGER TRAINS
III.26 III.1	52 COMPUTER COORDINATED TESTING OF MEDICAL DRUGS
III.47	COMPUTER MANAGED INSTRUCTION
<i>III</i> .19	COMPUTER-ASSISTED LABOR/MANAGEMENT NEGOTIATIONS
III.153	COMPUTERIZED MEDICAL TEST ANALYSIS
<i>III</i> .161	COMPUTERIZED TYPING STATIONS
<i>III</i> .37	COMPUTERIZED WASTE DISPOSAL PLANTS
III.80 III.10	14 CONSOLIDATED PUBLIC WELFARE SYSTEMS

# APPENDIX C Continued

Pages	Applications		
<i>III</i> .59	CREDIT TRANSFER (GIRO) SYSTEM		
III.140	CUSTOMER QUALITY ASSURANCE		
<i>III</i> .81	DEFENSE AGAINST A 100 MISSILE SALVO	ATTACK	
	DISEASE INFORMATION SYSTEMS		
<i>III</i> .48	DYNAMIC SCHEDULING OF EDUCATIONAL FA	ACILITIES	
<i>III</i> .38	ECOLOGICAL BALANCE CALCULATIONS		
<i>III</i> .39	ECOLOGICAL PLANT SCHEDULING		
<i>III</i> .20	ECONOMETRIC MODELS OF THE ECONOMY		
<i>III</i> .98	ELECTRONIC DELIVERY OF HARD COPY		
	ENTERPRISE SIMULATION		
III.60	FINANCIAL UTILITY		
III.68	FREIGHT RATE SERVICE		
	GOVERNMENT ACTIVITIES INFORMATION U		T DEIMMENO
III.82	GOVERNMENT OPERATING LOTTERIES AND . GOVERNMENTAL PLANNING SYSTEMS FOR DA		
III.83	HEALTH INFORMATION SYSTEMS	EVELOPING (	COUNTRIES
	HOME COMPUTER ASSISTED INSTRUCTION		
III.95	HOME SHOPPING SERVICES		
III.84	HUMAN RESOURCE SYSTEMS		
III.14	IN-FLIGHT MONITORING AND DIAGNOSTIC	S OF AIRCRA	AFT
<i>III</i> .117	INFORMATION RETRIEVAL UTILITIES	,	
<i>III</i> .61	INSURANCE SUPPORT SYSTEM		
<i>III</i> .62	INTEGRATED FINANCIAL SERVICE SYSTEM		-
<i>III</i> .96 <i>III</i> .148	INTERACTIVE NEWS AND ENTERTAINMENT		
<i>III</i> .69	INTERCONNECTED SHIPPERS AND CARRIER	SYSTEMS	
<i>III</i> .22	INVESTMENT MODELS		
III.118	JOB PLACEMENT SERVICES		
III.119	LAW SEARCH		
III.108 111.129 III.107	LEGISLATIVE SYSTEMS MANAGEMENT INFORMATION SYSTEMS		
III.85	METROPOLITAN PLANNING MODELS		
III.155	MULTI-PHASIC SCREENING		
III.97	MULTIPLE USE HOME TERMINAL		
III.86	NATIONWIDE AIR TRAFFIC CONTROL		
<i>III</i> .70	NATIONWIDE COORDINATION OF INTERMOD	AL FREIGHT	SHIPMENTS
III.87 III.120	NATIONWIDE DRIVER AND VEHICLE DATA	BANK	
<i>III</i> .108	NATIONWIDE POLICE INFORMATION SYSTE	M	
<i>III</i> .171	NATIONWIDE POWER GRID		
III.90	NATIONWIDE VOTER REGISTRATION		
III.88	NATIONAL HEALTH INSURANCE SYSTEMS	,	
III.89	NATIONAL LAND INVENTORY		
III.162	OFFICE ELECTRONIC MAIL SERVICE OUT-PATIENT MONITORING		
III.156 III.121	PATENT MONITORING PATENT SEARCH		•
III.121 III.130	PATENT SEARCH PENAL AND PAROLE INFORMATION SYSTEM	'S	
III.91	PERSONAL DATA BANKS		
III.40	POLLUTION MONITORING SYSTEMS		n view of the control
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# APPENDIX C Continued

Pages	Applications
TTT 450	DDDUGUTUE MEDICATUR DIAGNOCHIA GENHERA
III.157	PREVENTIVE MEDICINE DIAGNOSTIC CENTERS
III.141	PRODUCT DEVELOPMENT SIMULATION SYSTEM
III.122	PROFESSIONAL LITERATURE SEARCH SYSTEMS
III.71	RAILROAD CAR TRACING, TRACKING AND ALLOCATION
III.27 III.41	RESEARCH MONITORING FOR ECOLOGICAL EFFECTS
<i>III</i> .32	RETAIL TERMINAL SYSTEMS
III.142	ROBOT-CONTROLLED AUTOMOBILE CHECKOUT
<i>III</i> .109	STATE HEALTH INFORMATION SYSTEMS
<i>III</i> .33	SUPERMARKET CHECKOUT SYSTEMS
III.123 III.172	TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS
III.124	UNIVERSAL RESERVATION SYSTEMS
<i>III</i> .173	UTILITY USAGE RECORDING SYSTEM
III.125	VACATION AND TRAVEL PLANNING SYSTEMS
III.158	VERTICALLY INTEGRATED HEALTH CARE DELIVERY SYSTEM

APPENDIX D	Price/Performance Sensitive Applications
Percent of Respondents	Application
33.3	HOME SHOPPING SERVICES
32.8	AUTOMATED PUBLIC LIBRARIES
32.1	OFFICE ELECTRONIC MAIL SERVICE
29.8	INTERACTIVE NEWS AND ENTERTAINMENT
28.3	RETAIL TERMINAL SYSTEMS
27.5	NATIONWIDE DRIVER AND VEHICLE DATA BANK!
26.7	UNIVERSAL RESERVATION SYSTEMS
26.5	AUTOMATED DESIGN ENGINEERING
26.5	SUPERMARKET CHECKOUT SYSTEMS
25.9	HEALTH INFORMATION SYSTEMS
25.9	TELEPHONE DIRECTORY AND YELLOW PAGE DATA BANKS
25.0	HOME COMPUTER ASSISTED INSTRUCTION
25.0	INTERCONNECTED SHIPPERS AND CARRIER SYSTEMS
24.5	AUTOMATED MANUFACTURING PLANT
24.5	
	MANAGEMENT INFORMATION SYSTEMS
23.4	INSURANCE SUPPORT SYSTEM
22.7	ROBOT-CONTROLLED AUTOMOBILE CHECKOUT
22.6	NATIONWIDE COORDINATION OF INTERMODAL FREIGHT SHIPMENTS
22.6	STATE HEALTH INFORMATION SYSTEMS
22.6	MULTI-PHASIC SCREENING
22.6	COMPUTERIZED TYPING STATIONS
22.2	GOVERNMENT ACTIVITIES INFORMATION UTILITY
22.0	AUTOMATED MANUFACTURING ENGINEERING
21.6	PROFESSIONAL LITERATURE SEARCH SYSTEMS
21.4	VACATION AND TRAVEL PLANNING SYSTEMS
21.3	ELECTRONIC DELIVERY OF HARD COPY
20.8	COMPUTER CONTROL OF FREIGHT AND PASSENCER TRAINS
20.8	LEGISLATIVE SYSTEMS
20.0	AUTOMOBILE COLLISION AVOIDANCE SYSTEMS
20.0	CONSOLIDATED PUBLIC WELFARE SYSTEMS
20.0	AUTOMATED ROBOTS
20.0	AUTOMATED WEATHER FORECASTING
20.0	NATIONWIDE POWER GRID
20.0	BANKING SERVICE SYSTEM
20.0	INTEGRATED FINANCIAL SERVICE SYSTEM
19.6	COMPUTER ASSISTED INSTRUCTION - ON THE JOB TRAINING
19.3	LAW SEARCH
19.2	AUTOMATED LANDINGS AND TAKEOFFS
18.9	CLINICAL DECISION SUPPORT SYSTEMS
18.8	AUTOMATED PERIODICAL PUBLISHING
	MULTIPLE USE HOME TERMINAL
18.4	AUTOMATED TRAFFIC CONTROL
18.4	
18.0	AUTOMATED WAREHOUSES
18.0	AUTOMATED MASS TRANSIT SYSTEMS
17.9	COMPUTER ASSISTED INSTRUCTION EDUCATIONAL INSTITUTIONS
17.9	CREDIT TRANSFER (GIRO) SYSTEM
17.6	AUTOMATED FREIGHT TERMINALS
17.6	COMMERCIAL DATA PROCESSING SERVICES
17.6	AUTOMATED AIRCRAFT DIAGNOSTICS
17.4	RAILROAD CAR TRACING, TRACKING AND ALLOCATION

FINANCIAL UTILITY

17.4 17.4

17.3

RAILROAD CAR TRACING, TRACKING AND ALLOCATION

AUTOMATED FINGERPRINT ANALYSIS

Percent of Respondents	Application
17.0	AGRICULTURE INFORMATION AND ADMINISTRATION SYSTEM
17.0	AUTOMATED STOCK TRANSFER
	AUTOMATED VEHICLE DIAGNOSTIC CENTERS
16.7	CHECKLESS SOCIETY
	PENAL AND PAROLE INFORMATION SYSTEMS
	AUTOMATED PROCESS MANUFACTURING PLANT
	UTILITY USAGE RECORDING SYSTEM
	JOB PLACEMENT SERVICES
	IN-FLIGHT MONITORING AND DIAGNOSTICS OF AIRCRAFT
	FREIGHT RATE SERVICE
- · · · · · · · · · · · · · · · · · · ·	AUTOMATED PLANT INFORMATION SYSTEMS
	AUTOMATED ROADWAYS
16.1	PREVENTIVE MEDICINE DIAGNOSTIC CENTERS
	CUSTOMER QUALITY ASSURANCE
	AIR POLLUTION PREDICTION
	INFORMATION RETRIEVAL UTILITIES
	METROPOLITAN PLANNING MODELS
	NATIONVIDE AIR TRAFFIC CONTROL
	NATIONWIDE POLICE INFORMATION SYSTEM!
	AUTOMATED AIRLINE PASSENGER SERVICES SYSTEM
15.1	COMPUTER ASSISTED TESTING AND GUIDANCE COUNSELING
	AUTOMATED SUBSCRIPTION SERVICE
	AUTOMATED BAGGAGE CONTROL PRODUCT DEVELOPMENT SIMULATION SYSTEM
	COMPUTERIZED WASTE DISPOSAL PLANTS
	AUTOMATED COURT SCHEDULING
	AUTOMATIC IRRIGATION CONTROL
	OUT-PATIENT MONITORING
_	PATENT SEARCH
	DISEASE INFORMATION SYSTEMS
	COMPUTER COORDINATED TESTING OF MEDICAL DRUGS
	BANK RESERVE REQUIREMENTS MODEL
11.8	ECONOMETRIC MODELS OF THE ECONOMY
	COMMERCIAL LOAN CREDIT SCORING
11.1	ECOLOGICAL PLANT SCHEDULING
11.1	VERTICALLY INTEGRATED HEALTH CARE DELIVERY SYSTEM
10.9	COMPUTER-ASSISTED LABOR/MANAGEMENT NEGOTIATIONS
10.6	COMPUTER ASSISTED OCEANOGRAPHY
	INVESTMENT MODELS
9.3	ECOLOGICAL BALANCE CALCULATIONS
9.1	ENTERPRISE SIMULATION
	RESEARCH MONITORING FOR ECOLOGICAL EFFECTS
	NATIONAL LAND INVENTORY
	DEFENSE AGAINST A 100 MISSILE SALVO ATTACK
8.3	COMPUTERIZED MEDICAL TEST ANALYSIS
8.3	CASH FLOW SIMULATION
8.3	POLLUTION MONITORING SYSTEMS
7.5	DYNAMIC SCHEDULING OF EDUCATIONAL FACILITIES
6.8	HUMAN RESOURCE SYSTEMS
6.5	GOVERNMENT OPERATING LOTTERIES AND PARI-MUTUAL BETTING
6.4	NATIONAL HEALTH INSURANCE SYSTEMS
6.0	COMPUTER MANAGED INSTRUCTION
	PERSONAL DATA BANKS
4.3	NATIONWIDE VOTER REGISTRATIONN
1.9	CAREER PATH PLANNING
0.0	GOVERNMENTAL PLANNING SYSTEMS FOR DEVELOPING COUNTRIES