Information Services Program (ISP)

Information Systems Planning Report

Federal Government Sector

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DECEMBER 1987

INFORMATION SYSTEMS PLANNING REPORT

FEDERAL GOVERNMENT SECTOR

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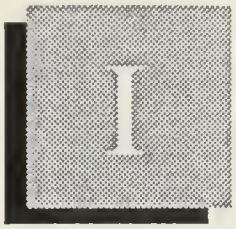
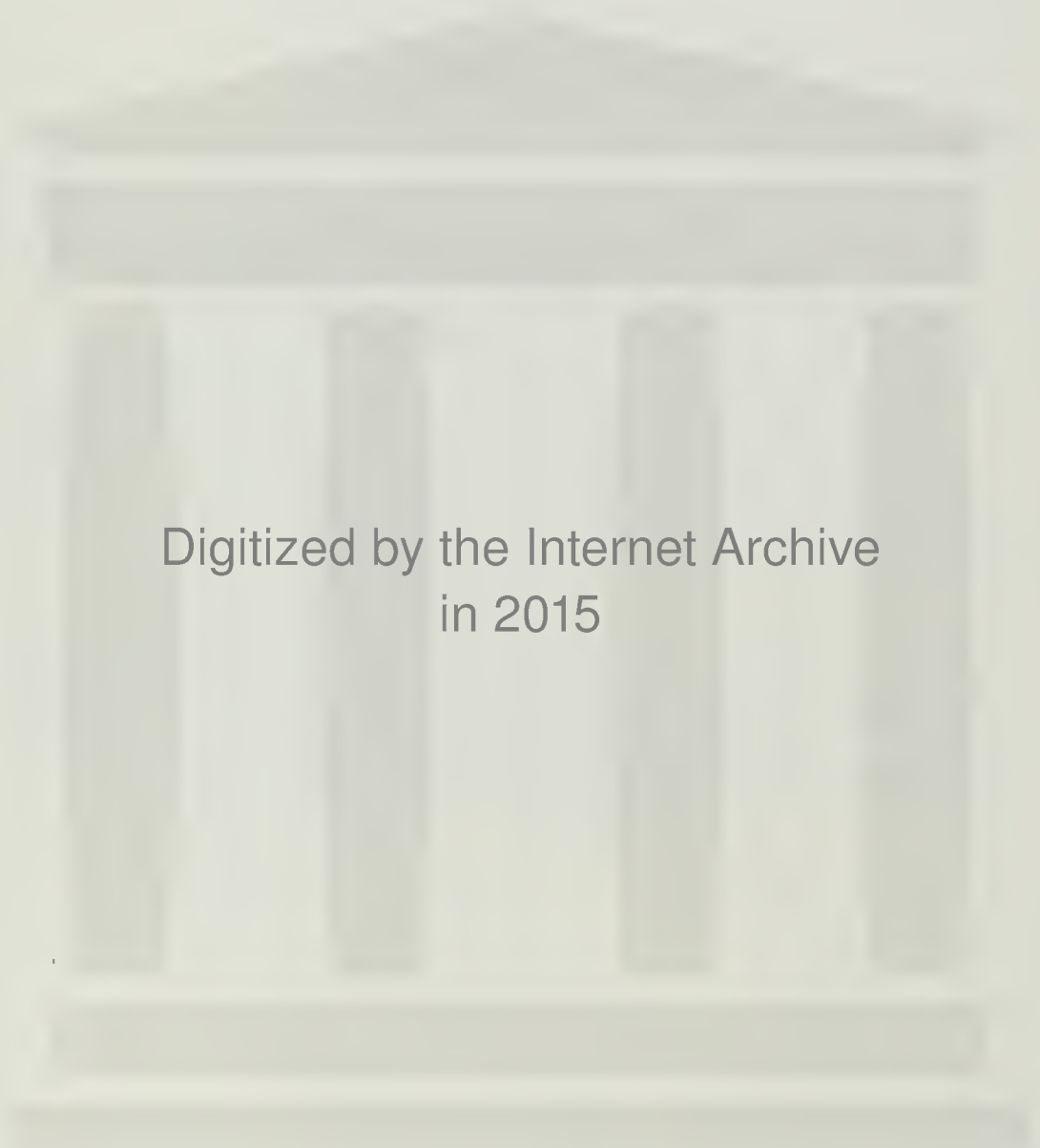
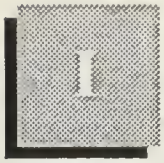


Major Issues





Major Issues

A

Driving Forces

The federal government was the first wide-based employer of large data processing capabilities. Despite an inventory in excess of 22,000 CPUs, current I.S. resources are experiencing difficulty in meeting rising service demands.

- Public service functions, such as social security and welfare, health and human services continue to escalate under Congressional initiatives.
- Congress needs newer, more frequent and more timely data and analyses from the departments and agencies it oversees.
- Administrative initiatives continue to uncover areas of executive branch information processing that are missing or inadequate to meet new management expectations.

While not as pronounced as the early 1980s, the ADP Equipment (ADPE) inventory includes a significant number of early third generation machines that lack the flexibility, speed, and capacity of currently available technologies.

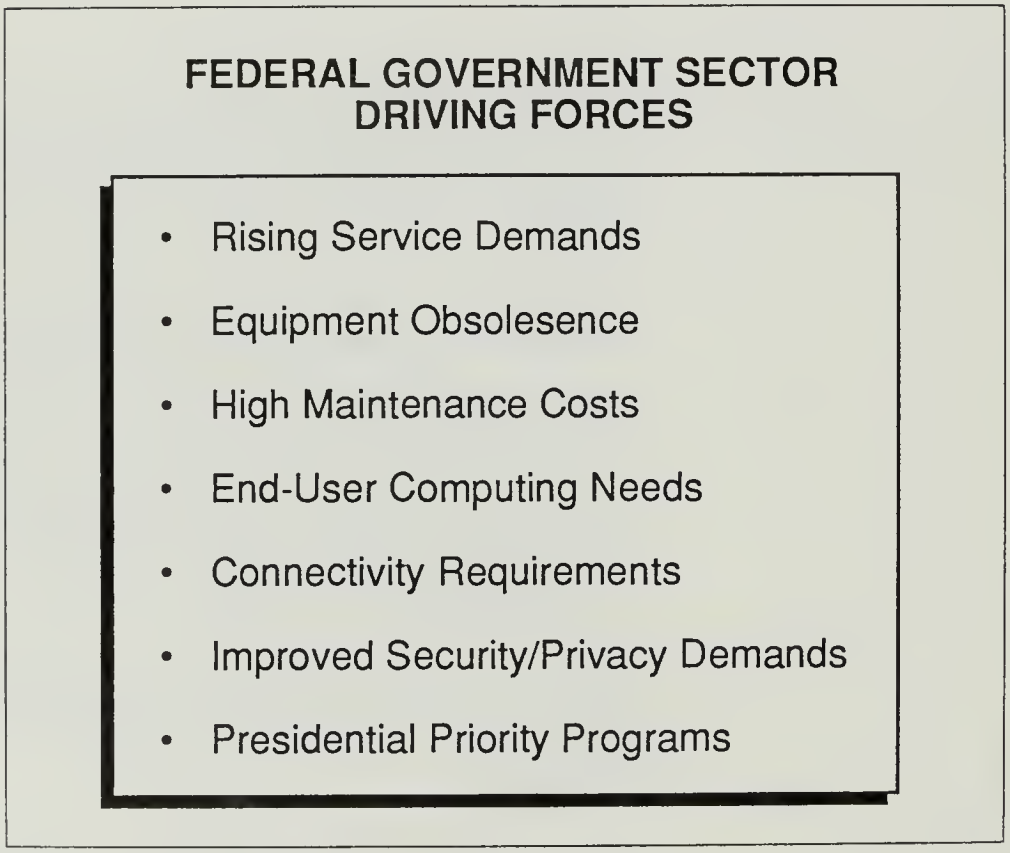
The combination of older ADPE and a very large inventory of custom software has driven maintenance costs up and extended repair times. GAO and NBS have estimated that about 70% of software life cycle costs go to maintenance and enhancement, and tie down an inordinate percentage of in-house I.S. staff.

Government personnel and managers requiring data processing support through end-user computing need dynamic response from data centers. Both volume and complexity are increasing, along with demands for more user-friendly computing support.

The need to share data, under the constraints of the Paperwork Reduction Act, and to interact to meet administration requirements, including the REFORM 88, CALS and SDI initiatives, are pressing for substantially improved connectivity. New standards are needed for uniform protocols, open system architectures and standard systems interconnections.

Administrative and Congressional demands for improved security measures concern both national security and individual privacy protection issues. Congress is also considering new computer theft and proprietary data protection measures. These driving forces are summarized in Exhibit I-1.

EXHIBIT I-1



The large number of new and replacement information systems in the procurement process required a priority process to assume completion of those associated with key administrative initiatives. In the *FY 1988 Report on Management of the United States Government*, 15 systems have been designated "Presidential Priority Systems". In addition, 12 more systems have been designated as Future Priority Systems, which are committed to meet industry standards by 1990.

B

Issues and Objectives

Cost containment has become a major issue under the combined pressures of Congress and rising budget deficits. Competitors are encouraged to submit fixed price bids on most systems integration and I.S. upgrade projects, while satisfying other issues identified in Exhibit I-2.

EXHIBIT I-2

New acquisition, management and usage procedures have been incorporated in the Federal Information Resource Management Regulations (FIRMR). The reforms are intended to streamline the purchasing process while improving the amount of competition. A number of improvement initiatives are underway.

- GO FOR 12 is a joint agency program to reduce the acquisition process to 12 months.
- TRAIL BOSS is a proposed program for increasing the acquisition authority of selected government program managers.
- FAR (Federal Acquisition Regulations) Streamline is a new initiative to further reduce the volume of the regulations and employ conventional business terminology.

Budget Deficit Control, whether provided under the terms of the Gramm-Rudman-Hollings Act or direct Congressional action is expected to impact the rate and/or extent of I.S. modernization in the agencies.

The major departments and agencies are concerned by the rising costs of software development and the resulting elongated delivery schedules. A number of initiatives have been implemented, principally by the Defense Department, GSA and NASA.

- Software Engineering Institute, awarded to the Carnegie Mellon Institute, to investigate new productivity and documentation methods.
- Defense and NASA commitment to employ Ada as the primary language of embedded information systems, to reduce the demand for programmers for a wide variety of languages.
- GSA implemented the Office of Software Technology and initiated the Programmers Work Bench (PWB) project to enhance agency software development.

In anticipation of issuing several new standards to improve interoperability and connectivity, NBS, GSA, DCA and key civilian agencies are reviewing several initiatives, including GOSIP (Government Open System Interconnection Profile), POSIX (Proposed Official version of UNIX) and simplification of a myriad of protocols.

The Competition in Contracting Act (CICA) provided both improvements and some impediments to the information resource acquisition process:

- Created a new and accelerated protest procedure under the GSA Board of Contract Appeals.
- Created the function of Competitive Ombudsman to assure full competition wherever possible.
- Established or reaffirmed procedures for protecting small businesses from unwarranted restrictions.

Integration of voice, image, text and data interchange within a single digital system is a key objective of GSA's FTS 2000 telecommunications project in the 1990s. An all-digital system would more readily permit encryption for security reasons and more cost-effective use of fiber optic transmission methods.

Improved, user-friendly data processing resources are key objectives of most current systems projects. A primary objective is improved data base availability, with affiliated protective measures in both hardware and software that respond to end-user needs.

GAO, GSA and NBS are pressing agencies to employ off-the-shelf or readily adaptable software products for a wide range of government

EXHIBIT I-3

FEDERAL GOVERNMENT SECTOR OBJECTIVES

- Voice-Data Integration
- Improved End-User Support
- Increased Software Product Applications
- Relational Data Bases
- Departmental Information Processing
- Transparent Connectivity
- Decision Support Systems

applications that closely resemble commercial processes. Objectives include:

- Reduced software development time and cost.
- Improve maintainability of software.
- Improve transportability of applications between processors.

There is increasing pressure for installation of relational data bases, equipped with SQL, to meet the data retrieval requirements of a widening community of end-users, which may also include the public.

The emphasis on IS departmental processing is improvement of services to end users, with purchased products, improved and timely data bases, and technical support.

The ultimate objective of current federal initiatives is implementation of systems with transparent connectivity with users and other systems.

One additional objective is the implementation of interface devices between office automation equipment and centralized data bases and other files to provide decision support systems to government executives.

C

Impact of Technology

Although the federal government supported the development of new information resource technology, a number of national issues and budget constraints delayed government implementation. Five key areas still in various stages of development that are expected to impact system deployment are listed in Exhibit I-4.

EXHIBIT I-4

FEDERAL GOVERNMENT SECTOR IMPACT OF TECHNOLOGY

- Supercomputer Improvements
- Digital Voice Systems
- Artificial Intelligence/Expert Systems
- Open System Architecture
- New Optical Memory Technology

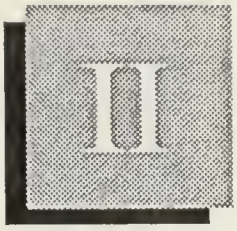
The federal government's need for and support of research on supercomputers has been given additional impetus by the race with the Japanese, the demands for SDI processing and the extended boundaries of physics and medical research. With increasing parallelism as one avenue of processing, pressures are increasing for other computers to write the required code.

New solid state developments and strides in voice recognition computers are offering new ways for entering data and encryption of voice communications for protection. A number of agencies need digital voice systems for authentication and operation in difficult environments.

Artificial intelligence, or more specifically, expert systems, have already been employed in limited applications. New approaches that use AI include software development, process monitoring and simulation.

Open system architecture, long an objective of military systems that are assembled in building block fashion, will now become the standard in non-military systems. Open systems improve the prospects of expansion and modification without requiring replacement of the basic processors.

New optical memory technology, such as CD-ROM, and large-scale laser disks support implementation of large personnel and financial systems, logistics and maintenance systems, to support a "less-paper" bureaucracy.



New Applications

II

New Applications

The sheer volume of transactions and complexity of operations within the federal government sector demands a changing focus of applications to apply new developments to a range of information service problems.

EXHIBIT II-1

FEDERAL GOVERNMENT SECTOR
NEW APPLICATIONS

- EDI - Networks and Services
- Computer-Aided Acquisition and Logistic Systems (CALS)
- End-User Computer Networks
- Automated Tax Processing
- Standardized Financial, Payroll and Personnel Systems
- AI Applied to Software Development and Simulation Modeling
- Speech Processing

Key among the emerging applications in Electronic Document Interchange (EDI) which accelerates the accurate interchange of procurement, logistics, data collection and funds transactions. Since EDI uses conven-

tional data processing and telecommunications capabilities, the emphasis in the federal sector will be development of vendor-furnished networks, software and services to facilitate EDI implementation.

The CALS (Computer-Aided Acquisition and Logistics Systems) Initiative of the Defense Department and NASA is a new application of automation of logistics to accomplish several goals:

- Integrate data life-cycle elements in a source-to-use network.
- Ensure compatibility of data interchange between logistic systems.
- Automate the acquisition elements of:
  - Stock order process;
  - Shipping document generation and handling;
  - Inventory analyses;
  - Technical order (repair) system;
  - Technical manual and documentation generation on demand basis.
- Demonstrate the initial design characteristics and criteria via selected projects.
- Involve industry and government in both the implementation and utilization of the systems.

The conventional approach of developing networks for I.S. centers to serve other centers and remote users is being invented by demand. Burgeoning end-user computing based on PCs is creating demand for sophisticated LANs for interconnection between users and links to data centers for data base access and software services. The I.S. facilities must comply with these demands or be by-passed in favor of commercial data sources.

Automated tax processing applications are being developed on several fronts:

- Internal automation at the IRS Regional Centers to provide enhanced capabilities for:
  - Rapid conversion of tax forms to electronic form;
  - Online retention of several year's returns;
  - Automated analyses to select returns that need detailed auditing (rather than sampling methods);
  - Automated preparation of refund payments.

- External automation of the tax return process on two levels:
  - Electronic filing of individual returns;
  - Electronic filing of small business returns, involving more forms;
  - Electronic fund transfers for tax payment and refunds.

After succession of GAO (General Accounting Office) audits that identified increasing incompatibility and decreasing accuracy of financial, payroll and personnel systems, OMB has directed conversion or replacement by all agencies:

- Financial systems must meet a single set of standards and produce compatible products by 1992.
- Payroll systems must meet new accuracy and timeliness standards, and be compatible within military and civilian agencies by 1990.
- Personnel systems must be upgraded to meet all of the EEO and privacy protection criteria by the early 1990s.

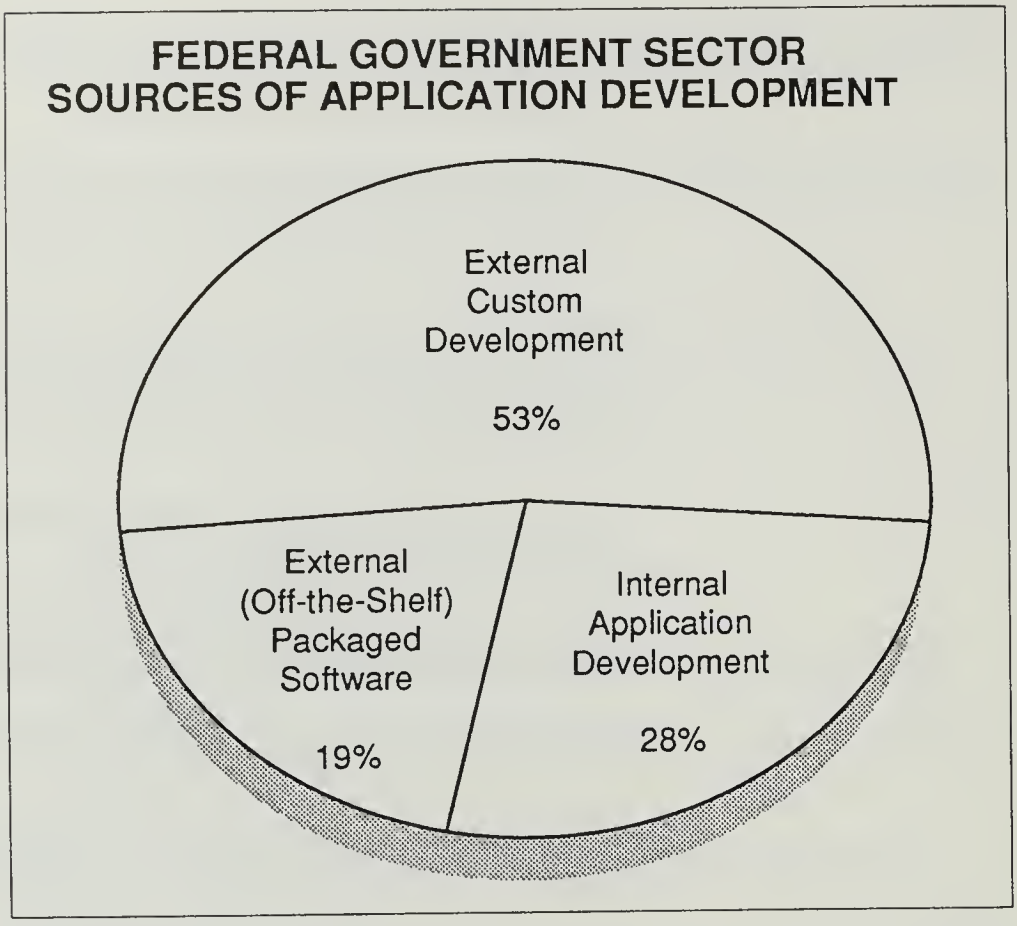
Artificial Intelligence/expert systems applications are moving to near-term implementation and availability in several areas:

- Defense has several pilot projects underway where AI can provide assistance to human control functions.
- AI is being employed to develop models for a number of applications, including the automated tax audit system, gaming for military training simulators, and automated logistics processes.
- AI is being tested for use in development of applications software, to include automated documentation generation and selection of alternatives that minimize future maintenance problems.

After several tests in cargo handling and customs identification problems, federal agencies are looking at a wide range of speech processing applications that go beyond the needs for voice encryption in security circumstances.

The federal government continues to be heavily dependent on custom development of new applications, partly based on a perceived need for government-unique solutions, and partly based on continuing dependence on a large inventory of early third-generation processors. This heavy dependence on outside development sources is illustrated in Exhibit II-2.

EXHIBIT II-2



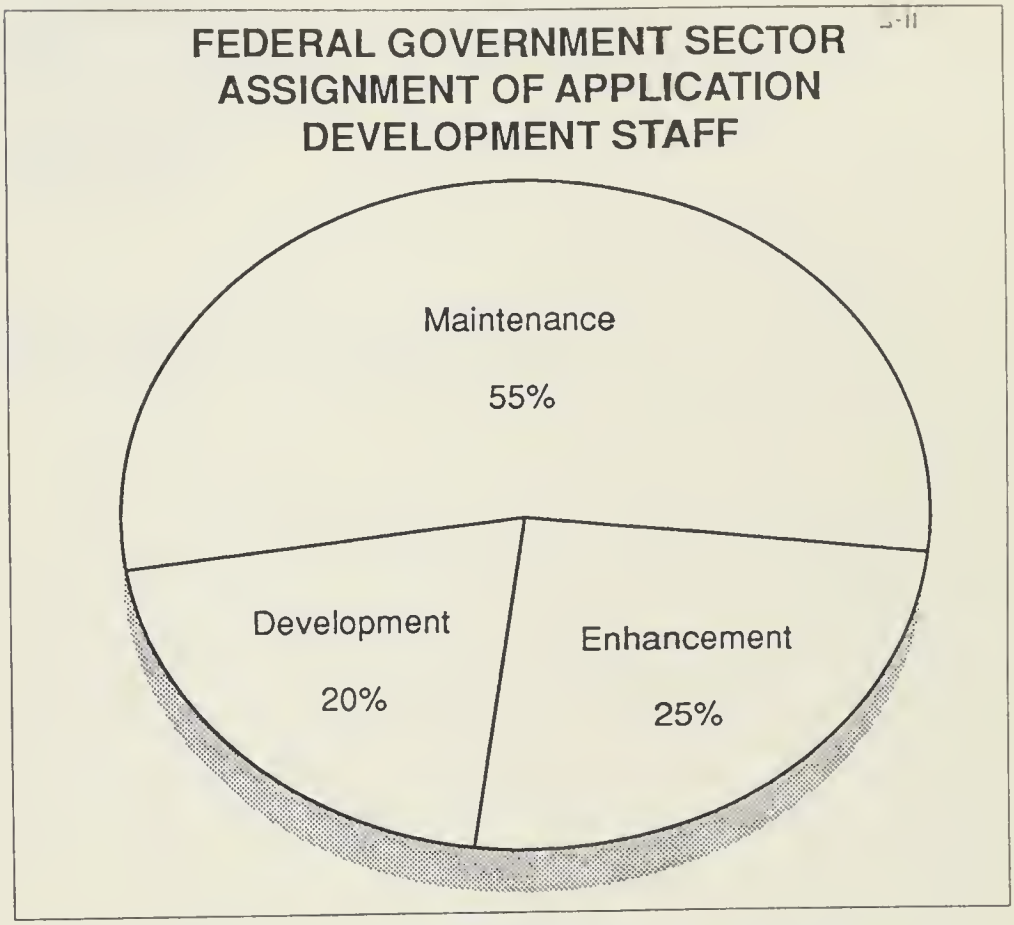
The externally developed, off-the-shelf software package source has been given a major impetus by the rapid growth of end-user personal computer usage. Packaged software has also become available for minicomputers, of which the government has a large inventory. The share of application development by this source is expected to continue to grow.

Demands on the internal (in-house) I.S. staff to maintain older but critical custom software prevents wider application to new developments by that staff. GAO and NBS surveys have demonstrated that more than 70% of the software life cycle costs are expended on maintenance and under-managed enhancements.

For now and the foreseeable future, the predominant source of major new application development will be external to the government. The majority of the development will come from professional services and software development firms. A smaller but very significant part of the development will come from universities and not-for-profit organizations, especially in AI, supercomputers, and automation applications.

Statistics regarding assignment of internal IS personnel to applications development assignments are approximations based on random interviews shown in Exhibit II-3. Excluded from the 126,574 manyears

EXHIBIT II-3

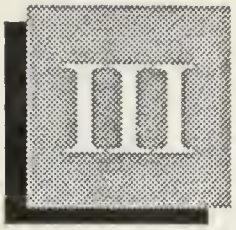


budgeted for 1987 and the 127,560 manyears for 1988 are personnel involved in data center operations, supervision, scheduling and data entry/report production functions.

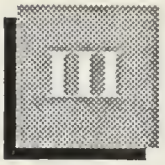
The National Bureau of Standards and General Services Administration software support studies indicated that 70-80 percent of the staff are involved in maintenance, but more recent investigations reveal that about a third of the effort is actually directed toward software enhancement. These reports noted an absence of appropriate management, including cost reporting and control procedures, that could have determined the cost benefit of replacement, rather than enhancement. Plans are being prepared whereby I.S. managers will be rewarded for making cost comparisons leading to increased software efficiencies, not currently recognized by the information resource managerial system.

The relatively small percentage of staff assigned to new applications development is crucial to the process of identifying the need for and acceptance criteria of new software and systems. Some applications are extremely sensitive to national security or protection of personal privacy, including the processing of general purpose data in secured enclaves. Internal staff are also needed for development of LTD (Live Test Demonstration) and benchmark test data that realistically reflect the most critical

requirements of new developments, without undue competitive risk to outside suppliers.



Budget Analysis



Budget Analysis

The 1987 budget of $16.9 billion represented an increase from 1.5% of the total federal budget in 1986 to 1.7%. The 1988 budget is expected to remain at 1.7%, at $17.4 billion. All of the federal I.S. budget categories have experienced strong growth in this decade, except personnel salaries and fringes. Beginning in 1986, however, with passage of the Gramm-Rudman-Hollings Act, that growth has slowed, while the personnel category has begun to grow. The budget distribution in 1987 and the projected 1988 changes are indicated in Exhibit III-1. Factors influencing growth include:

- Need to retain key I.S. personnel to operate new facilities and modernized current resources.
- Continued replacement of obsolete equipment to improve I.S. performance while reducing maintenance costs.
- Installation of higher-capacity, mass storage devices to increase availability of burgeoning data bases.
- Demand for standalone workstations and personal computers for support of military functions and civilian services.
- Emphasis on both custom and packaged software to meet interoperability, transportability and user-friendly requirements.
- Increasing demand for data communications for distributed processing, on-line data bases and service extension.

Despite the demand, some categories will decline in response to both expected and unplanned factors.

EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE FEDERAL GOVERNMENT SECTOR

BUDGET CATEGORY	1987 PERCENT OF I.S. BUDGET	1987-1988 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	22.5	3.6
Mainframe Processors	5.6	(3.1)
Minicomputers	3.7	(2.3)
Microcomputers	1.1	5.6
Mass Storage Devices	2.2	9.1
Other Hardware	9.3	(4.1)
Total Hardware	21.9	(2.9)
Data Communications	5.8	6.7
External Software	2.7	15.0
Professional Services	18.1	(1.6)
Turnkey Systems	3.9	(2.7)
Software Maintenance	2.7	(6.2)
Hardware Maintenance	6.9	(4.7)
Outside Processing Services	5.2	(1.8)
Other	10.3	2.5
Total	100.0	7.2

A number of replacement programs involving mainframe processors have been delayed, by:

- Re-evaluation of the overall replacement plans;
- Extension of the rate of implementation, to meet 1987-1988 Gramm-Rudman-Hollings cuts imposed in 1986;
- Changes or reductions in information processing needs of the agencies;

- Less demand for peripherals through increased I.S. center sharing of equipment.

- Reduction in hardware and software maintenance costs resulting from implementation of new systems.

- Less demand for outside processing services, as the result of:

  - Increasing availability of new in-house ADP resources;

  - Growing end-user computing employing personal computers and standalone workstations;

  - More competition from large federal data centers under revised OMB Circular A-76 policies.

- Response to agency budget restrictions includes some reduction of contractor operations support.

- Some reduction of investments in turnkey systems appears to be associated with indecisions about new federal language, protocol and network standards.

As of the writing of this report, the actual expenditure reductions to satisfy deficit control requirements had not been passed by Congress. I.S. is not expected to experience any severe cuts, but a number of approved programs may slip into another year. Present budget pressures have limited most non-operating obligations to replacement of high volume I.S. facilities that are becoming irreparable or increasingly expensive to operate.

The percent of agencies expecting their budgets to increase in 1988 versus those expecting a decrease from their 1987 budgets is shown in Exhibit III-2. None expected or requested unchanged budgets, for a variety of reasons.

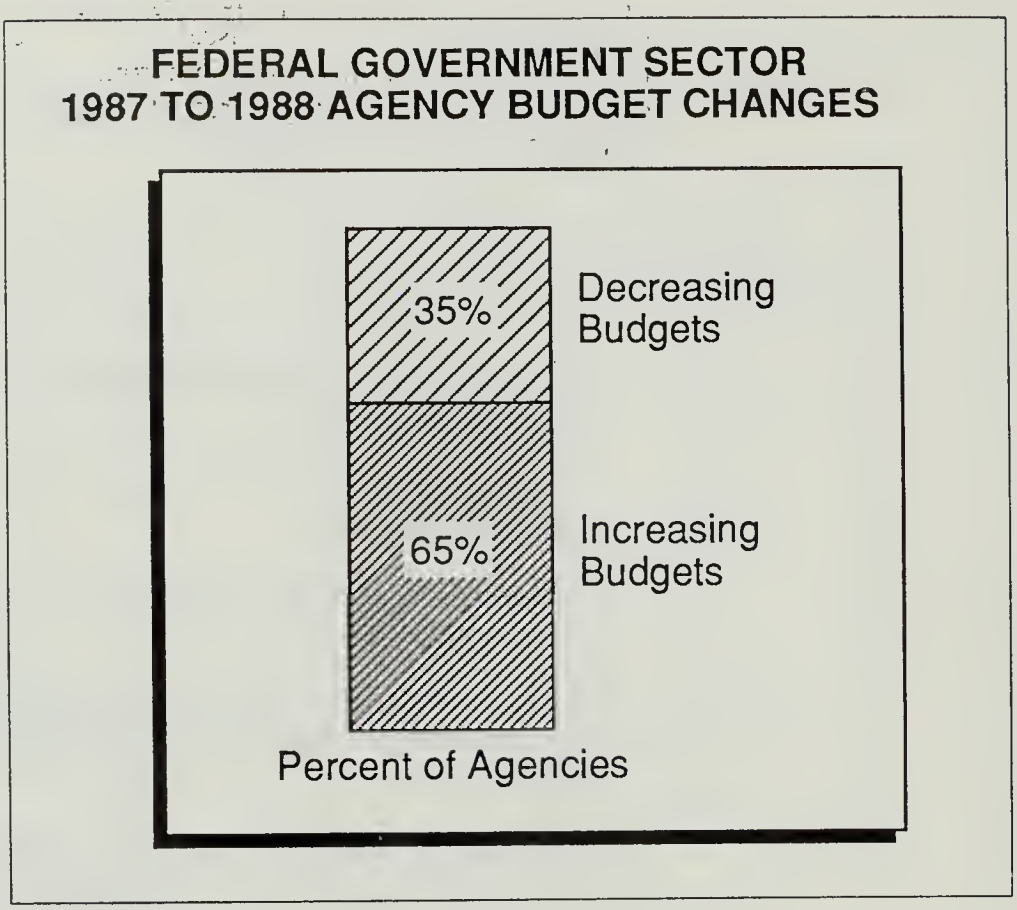
Factors that cause agencies to increase their 1988 budgets include:

- Ongoing ADPE replacement programs that have Congressional approval to proceed.

- Replacement programs being initiated that were previously delayed by budget cuts.

- Implementation of new software to replace systems that have become too expensive to maintain.

EXHIBIT III-2



- Increasing information processing demands mandated by Congress and the Administration.
- Support for improvements that directly affect revenue (tax) collection and services to the public.

Downsizing of budgets was not large for most of the agencies. Cuts were influenced by:

- Rejection of requests or directions to revise current system designs or estimates to complete.
- Completion of upgrade implementations and shift from procurement to operation and maintenance.
- Results of earlier budget reductions directed by Gramm-Rudman-Hollings or administration orders in training, telecommunications, and the use of contractor personnel.
- Expected cuts in defense spending determined as part of the administration's budget priorities.

The number of agencies experiencing budget cuts will be more evident when the federal government fiscal year 1988 budget, incorporating the joint Congress-Administration Compromise deficit control measures, becomes law. The majority of reductions are expected to occur in the commercial services sector.

About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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Planning Services for Management

Information
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Information Systems Planning Report

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INFORMATION SYSTEMS

PLANNING REPORT

1987

1987
Information Systems Planning Report

CONTENTS

I INTRODUCTION

- This report is part of INPUT's 1987 Information Systems Program. It identifies strategic planning issues and trends for information systems. The objective is to help information systems (IS) management make effective decisions regarding organization, hardware, software, systems, and procedures.

A. SCOPE AND METHODOLOGY

- The research of this report focuses on information system plans for companies in the following industries:
  - Banking and finance.
  - Discrete manufacturing.
  - Distribution (retail).
  - Distribution (wholesale).
  - Education.
  - Federal government.

- Insurance.
- Medical.
- Process manufacturing.
- Service industry.
- State and local government.
- Telecommunications.
- Transportation.
- Utilities.
- Other industry-specific sectors.

- The research is based on continuing interviews conducted throughout the year with IS executives from companies whose annual revenue exceeded $500 million. These interviews encompass IS plans, budgets, the role of technology, and directions over the next five years.

- Major vendors are also interviewed to determine product and service trends as well as their perspective on the computer industry in the next five years. INPUT's extensive research base for its Information Systems, Market Analysis, and Customer Service programs is also used in this report's analysis.

B. REPORT ORGANIZATION

- This report is orgonized as follows:

  - Section II is on executive overivew formatted os o presentotion of key IS issues for group discussions.

  - Section III presents the onnuol survey findings in eoch industry sector on the following topics:

    . Informotion Systems Directions. This section identifies mojor IS issues. Exhibit I-1 shows how the issues ore cotegorized, their focus, ond the plonning horizon.

    . Impact of Technology. This section discusses the impoct of new technology development on the company ond the industry.

    . New Applicotions. This section looks ot the mojor new opplicotions being developed ond the resources used to develop these systems.

    . Budget Analysis. This section onalyzes IS budget distribution ond growth and factors thot offect the budgetary process.

    . Unmet Needs. This section identifies users' needs which ore not being satisfied by vendors.

- The Appendices contain copies of the financial ond issue questionnaires.

EXHIBIT I-1

ISSUE HIERARCHY

MAJOR ISSUE SECTION	FOCUS	TIMEFRAME
Driving Forces	Strategic	Over 3 Years
Issues	Tactical	2 to 3 Years
Objectives	Operational	0 to 2 Years

C. RELATED INPUT REPORTS

- Readers are also referred to the following INPUT Information Systems Program reports:

  - Large-Scale Systems Directions.

    . Examines distributed systems development and computer/communications networks and provides residual value forecasts for IBM, Amdahl, and NAS large-scale systems.

  - Office Videotex.

    . Examines corporate in-house applications for this user-friendly technology which has so far failed to make an impact as a new, consumer-oriented media.

  - Distributed Processing Services.

    . Examines the role of DPS, which shares processing between on-site computers and a remote computing service.

  - IBM Operating Systems Strategies.

    . Analyzes the impact and implications of six major operating systems supporting IBM architectures.

  - Network Services Directions.

    . Provides a technology scan of networking techniques, vendor profiles, user attitudes, and perspectives on applications.

- Impact of CD ROM on Information Services.

  . Describes principal applications and presents strategic recommendations regarding CD ROM.

- Departmental Systems and Software Directions.

  . Describes work group computing, which integrates processors of all sizes, and presents recommendations on how to best integrate departmental software into existing IS environments.

II EXECUTIVE OVERVIEW

- This Executive Overview is designed in a presentation format in order to:
  - Help the busy reader quickly review key research findings.
  - Provide a ready-to-go executive presentation, complete with a script, to facilitate group communication.
- Key points of the report are summarized in Exhibits II-1 through II-4. On the left-hand page facing each exhibit is a script explaining the contents of the exhibit.

A. INFORMATION SYSTEMS MANAGEMENT ISSUES

- The five fundamental issues, outlined in Exhibit II-1, dominate the thinking of information systems management today, all relating directly to the quality, timeliness, and cost of the information services provided by corporate and departmental systems.

- There is no longer any doubt that the quality and timeliness of information made available by a company's systems (internal and/or external) play a critical role in the competitiveness of the entire business; this is true if the business entity is a bank, a manufacturing concern, an insurance company, etc.

- At the same time, there is concern that the huge investments already made in information systems and software should be leveraged to the greatest possible degree, which has led to the recent drive for the integration of existing and new systems into a single information processing capability. This almost invariably leads to networking and in some cases to network integration (data/text/voice and image communications on a single network).

- Further, there is tremendous pressure on corporate IS to contain and where possible reduce costs on the one hand and to find ways of offsetting existing unavoidable costs either through internal chargeback systems or by selling internal capabilities to the outside world.

- This is particularly crucial in view of the continual need to absorb new and future technologies since they are more easily justified if partially paid for by outside demand or revenue generation. As the pace of technological innovation accelerates, the life cycle of individual hardware, software, and network products decreases, requiring almost nonstop evolution of IS capabilities and continual upgrading of in-house staff knowledge and skills.

INPUT®

INFORMATION SYSTEMS MANAGEMENT ISSUES

- Competitiveness
- Optional Use of Existing Systems and Software
- Systems Integration
- Cost Control/Off-Set
- Future Directions of Technology

B. THE NETWORK WILL BECOME THE SYSTEM

- Network integration will become the dominant systems concern among larger organizations by the end of the decade. The portion of computing power residing at the corporate level will continue to decline as departmental systems emerge as equal nodes in a companywide network.

- The network will thus become the key element of the corporate DP system. The concept of a hierarchy of information (with the corporate data center as the controlling pinnacle) will dissolve to become a "joined hands" environment where all nodes are equal and data residency is transparent to the user. The implications of this new view of information systems are major:

  - A new way of thinking about information systems must evolve. Data becomes "ours" rather than "mine."

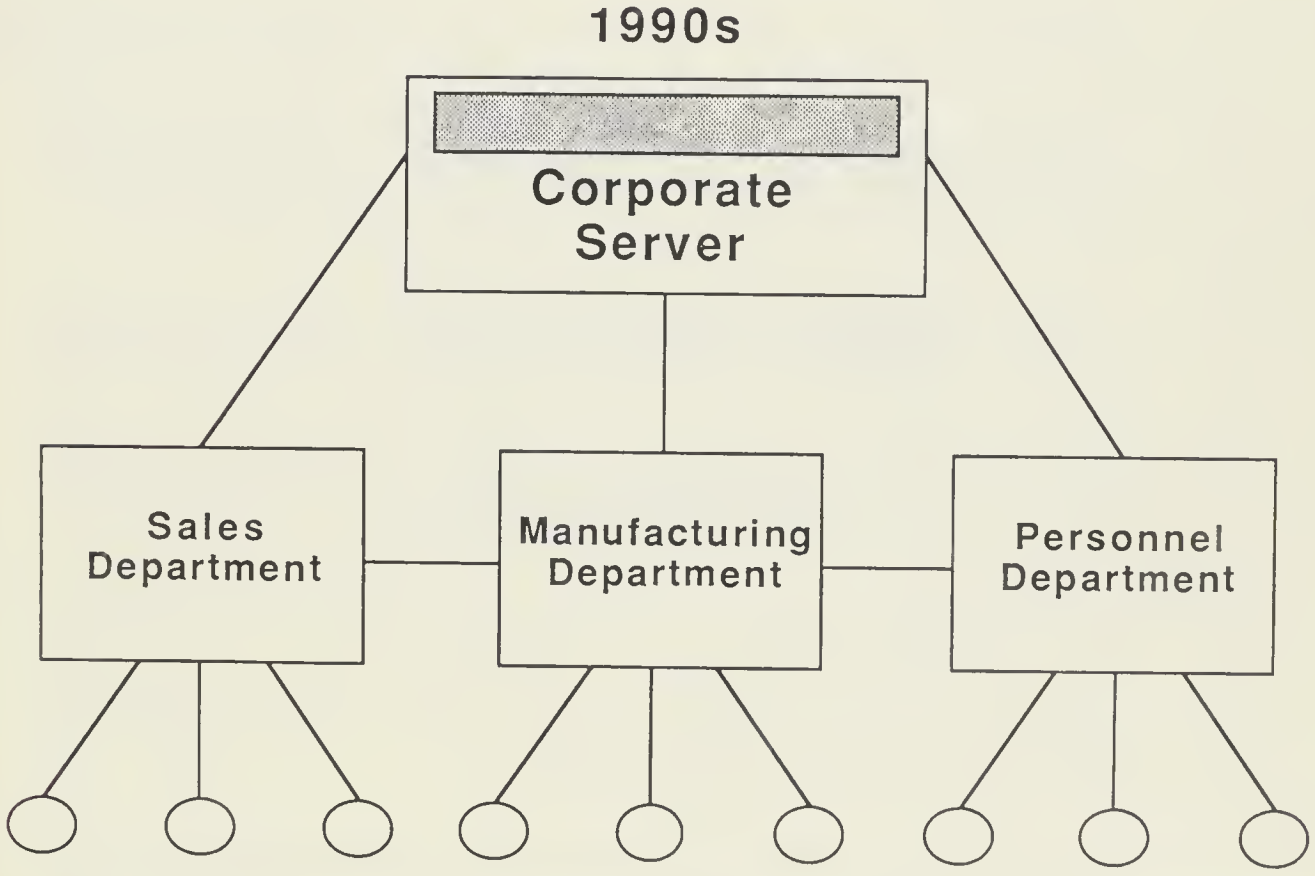
  - The "system" becomes the entire linked configuration, not just a single centralized processor or center.

- Departmental systems decisions become too important to be the exclusive province of individual department managers not versed in the issues of companywide information systems. Corporate IS management must be heavily involved, and departmental IS skills must be upgraded.

- Systems design becomes more complex--single processor residency of programs and data will be untenable. Telecommunications skills and planning are vital. A premium will be placed on methods for tracking data and maintaining security.

INPUT®

THE NETWORK WILL BECOME THE SYSTEM



C. I.S. BUDGET GROWTH HAS SLOWED

- IS budgets will grow at an average annual rate of 7% in 1987, representing a slower growth compared to the past two years. The emphasis is on better utilization and integration of existing information processing capabilities as a way of supporting and enhancing the competitiveness of the company. This affects all areas of business, from sales, distribution, and manufacturing to management.

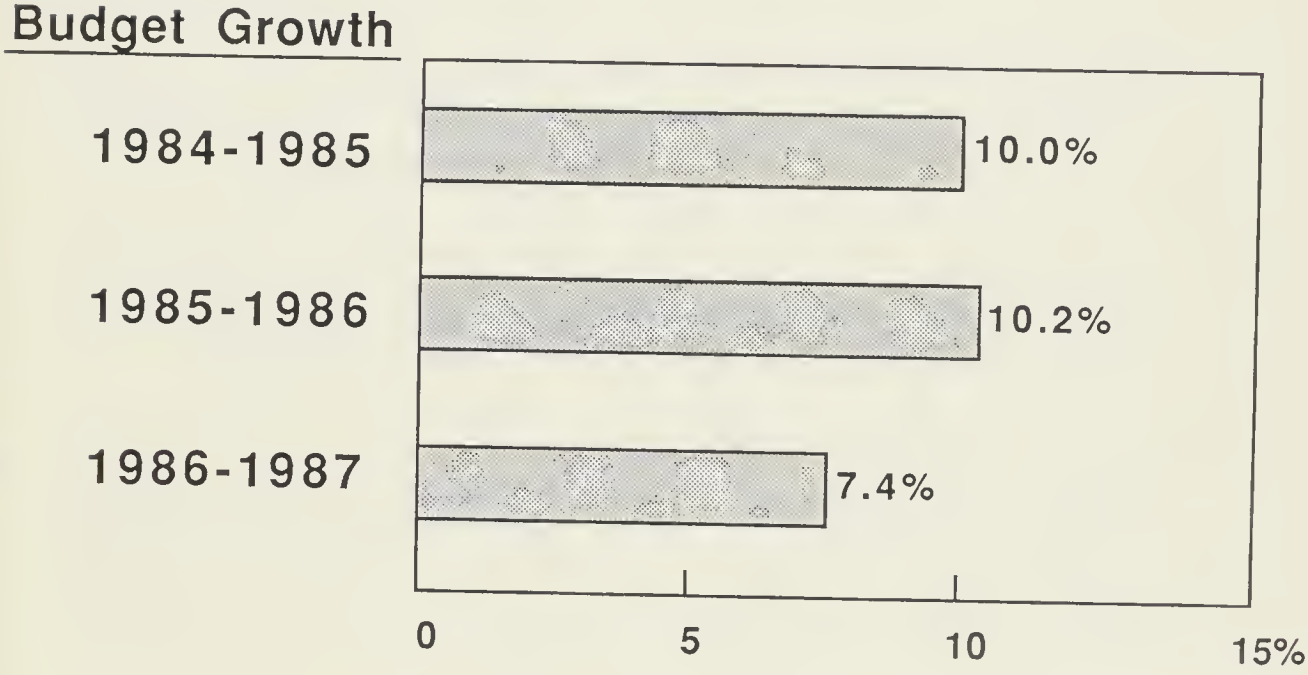
- The major growth areas in IS expenditures will be in software products and professional services (particularly customized software development). Most areas will show increases higher than the 3% inflation predicted for 1987.

- Industry-specific systems and applications software products will be especially strong in 1987 as managers embrace ways to automate mission-critical systems. Commercial systems integration--the linking of all information handling automation within the company, whether voice, data, text, or image-based--will continue to grow at a fast pace.

- From an industry sector point of view, segments growing as fast or faster than the overall average include transportation (10%) and insurance (7%). These areas of the economy are faced with major expenditures as they adjust to the new demands of a less regulated marketplace.

- Sectors growing less than average are education (3%), banking (3%), wholesale distribution (3%), and utilities (4%). These sectors are services-oriented and have spent heavily in IS in previous years and/or are facing extreme cost pressures which impact the entire firm's ability to spend.

I.S. BUDGET GROWTH HAS SLOWED



D. I.S. BUDGET DISTRIBUTION, 1986

- Personnel spending for IS employees absorbed 37% of the total IS budget in 1986. Labor costs in 1987 will increase slightly faster than inflation due to a shift toward higher skilled personnel caused by the demands of a more complex systems environment.

- Hardware costs comprised a quarter of the 1986 IS outlay, reflecting spending cutbacks in areas such as mainframe systems. INPUT surveys indicate, however, an 8% increase in hardware expenditures in 1987 as firms loosen their purse strings to support competitive-edge and mission-critical systems.

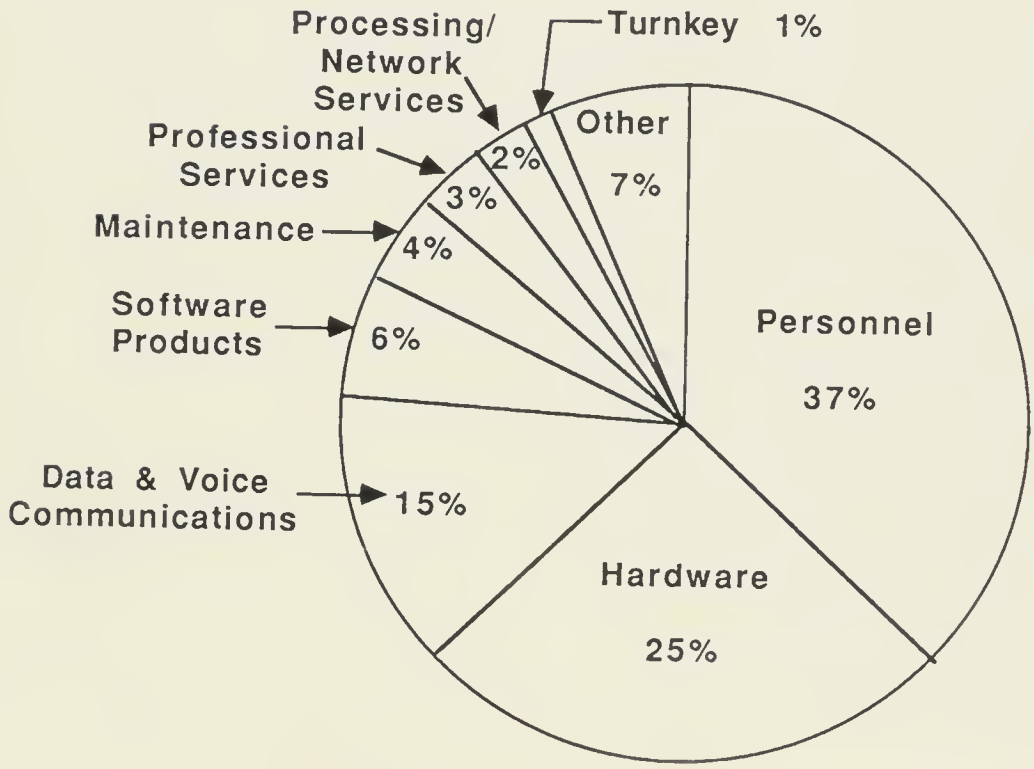
- Voice and data communications expenditures are now the third largest IS expense category with 15% of all costs. As more and more networked systems come on-line, this budget item will continue to grow in importance.

- Outlays on external information services vendors (e.g., software products, professional services, processing services, and turnkey systems) constitute 12% of the entire IS budget. The urgency and complexity of networked systems and systems integration make the special expertise of these suppliers especially appealing. Spending will increase 10% in 1987 for these services.

- Computer/communications technology is now too important to the success of an enterprise to be implemented independently of the firm's top business managers. Steps must be taken to ensure that the processing strategies directly support key business plans.

- Telecommunications systems are costly, complex, and time consuming to develop. It is especially important that the communications network be in place to serve today's needs immediately and that it be rapidly expandable to serve tomorrow's needs without undue delay.

I.S. BUDGET DISTRIBUTION 1986



Percent of IS Budget

INFORMATION SYSTEMS PLANNING REPORT
BANKING AND FINANCE SECTOR

NOVEMBER 1986

INFORMATION SYSTMES PLANNING REPORT
BANKING AND FINANCE SECTOR

CONTENTS

INFORMATION SYSTMES PLANNING REPORT
BANKING AND FINANCE SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- The changing regulations of federal and state governments in the banking and finance sector are dramatically affecting this sector's competitive environment.

  - The barriers to interstate banking are crumbling. Loopholes in the current laws are reducing the number of single unit regional banks.

    - Money center banks are establishing regional offices that technically are not banks. They either are loan offices or purely depositories.

    - To counter the encroachment by the money center banks, regional banks are forming interstate holding companies that typically consolidate operations and information systems organizations.

  - New technology, primarily in the form of intelligent network (ATMs) and ancillary services, has provided new expanded distribution channels for banking and financial services. This has also provided the opportunity for nontraditional competitors such as retail organizations to enter the financial services industry. The primary vehicles for entry are the POS and intelligent networks.

- Deregulation and consolidation have created another driving force--new economies of scale. Money center banks must remain sufficiently large to economically provide a full range of services to commercial and individual customers. These new economies of scale include:

  . Very large capital bases.

  . Extensive branch office network links to national ATM networks.

  . Integrated information networks.

  . Nationwide, even worldwide, "market presence."

  . Up-to-the-minute information on worldwide investment and currency markets.

- Large banks and other financial institutions will have to embrace two key consumer marketing tools--"share of mind" and "market presence"--in order to be successful. Simply stated, a financial institution's ability to market will be as good as its customer and demographic data base.

- Banks are likewise expanding services to include insurance and are leveraging their investment in networks and support software. As one of the respondents to the annual survey stated, "Banks are in the financial information business." This volatile sector is experiencing an extreme shakeout and consolidation by participants. This shakeout is affecting all sizes of institutions. The survivors will be the institutions that can leverage technology to provide product differentiation. Banking and finance sectors must change from a staid, highly regulated environment to one of wide open competition, similar to the retail

sector, yet maintain prudence and the confidence of their customers. Currently, too many are not successful, and public confidence in banking is at its lowest since the Great Depression. Exhibit I-1 summarizes the major driving forces affecting the banking and finance sector.

B. ISSUES AND OBJECTIVES

- Software is becoming obsolete faster due to competition and deregulation. There is a need for shorter development cycles and more flexible software.
  - Bank services are proliferating so fast that most systems development staffs cannot keep pace.
  - Many bank systems are over ten years old and do not account for the need for customer- versus function-oriented data bases.
- The advent of ATMs and the interbank EFT systems has made communications one of the key areas of change affecting this sector's IS departments.
  - The growing demand for electronic information delivery is also affecting the internal organization.
    - Customers having multiple accounts and numerous services are becoming more common.
    - The increased competition from within and outside the sector requires timely account information to be delivered throughout the organization.

EXHIBIT I-1

BANKING AND FINANCE
DRIVING FORCES

- Deregulation
- New Applied Technology
- Nontraditional Competitors
- Consolidation
- Changing Economies of Scale

- Major banks are planning to develop infarmatian architectures that are customer-oriented.

  . Systems development has been on an application (i.e., product) basis. Because of this structure, banks have a difficult time associating a customer with the services the banks perfarm. Banks are also having difficulty developing praspects far services from their current custamer base.

  . Developing this architecture is a major undertaking. The key will be creating a network af infarmation from campatible data bases. This task will involve restructuring most systems in the arganization. Those institutions that are undertaking this task are planning far up to five years to achieve their goal, with expenditures that may exceed $1 billian.

  . The need far this new acceptance is amplified by the growing use of ATMs. Max Happer, farmer Executive Vice President af Bank af America, estimates that the ATM enviranment will drive the transactian volume in majar banks to 1,000 per second by 1990.

- Deregulation and the erading barriers of interstate banking are accelerating the rate af bank mergers and acquisitians. This leads ta cansalidatian af IS departments inta infarmation service campanies in multibank halding companies.

  - Systems compatibility becames a majar issue. As different banks begin using a single source far infarmatian services, the migratian ta a campatible system becames paramaunt if the efficiencies inherent in this consalidatian are ta be realized.

- Most consolidations are only occurring at the data center. Systems development and maintenance still remain in the individual banks. Ultimately, the respondents that are consolidating are planning to consolidate the systems development group also, but this is a longer term and more complex goal.

- As more information is stored and processed, the need for internal and external data security increases dramatically. Consumer protection laws provide strong incentive for financial institutions to control the dissemination of financial information.

- Even though the banking and finance sector is experiencing the most technological opportunity (and disruption) of any sector, the top IS objective is still cost containment.

  - Increased competitive pressures have translated into cost containment strategies for administrative systems.

  - Until recently, bank profitability has been under severe pressure due to poor loan performance. Management is trying to reduce costs to keep its equity position high enough to prevent regulatory intervention.

- Banking management is in a dilemma regarding information systems.

  - It must invest heavily in new systems and technologies to meet the competitive threat of other financial institutions, insurance companies, and nontraditional competitors such as retailers.

  - Yet poor loan performance means that costs must be controlled to maintain acceptable profitability.

  - The financial institutions that can overcome this dilemma can reap the rich potential that the electronic banking age will hold.

- "Account control" has become a key banking and financial services issue. The proliferation of computer software and turnkey systems must be directed toward one goal. To gain maximum leverage of marketing efforts, financial organizations must keep the customers they worked so hard to sign. MIS will work closer with senior management to implement and analyze necessary account information and find the appropriate products or services for the organization's customer base. Information in the financial services business can no longer be seen as a competitive advantage; it is a necessity.

- Deregulation has indirectly led to a growing application backlog. While all applications may not be of equal importance, the sheer number of unmet application requests must be reduced. Shorter software development cycles are made possible through the use of fourth generation languages.

- Exhibits I-2 and I-3 summarize the top issues and objectives in priority order for this sector.

C. MANAGEMENT PERCEPTION AND ORGANIZATIONAL ISSUES

- Most of the respondents believe their management views IS as a corporate asset. However, the middle management in this sector still views IS as an unavoidable cost.

  - This is due to senior management's strategic view. They see IS as a key competitive tool and a major component of new services.

  - Middle management still sees IS as an expense that they cannot control. Most areas have not realized increased revenue from IS-based services. Until this occurs, the middle manager's attitudes will not change.

BANKING AND FINANCE ISSUES

- Software Obsolescence
- Growing Demand for Electronic Information Delivery Systems
- Need for an Integrated Information Architecture - Shift from Functional to Customer Orientation
- New Services Are Being Developed Faster Than IS Can Provide Support
- Mergers and Acquisition Activity Is Requiring Consolidation of Data Center, Software, and Staff within the Affected Institutions
- Growing Importance of Computer System Security

BANKING AND FINANCE OBJECTIVES

- Cost Containment
- Improve Information Delivery within the Company
- Shorten Software Development Cycle
- Respond to Regulatory Requirements

- IS measurements to management have centered on two major factors.

  - Cost. Meeting budget constraints and having spending levels comparable with key competitors.

  - Return on investment and cost benefit analysis. Although these analytical approaches have been widely used, more emphasis is now being placed on revenue producing versus cost reduction tasks. The use of post-implementation analysis is still rare. It appears that once a project is approved, it will be implemented and remain in operation until someone can convince management it should be replaced. This must change--the post-implementation analysis is vital to the success of the project and the profitability of new services.

  - Some institutions view IS as essential to their success, so essential that no measurement of success is required. This is a two-edged sword.

    . It minimizes IS department efforts to prove its worth to the organization.

    . It may reduce the benefit of IS to the organization. Management may perceive a value from IS that is less than its true potential. It is IS' responsibility to sell itself to management. Even if management does not require it, IS must initiate a sales campaign of its own.

- IS' status has increased in the last two years in responding institutions. The head of IS reports to the president, vice chairperson, or executive vice president level. They are moving away from reporting to the financial segment of the organization and are being viewed as an operating and, in some cases, a profit center of the organization.

- IS is becoming an equal participant in the strategic planning process. In the next two years, IS will assume an increasing role in product development. Most of the respondents said their major role in this period will be to improve information delivery, with the head of IS becoming the chief information officer.

- The respondents believe information systems can become a competitive weapon in this sector by:

  - Reaching customers by electronic delivery of information.

    . ATM.

    . Home banking.

    . EFT (electronic funds transfer).

  - Developing flexible systems that improve the institution's ability to react to outside influences (e.g., competition and deregulation).

D. IMPACT OF TECHNOLOGY

- End-user computing is having a moderate impact on this sector. Most respondents were marshalling resources to support personal computers, not end-user computing in general. They see their role as satisfying users' immediate needs and not anticipating future requirements.

- Departmental processing is viewed as having a low impact in this section. Ultimately, departmental processors will be part of an office automation strategy, but the current centralized focus of developing a central systems architecture is deferring any action in this area.

- Connectivity is moving rapidly toward great importance in this sector due to system integration needs of users. Diverse hardware and software need to be integrated to gain maximum use of installed equipment and to facilitate the exchange of information and ideas in the organization.

- Relational data bases on mainframes have had little activity other than study and some pilot programs.

- Voice and data integration is believed to have medium impact on this sector. Electronic information delivery is vital to the success of banks and financial institutions. The cost of networks is a key concern, and respondents believe that merging voice and data networks is a means of reducing costs; however, recent trends indicate limited implementation.

- LANs have had limited use in this sector. The lack of LAN standards has also delayed extensive use of this media.

- Exhibit I-4 summarizes the impact of the above technologies on the banking and finance sector.

- In 1986, banking and finance users' interests centered on the means to integrate existing data and the potential pitfalls of integration. Control of data, data integrity, and data security are of more concern to IS directors. According to Exhibit I-5, fourth generation languages (application development tools), which fell out of favor two years ago, are now back in favor and are seen as a key means of reducing the application backlog.

- The information center (IC) has been the focal point for end-user training as the responsibilities of the IC have been expanded to include microcomputer support and most end-user training. Some of the respondents have begun using computer-based training as part of their training program, but most respondents are limiting microcomputer training to classroom training of selected software packages.

EXHIBIT I-4

BANKING AND FINANCE
IMPACT OF TECHNOLOGY

	IMPACT	COMMENTS
End-User Computing	Medium	Most using IC for support. See as future force, but now in control phase.
Departmental Processing	Low	Unsure of application other than OA.
Connectivity	High	Connectivity required for maximum MIS efficiency.
Relational Data Bases	Low	Most studying the issue, very little implementation activity.
Voice/Data Integration	Medium	While viewed as important, connectivity outranks voice/data integration needs.
LANs	Low	Low usage, lack of LAN standards have inhibited corporate commitment.

BANKING AND FINANCE
AREAS OF NEW TECHNOLOGY INTEREST

- Connectivity
  - Wide Area Networks
  - Medium Area Networks
  - Control of Shared Data
- End-User Computing
  - Interaction with Corporate Data Base through Microcomputers
  - Data Integrity
  - Data Security
  - Utilization of Fourth and Fifth Generation Languages

II NEW APPLICATIONS

- The most important new applications involve integration of fundamental banking applications--deposit systems, trust management, and loan application processing.

  - The changing economics of delivery services are rendering fundamental systems obsolete. Many of these systems are over 20 years old. They have been heavily modified and do not interface with other systems.

  - The move toward developing a central architecture requires that these core systems conform to this central structure. Typically, these systems would be the first to be designed since they make up the foundation of the banking business.

  - Continuing consolidation of multiple bank IS departments under a single holding company division is creating a need for either a single system or compatible systems that can service all banks within the holding company.

- Information delivery within the organization is creating a high demand for query and customer information systems. External delivery of information is being driven through the ATM/POS networks. These networks are providing a vehicle for customer information and services that can provide a competitive advantage to financial institutions.

- Fifty-five percent of the major new systems are being developed by internal staff, 23% are developed externally via packages and contract personnel, and 22% are developed by both internal and external resources. The return to internal from external resources is caused by the rapidly changing competitive and regulatory environment and banks' views of information as an operational necessity.

- Exhibits II-1, II-2, and II-3 summarize the major applications activity in the banking and finance sector. Note that new application development activities now represent more than 60% of typical software staffing.

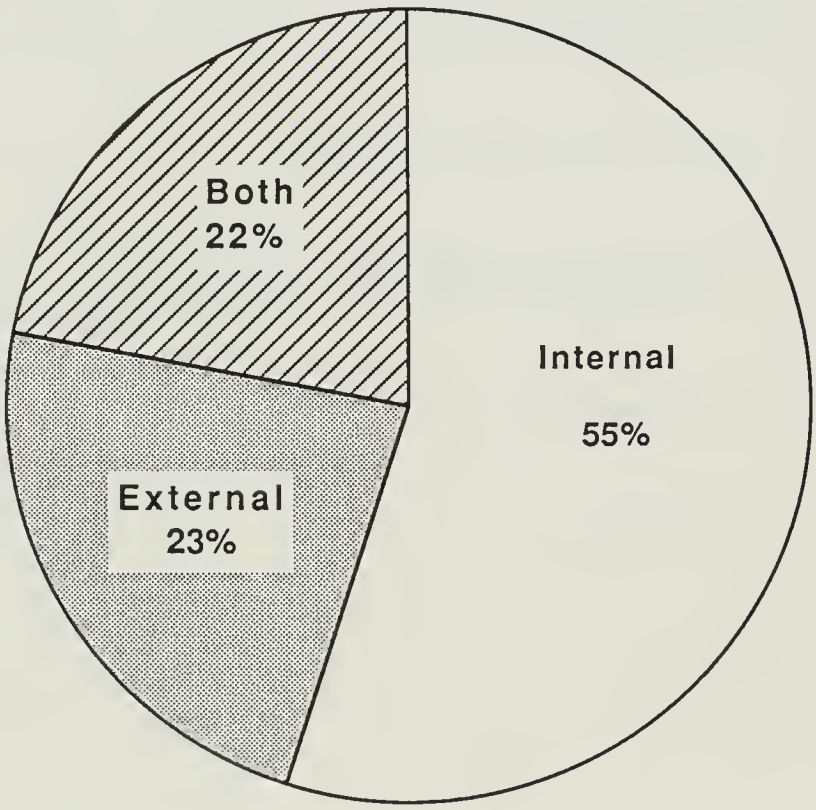
EXHIBIT II-1

BANKING AND FINANCE
NEW APPLICATIONS, 1986

- Trust Management
- Integrated Deposit System
- Converting Central Files to Data Base Management System
- Electronic Banking
- ATM/POS

EXHIBIT II-2

BANKING AND FINANCE
SOURCE OF DEVELOPMENT FOR NEW MAJOR APPLICATIONS



External Sources

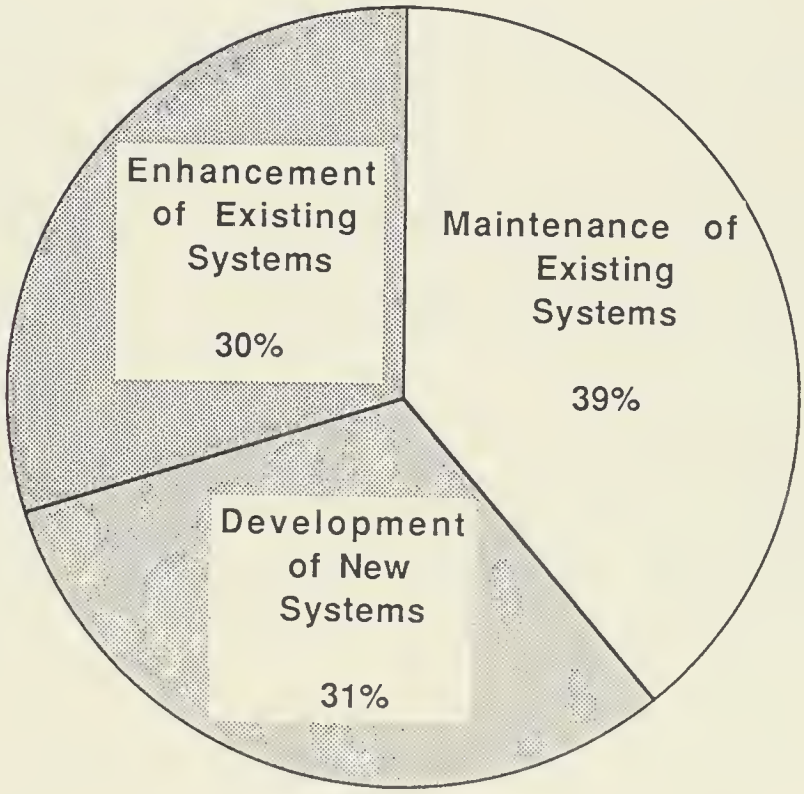
Internal Sources

Combination of Internal and External Sources

Cost Range of New Application Software: $15,000 - $8,000,000

EXHIBIT II-3

BANKING AND FINANCE
ASSIGNMENT OF APPLICATION DEVELOPMENT STAFF



Percent of Application Development Staff

III BUDGET ANALYSIS

- Exhibit III-1 shows the 1986 budget distributian and the projected growth af budget categories in 1987. Expenditures far "ather hardware" is the anly budget categary prajected to decrease.

- Micracamputers is the largest projected growth categary at 14.1% in 1987.

- Persannel expenses cantinue to graw and account far nearly 40% of tatal IS budgets.

- Fifty-faur percent af the respondents in the banking sector said their 1987 budgets will decrease following installatian af new computer systems or upgrades campleted in 1986. Of thase reparting increased 1987 budgets, 64% reparted that increases far 1987 will be at a lesser rate than from 1985-1986 (see Exhibit III-2).

- Once again, persannel expense leads the list af reasans far increased 1986 IS budgets, fallawed by hardware and saftware purchases. New cantributing factars (facility expansion, disaster recovery services, and supplies expense) validate a trend toward increasing importance af areas autside traditianal hardware and saftware purchases (see Exhibit III-3).

- Exhibit III-4 reveals that the "traditional" areas af persannel expense and new hardware purchases will prapel expected 1987 MIS budget increases. Interestingly, facility expansian expenses will cantinue ta play a greater rale in IS

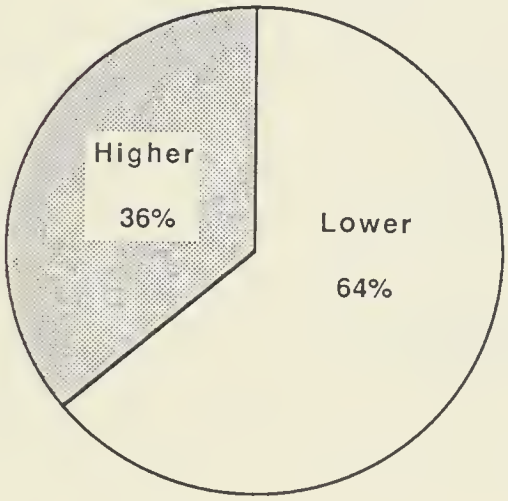
EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE BANKING AND FINANCE SECTOR

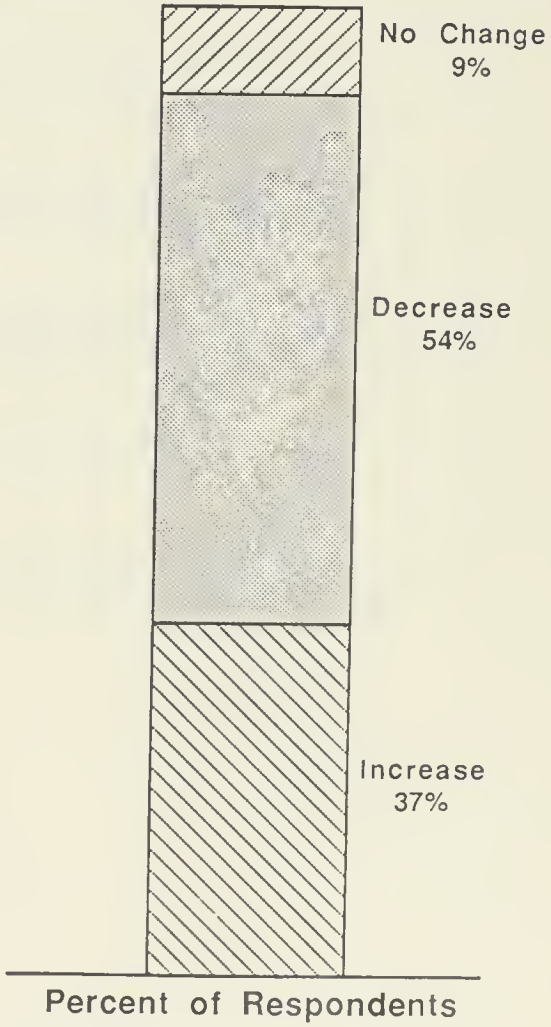
BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	39.9%	3.7%
Mainframe Processors	8.1%	6.9%
Minicomputers	1.2%	3.4%
Microcomputers	4.9%	14.1%
Mass Storage Devices	5.3%	7.5%
Other Hardware	6.9%	(3.7%)
Total Hardware	26.4%	1.4%
Data Communications	10.1%	8.3%
External Software	2.8%	4.9%
Professional Services	1.7%	1.4%
Turnkey Systems	0.8%	0.3%
Software Maintenance	0.8%	6.6%
Hardware Maintenance	8.4%	3.1%
Outside Processing Services	1.0%	1.4%
Other	8.1%	1.8%
Total	100.0%	2.6%

BANKING AND FINANCE
MOST 1987 I.S. BUDGETS WILL DECREASE COMPARED TO 1986

Percentage Growth in
1987 Budget vs. 1986
(Of Those Respondents Indicating
a Budget Increase)



1987 Budget vs. 1986



BANKING AND FINANCE
FACTORS CONTRIBUTING TO INCREASED 1986 I.S. BUDGETS
(In Order of Frequency of Mentions)

- Personnel Expense
- Hardware Purchases
- Software Purchases
- Hardware Maintenance
- Facility Expansion/Enhancement
- Disaster Recovery Services
- Supplies Expense

BANKING AND FINANCE
FACTORS CONTRIBUTING TO INCREASING 1987 I.S. BUDGETS
(In Order of Frequency of Mentions)

- Personnel Expense
- Hardware Purchases
- Facility Expansion
- Hardware Maintenance
- Communications Costs

budgets. INPUT believes users' increased disk storage and data communications requirements now exceed available floor space, and financial institutions which have delayed facility expansion for two to three years must now make those expenditures.

Information Services Program (ISP)

Information Systems Planning Report

Banking and Finance Sector

INPUT®

1280 Villa Street, Mountain View, CA 94041 (415) 961-3300

DECEMBER 1987

INFORMATION SYSTEMS PLANNING REPORT

BANKING AND FINANCE SECTOR

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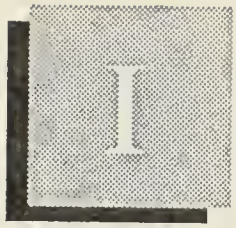


Major Issues

I

Major Issues

A

Driving Forces

Cost pressures intensified by increases in loan loss provisions and turbulent financial market conditions became the major driving force in the market during 1987.

Cost pressures are leading banks to consider mergers, shared operations, or offloading part of their operational load to processing vendors. Processing vendors are enjoying an expansion of work as a result and are greatly increasing the services that they offer. MTech has added more ATM capability, a COM service bureau, education and training courses, and new commercial bank processing services. First Financial Management has also acquired a COM facility and added other new products.

Cost pressures have also intensified the effort by major banks to find new sources of revenues through market place expansion or the development of new or enhanced products.

Deregulation by federal and state governments in the banking and finance sector have dramatically affected the competitive environment and banks would like to see further deregulation, particularly in regard to the Glass-Steagall act.

- Money center banks have carried out a number of mergers across, as well as within, state boundaries and will be involved in more mergers, to reduce costs through consolidation of operations and to gain access to new markets.

- One regional bank, First Tennessee, was involved in over 30 mergers in the mid 1930's.

- The emerging super regional banks such as Core States, Midtlantic, and First Wachovia will also be involved in more acquisition and merger activities.

Due to the market entry of new small financial service institutions (FSI's), particularly savings and loan institutions, the total number of FSI's will not decrease as rapidly as formerly projected.

New technology, primarily in the form of intelligent network services, including new approaches to credit card and ATM use (touch screen versus keyboard input and uses of A.I.), will continue to expand distribution channels for banking and financial services. It will also provide the opportunity for nontraditional competitors such as retail organizations to expand services to the financial services industry.

Deregulation and consolidation have provided the opportunity for banks to attempt to improve productivity through economies of scale.

Money center banks must continue to grow in size to economically provide a full range of services to commercial and individual customers through:

- Efficient interfaces to major money transfer systems.
- Extensive branch office network links to national ATM networks.
- Large scale processing capabilities for check clearance, loan handling, and other processing functions.
- Integrated information networks to support business offices and bank clients.
- Services that offer nationwide, and in some cases worldwide, "market presence."
- Up-to-the-minute information on worldwide lending, currency, and investment markets.

A number of large banks have or are attempting to leverage their size, resources, and market knowledge to gain market share in certain product areas through the use of technology.

- Chase dominates ACH origination through this strategy.
- Citibank, Bank America, Chase, and First of Chicago dominate bank card insurance.
- Bank of New York has become a significant player in many areas of security processing.

Some industry observers feel that the combination of asset size and the use of technology will result in the domination of the industry by large institutions, those who can afford to buy the most effective systems.

However, the creation of competitive large-scale capabilities by a group of major banks to serve clients has created a situation of over-capacity where individual banks may find that they cannot run their systems with sufficient volume to create peak efficiency.

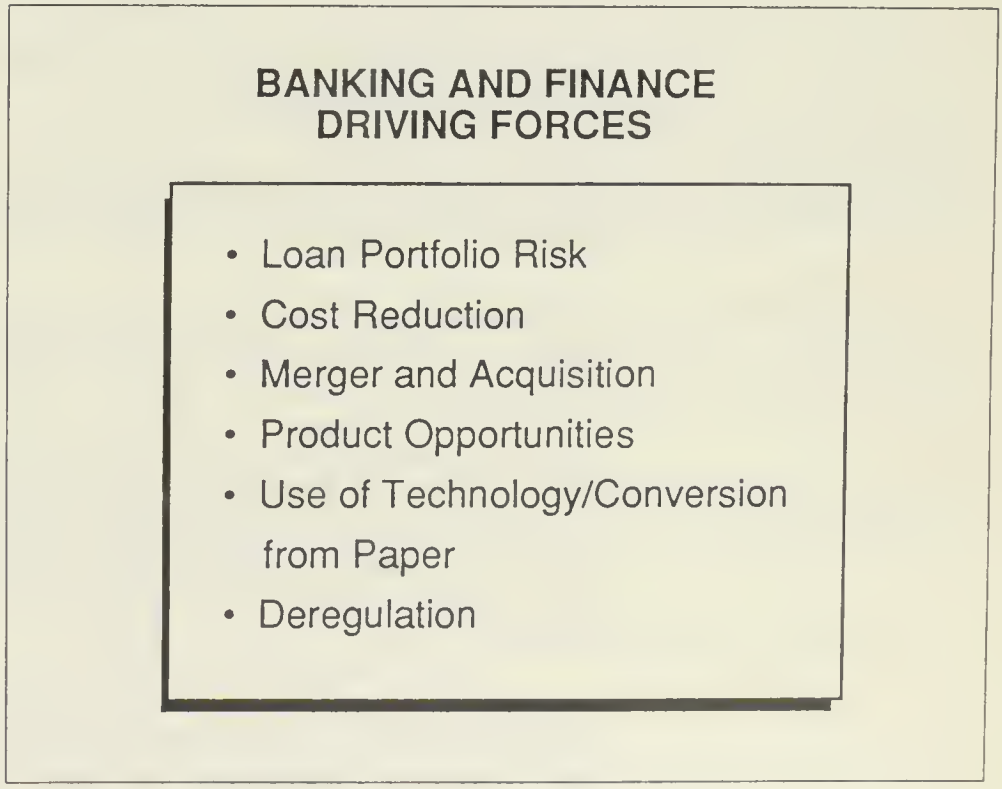
Banks below the top ten in asset size have also demonstrated the ability to use technology profitably. The check clearing services of First Tennessee and National Bank of Detroit illustrate this.

A few large banks may be able to concentrate their attention on segments of work (e.g., Bankers Trust on corporate banking and Continental of Illinois on merchant banking), but most large banks will continue to provide a mix of services to both retail and corporate clients.

Large banks and other financial institutions will also have to pay more attention to their markets. Their ability to sell to chosen markets may become limited by their customer and demographic data bases.

Exhibit I-1 summarizes the major driving forces affecting the Banking and Finance sector.

EXHIBIT I-1



B

Issues and Objectives

There is pressure to upgrade and integrate software faster due to product changes, competition, and deregulation, which causes a need for faster development methods and more flexible software.

- Bank services are changing and increasing so rapidly that the professional services capabilities, application packages, processing capabilities, and in many cases, product knowledge of vendors must be called on for assistance.

- Many bank systems are old and do not account for the need for customer—versus functionally oriented data bases.

The continuing growth of ATM and POS use, the interbank EFT systems and on-line applications have made communications one of the key areas of change affecting this sector's IS department.

- The growing demand for electronic information delivery is affecting many industries.

- Banks have to be prepared to supply electronic information to a group of offices at client corporations as well as to link corporations for such purposes as trade payments.

- Individuals now also receive electronic information on payments, account details and investment opportunities from banks.

Major banks are planning to expand and upgrade information service capabilities that are customer-oriented.

- A greater use of user-friendly interfaces, such as the Citibank ATM display, and the use of AI in interface systems has been explored in 1987.

- Improved CIF capabilities are being introduced in retail and wholesale banking, and banks and other FSI are intensifying efforts to locate and sell prospects.

- Systems development has been focused on an application (i.e., product) basis. Because of this structure, banks have a difficult time associating a customer with the services the banks perform. Banks are also having difficulty developing prospects for services from their current customer base. Steps are underway to orient business more toward customer relations.

Developing an architecture that offers an integration and improvement of customer services is a major undertaking. The key will be to obtain and relate information from separate data bases. This task could involve

restructuring most systems in the organization. The institutions that are considering or undertaking this task are planning for up to five years to achieve their goal, with expenditures that may exceed $1 billion. Each bank must consider their needs and situation in developing an architecture.

- Core States developed a plan that allowed migration toward an integrated data base through a gradual upgrade of applications.

- First Tennessee developed a plan that relates customer accounts in two ways, for operational or marketing needs.

The need to reduce costs or expand processing to gain economies of scale or expand revenue has benefited from deregulation and the eroding barriers of interstate banking. This has accelerated the rate of bank mergers and acquisitions which has led to consolidation of IS departments and the development of information service companies in multibank holding companies.

- Systems compatibility has become a major issue. As different banks begin using a single consolidated source for information services, the migration to compatible computing systems becomes paramount if the efficiencies inherent in the consolidation are to be realized.

- A number of banks now find themselves with two, three, four, or even five manufacturers of computing systems. The costs of IS per asset dollar can be considerably higher in these institutions.

- Some consolidations of financial institutions are only occurring at the data center level. Systems development and maintenance still remain in the individual banks. Ultimately, the institutions that are merging are planning to consolidate the systems development group also, but this is a longer term and more complex goal.

As more information is stored and processed, the need for internal and external data security increases dramatically. Consumer protection laws provide strong incentives for financial institutions to control the dissemination of financial information.

Even though the banking and finance sector is continuing to exhibit the most technological opportunity (and disruption) of any sector, the top IS objective is still cost containment.

- Increased competitive pressures have mandated cost containment strategies for administrative systems.

- Bank profitability continues to be under severe pressure due to poor loan performance. Management is trying to reduce costs to keep its equity position high enough to prevent regulatory intervention.

Banking management is in a dilemma regarding information systems.

- It must invest heavily in new systems and technologies to meet the competitive threat of other financial institutions, insurance companies, and nontraditional competitors such as retailers.

- But if business doesn't increase, banks may find themselves burdened with overcapacity.

- And poor loan performance means that costs must be controlled to maintain acceptable profitability.

Some banks may find that the only solution is to share production or use third-party processors where economies of scale dictate a heavy use of technology but competition may prevent business from expanding to fill the capacity.

To gain maximum leverage of marketing efforts, financial service organizations must keep the customers they worked so hard to sign. MIS must work more closely with senior management to obtain and analyze necessary account information and find the appropriate products or services for the organization's customer base. Information in the financial services business can no longer be seen as a competitive advantage; it is a necessity.

Deregulation, new products, and the need for more integration has led to a growing applications backlog. While all applications may not be of equal importance, the sheer number of unmet application requests must be dealt with. Shorter development cycles, the use of application software packages and outside services must be considered.

Exhibits I-2 and I-3 summarize the top issues and objectives in priority order for this sector.

EXHIBIT I-2

BANKING AND FINANCE ISSUES

- New Services or Product Requirements, particularly for new revenue opportunities, can not be met rapidly enough.
- Need for Integrated Information Architecture.
- Growing Demand for Electronic Information Delivery Systems.
- Merger and Acquisition Activity that favors Consolidation of Data Centers, Software, and IS Staff within the Affected Institutions.
- The creation of over-capacity in a desire to upgrade systems.
- Possible decrease of costs through a Shift of Work to External or Shared Processing Facilities.
- Growing Importance of Computer System Security.

EXHIBIT I-3

BANKING AND FINANCE OBJECTIVES

- Cost Containment.
- Handle expanding or changing system requirements for products more rapidly.
- Improve Information Delivery within institutions and to customers.
- Respond to Regulatory Requirements

C

Management Perception and Organizational Issues

Most banks view IS as a corporate asset. However, upper management is beginning to question the growth of expenses in relation to earnings.

- Senior management has a strategic view of IS as a key competitive tool and a major component of new services. Cost pressures have, however, forced senior management to review IS plans to a greater extent.

- Middle management may see IS as an expense that they cannot control if they have not realized increased revenue from IS-based services.

IS reporting to bank management has focused on two major factors.

- Meeting budget constraints and keeping spending levels comparable with key competitors.

- Having return on investment and cost benefit analysis for recommended activities. The use of post-implementation analysis is still rare. It appears that once a project is approved, it will be implemented and remain in operation until someone can convince management it should be replaced. This must change—the post-implementation analysis is vital to the success of the product and the profitability of new services.

Some financial institutions such as Security Pacific have concentrated on measuring results as well as obtaining agreements with users and management to achieve results while holding costs down (management by results).

Some institutions view IS as so essential to business that no measurement of total costs or benefits is made. This is a two-edged sword.

- It does not sufficiently encourage the IS department to evaluate opportunities to lower costs and improve productivity.

- It does not encourage IS to sell itself to management. Even if management does not require it, IS should convince users and management that its expenses are worthwhile.

IS' status has increased steadily in the last five years in responding institutions. The head of IS has a higher title such as senior or executive vice president, and reports to the president, vice chairperson, or executive vice president level. IS has moved away from reporting to the financial segment of the organization and is being viewed as an operating and, in some cases, a profit center of the organization. More IS executives have moved to the top levels of bank management as well.

IS is becoming an equal participant in the strategic process and has taken on an increasing role in product development. The role of IS in this period will be to improve information delivery in general.

Respondents believe information systems can become a competitive weapon in this sector by:

- Implementing systems that increase an institution's ability to gain market share of deposit, loan payment, investment, or their products.
- Reaching more customers in more effective ways through electronic delivery of information.
  - On treasury work stations.
  - Through ATMs and credit cards with new features.
  - Through EDI systems for transferring payments.
- Developing flexible systems that improve the institution's ability to react to outside influences (e.g., competition and deregulation).

D

Impact of Technology

End-user computing is having an increasing impact on this sector, although many respondents are marshalling resources to support personal computers rather than end-user computing in general.

Departmental processing is being implemented in larger banks to serve application needs as well as OA. Systems to plan customer strategies and contact schedules as well as to handle products are being implemented in user areas. The current focus of developing a central systems architecture is deferring action toward departmental systems in many mid-sized and smaller institutions.

Connectivity has become of great importance in this sector due to system integration needs of users. Diverse hardware and software need to be integrated to gain maximum use of installed equipment and to facilitate the exchange of information and ideas in the organization.

Relational data bases on mainframes have begun to be installed in the top fifty banks. DB2 use has grown rapidly.

Voice and data integration is believed to have medium impact on this sector. Electronic information delivery is vital to the success of banks and financial institutions. The cost of networks is a key concern, and respondents believe that merging voice and data networks is a means of reducing costs; however, recent trends indicate implementation has not been wide spread.

LANs have been used in the top fifty and some smaller banks to link functional areas or those concerned with certain processing systems. The lack of LAN standards has been a problem in this regard.

Optical storage (CD-ROM) has only been considered in an experimental way but its usage for information storage will begin to grow in 1988.

Exhibit I-4 summarizes the impact of the above technologies on the banking and finance sector.

EXHIBIT I-4

BANKING AND FINANCE
IMPACT OF TECHNOLOGY

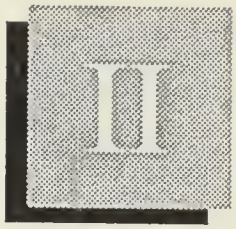
	IMPACT	COMMENTS
End-User Computing	Medium	Growing in larger banks.
Departmental Processing	Medium	Applications and OA are now being done on departmental computing systems in large banks.
Connectivity	High	Connectivity required to serve marketing, contact, and planning needs.
Relational Data Bases	Low	Larger banks are interested.
Voice/Data Integration	Medium	While viewed as important, connectivity outranks voice/data integration needs.
LANs	Medium	Usage has grown.
CD ROM	Low	Will be introduced for storage of data for occassional retrieval.
Use of AI	Low	Will be introduced in Credit and Investment Evaluation and in ATM interaction.

In 1987, banking and finance users' interests in technology centered on means to achieve connectivity; and integrate existing systems providing data integrity, control and security, as shown in Exhibit I-5. The use of AI was also receiving interest as a new area of technology, particularly in credit, investment, and ATM applications. Although the use of smart cards was being discussed, this product did not appear to receive much attention, despite its potential for off-line card applications.

EXHIBIT I-5

BANKING AND FINANCE AREAS OF NEW TECHNOLOGY INTEREST

- Connectivity
  - Wide Area Networks
  - Medium Area Networks
  - Control of Shared Data
- End-User Computing
  - Interaction with Corporate Data Base through Microcomputers and Distributed Minicomputers
  - Data Integrity
  - Data Security
- Use of AI in credit, investment, and ATM interfaces



New and Changing Applications

II

New and Changing Applications

New or expanded requirements for international lending, foreign exchange trading and foreign debt monitoring and restructuring will continue to have an impact on vendor assignments and on internal development.

Application software packages and professional service software development work will also continue to show an emphasis upon integration of fundamental banking applications -retail and wholesale deposit, trust management, and international lending.

- The changing economics of delivery services have rendered systems obsolete. Many of these systems are over 20 years old. They have been heavily modified and do not interface with other systems.

- Improved customer information and profitability systems require that older systems be redesigned so that they can interface.

- Consolidation of multiple bank IS departments under a single system or compatible systems can service all banks within the holding company.

Information delivery within the organization is creating a high demand for query and customer information systems. External delivery of information is being driven through the ATM/POS networks. These networks are providing a vehicle for customer information and services that can provide a competitive advantage to financial institutions.

- More information will be gathered by these systems in the future. AI technologies will be used to help gather information and initiate new services.

- New types of ATM/POS units should be anticipated (e.g., touch screens in place of keyboards and the use of smart cards or their technology to handle ATM or POS transactions off-line).

About 50% of the major new systems are being developed by internal staff, 27% are developed by externally via packages and contract personnel, and 22% are developed by both internal and external resources. The use of both internal and external resources is caused by the rapidly changing competitive and regulatory environment and banks' views of information as an operational necessity.

Exhibits II-1, II-2, and II-3 summarize the major applications activity in the banking and finance sector. Note that new application development activities now represent more than 60% of typical software staffing.

EXHIBIT II-1

BANKING AND FINANCE APPLICATIONS EMPHASIS IN 1987

- International Lending, Foreign Exchange Trading and Foreign Debt Monitoring and Restructuring.
- Integrated Retail and Wholesale Deposit System.
- Securities Processing and Analysis for Trading Purposes and Portfolio Management.
- Converting Central Files to Data Base Management System.
- Electronic Data Interchange and Distribution.

EXHIBIT II-2

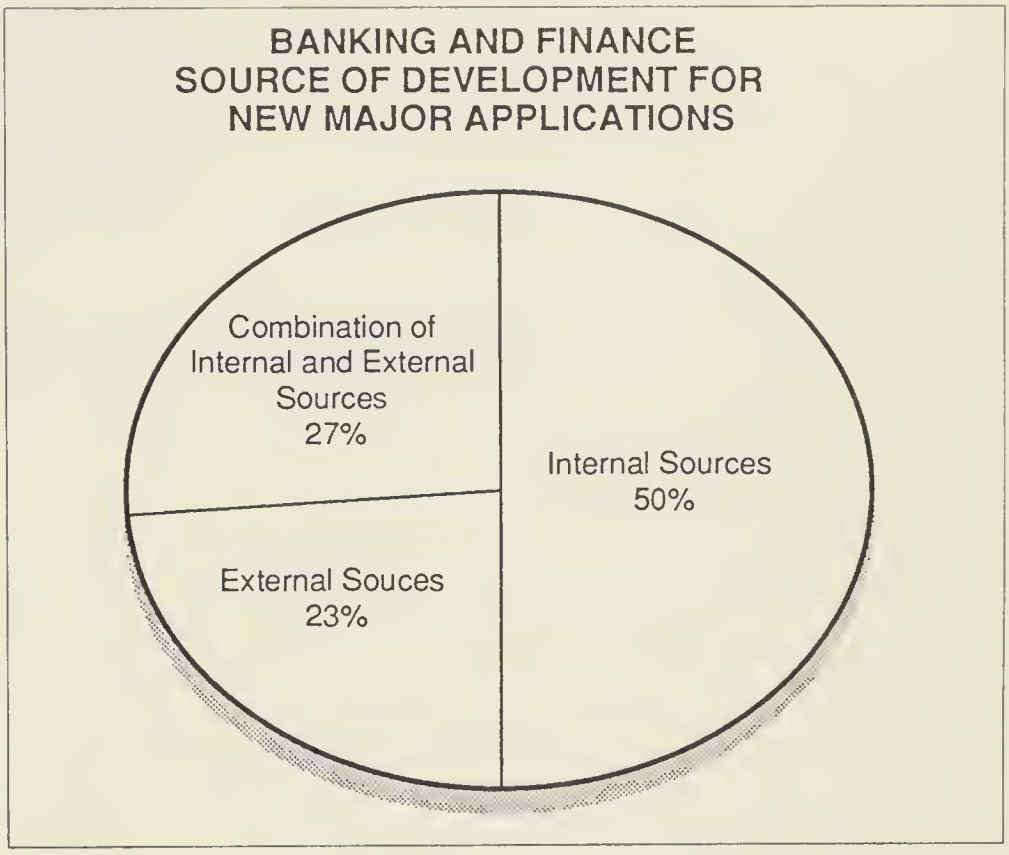
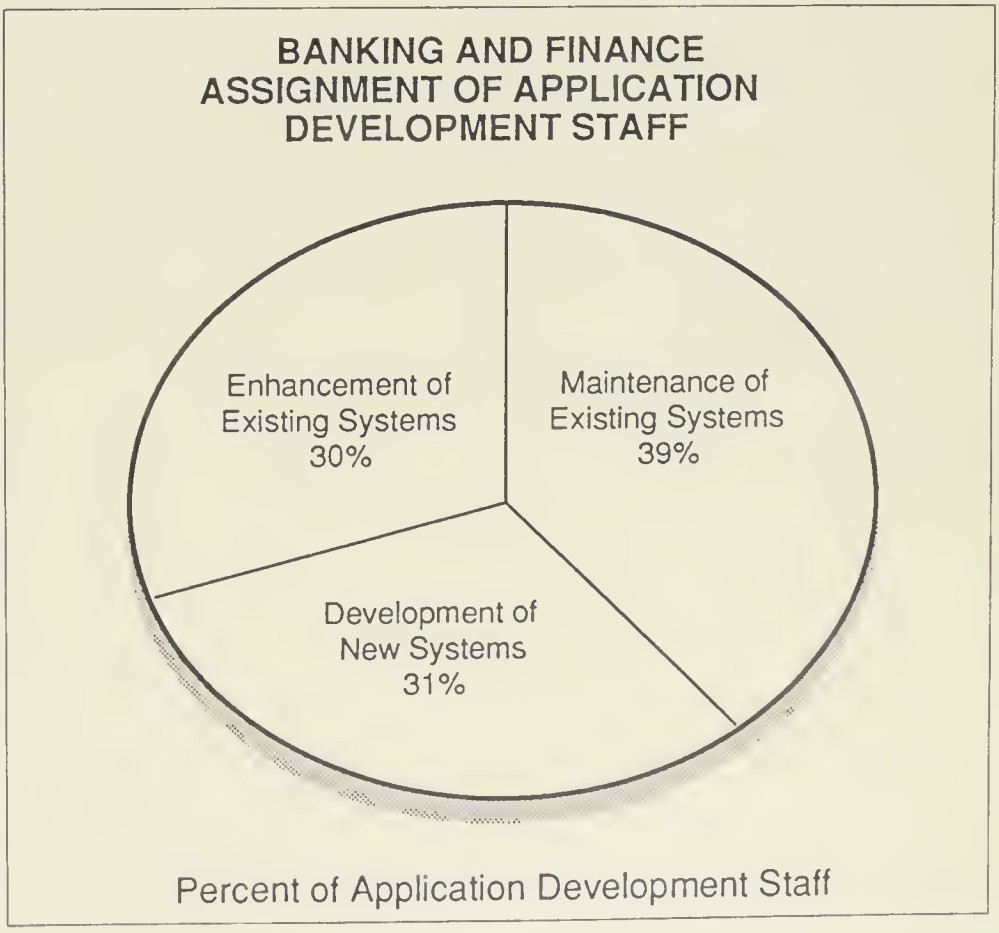
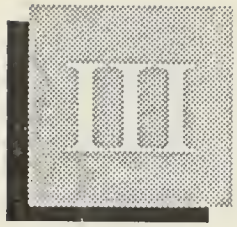


EXHIBIT II-3





Budget Analysis

III

Budget Analysis

Exhibit III-1 shows the 1987 budget distribution and the projected growth of budget categories in 1988. Expenditures for "other hardware" is the only budget category projected to decrease.

Data communications and microcomputers have the largest estimated growth rates in 1987. Both are projected at 8.1%.

Personnel expenses continue to grow and account for about 40% of total IS budgets.

An estimated 56% of the respondents in the banking sector will decrease budgets in 1988. Those increasing budgets will do so at a lower rate than in 1988.

Once again, personnel expense leads the list of reasons for increased 1987 budgets, followed by hardware and software purchases. New contributing factors (facility expansion, disaster recovery services, and supplies expense) validate a trend toward increasing importance of areas outside traditional hardware and software purchases (see Exhibit III-3).

Exhibit III-4 reveals that the "traditional" areas of personnel expense and new hardware purchases will propel expected 1988 MIS budget increases. Facility expansion or changes will continue to play a greater role in IS budgets as equipment is consolidated into new sites or end-user areas invest in computer sites.

EXHIBIT III-1

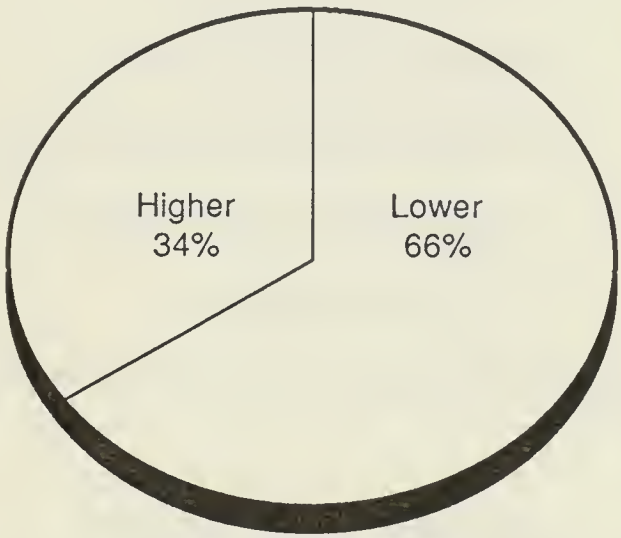
1987 BUDGET DISTRIBUTION AND 1987 AND 1988 CHANGES IN THE BANKING AND FINANCE SECTOR

BUDGET CATEGORY	ESTIMATED 1987 PERCENT OF I.S. BUDGET	1987-1988 ESTIMATED BUDGET GROWTH (Percent)
Personnel Salaries and Fringes	40.1	1.8
Mainframe Processors	8.2	6.1
Minicomputers	1.2	3.0
Microcomputers	5.0	8.1
Mass Storage Devices	5.4	6.2
Other Hardware	6.5	(2.0)
Total Hardware	26.3	1.4
Data Communications	10.2	8.1
External Software	2.8	4.8
Professional Services	1.7	1.5
Turnkey Systems	0.8	0.3
Software Maintenance	0.9	6.4
Hardware Maintenance	8.3	3.0
Outside Processing Services	1.1	1.4
Other	7.8	1.6
Total	100.0	2.6

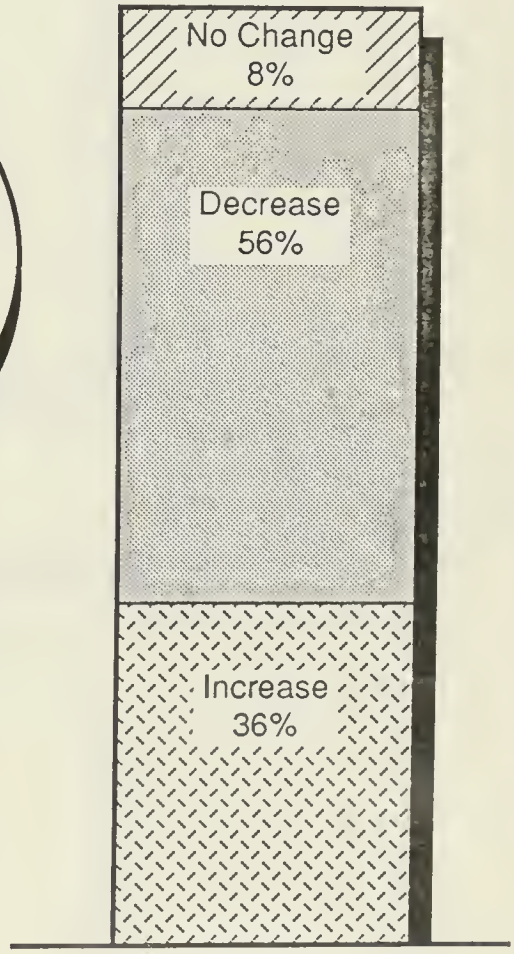
EXHIBIT III-2

BANKING AND FINANCE
MOST 1988 I.S. BUDGETS WILL DECREASE COMPARED TO 1987

Percentage Growth in
1988 Budget Versus 1987
Where a Budget Increase is Likely



1988 Budget
Versus 1987



Percent of
Respondents

EXHIBIT III-3

BANKING AND FINANCE
FACTORS CONTRIBUTING TO INCREASED 1987 I.S. BUDGETS
(In Order of Frequency of Mentions)

- Personnel Expenses
- Hardware Purchases
- Software Purchases
- Hardware Maintenance
- Facility Expansion/Enhancement
- Disaster Recovery Services
- Supplies Expense

EXHIBIT III-4

BANKING AND FINANCE
FACTORS CONTRIBUTING TO INCREASED 1988 I.S. BUDGETS
(In Order of Frequency of Mentions)

- Personnel Expenses
- Hardware Purchases
- Facility Expansion or Change
- Hardware Maintenance
- Communications Costs

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INFORMATION SYSTEMS PLANNING REPORT
DISCRETE MANUFACTURING SECTOR

NOVEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
DISCRETE MANUFACTURING SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
DISCRETE MANUFACTURING SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- Discrete manufacturers are facing a continuing threat from foreign competition. To avert this threat, manufacturers are viewing technology as the major vehicle for reducing costs while producing quality, competitive products.

- With product life cycles becoming shorter, product design and implementation cycles must also be shortened to remain competitive.

- Mature markets combined with the slow growth of the economy have increased manufacturers' demands for automation.

- Exhibit I-1 summarizes the driving forces for the discrete manufacturing sector.

B. ISSUES AND OBJECTIVES

- Productivity improvement is the major goal for manufacturers. The entire product development cycle--from planning to development to marketing--has been slated by manufacturers for automation.

EXHIBIT I-1

DISCRETE MANUFACTURING
DRIVING FORCES

- Manufacturing Costs
- Foreign Competition
- Mature Markets
- Slow Growth of the Economy

- Manufacturers are moving away from the older technology of standalone automation and toward computer-integrated manufacturing (CIM), where the process of making business decisions is integrated with the actual manufacturing processes.

- IS managers are attempting to show senior management the true potential impact that information systems can have on the organization. This requires:

  - Management realization that information systems are not just automation of manual functions but a means to achieve corporate goals.

  - IS becoming part of the corporate planning process.

  - Increased corporate IS visibility.

- Manufacturers are examining electronic document interchange (EDI) to reduce the ever increasing burden of office paperwork. Goals include linking vendors, distributors, and customers to achieve a near paperless work environment.

- Exhibit I-2 describes the issues and objectives for the discrete manufacturing sector.

C. IMPACT OF NEW TECHNOLOGY

- End-user computing is continuing to have a large impact on organizations. Microcomputer hardware and software purchases and the education and training of users are now taking up a sizable part of corporate IS resources.

- Historically, computer systems in the manufacturing environment have been built on the foundation of existing systems, without regard to future integration. Now the need to plan for the future's requirements is becoming evident,

EXHIBIT I-2

DISCRETE MANUFACTURING ISSUES AND OBJECTIVES

- Product Development Automation
- Computer-Integrated Manufacturing
- Electronic Data Interchange
  - Vendors
  - Distributors
  - Customers

and corporations will need to make the necessary changes to bring about an orderly and complete transition from older technology to new.

- Communication between computers has become a major requirement of the IS department.

  - A typical manufacturing environment includes multivendor hardware. IS departments report difficulties in connecting different hardware to each other or to a network. Surprisingly, communications between machines of the same vendor also have this problem.

  - Micro-to-micro connections, as well as micro-to-mainframe links, have recently emerged as major system software products. These types of products are imperative as management must have access to the most accurate and timely information available on whatever computer hardware the information resides.

- Exhibit I-3 summarizes the impact of new technology on discrete manufacturers.

EXHIBIT I-3

DISCRETE MANUFACTURING
IMPACT OF NEW TECHNOLOGY

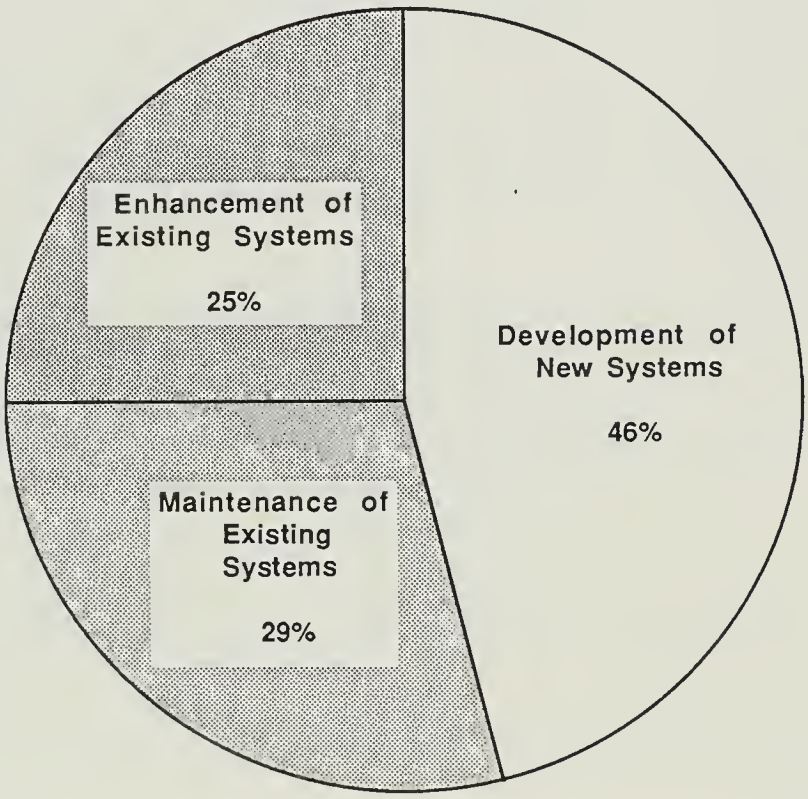
- End-User Computing
- Integration
- Communications
  - Micro-to-Micro
  - Micro-to-Mainframe
  - Intervendor
  - Intravendor

II NEW APPLICATIONS

- Application development in this sector is primarily done by internal IS staff.
- Exhibit II-1 reports that over 70% of IS departments' application development staff is being used to enhance currently existing systems and to develop new systems.
  - Packaged software typically does not meet a manufacturer's needs.
  - Internal IS staff must modify and integrate packaged software into their own unique manufacturing environment.
- To allow management instant access to company information, centralizing the organization's financial and accounting systems has become mandatory.
- Computer-integrated manufacturing (CIM) will continue to be a high priority for manufacturers.
  - Many large manufacturers have already adopted CIM strategies.
  - Medium-sized manufacturers are taking a cautious approach, due to the financial resources and staff requirements needed to implement systems that can be integrated under a CIM architecture.

EXHIBIT II-1

DISCRETE MANUFACTURING ASSIGNMENT OF INTERNAL APPLICATION DEVELOPMENT STAFF



- Small manufacturers see the benefits of integration and are waiting for this technology to become more affordable.

- Discrete manufacturers have acknowledged that manufacturing resource planning systems (MRP II) will provide benefits in:

  - Computer software, which is used to track orders and materials from vendor, to the storeroom, to the factory floor, and finally to the customer.

  - New business procedures, which address product forecasting, scheduling, and production planning.

  - Analysis of existing hardware systems, which could lead to a change in the organization's actual manufacturing operations.

- Important applications for the discrete manufacturing sector are listed in Exhibit II-2.

EXHIBIT II-2

DISCRETE MANUFACTURING
IMPORTANT APPLICATIONS

- Centralized Financial and Accounting
- Computer-Integrated Manufacturing
- Manufacturing Resource Planning

III BUDGET ANALYSIS

- Exhibit III-1 shows the 1986 budget distribution and the projected budget growth for 1987.

- The largest budget growth areas are in computer hardware, highlighting discrete manufacturers' commitment to having the hardware or foundation needed to implement their automation plans.

  - Mainframe processors, 10.9% growth.

  - Minicomputers, 11.2% growth.

  - Microcomputers, 10.7% growth.

- Professional services is the only category expected to decline, reflecting the emphasis manufacturers are increasingly placing on internal resources to solve data processing problems.

- Showing the need and importance networks will have in manufacturers' future, IS is budgeting over 10% to data communications.

- Exhibit III-2 shows that over 80% of respondents believe that their IS budgets will increase or remain the same for 1987.

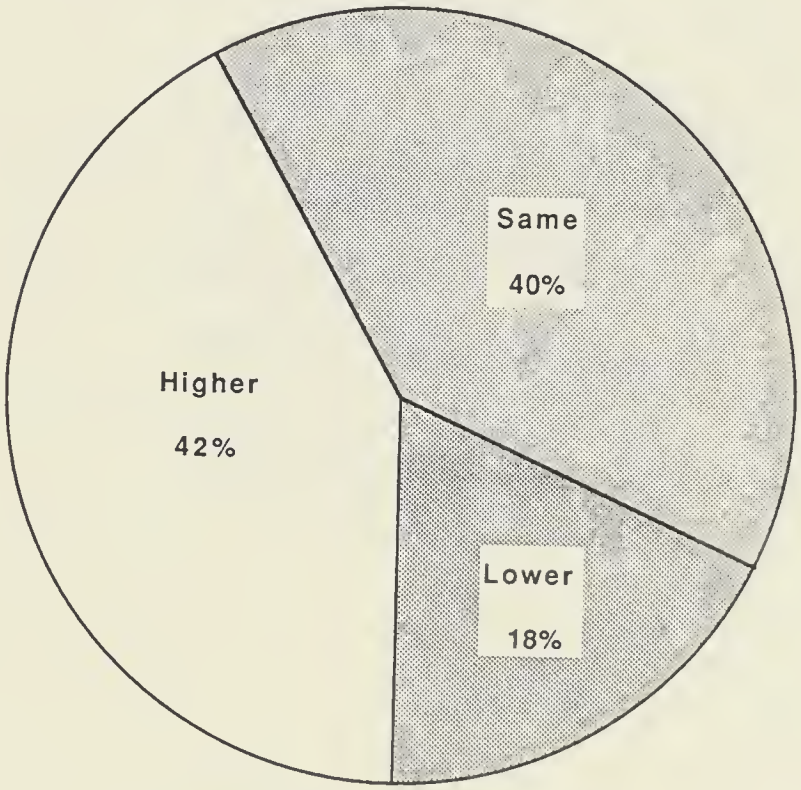
EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE DISCRETE MANUFACTURING SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986/1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	45.5%	5.4%
Mainframe Processors	7.0%	10.9%
Minicomputers	3.9%	11.2%
Microcomputers	3.7%	10.7%
Mass Storage Devices	2.1%	7.6%
Other Hardware	7.5%	4.0%
Total Hardware	24.2%	8.5%
Data Communications	10.5%	4.6%
External Software	5.4%	5.2%
Professional Services	2.9%	(2.5%)
Software Maintenance	2.3%	1.5%
Hardware Maintenance	7.0%	8.7%
Other	2.2%	10.0%
Total	100.0%	6.1%

EXHIBIT III-2

DISCRETE MANUFACTURING
BUDGETS WILL INCREASE OR REMAIN THE SAME



Percent of All Respondents

- Factors contributing to the increase in the 1987 IS budgets were:
  - Hardware.
  - Personnel expense.
  - Hardware maintenance costs.
- Factors contributing toward decreasing the IS budget were:
  - Poor revenue outlook.
  - Improved hardware and software price performance.
  - Management demands for cost cutting.

Information
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(ISP)

Information Systems Planning Report

Discrete Manufacturing Sector

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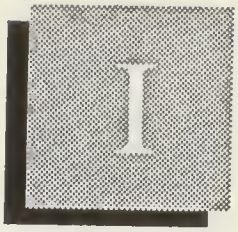


Major Issues

I

Major Issues

A

Driving Forces

Continued slow economic growth and foreign competition contribute to slowly increasing or flat revenues. This has escalated the manufacturer's need for expense reduction and productivity improvements.

Computer technology has continued to improve, and companies are looking to Information Systems (IS) for better computerized manufacturing tools while maintaining or decreasing the expense line. Executives are also increasing their demand on IS for business management tools that are easy to use and reduce the cost of all corporate processes from long-range planning through consumer support.

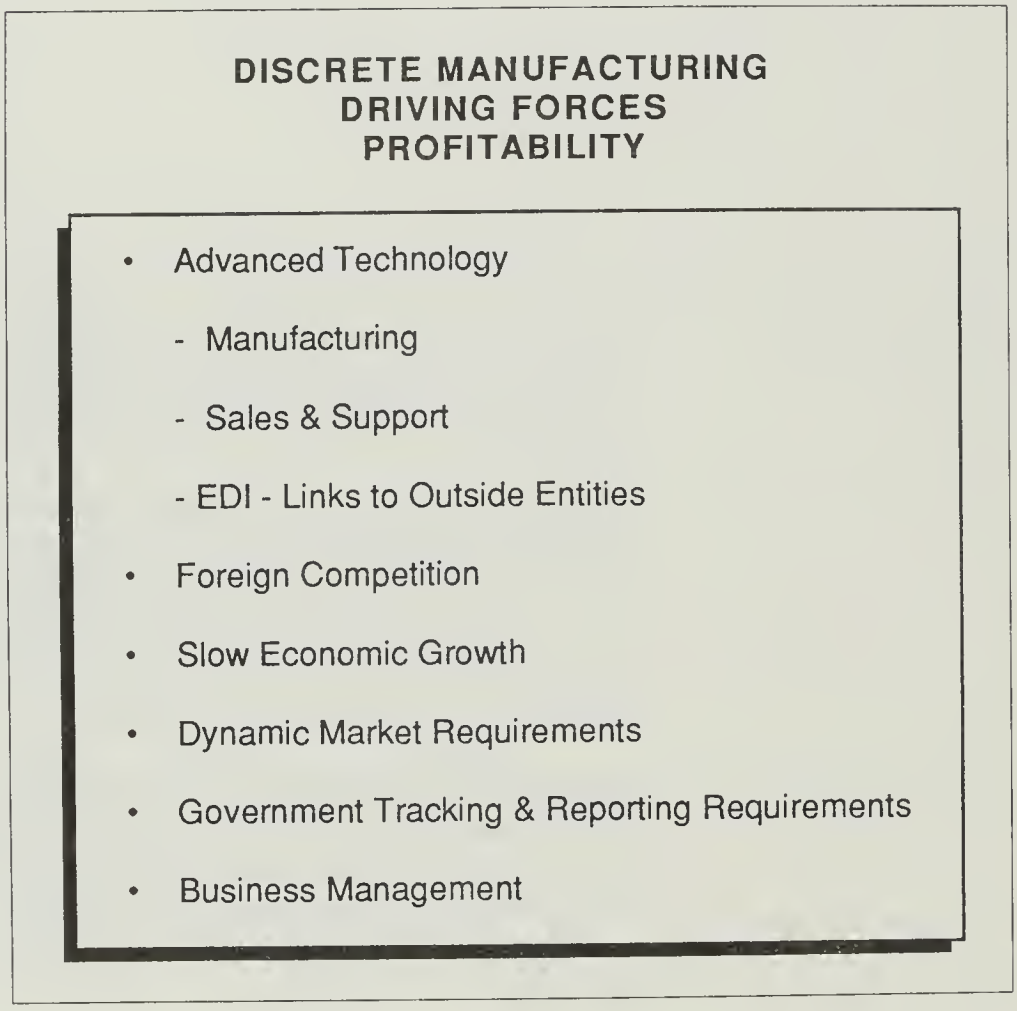
Mature markets and shorter product life cycles have made productivity and profit margin improvements critical to success. This is increasingly being accomplished through automation of manufacturing processes and elimination of paperwork. Electronic Document Interchange (EDI) lowers overhead, and improves service to the consumer, and has become a major objective of all respondents.

The government has mandated new controls as well as related tracking and reporting systems. This causes an investment in new and costly systems without related new profits. Examples include the requirement for government suppliers to maintain product specifications, program management, and product purchaser information in specific formats. These must be accessible to the government for auditing purposes and, often, to other suppliers in multi-vendor programs.

IS is becoming a full business partner and contributor in the discrete manufacturing sector. Most manufacturing corporations no longer treat IS as an overhead function but integrate IS costs into product costs.

Flexibility is becoming a primary key to profits. Corporations are finding it crucial to reduce the time needed to introduce a new or improved product in response to changing market demands and/or technological developments. Exhibit I-1 summarizes the driving forces for the discrete manufacturing industry.

EXHIBIT I-1



B

Information Systems Issues and Objectives

The growing manufacturing applications development backlog remains a major issue for most respondents. Maintenance continues to grow due to "development drop down" (incremental maintenance created by a newly developed application) at a pace that threatens to bring development to a standstill. The survey respondents look to tools such as code generators and CASE systems to reverse this trend. Some pilot projects are in place but there is consensus that a mature technical solution is not yet available.

The demand for PCs and LANs, including integrated networks of mixed hardware and software products, remains strong. With no satisfactory solution available this remains a major issue for all respondents.

Government mandates are creating an application support system backlog for tracking, control, and EDI systems. Similar EDI demands are being made by in-house executives for communication with vendors and consumers to improve profit and service. All this adds substantially to the applications backlog.

Integration of IS into the manufacturing business is creating a growing requirement for IS business management tools.

When a company fully integrates IS expenses and resources into the business, IS no longer owns the applications backlog. IS becomes the repository and distributor of data. The manufacturing user organization owns its IS budget and makes decisions about the allocation of IS development resources to best meet its objectives within profit and expense constraints. Thirty percent of respondents indicated that this approach has resulted in dramatically improved expense management as well as getting the user backlog under management's business control and increasing IS user satisfaction.

Exhibit I-2 summarizes the key IS issues and Exhibit I-3 key IS objectives.

EXHIBIT I-2

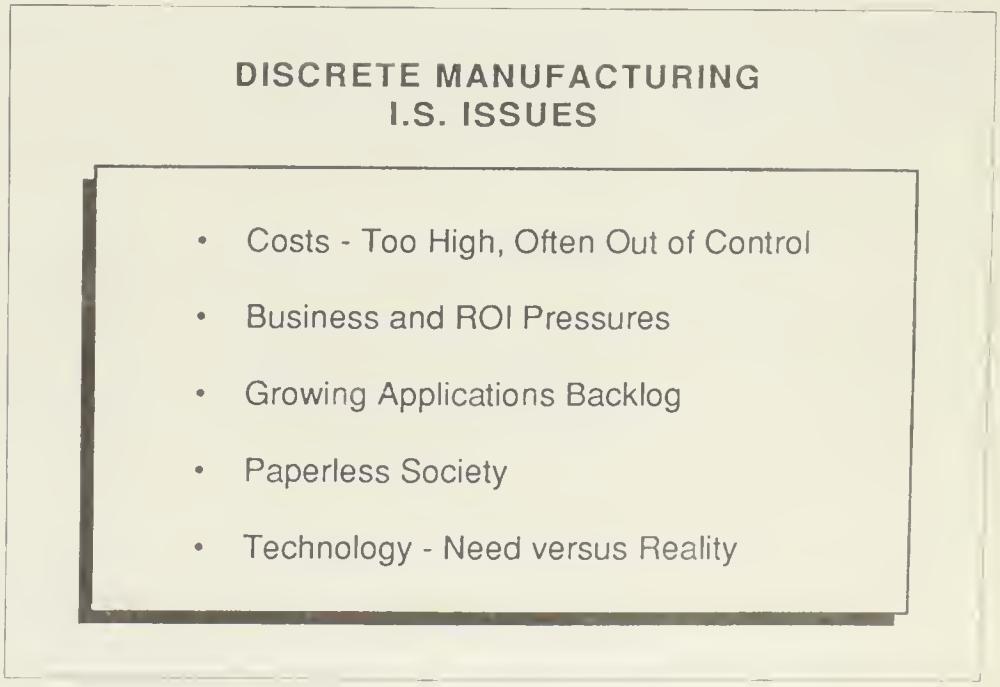


EXHIBIT I-3

DISCRETE MANUFACTURING
I.S. OBJECTIVES

- Control and Leverage of Technology and Expense
- Evolve Role and Function - To Business Team Member, Repository of Data and Distributor of Information
- Electronic Data Interchange - Government, Supplier, Internal User, and Consumer Links
- Expand Computer Integrated Manufacturing
- Multi-Vendor Integration
- Business Systems - Updating Old and Managing the Applications Backlog

C

Impact of New Technology

Lack of integrated support for mixed-vendor PCs, LANs, micro-mainframe links, and truly distributed data bases is the primary deterrent to increased application of these technologies. Relational data bases are cited as important only after the proceeding requirements are satisfied.

Artificial intelligence (AI) and expert systems are expected to dramatically impact manufacturing within the strategic timeframe. They will be used, for example, to improve the speed and quality of manufacturing processes as well as to improve business applications such as bill of materials and pricing. Some rule-based systems are already successfully in place, and vendors of AI products are optimistic they can meet manufacturers' requirements.

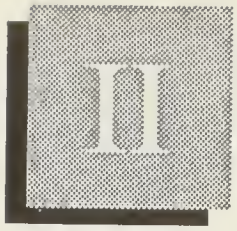
CASE, fourth generation, and code generating systems are mentioned almost interchangeably as solutions to the applications development backlog and maintenance challenges. Ten percent of respondents have

hired computer science graduates to work this issue internally as a hedge against the uncertain delivery schedule of outside vendors. Exhibit I-4 summarizes key areas of new technology interest.

EXHIBIT I-4

DISCRETE MANUFACTURING
AREAS OF NEW TECHNOLOGY INTEREST

- PCs as "Pencil Type" Tool for the Masses
- Mixed-Vendor LANs and Central Links
- Artificial Intelligence and Expert Systems
- CASE Tools, Fourth Generation Language Systems, and Code Generators
- Relational and/or Distributed Data Bases



New Applications

II

New Applications

Exhibit II-1 summarizes major new applications as identified by the respondents. Included in this exhibit are those applications considered essential to business profitability and growth.

EXHIBIT II-1

DISCRETE MANUFACTURING NEW APPLICATIONS

- EDI - The Plugged in Foreman, Salesman, Consumer Distributor, Supplier, and Government Watchdog
- Distributed and/or Relational Composite Data Bases
- Rule-based Systems
- Bar Codes for All Goods
- Government Tracking and Control Systems
- Flexible Management ROI Tools

- EDI Systems and applications are being developed that are designed to:

  1. Replace paperwork
  2. Reduce costs
  3. Reduce time required to create and transport documents
  4. Ensure information accuracy
  5. Improve sales and support staff productivity
  6. Communicate with the government and/or other suppliers

- Pilot distributed and relational data bases are being put in place in anticipation of long term-solutions.

- Custom LANs and PC-to-mainframe links are being developed as interim solutions until satisfactory vendor products are available. There is serious concern that the larger vendors may not meet this requirement in the near future and that custom development will be necessary. Respondents agreed the need was so critical that they would meet it themselves but universally preferred an outside vendor. Ninety percent said they will go with the first hardware vendor to meet this requirement even if it means a major and costly system conversion.

- Simple rule-based systems are being designed and piloted in areas such as bill of materials and inventory management. These are the first tangible examples of major efforts underway in the AI area.

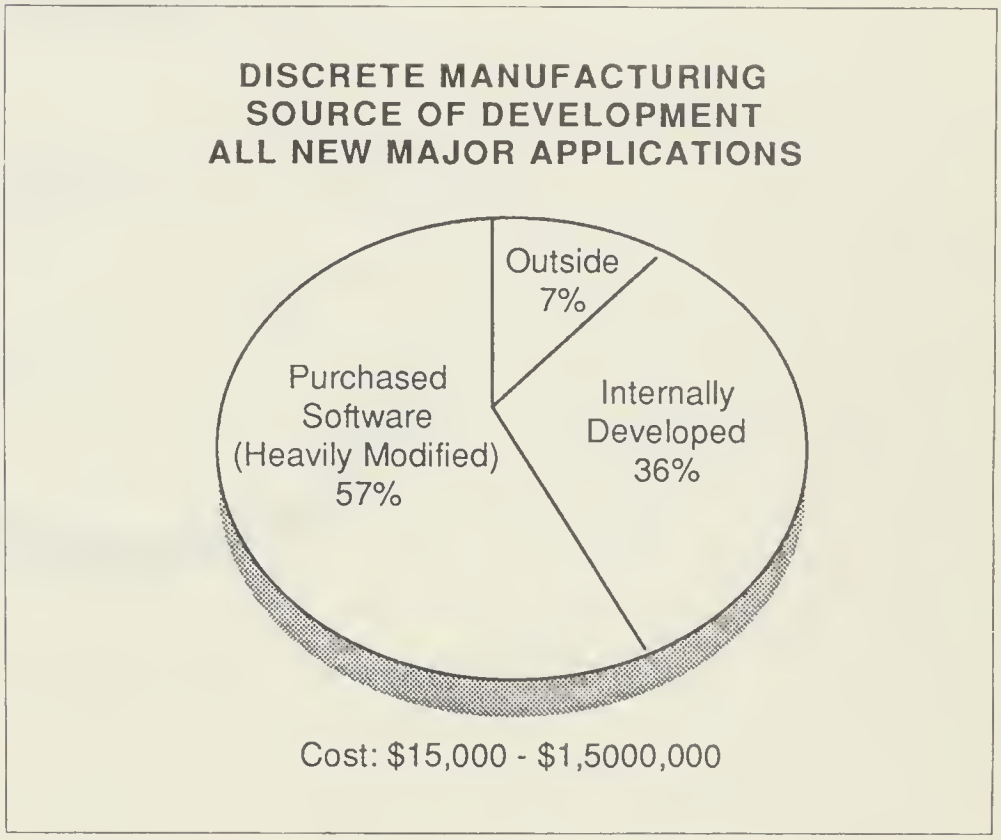
- Bar code systems for most products and MRP systems that meet government mandated requirements are two major applications being developed in 1987.

- Business management IS tools are being developed to support long-range planning, product marketing and planning, finance, manufacturing management, and customer services.

Application systems development is being implemented primarily by IS staff. There is a strong preference for purchasing outside packages, but these rarely do the job as delivered and are customized by the purchasing firm's IS staff. Thirty-six percent of the applications are entirely developed in-house, and 57 percent are heavily customized purchased

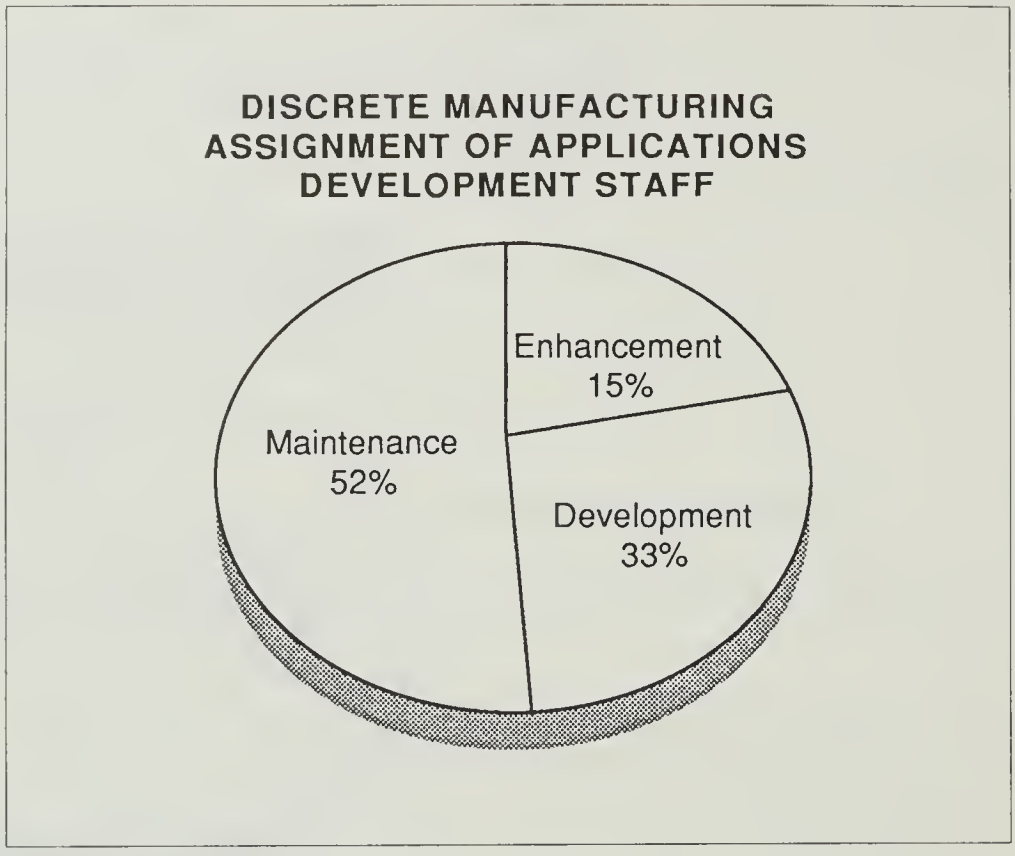
products. Only seven percent are built by outside professionals, and these projects are always conducted in conjunction with a strong inside technical team. Exhibit II-2 summarizes sources of new applications products.

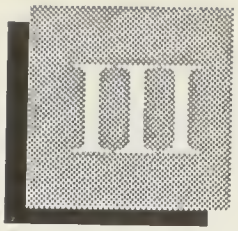
EXHIBIT II-2



Applications staff are currently allocated 33 percent to development, 52 percent to maintenance, and 15 percent to enhancement. There is strong agreement that, in the long term, maintenance must decrease substantially to permit development focused on making the business more profitable.

EXHIBIT II-3





Budget Analysis

III

Budget Analysis

Exhibit III-1 shows the 1987 budget distribution and projects the 1988 budget growth for IS expenses. Distribution of expenses has not changed substantially from 1986. People, communications, software, mainframe, and micro costs are up as a percent of the total budget, but only by a single percent or less. Maintenance, minicomputer, external processing, and professional services are down a small percent each. Factors influencing budget growth include:

- Upgrading of technology and capacity
- New CIM manufacturing and on-line end-user applications
- Inflation
- Government tracking and control requirements

EXHIBIT III-1

DISCRETE MANUFACTURING 1987 BUDGET DISTRIBUTION AND 1987/1988 CHANGES IN THE DISCRETE MANUFACTURING SECTOR

BUDGET CATEGORY	1987 PERCENT OF I.S. BUDGET (PERCENT)	1986/1987 EXPECTED BUDGET GROWTH (PERCENT)
Personnel Salaries and Fringes	46.0	6.0
Mainframe Processors	9.4	10.9
Minicomputers	3.7	6.2
Microcomputers	4.9	15.1
Mass Storage Devices	3.0	8.0
Other Hardware	3.6	3.5
Total Hardware	24.6	10.2
Data Communications	13.4	10.2
External Software	6.2	4.2
Professional Services	.5	(10.0)
Software Maintenance	2.2	3.0
Hardware Maintenance	4.6	8.8
Other	2.5	5.2
Total	100.0	7.6

A 10 percent increase in mainframe and micro systems hardware and software reflects corporations' realization that managing information is essential to business success and that this must be done with the best IS tools available.

Communications costs continue to grow as manufacturing, sales, support and consumers are being brought on-line to improve productivity and profits. Factors influencing budget stabilization include:

- Expense management
- Better hardware and software price/performance
- Productivity improvements

Factors influencing budget decreases include:

- Revenue decrease and related expense controls
- Continued decrease in use of outside services and consultants. This reflects a determination to keep costs down and to be self-reliant.
- Data center consolidation

Exhibit III-2 shows the percent of respondents expecting their budget to grow, stabilize, or downsize in 1988. The financials continue to indicate a down turn in the manufacturing sector and a strong emphasis on expense and profit management. This is reflected in a consistent movement to integrate IS as a full partner in the management of the business and to justify and approve all IS work (new hardware and applications,) primarily on an ROI basis.

Forty percent expect to see budget growth in the 12 percent range. Factors influencing budget growth include:

- Increased investment in computer manufacturing-related IS hardware and software
- Inflation
- Increased business revenues
- Upgrade in hardware technology and capacity

- Investment in end-user and consumer applications
- Government tracking and inventory management requirements
- Personnel expense

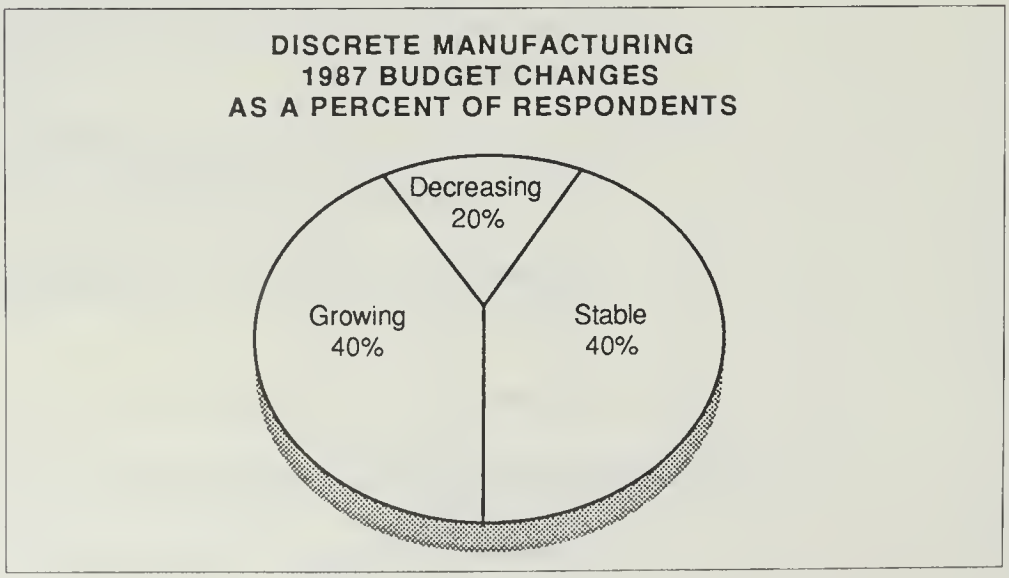
Twenty percent expect serious downsizing of the IS operation and budget. Factors influencing budget decreases include:

- Consolidation of IS centers
- Poor revenue outlook
- Expense control

Forty percent expect their costs to remain at the same level as this year. This implies a real decrease in expenses as they all expected inflation to raise actual costs. Factors influencing budget stabilization include:

- Business revenues stable to decreasing
- Consolidation of data centers
- Improving hardware and software price/performance
- Lower and seemingly stable inflation
- Downsizing to stay profitable

EXHIBIT III-2



About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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RETAIL DISTRIBUTION SECTOR

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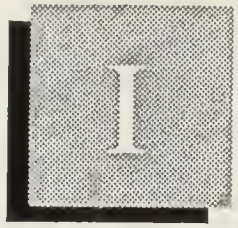
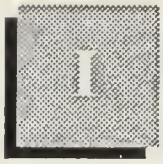


Major Issues



Major Issues

During the past five years automation for the retail industry has been accelerating rapidly. Revenue from information services sold to this industry is growing at 22% annually, and INPUT expects retail to remain one of the fastest-growing markets for computer services. Information Services departments do not account for all of this growth, since there are an increasing number of applications of technology that do not fall under the jurisdiction or budget of IS. However, IS departments in the retail industry are increasing spending at a healthy rate that reflects improved technology and the competitive necessity to automate.

This report includes a brief overview of the forces driving automation in the retail industry and a discussion of some of the issues and problems encountered by IS managers, along with an analysis of IS budgets and a look at applications and the impact of technology on the retail industry. In the impact-of-technology section INPUT divides retail into six subsectors:

1. Department Stores
2. Specialty Stores
3. Food Retailers
4. Eating and Drinking Establishments
5. Automobile Dealerships
6. Gasoline Service Stations

A Driving Forces

Retail Distribution is among the two or three most sophisticated industries in its use of information systems technology. Computers improve efficiency in the warehouse and back office, and raise the level of service that stores can provide to their customers. For these reasons, automation has become a competitive weapon.

Profit margins in the retail industry are typically quite low, so pressure to improve efficiency at all levels is strong. Minimizing inventory and providing the best possible customer service are the keys to maximizing profits, and therefore are the issues most commonly addressed by auto-

mation. Extensive networked systems gather and maintain information on sales, demographics, and inventory to assist in every department:

- The marketing department analyzes sales data to help focus its efforts.
- Inventory and distribution departments monitor stock and schedule replenishments.
- Customers check out rapidly using automated point-of-sale systems. These systems may also make price and item availability information available on request.

Applications for retail and wholesale are increasingly interdependent. For example, many wholesalers now require their retailers to use EDI services for purchase orders. In some cases, retail inventory control systems automatically reorder stock when it reaches a certain level. As technology for retail improves, it opens new possibilities for wholesale, and vice versa.

Retail is always the first and most profoundly affected industry sector when there is a change in the economy. The efficiency and quickness of response afforded by extensive automation is therefore especially important to this industry.

Competition is the fundamental driving force behind all others. When asked how technology is used to give his company a competitive advantage, one IS manager replied: "It isn't—it's just helping us maintain our current position."

Exhibit I-1 summarizes driving forces for automation in retail.

B

Issues and Objectives

As mentioned earlier, the fundamental objective of every participant in the retail industry is to improve competitive position by providing the best possible customer service, and by making operations as efficient as possible. Clearly, automation plays an important role in improving competitive position, but there are always obstacles that keep the implementation and operation of automation from proceeding smoothly. This section begins by discussing some of the objectives of IS departments as they fulfill their roles in making retailers more competitive, and concludes with an overview of some of the issues IS managers face in pursuing those objectives.

1. Objectives

The greatest potential for improving efficiency and increasing profit margin lies in the area of distribution/inventory management. Sixty percent of the IS managers we spoke with list implementing or expanding their use of Electronic Data Interchange (EDI) as an objective for the coming year. All of the major department stores INPUT contacted plan to implement or increase EDI use in 1988.

EXHIBIT I-1

RETAIL DISTRIBUTION— DRIVING FORCES

- Automation Is a Competitive Necessity
- Efficiency Improves Profit Margins
- Retail and Wholesale Applications Are Increasingly Interdependent
- Rapidly Changing Economy and Consumer Preferences Require Rapid Responses

The benefits of EDI include significant reduction in paperwork, and increased speed in placing orders to vendors. EDI alone can reduce the cost of purchase orders in the short run. In the long run (3-5 years), however, IS managers plan to develop integrated distribution systems that will employ distribution requirements forecasting and/or expert systems along with EDI. In a few cases there are plans to implement automatic inventory replenishment so that whenever stock at a given store reaches a certain level, in-store computers automatically place an order to replenish stock.

Automation can also help improve marketing and customer service. One common approach is to distribute processing power to individual store locations. Distributed processing is valuable for marketing since it allows stores to adapt their product mixes and marketing strategies to local markets based on local sales data. Distributed processing improves customer service by tailoring each store's focus to a smaller market than would be possible if processing were done only at a central location with aggregate data. For these reasons, one large department store chain INPUT contacted plans to have a minicomputer in every store within five years.

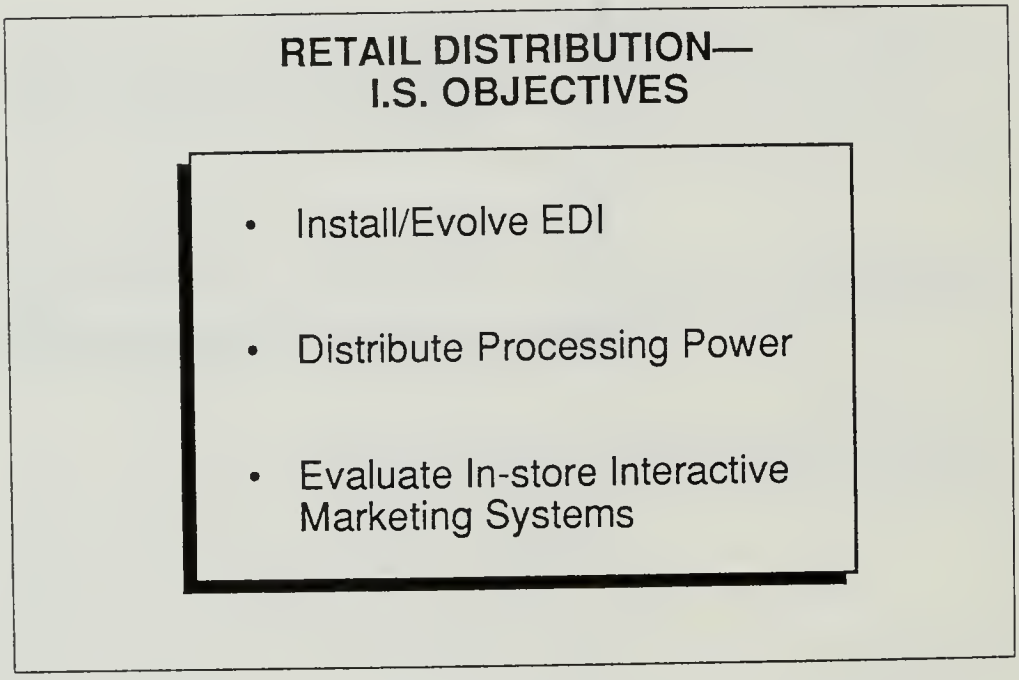
A less urgent objective of IS departments in the retail industry is implementing in-store video marketing devices. These include interactive

displays, which may have touch screens and/or keyboards with which customers can order goods.

To make full and efficient use of automation, applications need to be integrated. The IS managers we spoke with indicated a preference to purchase integrated systems, but also commented that, due to the rate of change in technology and business needs, this integration has proved difficult to implement. For the most part, IS is replacing individual systems when necessary and is integrating a step at a time.

Exhibit I-2 summarizes the major objectives.

EXHIBIT I-2



2. Issues

Of course, there are always obstacles. Some of these include protocol standards for EDI, budget restrictions, and obsolescence.

Although retailers are eager to use EDI, many are holding back until standards are developed. Tom Rittenhouse of Strowbridge and Clothier says in an interview with *STORES* magazine (Sept., 1987) that his company wants to start using EDI but, "We don't want to support a couple hundred protocols. We want to support a particular protocol and a particular format so we can communicate with all vendors the same way."

There is a significant effort afoot to standardize protocols and formats. There are at least 15 agencies and associations involved in developing EDI standards. Perhaps the large number of groups involved is an indication that we are still a long way from having useful standards.

Regardless of the lack of standards, the market for EDI services in all industries is growing at a phenomenal 88% per year. IS managers are faced with a decision between reaping the benefits of EDI as it is, while accepting the lack of standards, or waiting to reap the future benefits of EDI when it is closer to being standardized. The decision should be based on the number of trading partners a retailer deals with, and the degree of standardization in its particular industry segment.

Eighty percent of retail IS managers are under pressure to reduce their budgets as a percentage of sales. This is not to say that IS managers are expected to decrease the dollar amount of their budgets. Rather, they are expected to increase their budgets at a slower rate than for the company overall.

These budgetary restrictions are a source of frustration for IS managers who believe that technology reduces costs in other departments by greater margins than it increases IS costs. Decreasing hardware costs help mitigate this budgetary pinch, but restrictions are still a problem. In the most progressive companies, the IS budget grows in proportion to company growth, but no IS managers reported budgets growing more rapidly than company revenue.

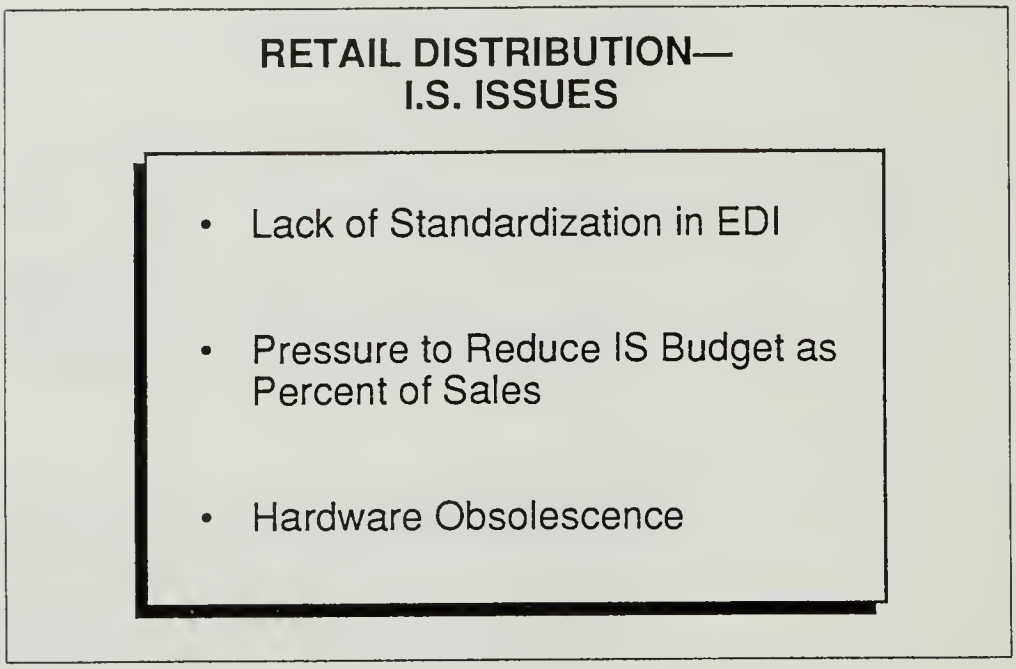
Another problem encountered by a large majority of interviewees is hardware obsolescence. One respondent expressed interest in converting from manual-entry to laser scanning at the point of sale but, being tied down by the company's 4000 manual-entry registers, is forced to wait until the old, relatively inefficient machines wear out before installing scanners. This delay results in a piecemeal approach to implementing automation. Although a piecemeal approach may be the only achievable approach, it yields a hybrid system that requires more management and maintenance than does a single integrated system.

Some of the day-to-day operational concerns of IS managers include the following:

- Difficulty maintaining old equipment
- Other maintenance problems due to mergers or closures among vendors
- Data integrity and repetitive data entry
- Overdependence on central mainframes
- Insufficient resources for training users

Exhibit I-3 lists the major issues of IS departments in the retail industry.

EXHIBIT I-3



C

Impact of Technology

Food retailers are the leaders in retail automation. The grocery industry was the first to implement bar codes, and has taken the fullest advantage of the opportunities that bar coding provides. Other segments of the retail industry have been a bit slower to implement the technology, but are now rapidly catching up. In all segments of retail, technology has had, and will continue to have, a profound impact on the competitive environment.

Data-capturing devices and point-of-sale (POS) terminals provide huge volumes of data for sales analysis and inventory tracking. These data and functions form the core of retail automation, making it possible for retailers to expand profit margins by reducing stored inventory, and by improving customer service.

Connecting POS terminals to a central mainframe gives chains centralized control over prices, inventory, and general marketing strategies, whereas distributed processing gives individual stores the ability to do "surgical marketing," i.e., to use local sales data to develop a product mix and marketing strategy based on chain policy, but modified to address a specific local market.

The above applies to all segments of the retail industry. The following section includes comments on the impact of technology in each of six specific segments.

1. Department Stores

Department stores have lagged behind grocery stores in use of automation. As Stanley Marcus says in an interview with *STORES* magazine

(May 1987), "I'll guarantee you it will take longer to get two items processed (in a department store) than it will to get 15 grocery items charged and paid and sacked in a supermarket." It is still the case that department stores are slower, but this is changing as department stores adapt new data-capturing techniques.

A dichotomy is developing in the department store segment between the full-service department stores committed to making shopping a pleasurable experience, and the mass-merchandisers committed to providing variety and low prices. This dichotomy is perhaps more a reflection of the state of society than the state of technology, but technology makes the dichotomy possible. Mass merchandisers use inventory control, laser scanning, and POS technology to achieve minimized inventory costs and quick checkout. Full-service department stores, however, use their inventory tracking and purchase ordering capabilities to locate specific items for customers and to speed special orders.

Some prognosticators see department stores being radically altered by technology in the future. Store designers daydreamed about the department store of the future in a May, 1987 article in *Chain Store Executive Age*: "We've kicked around the idea that people will go to a Macy's that's no bigger than a phone booth. You'd have a terminal and a screen. You could shop in one location in five minutes and have the thing delivered to you or waiting for you at the other end of the building, like in a catalog showroom."

This is an unlikely scenario. It is difficult to imagine that Americans would give up the ancillary pleasures of shopping in favor of a shopping environment like the one described above, but technology will certainly have a significant impact on the way department stores run their businesses. EDI will reduce the paperwork involved in ordering stock replenishments, and should reduce errors by decreasing the number of times orders must be entered. EDI, POS, and expert systems will combine to help the distribution channels of large chains to approach Just-In-Time (JIT) inventory replenishment.

2. Specialty Stores

The category of Specialty Stores encompasses a wide variety of retail businesses, so it is difficult to generalize about the state of automation in this segment. Examples of goods carried by specialty stores include furniture, electronics, jewelry, apparel, shoes, sporting goods, and pharmaceuticals.

Independent specialty stores and very small chains are slow to automate because they lack the economies of scale from which larger chains benefit. Most large chains, however, are actively automating. The GAP (which owns Banana Republic) is involved in a major revamping of its systems, and Radio Shack, being a subsidiary of a computer systems vendor, is extensively automated.

The impact of automated inventory control systems is greater among specialty stores than among department stores because of the smaller number of items stocked. The smaller number of items makes for a less complicated distribution network, which lends itself more easily to automation. Besides this difference, the impact of technology on specialty stores is much the same as it is on department stores.

3. Food Retailers

Food retailers have more-complete automated systems than retailers in any other segment. In many cases, a grocery chain mainframe connects with every store in the chain, so chainwide price changes can be implemented from the central mainframe, and POS systems can be polled easily.

The changes brought about in retail by technology have been dramatic. Laser scanning, debit card machines, and automated check authorization machines have improved checkout time to such an extent that all major grocery chains have been forced to implement them in order to stay competitive. Grocery chains have now turned to other service-oriented marketing ploys to gain a competitive edge. Automation has ushered in a new age of service competition among grocery stores where price competition used to be the only criterion.

4. Eating and Drinking Establishments

The use of automation in restaurants is similar to its use in department and specialty stores, except that restaurants must place even stronger emphasis on providing service to customers.

Fast-food franchises are the most advanced technology users in this segment, using sophisticated point-of-sale devices to collect very precise sales information. This information directly affects menu development, pricing, and marketing strategies.

Full-service chain restaurants use the same kinds of systems in ways that are more transparent to customers. In addition to using the information to develop menus, pricing, and marketing, full-service restaurants use the information to help schedule food preparation.

5. Automobile Dealerships

"Megadealerships" and multifranchise dealerships are the coming standard in this segment. Nearly 60% of all dealerships are now multifranchise, and average sales per location have reached $10 million. The bigger an organization gets, the more useful—or necessary—automation becomes.

The principal effects of automation in auto dealerships are to link franchises together, to catalog parts departments, and to provide sales support.

6. Gasoline Service Stations

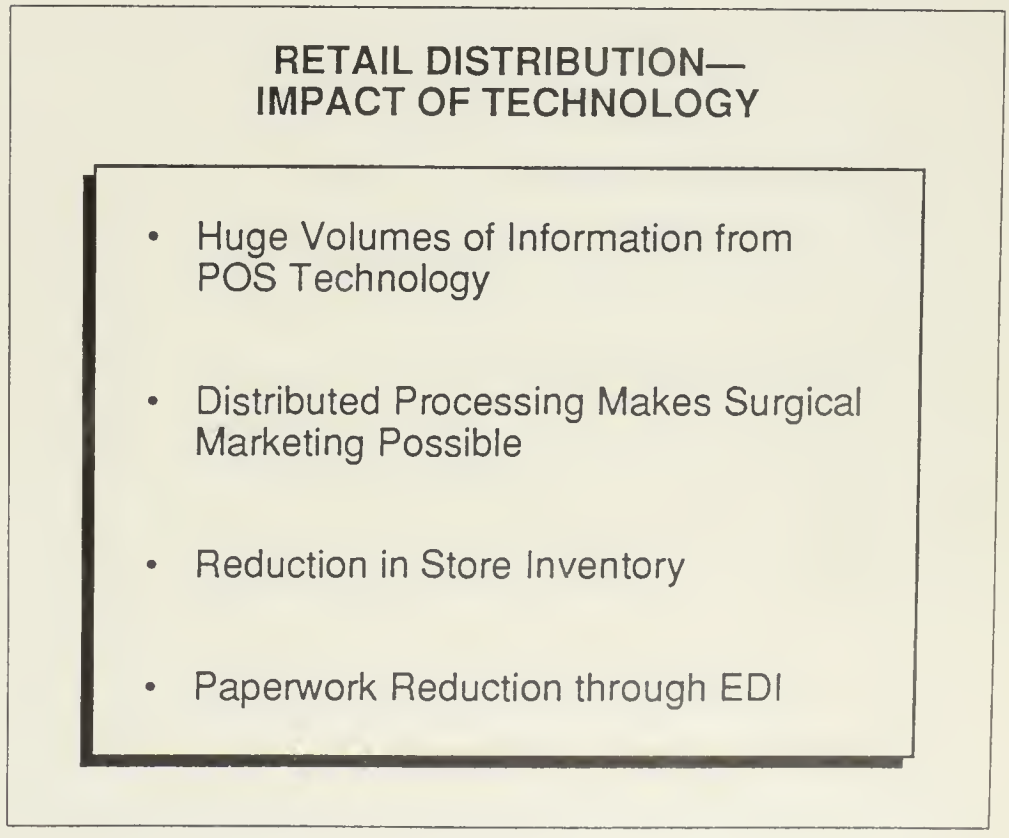
The current emphasis in this segment is to make available a number of different payment methods. Credit processing technology has made it possible for oil companies to accept major bank credit cards, bank debit cards, and oil company credit cards.

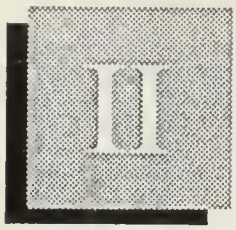
Technology has also improved security by linking gas pumps to a POS terminal in the cashier's booth. With this configuration the cashier can remain behind the cash register, and is less vulnerable to robbery.

Service stations have particular difficulties in implementing and maintaining automated systems. Individual stations are often located in remote places, making service calls difficult and expensive. The environment of most gas stations is not conducive to the proper care of electronic equipment, and it is difficult to find personnel with the knowledge and background to run the systems. In addition, distributing systems to all stations is a complex process because of the large number of locations. One major oil company has been working for 18 months to implement a companywide system of POS devices and controllers, and considers its major goal for the coming year to be carrying the systems to as many locations as possible.

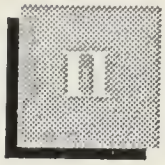
Exhibit I-4 summarizes the impact of technology on the retail industry.

EXHIBIT I-4





New Applications



New Applications

The central focus of a retail system is collecting data from the point of sale. The number of applications that utilize and analyze these data is practically unlimited.

Other applications that do not directly utilize point-of-sale information include EDI, interactive marketing systems, and credit authorization.

Relatively few retailers use POS data to automatically order inventory replenishments. Only 20% of the retailers INPUT spoke with have any kind of automatic replenishment system, and most of these are limited to a few key items. However, 40% have plans to implement automatic replenishment systems within five years.

Distribution and inventory control systems should change considerably over the next five years as standards for EDI are developed and as automatic inventory replenishment applications and techniques for minimizing stored inventory improve. With quick communications from EDI and with frequent, accurate sales reports from POS systems, the whole distribution network speeds up. Retailers order next week's inventory based on last week's sales information rather than using sales data compiled over several months to order large quantities well in advance. In this situation, misjudgments in ordering quantities or styles are less costly and consumers are more likely to find the items they want on the shelves. Ordering stock becomes a reaction to consumer behavior rather than a guess as to what consumer preferences will be.

Interactive marketing systems are still largely a thing of the future; however, automobile dealerships, department stores, and specialty stores have begun to take advantage of the technology.

Reynolds and Reynolds provides auto dealerships with systems that a car buyer can use to assemble the model of his/her choice with the features and options of his/her choice. The completed vehicle appears on the screen and the consumer can take the car for a simulated test drive.

Many department and specialty stores use video demonstrations of products. The next step is interactive video/touch-screen displays that allow customers to select information on specific products. One department store INPUT spoke with plans to significantly expand its use of interactive marketing technology within the next five years.

Expert systems are also generally considered to be the systems of the future, but consultant Bob Zimmerman (*STORES*, September, 1987) believes such systems are currently viable, if not yet refined. Expert systems are well suited to considering all the variables involved in planning inventory shipments to all locations in a chain. One major department store we spoke with will be implementing expert systems for inventory management in 1988.

Exhibit II-1 lists some of the new applications being evaluated or implemented by IS departments in the retail industry.

EXHIBIT II-1

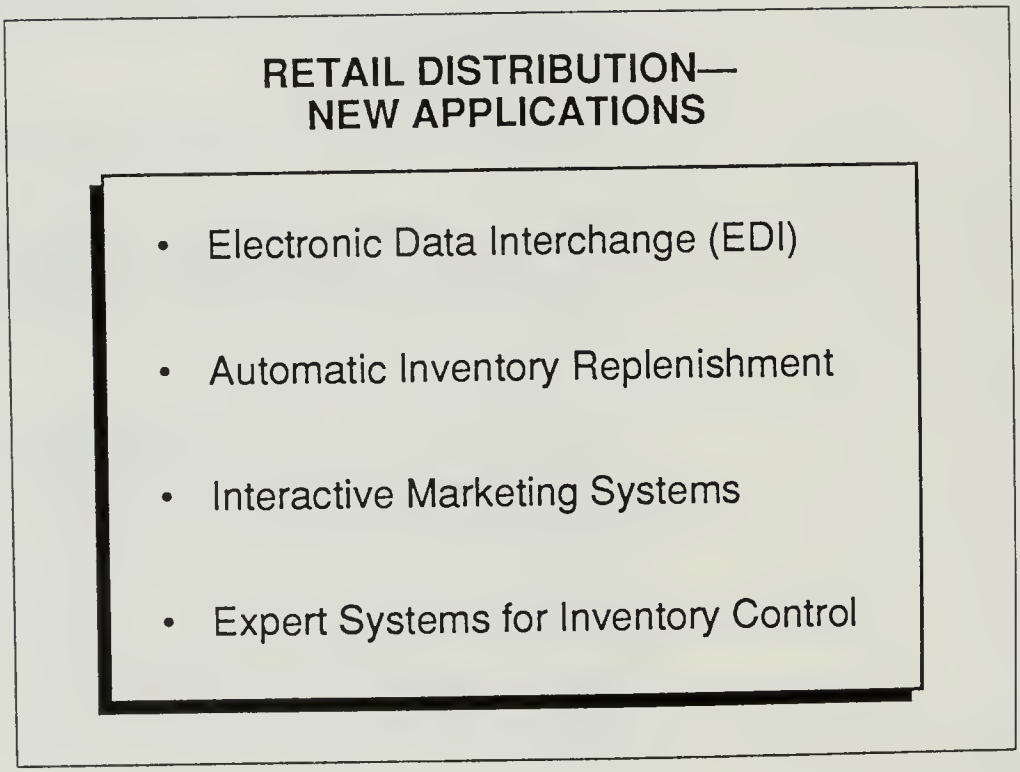
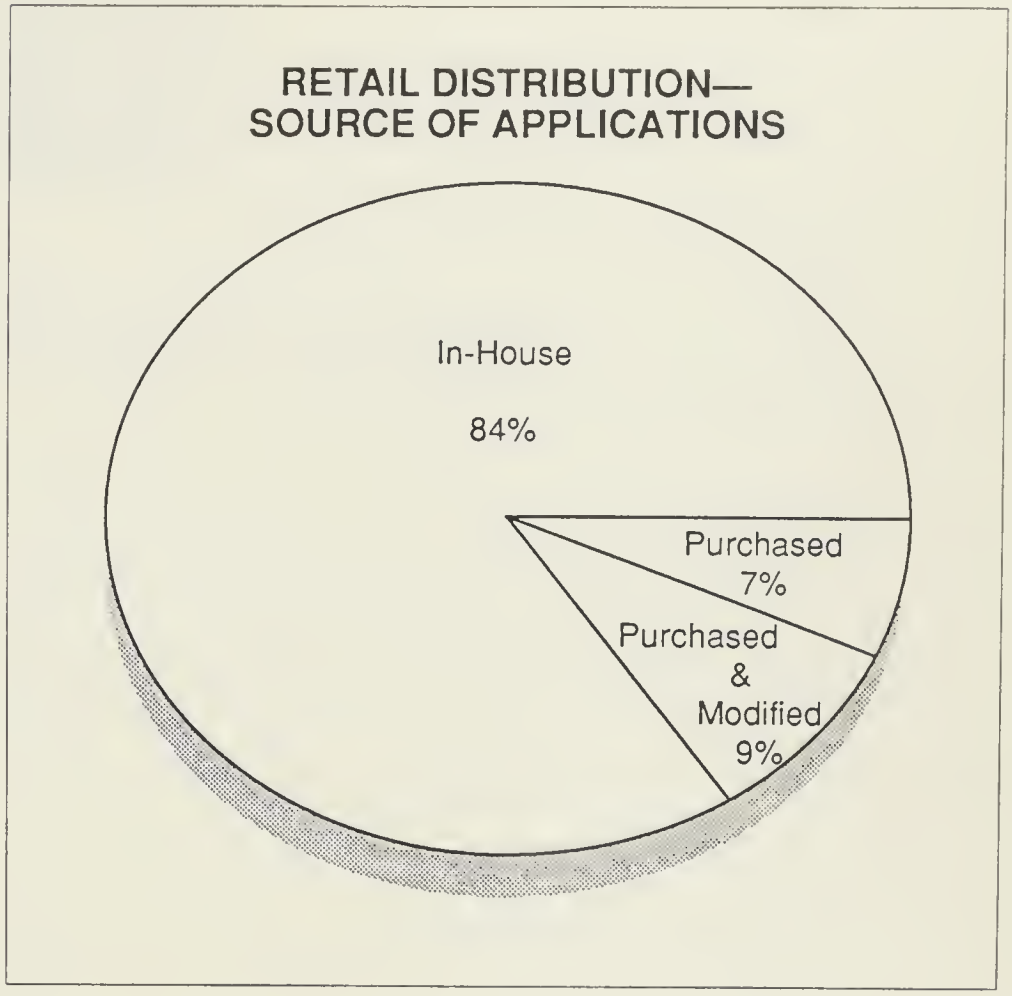
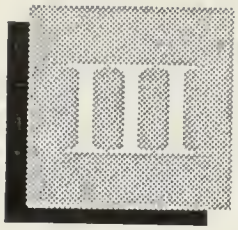


Exhibit II-2 shows the sources of applications software for the retail industry.

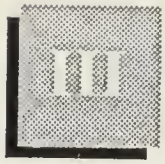
- Retailers develop 84% of their applications software in-house.
- They purchase and modify 9%, and use the remaining 7% directly off the shelf.

EXHIBIT II-2





Budget Analysis



Budget Analysis

The importance of automation as a competitive weapon is reflected in the healthy 11% growth rate of IS budgets. Still, no IS budget is increasing at a faster rate than corporate revenue.

Exhibit III-1 shows a breakdown of IS budgets in the retail industry and expected growth for 1988.

EXHIBIT III-1

RETAIL DISTRIBUTION—1987 BUDGET DISTRIBUTION AND 1987-1988 CHANGES IN THE RETAIL DISTRIBUTION SECTOR

Budget Category	1987 I.S. Budget (Percent)	1987-1988 Expected Budget Growth (Percent)
Personnel Salaries and Fringes	43	9
Mainframe Processors	27	8
Minicomputers	3	15
Microcomputers	2	7
Total Hardware	32	8
Data Communications	4	21
External Sortware	7	13
Professional Services	1	15
Software Maintenance	1	10
Hardware Maintenance	6	7
Other	6	1
Total	100	11

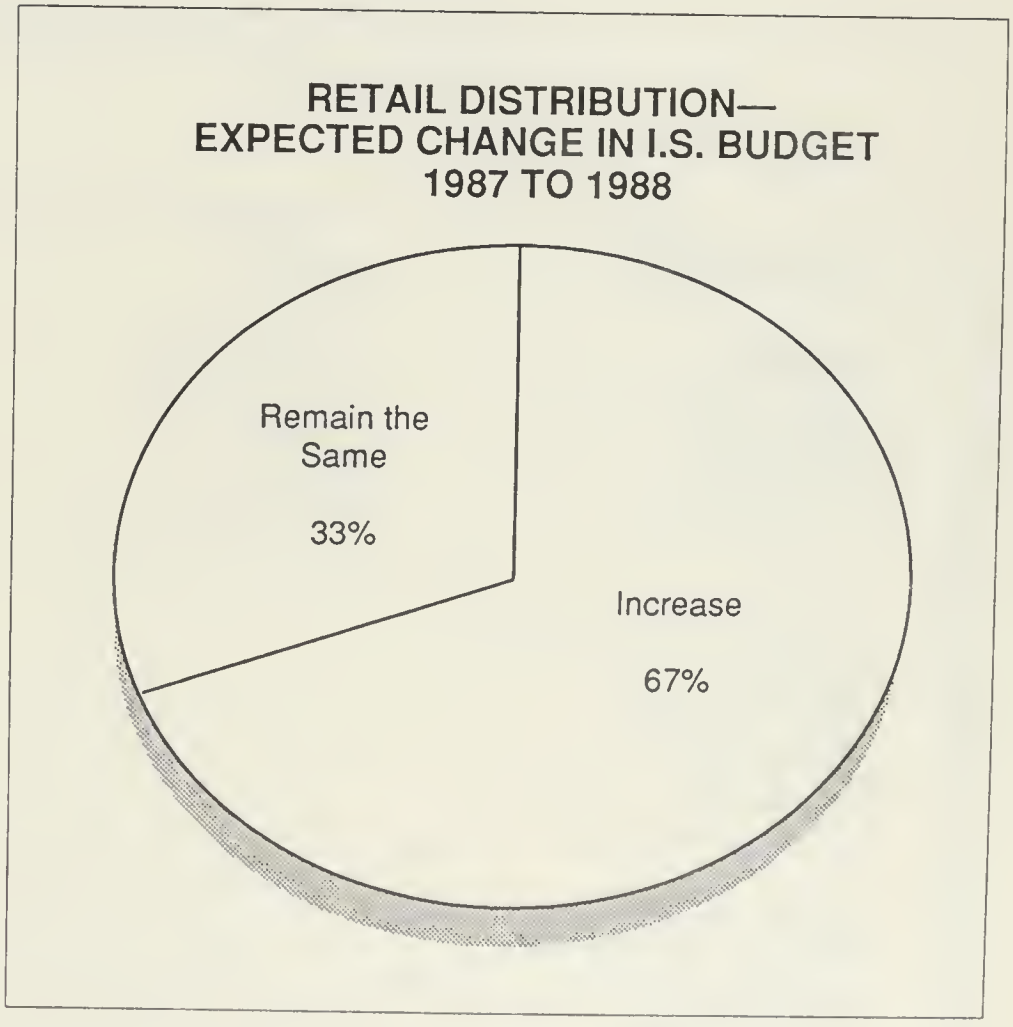
- Data communications is the fastest-growing budget item at 21%. This rapid growth reflects the rapid increase in distributed processing and EDI, as well as the increasing importance of communications to competitive health.

- Mainframe processors account for the largest chunk of the hardware budget, with 27% of the overall IS budget. This figure is considerably higher than last year's figure of 12.2% because more of the large retailers interviewed this year include distributed systems, and in some cases POS terminals, in store budgets rather than in the IS budget.

- Personnel costs make up 44% of the IS budget. This is the largest single item in the budget, and is growing at a healthy rate of 9%.

Exhibit III-2 shows the distribution of expected budget change. Thirty-three percent of the IS managers interviewed expect budgets to remain the same in 1988 as in 1987. The other 67% expect budgets to increase. None expects the IS budget to decrease.

EXHIBIT III-2



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INFORMATION SYSTEMS PLANNING REPORT
RETAIL SECTOR

DECEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
RETAIL SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
RETAIL SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- Profit margins in the retail industry are low--typically 2-3%--so pressure to improve efficiency is strong.

- Minimizing inventory and providing the best possible customer service are the keys to maximizing profits in retail.

- Retail is always the first industry sector to be affected by cyclical changes in the economy and is also the most profoundly affected sector. It is particularly important, therefore, that managers in this sector monitor changes in the economy and consumer spending and keep tight control of costs.

- The height of the economic recovery has passed, causing slackening of consumer demand.

- Computer applications in the retail and wholesale sectors are becoming more interdependent as technology advances. Inventory control applications make use of the results of sales forecasting applications to help schedule replenishments. In turn, forecasting applications utilize data collected at the point of sale.

- Competition is the fundamental driving force behind all other driving forces. Automation has become a necessity for survival as retailers use automation to continually improve service and efficiency. When asked how technology is used to give his company a competitive advantage, one survey respondent answered: "It isn't--it's just helping us maintain our current position." Technology is moving rapidly in this sector, and IS departments are racing to keep up.

- Exhibit I-1 summarizes the driving forces for the retail distribution sector.

B. ISSUES AND OBJECTIVES

- Retailers depend on communication with their distributors. Traditionally, order processing has relied on paperwork, but electronic data interchange (EDI) and electronic mail are quickly gaining favor. EDI is used in retail primarily for order entry directly to distributors' computers, thus reducing paperwork and avoiding redundant data entry.

- Compatibility and standards are major issues in retail because of the interdependence of retail systems and distribution systems and because of the importance of communications to this sector.

  - Computers for analysis and forecasting should connect with computers for inventory control, and, ideally, both should connect with point-of-sale (POS) terminals.

  - EDI is still a young technology and absolute standards have not been set. Although it is already useful, its ability to facilitate order processing and improve efficiency will increase when and if standards are developed.

EXHIBIT I-1

RETAIL
DRIVING FORCES

- Low Profit Margins
- Economic Pressures
- Technology Trends
- Competitive Pressures

- A related issue is that of software integration. Connectable computers cannot provide maximum efficiency unless the software on one node can communicate with software on others. In order to avoid duplicating data entry, it is important that data collected for one purpose can be used for other purposes. IS managers are confronting this issue early in the implementation of automation for retail because so many applications in this sector rely on data from a single source--point of sale.

- IS managers are distributing processing power to end users at individual retail sites. This will give store managers more autonomy and will enable them to adapt to local markets.

- A number of survey respondents noted a lack of qualified software development personnel as a major hurdle in pursuing IS goals. Applications for retail are improving rapidly, and competitive considerations make it imperative for IS departments to keep up. Since most large retailers prefer to develop applications in-house rather than buying packaged software, this personnel shortage presents a challenge to IS managers.

- Exhibit I-2 summarizes the primary issues and objectives to be addressed by survey respondents.

C. IMPACT OF TECHNOLOGY

- Point-of-sale (POS) technology is the most obvious recent development in retail automation. Point-of-sale systems simplify the payment process both by simplifying the cashier's job and by offering consumers a number of ways to pay.

- Retail grocery stores are the leaders in implementation of automation. There are three ways automation improves customer service at the grocery checkout line.

EXHIBIT I-2

RETAIL
ISSUES AND OBJECTIVES

- Implementation of EDI
- Integration and Connectivity
- Shortage of Qualified Applications Development Personnel

- Laser scanning bypasses the process of keying prices into a cash register one at a time. Scanning involves only passing items over a scanner which reads bar codes printed on labels. This automatically enters the proper prices and inventory information into the cash register.

- Electronic funds transfer (EFT) machines have begun to appear in grocery stores and gas stations. These machines allow consumers to transfer money directly from their checking accounts to stores' accounts using their bank ATM cards.

- Check approval machines reduce the time customers spend in checkout lines by automatically approving checks before shopping. The decision whether or not to approve the check is based on matching a personal identification number (PIN) with credit records stored in a central computer.

• Distributed computing power improves customer service and provides greater autonomy to store managers.

- With computers located on the premises, each of a chain's locations can operate almost as an independent store. Payroll, staff scheduling, and time card applications can all reside on local computers.

- Marketing personnel in individual stores have a better feel for how to address local markets than regional or corporate marketing departments. Allowing store marketing departments to analyze their own sales data enables them to develop strategies aimed at specific local markets.

• EDI drastically reduces paperwork involved with order processing. Traditional order processing methods involve as many as 17 separate forms, each of which

represents handling costs and opportunities for the introduction of human error. Order processing using EDI transfers the forms electronically.

- Advancing software technology yields more efficient programs by having a number of applications draw data from a single data base and by storing only one version of procedures that are used many times in different contexts.

- Exhibit I-3 summarizes the impact of four areas of technology on the retail sector.

EXHIBIT I-3

RETAIL
IMPACT OF TECHNOLOGY

TECHNOLOGY	COMMENTS
POS	Effective for Data Capture
Distributed Systems	Allows Localized Marketing Strategies
EDI	Streamlines Order Processing
Software Integration	Makes More Efficient Use of Data

II NEW APPLICATIONS

- Survey respondents listed a wide variety of applications among the programs they plan to implement in the next 12 months. A few came up repeatedly:
  - Point-of-sale (POS).
  - Price look-up.
  - EDI or other forms of data transfer.
  - Marketing and merchandising applications.
- A number of methods for capturing data at the point of sale are currently in use.
  - Kimball tags are price tags that double as small keypunch cards. Each card carries a product code that is associated with product identity, price, color, and other information held in central computers.
  - Magnetic stripes identify products by means of information magnetically encoded in price tags.
  - Optical Character Recognition (OCR) machines are capable of identifying numbers printed on price tags. Equipment for this method is currently very expensive.

- Bar code scanners are not portable. This method is likely to become the standard when portable or hand-held scanners become available.

- POS technology, including bar coding and laser scanning, makes sales data readily available to applications such as sales forecasting and inventory control.

- Price look-up enables clerks to check prices and availability of products on the spot.

- EDI will eliminate much of the paperwork associated with order processing. The EDI market is still small, but will grow at an average annual rate of over 100% for the next five years.

- Merchandising applications use sales data to help determine effectiveness of advertising and to enable decisions to be made on how to change and refine product lines.

- A few retailers indicated that they are implementing in-store marketing and customer service applications.

  - One store has installed a computerized bridal registry system in which customers look up names and items by means of a touch-screen.

  - Other in-store marketing applications allow customers to read descriptions and watch video demonstrations of products by means of touch screens or keyboards.

- In addition to EDI, price look-up, POS, and marketing applications, survey respondents listed inventory control, micro-mainframe links, sales forecasting, and price management among new applications.

- Exhibit II-1 summarizes the new applications retailers will be implementing in 1987.

- Approximately 60% of in-house programming staff will be developing new systems. The other 40% will maintain and enhance old systems.

EXHIBIT II-1

RETAIL
NEW APPLICATIONS

- POS
- Price Look-Up
- EDI and Data Transfer
- Marketing and Merchandising

III BUDGET ANALYSIS

- IS budget growth in 1987 will be essentially flat in every category. IS managers report no change in overall IS budgets, with no category varying more than 6% from zero growth. This is consistent with IS budgets in all industries, though a bit lower than average.

- The area of greatest growth is communications at 6%. This shows, once again, the importance of communications to this sector. Retailers will be allocating more resources to EDI and networking as the technology develops and as the benefits of these forms of communication become apparent.

- Personnel expenditures will see slight growth in 1987, reflecting the shortage of qualified IS personnel (as discussed in Issues and Objectives) and the increasing sophistication of computer systems.

- "Salaries and fringes" captures the largest share of IS expenditures overall--41.8%--followed by "total hardware" with 24.3%, a surprisingly large "other" category at 15.4%, and "communications" at 12.9%. The "other" category includes forms, disks, miscellaneous supplies, and any items not included in standard budget categories.

- Approximately one-third of survey respondents indicated their budgets will increase in 1987, one-third expect a decrease, and another third expect the IS budget to be the same in 1987 as in 1986.

- Exhibit III-1 shows the 1986 budget distribution and projects growth of budget categories in 1987.

EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE RETAIL DISTRIBUTION SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	41.8%	1.1%
Mainframe Processors	12.2%	(1.5)%
Minicomputers	1.2%	(2)%
Microcomputers	8.8%	(1)%
Mass Storage Devices	1.5%	(2)%
Other Hardware	.6%	(2)%
Total Hardware	24.3%	(2.5)%
Data Communications	12.9%	6%
External Software	6.1%	(1.4)%
Professional Services	1.0%	(2.5)%
Software Maintenance	3.2%	0%
Hardware Maintenance	5.8%	0%
Other	4.9%	(1)%
Total	100.0%	0%

INFORMATION SYSTEMS PLANNING REPORT
WHOLESALE DISTRIBUTION SECTOR

NOVEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
WHOLESALE DISTRIBUTION SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
WHOLESALE DISTRIBUTION SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- Profit margins in the wholesale distribution industry are quite low--typically 2-3%--so pressure to improve efficiency is strong.

  - The cost of storing inventory can approach 40% of its value. Minimizing unused stock is, therefore, central to maximizing profits.

  - Order processing involves large volumes of cumbersome paperwork and presents many opportunities for human error. Minimizing this paperwork is also essential to maximizing profits.

- Grocery distributors represent a large percentage (20-30%) of the wholesale distribution industry. The current state of the agricultural economy forces grocery distributors to find ways to cut expenses and boost revenue.

- Computer applications in the wholesale and retail sectors are becoming more and more interdependent as technology advances. Inventory control applications make use of results from sales forecasting applications which, in turn, rely on information gathered at the point-of-sale.

- New technology in retail drives parallel developments in the wholesale sector and vice versa. To take full advantage of information provided by point-of-

sale terminals and to remain competitive, wholesalers will have to implement demand forecasting and other applications requiring sales information.

- Most independent wholesale operations are small businesses competing for a market niche. The wholesalers who thrive will not necessarily be those offering the lowest prices. Rather, they will be those offering a comprehensive line of services. These services may include acting as automation consultants and as suppliers of hardware and software to retail establishments.

- Exhibit I-1 summarizes the driving forces for the wholesale distribution sector.

B. ISSUES AND OBJECTIVES

- Offering consulting services and installing automation for retail will become the responsibility of wholesale distributors. This will present a challenge as well as an opportunity for distributors.

  - Distributors within large chains have the financial backing of the entire chain, giving them the flexibility to initiate new services at a short-term loss, leading eventually to long-term gains.

  - Independent distributors have to compete with chain stores, so they require the same services from their independent wholesalers as chain stores require from their distributors. This puts a squeeze on independent wholesalers whose low profit margins make it difficult to take the risks and short-term losses associated with initiating new services or lines of business. If wholesalers can afford the short-term losses, offering automation consulting and installation will boost profits and enhance competitive position.

EXHIBIT I-1

WHOLESALE DISTRIBUTION
DRIVING FORCES

- Low Profit Margins
- Economic Pressures
- Technology Trends
- Competitive Pressures

- Distributors depend on communication with manufacturers and retailers. Traditionally, order processing has relied on paperwork, but electronic data interchange (EDI) and electronic mail are quickly gaining favor. The primary use of EDI in wholesale distribution is to enter orders from retailers directly into computers, thus reducing paperwork and avoiding redundant data entry.

- Compatibility and standards are major issues in wholesale distribution because of the interdependence of retail systems and wholesale systems and because of the importance of communications to this sector.

  - Computers for analysis and forecasting should connect with computers for inventory control, and, ideally, both should connect point-of-sale terminals and computers on retail premises.

  - EDI is still a young technology, and standards have not yet been set. Although it is already useful, its ability to facilitate order processing and improve efficiency will increase significantly when and if standards are developed.

  - One unfavorable effect of hardware and software standardization is that it will weaken the hold distributors have on their customers. Without standards, switching wholesalers involves enormous operational changes since it can involve changing computer systems. If standards are imposed, retailers will be far more willing to switch suppliers for other reasons.

- A related issue is that of software integration. Connectable computers cannot provide maximum efficiency unless the software on one node can communicate with the software on others. In order to avoid duplicating data entry, it is important that data collected for one purpose can be used for other purposes. IS managers are confronting this issue early in the implementation of automation for distribution because so many applications in this sector rely on data from a single source--point-of-sale.

- The job of sorting and analyzing the overabundant data from the point-of-sale will fall to white collar workers. Their productivity must increase to keep up with data capture techniques. White collar workers must also learn to choose judiciously which data to analyze and which to discard.

- Exhibit I-2 summarizes the primary issues and objectives addressed by the IS respondents for this sector.

C. IMPACT OF TECHNOLOGY

- Nondurable goods wholesalers have a lead over durable goods wholesalers in the sophistication of their automated systems.

  - Durable goods include bulky or irregularly shaped items like building materials and clothing. These items do not lend themselves well to laser scanning or to other electronic data capture techniques.

  - Nondurable goods, on the other hand, are generally small, uniformly packaged items which lend themselves nicely to laser scanning. Bar codes can be included in label design, and items are small enough that checkers can easily pass them over a scanner.

- Methods for electronically identifying durable goods are currently being studied and developed, but a clear-cut "best answer" has not emerged. Present possibilities include the following:

  - Kimball tags. Price tags double as small keypunch cards. Each card carries a product code which is associated with product identity, price, color, and other information held in central computers.

EXHIBIT I-2

WHOLESALE DISTRIBUTION ISSUES AND OBJECTIVES

- Implementation of EDI
- Integration and Connectivity
- White Collar Productivity

- Magnetic stripes. Information magnetically encoded on price tags identifies products.

- Optical character recognition. Electronic readers are capable of identifying numbers printed on price tags. Equipment for this method is currently very expensive.

- Bar code scanning. This method will be very useful when portable or hand-held scanners become available, but scanners are currently not portable.

- Point-of-sale (POS) technology, including bar coding and laser scanning, makes sales data readily available to applications such as sales forecasting and precision inventory control.

- While EDI is still in its infancy, it will be used extensively in the next five years to transfer business documents over networks. In wholesale, EDI will be particularly useful for reducing the plethora of paperwork now required for order processing.

- Automation of wholesale distribution has traditionally included applications to facilitate inventory management and vehicle scheduling, but little beyond these. Inventory management and vehicle scheduling are still the most important aspects of automation, but they are quickly advancing in sophistication, and there is a strong emphasis on integration of all applications.

- American distribution organizations and software companies have adopted the Japanese "just-in-time" inventory replenishment strategy and have used variations of it to develop software packages for Distribution Resource Planning (DRP).

- Advanced software technology will yield increased program efficiency by integrating large packages using one data base for a number of applications

and by storing only one version of a procedure that is used many times in different contexts. This is particularly relevant to wholesaling since many different tasks rely on one set of data.

- Exhibit I-3 summarizes the impact of four major areas of technology on the wholesale sector.

EXHIBIT I-3

WHOLESALE DISTRIBUTION
IMPACT OF TECHNOLOGY

TECHNOLOGY	COMMENTS
POS	Large Potential for Data Capture
EDI	Streamlines Order Processing
Inventory Control	Cuts Storage Costs
Software Integration	Makes More Efficient Use of Data

II NEW APPLICATIONS

- Electronic Document Interchange (EDI) will eliminate much of the paperwork associated with order processing. The EDI market is still small but will grow at an average annual rate of over 100% for the next five years. EDI lends itself nicely to order processing tasks and may well reduce the cost of order processing by as much as 70%.

- New Distribution Resource Planning (DRP) programs automate storage and retrieval and utilize sales forecasts to determine the size and frequency of replenishments. DRP reduces storage and inventory costs by keeping excess inventory to an absolute minimum.

- Vehicle loading and scheduling programs interact with DRP to coordinate deliveries and pickups.

- In addition to EDI, DRP, and vehicle scheduling, survey respondents listed sales forecasting and bar code technology among new applications.

- Exhibit II-1 summarizes the new applications wholesalers will be implementing in 1987.

- Over 60% of all new applications being implemented in the next year are being developed in-house by internal staff.

WHOLESALE DISTRIBUTION
NEW APPLICATIONS

- Electronic Document Interchange
- Inventory Control
- Order Processing
- Vehicle Scheduling
- Sales Forecasting
- Bar Coding

- Wholesalers will purchase but then customize approximately 23% of the applications they implement in the next 12 months (i.e., 23% of the new applications respondents mentioned will be developed outside, but modified in-house).

- They will buy and use approximately 17% of their new applications off-the-shelf with no modifications.

- Exhibit II-2 summarizes sources of new applications.

- Approximately 44% of in-house programming personnel will maintain and enhance existing systems. The other 56% will be developing new applications (see Exhibit II-3).

EXHIBIT II-2

SOURCES OF NEW APPLICATIONS

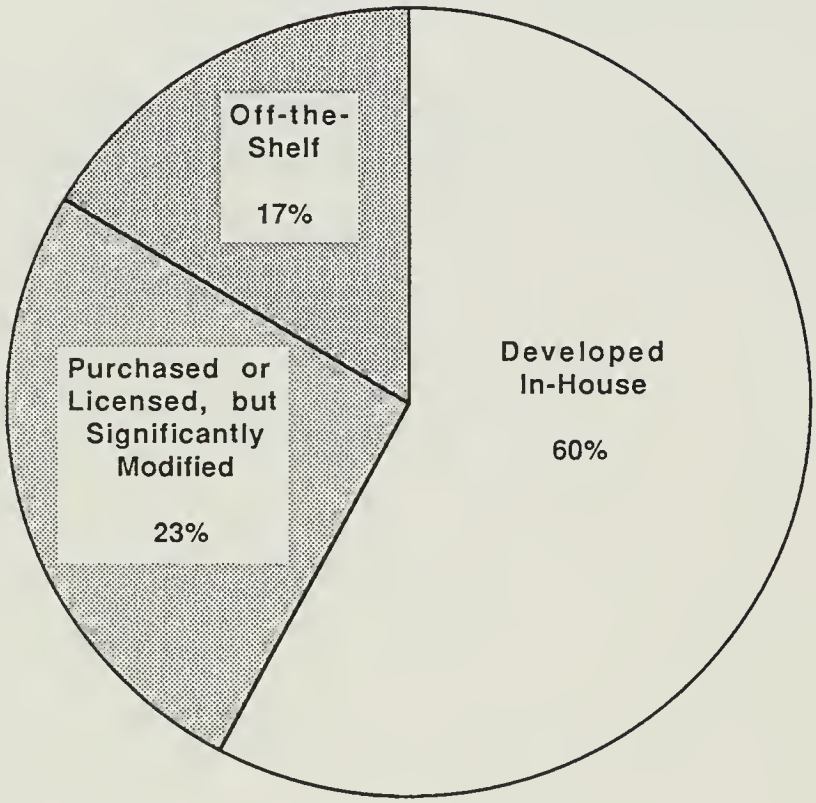
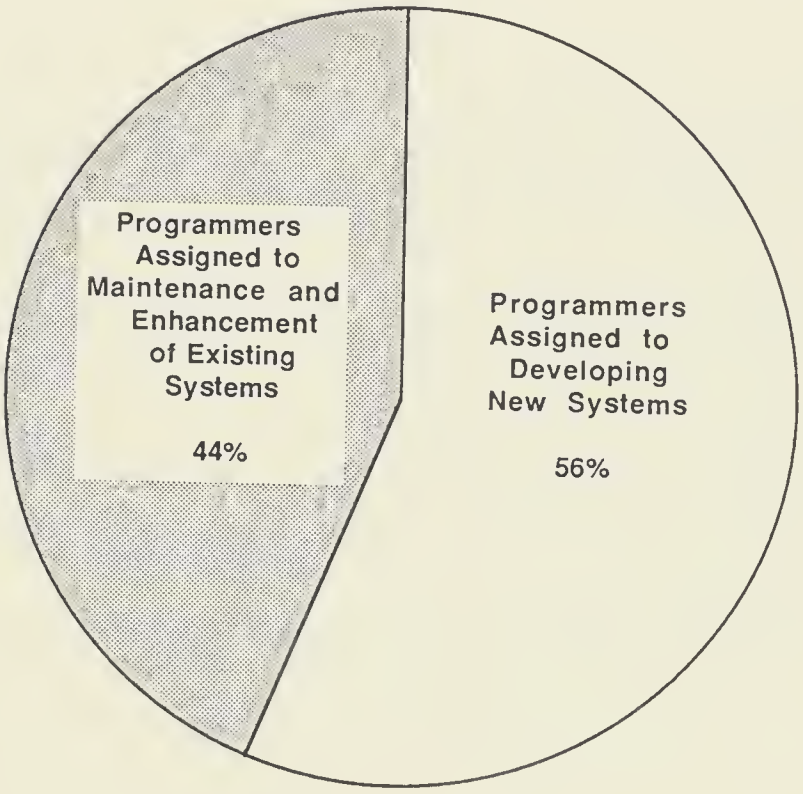


EXHIBIT II-3

ALLOCATION OF PROGRAMMING STAFF



III BUDGET ANALYSIS

- Forty percent of the companies in this sector expect information systems budgets to increase in 1987, another 40% expect budgets to remain the same, and 20% expect decreases (see Exhibit III-1).

- The average budget growth expected for 1987 is 2.7%. In 1985, budget growth was 5.4%.

- Exhibit III-2 shows the distribution of expenses in wholesale distribution IS budgets.

- The three largest categories of 1986 budgets were personnel at 44.5%, hardware at 31.4%, and communications at 6.5%.

- The largest growth categories for 1987 are expected to be applications software and communications.

  - Applications software should increase nearly 13% in 1987. This is because of the ever-increasing emphasis on software integration. Many wholesalers are now purchasing modular software systems to which they may add new application modules as the need arises.

  - IS managers expect communications to grow 6% in 1987. This reflects increasing emphasis on using data from point-of-sale and the beginning of EDI use.

EXHIBIT III-1

WHOLESALE DISTRIBUTION
CHANGE IN BUDGET, 1986-1987

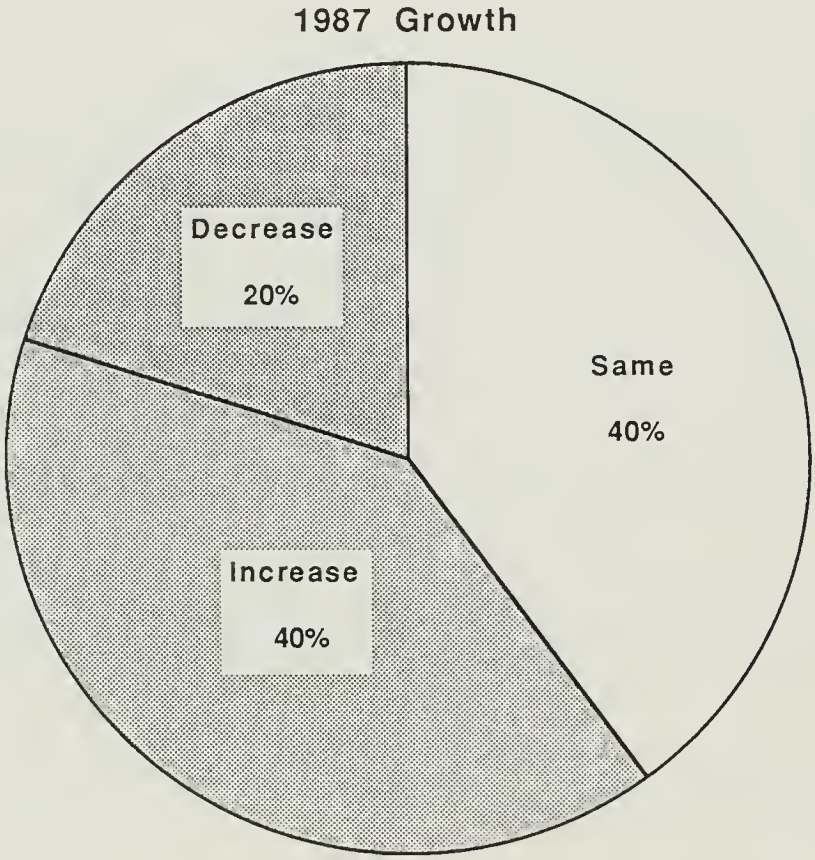


EXHIBIT III-2

WHOLESALE DISTRIBUTION
1986 BUDGET DISTRIBUTION

BUDGET CATEGORY	1986 I.S. BUDGET (Percent)	EXPECTED GROWTH
Personnel	44.5%	2.1%
Mainframe	18.4%	1.5%
Mini	4.4%	1.0%
Micro	7.5%	1.0%
Other Hardware	1.1%	3.9%
Total Hardware	31.4%	1.4%
Communications	6.5%	6.0%
PFS/SW Development	1.0%	0.0%
Applications Software	4.2%	12.7%
Systems Software	2.5%	1.4%
Hardware Maintenance	4.3%	4.4%
Software Maintenance	3.4%	0.0%
Other	2.2%	1.8%
Total	100%	2.7%

- Information systems budgets are approximately 0.7% of revenue in the wholesale distribution industry. This is close to the average for all industries.

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Information Systems Planning Report–Education Sector

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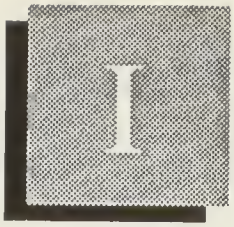


Major Issues

I

Major Issues

A

Driving Forces

Administrative applications are being bought to increase the efficiency of the business and administrative functions in the education sector. Schools are purchasing microcomputers to "front end" larger computer systems. New administrative applications should integrate with the basic financial systems.

Strategic planning is higher education's latest buzzword. Like businesses, schools need to do strategic planning. This need is fueled by declining birth rates, an orientation toward "vocational" or skills-based training, and specific employer needs.

Desktop publishing is hot! It is being used to produce a wide range of materials for schools of all sizes. In addition, with the proliferation of personal computers, IS departments are hiring separate staff or allocating part of existing staff for end-user support.

The education sector continues to deal with political pressures such as:

- Cost cutting. While IS can provide a means to improve productivity and information for decision making in key administrative departments, it, too, is under severe cost constraints.

- Changing administrative requirements. State and local governments frequently change administrative reporting requirements and budgeting procedures. Working within a shifting bureaucracy represents a real challenge.

Improved service to high school and post-secondary school students remains a priority. Service improvements include better information for student registration, on-line registration, and better management reporting about the registration process. Since declining birth rates in the 1960s have resulted in a smaller pool of applicants for post-secondary institutions,

colleges, universities, and technical and vocational schools must offer the right classes and services to students in order to grow.

Exhibit I-1 lists the driving forces affecting IS departments in the education sector.

EXHIBIT I-1

EDUCATION SECTOR – DRIVING FORCES

- Improve Education Administration
- Support Strategic Planning
- Begin Desktop Publishing
- Support End-User Computing
- Deal with Politics of Government and School Boards
- Improve Service to Students
- Appeal to a Decreasing Supply of Students for Post-Secondary Institutions

B

Issues and Objectives

IS must develop data-oriented as opposed to process-oriented information, representing a major change in the way educational institutions operate. Department-level fiefdoms are giving way to centrally managed resources with related growth in information necessary to further the strategic planning efforts. A good example is the efforts of many institutional IS organizations to support the school's recruitment efforts; rather than strict cost reduction, IS must support post-secondary institutions' recruitment efforts. Such support consists of data base management programming and mail list management.

Another major issue is the establishment of centralized, integrated student information systems as the key means of providing better services to students. Better service is not simply a concept–it is a key differentiator among competing institutions.

Key IS objectives include:

- Resolving the paradox of providing more support to a broader range of users with tighter budgets.
- Waiting for technological advances or industry standards which will enable communication between incompatible hardware.
- Providing the necessary data to support an increased level of strategic planning by post-secondary schools.

Exhibits I-2 and I-3 summarize the issues and objectives identified by education sector survey respondents.

EXHIBIT I-2

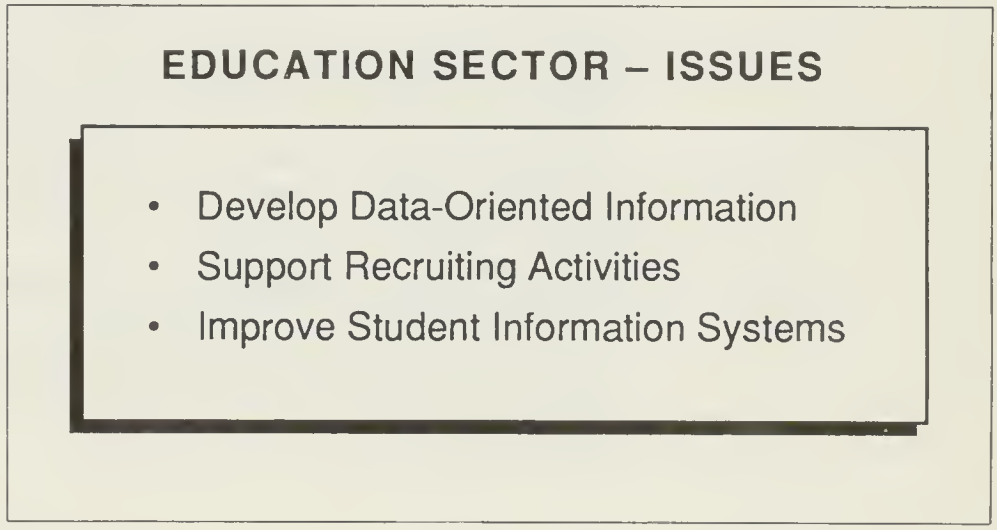
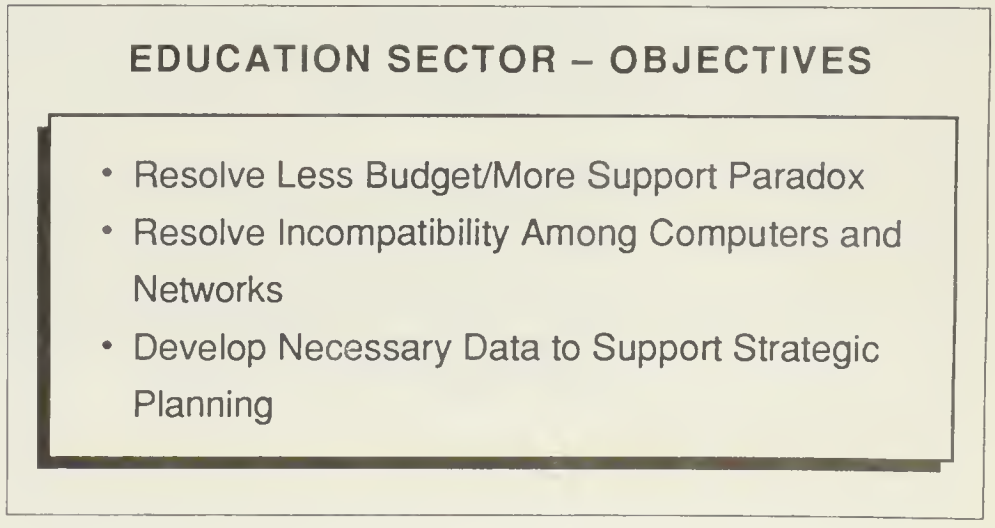


EXHIBIT I-3



C

Management Perception and Organizational Issues

With the growing importance of strategic planning, schools' senior management is relying heavily on IS directors to define and implement the necessary information. IS is now directly supporting senior management at post-secondary institutions in two key areas–financial information and the long-range planning process.

- Financial information must be gathered and consolidated in a meaningful way for use by senior management.

- No longer can university presidents run a fully decentralized operation. Deans and department heads are being made accountable for head counts, capital budgets, and operating budgets to support long-range objectives.

Since they do not directly represent a particular department or academic discipline, IS directors are seen as a "neutral" party to gather and present necessary information; hence, their importance is increasing. Furthermore, technological advances in networking, data base software, and integrated voice/data communications are forcing recognition of the skills and knowledge of the IS director.

Retaining technical staff is becoming a critical success factor. Some schools have experienced incredible turnover during the past year, with staff lured by better salaries and growth opportunities in other industries. As a result of key staff shortages, IS management cannot implement departmental plans.

D

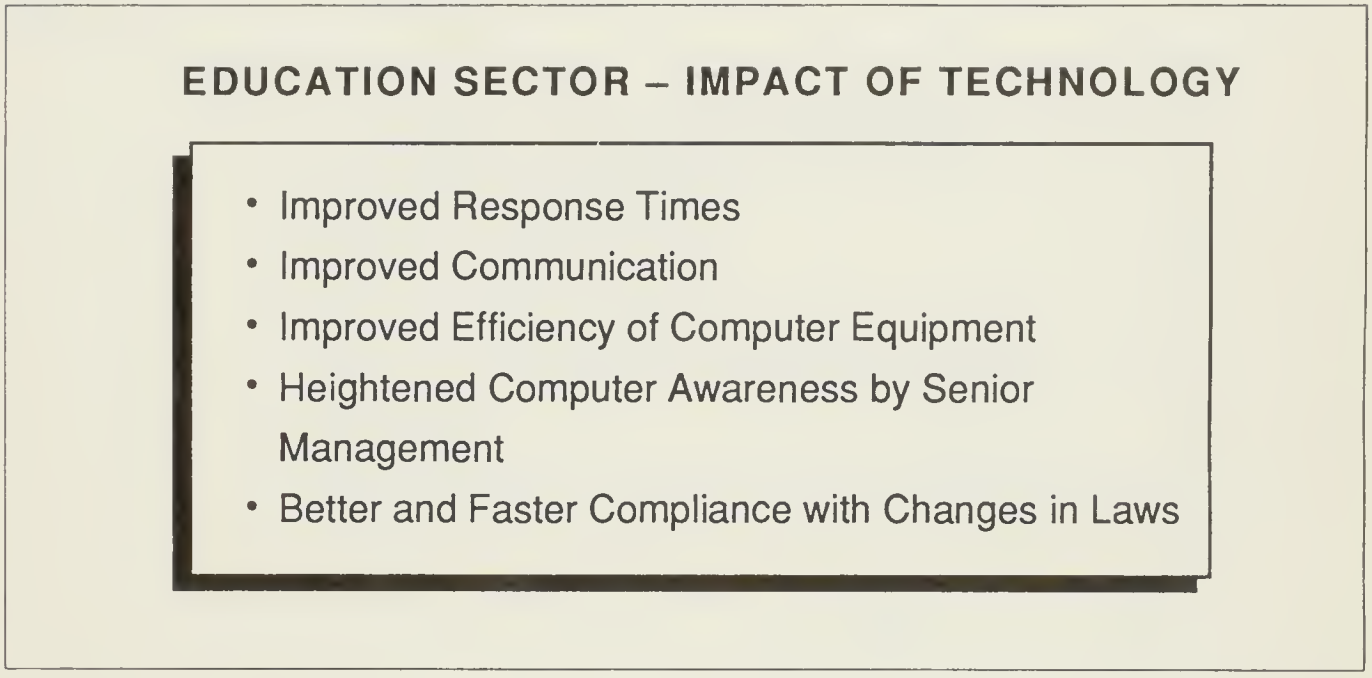
Impact of Technology

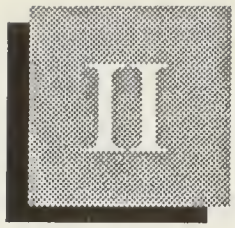
New technology has fostered a faster document turnaround to meet the demands for faster-paced administrative processing. Also, networks enable colleges and universities to link geographically separate offices/branches for file transfer and administrative purposes.

INPUT also observed that universities are taking advantage of the fact that replacing old with newer technology will permit growth in processing capability and storage capacity while maintaining a flat budget. And, new technology has enabled IS to promote a "buy-in" by senior management of computerization through daily use of computers as a tool. Major administrative functions include: electronic mail, calendars, data manipulation, and report writing.

Finally, new technology has enabled schools to better comply with changes in state and federal laws and related reporting requirements as well as changes in auditing procedures.

EXHIBIT I-4





New Applications

II

New Applications

Colleges and universities support a wide range of business activities, resulting in a diverse base of applications software. Primary applications include; accounting and finance, admission, financial aid, development/ fund raising, registration, bookstore, and administrative offices of the president and various deans. Exhibit II-1 details new applications identified by INPUT survey respondents.

EXHIBIT II-1

EDUCATION SECTOR – NEW APPLICATIONS IN 1987

- Applications Based on Data Base Management Systems
- Voice/Data Networks
- Desktop Publishing

Post-secondary and secondary institutions are implementing more applications based on data base management systems, including:

- Registrar files.
- On-line library catalog systems.
- On-line registration.

- On-line student fee collection systems.
- Budgeting systems.
- Installation tracking of microcomputer hardware and software.
- Purchasing.

Campus-wide voice/data networks, while not strictly application software-based, are becoming more widespread. The past two years' planning efforts are becoming reality.

But, the hottest new application is microcomputer-based desktop publishing. Between 1986 and 1987, desktop publishing appeared across a diverse user base of educational institutions. INPUT believes this represents a significant trend, not a one-time temporary aberration.

The education sector has a few IS needs which respondents believe are not well served by vendors. Specifically, schools want:

- A network version of Lotus 1-2-3.
- Micro-to-mainframe links, especially those compatible with IBM mainframe operating systems.
- Software to integrate existing workstations.
- CPU to CPU communication between different vendors' products.
- More software for primary and secondary school districts' applications, especially payroll, personnel, and finance, running on non-DEC and non-IBM computers.

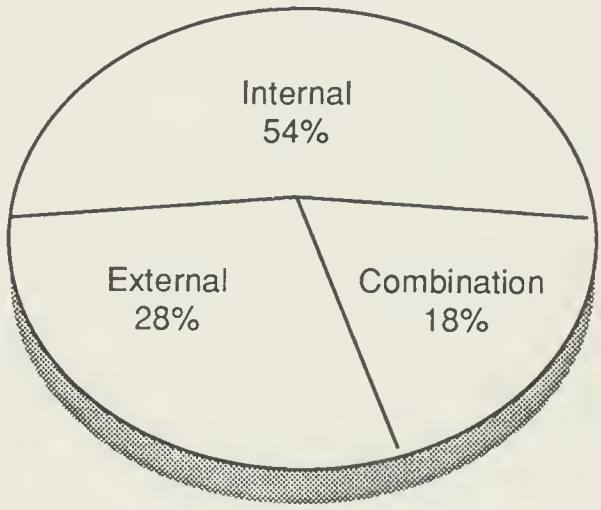
The education sector is divided in its approach to software development. Larger colleges and universities tend to develop new applications in-house while smaller colleges and universities generally rely on third-party software for new applications. In either case, maintenance and enhancement of existing applications takes far greater share of the resources than developing new applications.

- Larger colleges and universities devote around 40% of software development staff to developing new applications.
- Smaller schools devote less than 25% of their software development staff to developing new applications.

Exhibit II-2 shows educational institutions' sources for new applications software. Internally developed software continues to account for the most frequently used software acquisition method. However, off-the-shelf applications software is used more than a combination of third-party software with either internal development or outside professional services.

EXHIBIT II-2

EDUCATION SECTOR
SOURCES OF APPLICATION DEVELOPMENT
(For Major New Applications)



Cost Range of New Applications Software:
- Mainframe-Based: $30,000 - $1,000,000
- Minicomputer-Based: $15,000 - $800,000
- Microcomputer-Based: $125 - $16,000

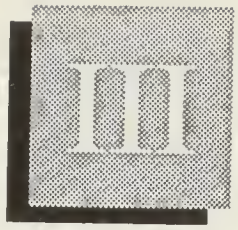
Average Cost of New Applications Software:
- Mainframe-Based: $450,000
- Minicomputer-Based: $205,000
- Microcomputer-Based: $975

- Driven by legislative and accounting requirements, more schools are now updating their 1970s vintage in-house developed software.

- The relatively low salaries paid to programmers and systems analysts in the education sector may provide economic justification for continuing in-house applications software development.

- While it may be necessary for more schools to eventually shift to third-party integrated applications software, many schools continue to do in-house work, reflecting a "not invented here" attitude.

- However, there are not sufficient in-house programmers to both maintain and enhance existing applications and develop new applications. The increase in external software development indicates IS management is moving in the right direction.



Budget Analysis

III

Budget Analysis

In 1987, respondents experienced limited growth in their IS budgets, due primarily to increases in salaries and fringe benefits and applications software.

- IS spending in 1988 is projected to increase 3-5% for inflation, salaries, and benefits.

- Exhibit III-1 shows the 1987 budget distribution and projects the growth in specific budget categories in 1988.

In general, private secondary and post-secondary schools' budgets are growing at a faster pace than public secondary and post-secondary schools. IS spending in unified primary and secondary school districts is increasing at a slower rate than non-unified school districts.

Nearly 80% of the respondents project that their IS budgets will increase or remain the same in 1988 as in 1987. More than 50% of respondents believe the 1988 growth rates will be greater than in 1987 (see Exhibit III-2).

- Factors contributing to increases in the IS budget include (in order of most frequently mentioned factors):

- Hardware maintenance.

- Software maintenance.

- Personnel expenses.

- New applications software purchases.

- New hardware purchases.

- Telecommunications cost increases.

EXHIBIT III-1

1987 BUDGET DISTRIBUTION AND 1987-1988 CHANGES IN THE EDUCATION SECTOR

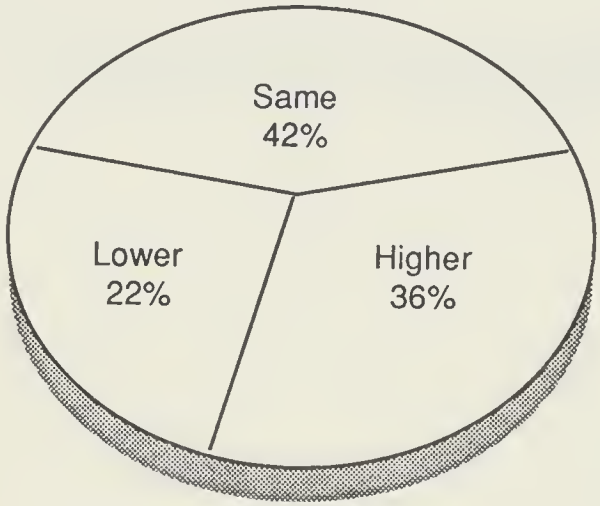
BUDGET CATEGORY	1987 I.S. BUDGET (Percent)	1987-1988 Expected Budget Growth (Percent)
PERSONNEL (Salaries & Fringe Benefits)	48.2	2.6
HARDWARE		
Mainframes	6.7	2.1
Minicomputers	6.7	3.5
Microcomputers	5.3	3.9
Mass Storage Devices	4.2	2.0
Other Hardware	0.6	1.1
TOTAL HARDWARE	23.5	2.8
Data & Voice Communications	3.7	5.2
External Software	7.3	12.6
Professional Services	0.3	(0.7)
Turnkey Systems	0.1	0.3
Software Maintenance	2.4	1.9
Hardware Maintenance	8.3	4.5
Outside Processing Services	0.2	(2.0)
Supplies	5.1	2.5
Travel, Subscriptions, Etc.	0.9	1.1
TOTAL	100.0	3.6

EXHIBIT III-2

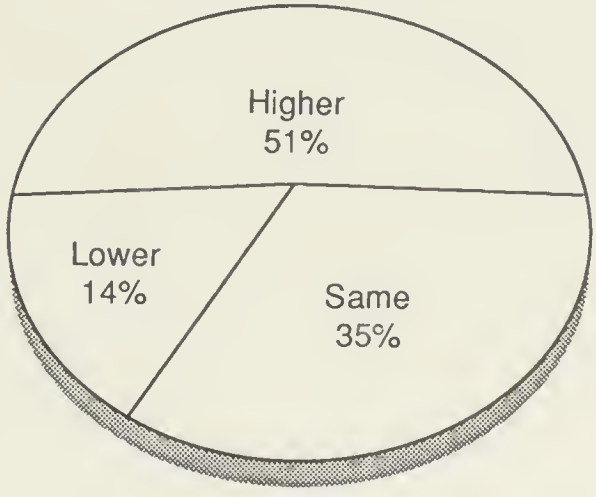
EDUCATION SECTOR

MOST BUDGETS ARE INCREASING AT A FASTER RATE

Comparison of
1988 and 1987
I.S. Budget



Comparison of
Changes in Growth Rates of
1987 and 1988 I.S. Budgets



- One factor was listed as the major contributing factor to decreases in the IS budget, namely declining state/local economy (which leads to decreases in funding from the legislature).

Head count from 1986 to 1987 within education sector IS departments changed in no significant pattern.

- Twenty-three percent indicated head count increased.
- Forty-four percent indicated head count remained the same.
- Thirty-three percent indicated head count decreased.

Head count increased in those institutions implementing new, expensive applications. Generally, head count in junior colleges and secondary school districts was the same as last year.

About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

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Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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INFORMATION SYSTEMS PLANNING REPORT
EDUCATION SECTOR

NOVEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
EDUCATION SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
EDUCATION SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- Administrative applicatians are being used ta increase the efficiency of the business and administrative functions in the educatian sectar. Micro-computers are being used as an additian ar supplement to larger computer systems. New administrative applicatians should integrate with the basic administrative systems (e.g., budgeting, general ledger, payrall, etc.).

- Wide area netwarks will be develaped extensively to link universities intern-ally and with ather institutians araund the cauntry. These netwarks will permit universities ta gain access to other schaals' resources (e.g., library catalogs). This will require large telecammunicatians and data administratian effarts far netwark participants.

- Primary and secandary schaals as well as past-secondary institutians are using micros as taals in the educatianal pracess. Originally, micros were used to teach camputer literacy cancepts, an appraach which did nat wark due mainly to a lack af trained teachers.

- The education sector is always under severe palitical pressure ta cut casts. IS can pravide a means ta imprave praductivity in administrative departments, but it, taa, is under severe cast constraints. IS' challenge is to produce beneficial systems while operating under tight budgetary contrals.

- Declining birth rates in the 1960s have resulted in a smaller pool of applicants for post-secondary institutions. Colleges, universities, and technical and vocational schools must offer more services to students and learn consumer marketing techniques.

- Exhibit I-1 lists the driving forces affecting the education sector's IS departments.

B. ISSUES AND OBJECTIVES

- The major issues and objectives being addressed by this sector can be categorized as follows:

  - Reduce costs. IS must produce cost savings systems and yet keep its budget growth to a minimum.

  - Improve and expand data communications. Communication within and outside an institution is required for document interchange and to link academic systems. Incompatibility between computers and among networks is a major impediment to achieving this goal.

  - Improve staff productivity, especially in student services applications.

  - Establish centralized, integrated student information systems as the key means of providing better services to students.

- Exhibits I-2 and I-3 summarize the issues and objectives identified by the respondents in this sector.

EXHIBIT I-1

EDUCATION
DRIVING FORCES

- Demand to Integrate Administrative Systems
- Inter-University Networks
- Changing Use of Micros in Education
- Politics of Government and School Boards
- Cost Containment
- Decreasing Supply of Students for Post-Secondary Institutions

EDUCATION
ISSUES

- Document Exchange among Various Computers
- Demand for Enhanced Telecommunication Networks
- Integrated Student Information System

EXHIBIT I-3

EDUCATION
OBJECTIVES

- IS Survival with Decreasing Budgets
- Resolve Incompatibility among Computers and Networks
- Upgrade Hardware and Software
- Improve Productivity
- Establish a Central, Integrated Administration System

C. MANAGEMENT PERCEPTION AND ORGANIZATIONAL ISSUES

- Management views IS as an important resource, but its main emphasis is on IS as a cost controlling source. This sector's respondents generally do not believe that IS will be used for strategic purposes as long as management must comply with severe budgetary pressures.

- In the past two years, the respondents have seen their management visibility improve and their user base expand. In the next two years the respondents see their role becoming more consultative, especially with the growing use of micros in administration and academic applications.

- IS plays a significant role in the planning process. One respondent stated that "IS controls the planning process." The need for systems puts IS into a major planning role in larger educational institutions.

D. IMPACT OF TECHNOLOGY

- End-user computing primarily centers on micro support and micro-to-mainframe applications. End-user computing accounts for about 40% of the expenditures in respondent institutions.

- Departmental processing is being actively studied by respondents, but most believe that micro-to-mainframe applications will be used instead of departmental processing.

- Distributed systems development (DSD) is not being used by respondents. Some are planning to use DSD for office systems development, but not in the next two years.

- There is little activity in the use of relational data bases other than using relational-like data bases with fourth generation languages.

- The respondents thought it was technologically premature to consider merging voice and data communications. It is currently too expensive to even consider experimentally. In 1986, larger universities have begun studies for implementation in the two- to five-year timeframe.

- There is some localized use of LANs on campuses, but the lack of standards has inhibited their widespread use.

- Exhibit I-4 summarizes the impact of the above technological issues in IS for the education sector.

- The respondents have allocated a substantial portion of their IS resources to end-user computing. This has spurred growth in IS and shifted resourced from data processing operations to end-user support.

- In most cases, IS has established a formal training group to support end users. It conducts classes, controls purchases of microcomputers, publishes newsletters, and establishes workshops. IS does most of the end-user training in these respondents' institutions.

EXHIBIT I-4

EDUCATION
IMPACT OF TECHNOLOGY

	IMPACT	COMMENTS
End-User Computing	High	Requires increased IS support staff. Many micro-to-mainframe concerns.
Departmental Processing	Low/ Medium	Primarily micro-to-mainframe storage requirements are too great for minis, although some application may exist.
Distributed Systems Development	Low	Primarily at OA level.
Relational Data Bases	Medium	Users are slowly implementing IBM IDBS/R, although data bases are seen as important.
Voice/Data Integration	Low	Activity limited to studies for 2-5 year implementation.
LANs	Low	Lack of standards inhibiting growth. Some minor activity.

II NEW APPLICATIONS

- As the basis for offering student services in a competitive educational environment, integrated student information systems is the dominant new application. Converting data base information to relational data bases is now a reality. Asset management (human, facilities, and vehicles) represents an area with good payback from computerization.

- Exhibit II-1 shows the major new applications identified by respondent institutions in this sector.

- The education sector tends to keep software development in-house, as evidenced by the overwhelming proportion of in-house development for new applications (see Exhibit II-2).

- Student information systems and student records were the most expensive new education applications; the cost of each exceeds $1 million and will be implemented over two to three years.

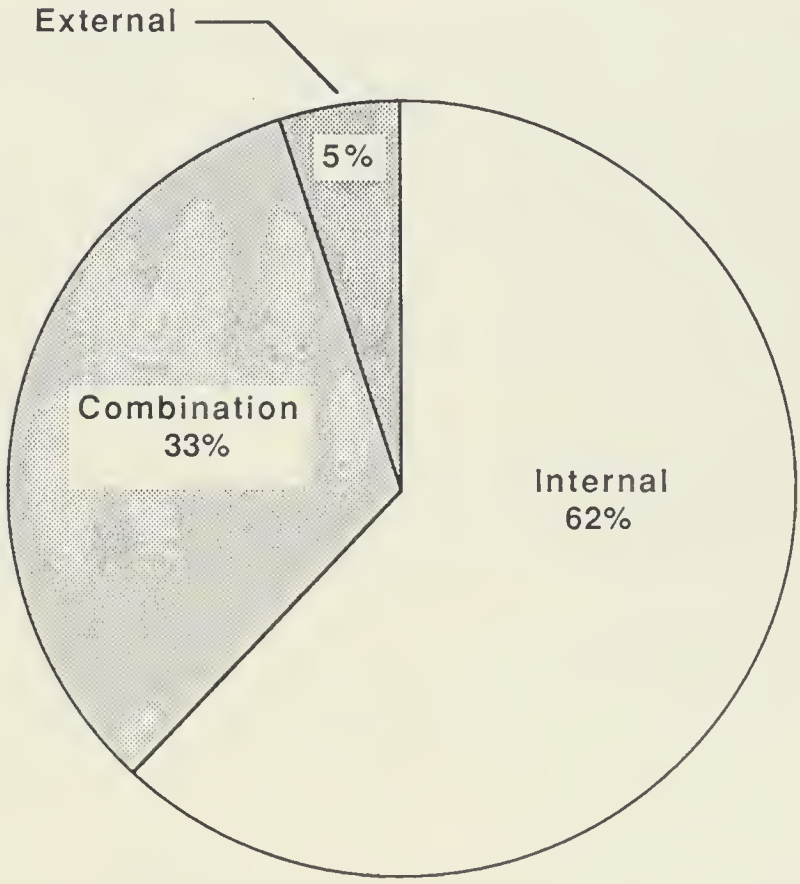
EXHIBIT II-1

EDUCATION
NEW APPLICATIONS IN 1986

- Integrated Student Information System
- Human Resource Management
- Extending Data Base Management Software
- Student Records System
- Property Control System
- Library Catalogue System

EXHIBIT II-2

EDUCATION
SOURCE OF APPLICATION DEVELOPMENT
(All Major New Applications)



Cost Range of New Applications Software: $8,000 - $3,000,000

Average Cost of New Application Software: $400,000

III BUDGET ANALYSIS

- In 1986, the respondents experienced limited growth in their IS budgets. This was primarily due to increases in salaries and fringe benefits in some schools balanced by mandatory cost reductions in other schools. 1987 is projected to have a significantly slower growth as new applications started this year are implemented and end-user support groups maintain current staff levels.

  - Exhibit III-1 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

- Three-fourths of the respondents project that their IS budgets will increase or remain the same in 1987, but one-fourth believe the growth rates will be lower than 1986 (see Exhibit III-2).

  - Factors contributing to increases in the IS budget include (in order of most frequently mentioned factors):

    . Personnel.

    . Hardware.

    . Supplies and outside services.

  - Factors contributing to decreases in the IS budget include:

    . Government funding.

EXHIBIT III-1

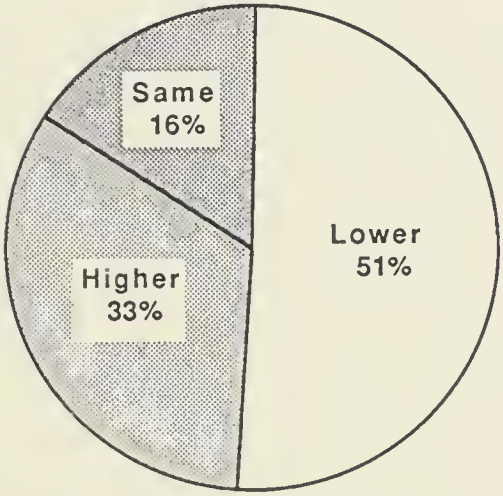
1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE EDUCATION SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	47.2%	3.8%
Mainframe Processors	10.6%	(4.8%)
Minicomputers	6.2%	(2.8%)
Microcomputers	5.8%	3.2%
Mass Storage Devices	4.9%	2.1%
Other Hardware	3.0%	(15.3%)
Total Hardware	30.5%	(0.9%)
Data Communications	5.2%	5.8%
External Software	5.7%	11.2%
Professional Services	1.2%	(0.9%)
Turnkey Systems	0.1%	2.3%
Software Maintenance	4.6%	6.2%
Hardware Maintenance	5.3%	8.4%
Outside Processing Services	0.1%	(2.3%)
Other	0.1%	3.5%
Total	100.0%	2.5%

EXHIBIT III-2

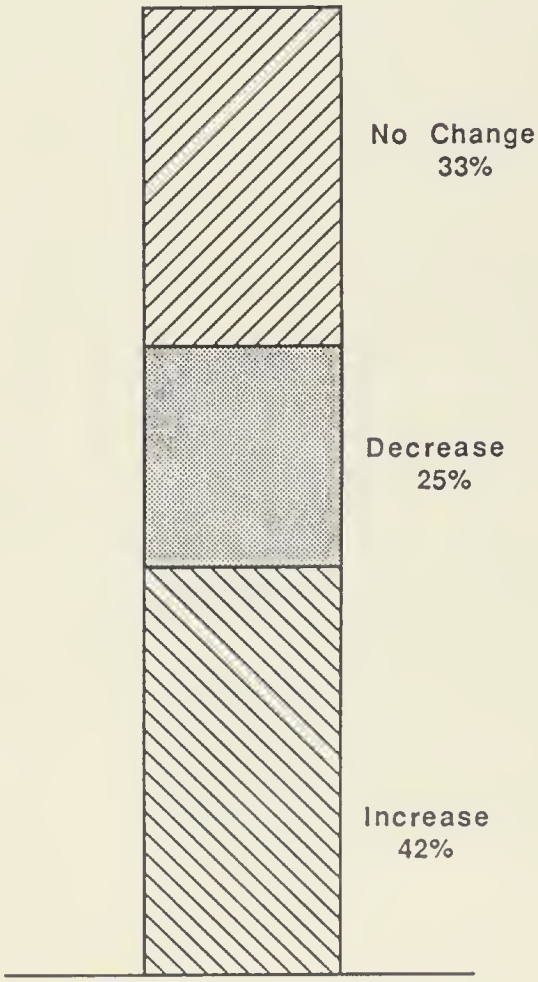
EDUCATION
MOST BUDGETS ARE INCREASING AT A LOWER RATE

1987 Budget Growth
versus
1986 Budget Growth



Percent of Respondents

1987 Budget
versus
1986 Budget



Percent of Respondents

- Sixty-four percent of respondents indicated that MIS department headcount increased in 1986 from 1985. The remaining 36% of respondents indicated 1986 headcount remained the same.

- The IS budget in the education sector is dependent on government appropriations. Since most of this sector is controlled by public agencies, IS management must spend a considerable portion of their time "lobbying" for funding. Thus, this sector's IS organizations usually lag in the use of new technology and systems.

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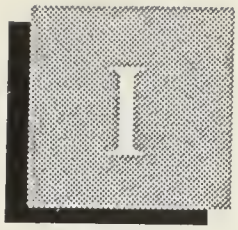
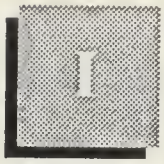


Major Issues



Major Issues

A

Driving Forces

The federal government was the first wide-based employer of large data processing capabilities. Despite an inventory in excess of 22,000 CPUs, current I.S. resources are experiencing difficulty in meeting rising service demands.

- Public service functions, such as social security and welfare, health and human services continue to escalate under Congressional initiatives.
- Congress needs newer, more frequent and more timely data and analyses from the departments and agencies it oversees.
- Administrative initiatives continue to uncover areas of executive branch information processing that are missing or inadequate to meet new management expectations.

While not as pronounced as the early 1980s, the ADP Equipment (ADPE) inventory includes a significant number of early third generation machines that lack the flexibility, speed, and capacity of currently available technologies.

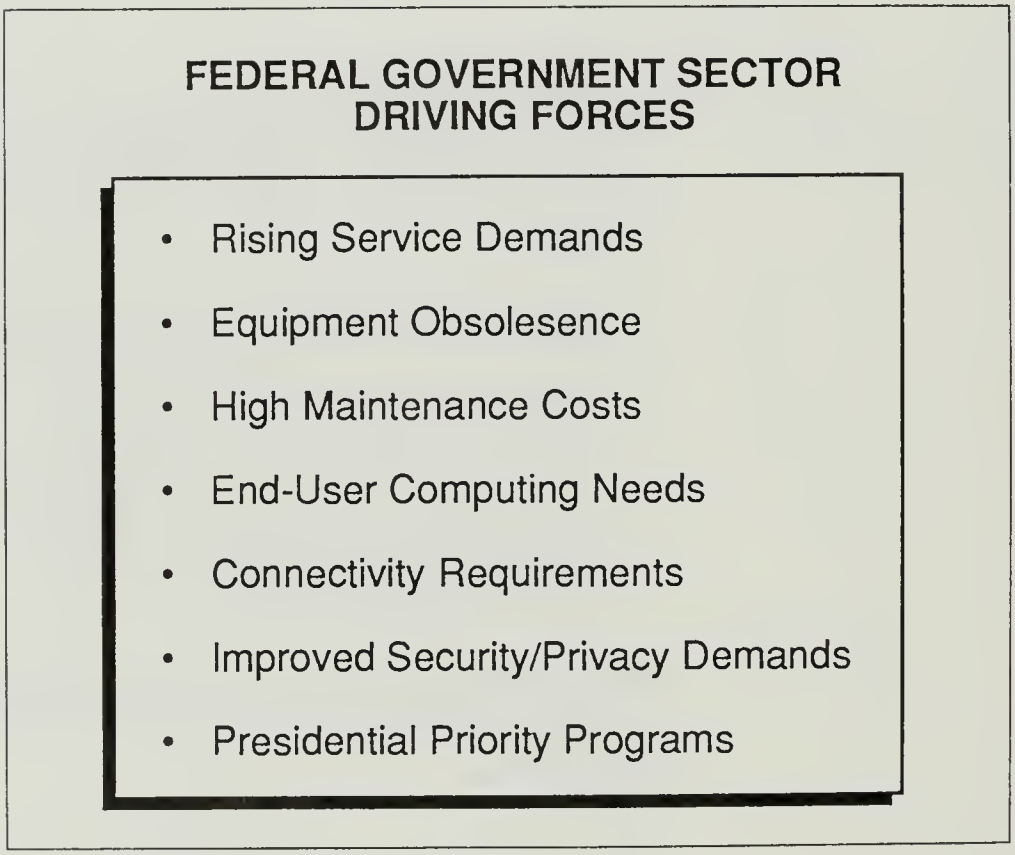
The combination of older ADPE and a very large inventory of custom software has driven maintenance costs up and extended repair times. GAO and NBS have estimated that about 70% of software life cycle costs go to maintenance and enhancement, and tie down an inordinate percentage of in-house I.S. staff.

Government personnel and managers requiring data processing support through end-user computing need dynamic response from data centers. Both volume and complexity are increasing, along with demands for more user-friendly computing support.

The need to share data, under the constraints of the Paperwork Reduction Act, and to interact to meet administration requirements, including the REFORM 88, CALS and SDI initiatives, are pressing for substantially improved connectivity. New standards are needed for uniform protocols, open system architectures and standard systems interconnections.

Administrative and Congressional demands for improved security measures concern both national security and individual privacy protection issues. Congress is also considering new computer theft and proprietary data protection measures. These driving forces are summarized in Exhibit I-1.

EXHIBIT I-1



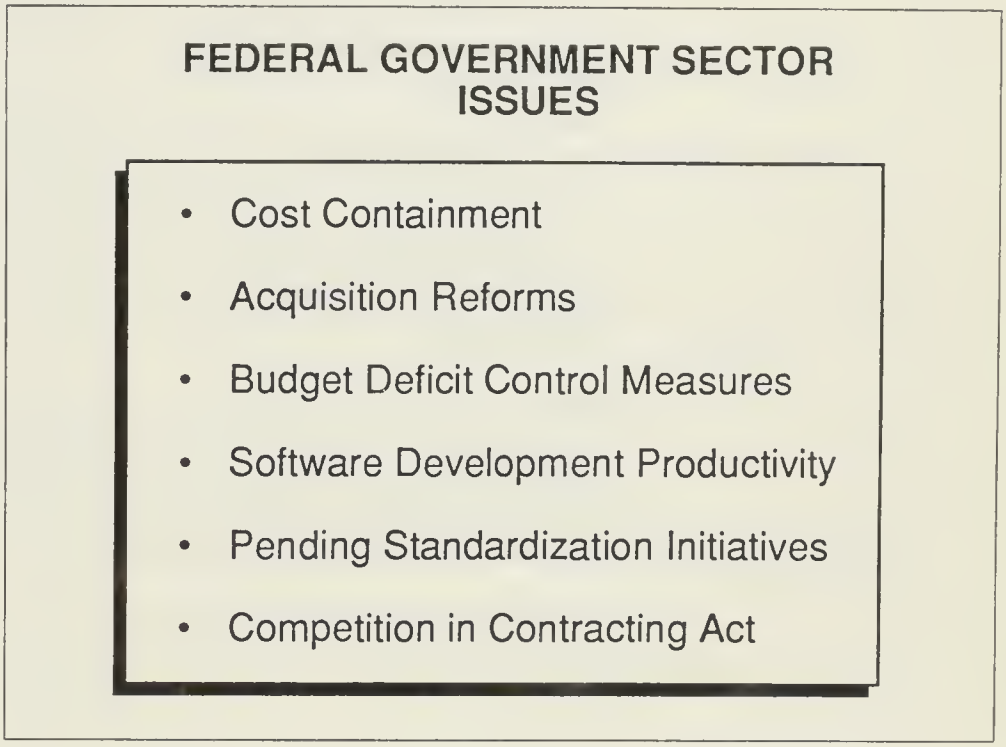
The large number of new and replacement information systems in the procurement process required a priority process to assume completion of those associated with key administrative initiatives. In the *FY 1988 Report on Management of the United States Government*, 15 systems have been designated "Presidential Priority Systems". In addition, 12 more systems have been designated as Future Priority Systems, which are committed to meet industry standards by 1990.

B

Issues and Objectives

Cost containment has become a major issue under the combined pressures of Congress and rising budget deficits. Competitors are encouraged to submit fixed price bids on most systems integration and I.S. upgrade projects, while satisfying other issues identified in Exhibit I-2.

EXHIBIT I-2



New acquisition, management and usage procedures have been incorporated in the Federal Information Resource Management Regulations (FIRMR). The reforms are intended to streamline the purchasing process while improving the amount of competition. A number of improvement initiatives are underway.

- GO FOR 12 is a joint agency program to reduce the acquisition process to 12 months.

- TRAIL BOSS is a proposed program for increasing the acquisition authority of selected government program managers.

- FAR (Federal Acquisition Regulations) Streamline is a new initiative to further reduce the volume of the regulations and employ conventional business terminology.

Budget Deficit Control, whether provided under the terms of the Gramm-Rudman-Hollings Act or direct Congressional action is expected to impact the rate and/or extent of I.S. modernization in the agencies.

The major departments and agencies are concerned by the rising costs of software development and the resulting elongated delivery schedules. A number of initiatives have been implemented, principally by the Defense Department, GSA and NASA.

- Software Engineering Institute, awarded to the Carnegie Mellon Institute, to investigate new productivity and documentation methods.
- Defense and NASA commitment to employ Ada as the primary language of embedded information systems, to reduce the demand for programmers for a wide variety of languages.
- GSA implemented the Office of Software Technology and initiated the Programmers Work Bench (PWB) project to enhance agency software development.

In anticipation of issuing several new standards to improve interoperability and connectivity, NBS, GSA, DCA and key civilian agencies are reviewing several initiatives, including GOSIP (Government Open System Interconnection Profile), POSIX (Proposed Official version of UNIX) and simplification of a myriad of protocols.

The Competition in Contracting Act (CICA) provided both improvements and some impediments to the information resource acquisition process:

- Created a new and accelerated protest procedure under the GSA Board of Contract Appeals.
- Created the function of Competitive Ombudsman to assure full competition wherever possible.
- Established or reaffirmed procedures for protecting small businesses from unwarranted restrictions.

Integration of voice, image, text and data interchange within a single digital system is a key objective of GSA's FTS 2000 telecommunications project in the 1990s. An all-digital system would more readily permit encryption for security reasons and more cost-effective use of fiber optic transmission methods.

Improved, user-friendly data processing resources are key objectives of most current systems projects. A primary objective is improved data base availability, with affiliated protective measures in both hardware and software that respond to end-user needs.

GAO, GSA and NBS are pressing agencies to employ off-the-shelf or readily adaptable software products for a wide range of government

EXHIBIT I-3

FEDERAL GOVERNMENT SECTOR OBJECTIVES

- Voice-Data Integration
- Improved End-User Support
- Increased Software Product Applications
- Relational Data Bases
- Departmental Information Processing
- Transparent Connectivity
- Decision Support Systems

applications that closely resemble commercial processes. Objectives include:

- Reduced software development time and cost.
- Improve maintainability of software.
- Improve transportability of applications between processors.

There is increasing pressure for installation of relational data bases, equipped with SQL, to meet the data retrieval requirements of a widening community of end-users, which may also include the public.

The emphasis on IS departmental processing is improvement of services to end users, with purchased products, improved and timely data bases, and technical support.

The ultimate objective of current federal initiatives is implementation of systems with transparent connectivity with users and other systems.

One additional objective is the implementation of interface devices between office automation equipment and centralized data bases and other files to provide decision support systems to government executives.

C

Impact of Technology

Although the federal government supported the development of new information resource technology, a number of national issues and budget constraints delayed government implementation. Five key areas still in various stages of development that are expected to impact system deployment are listed in Exhibit I-4.

EXHIBIT I-4

FEDERAL GOVERNMENT SECTOR
IMPACT OF TECHNOLOGY

- Supercomputer Improvements
- Digital Voice Systems
- Artificial Intelligence/Expert Systems
- Open System Architecture
- New Optical Memory Technology

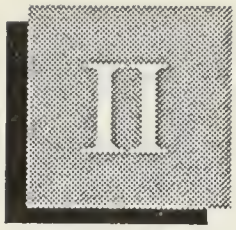
The federal government's need for and support of research on supercomputers has been given additional impetus by the race with the Japanese, the demands for SDI processing and the extended boundaries of physics and medical research. With increasing parallelism as one avenue of processing, pressures are increasing for other computers to write the required code.

New solid state developments and strides in voice recognition computers are offering new ways for entering data and encryption of voice communications for protection. A number of agencies need digital voice systems for authentication and operation in difficult environments.

Artificial intelligence, or more specifically, expert systems, have already been employed in limited applications. New approaches that use AI include software development, process monitoring and simulation.

Open system architecture, long an objective of military systems that are assembled in building block fashion, will now become the standard in non-military systems. Open systems improve the prospects of expansion and modification without requiring replacement of the basic processors.

New optical memory technology, such as CD-ROM, and large-scale laser disks support implementation of large personnel and financial systems, logistics and maintenance systems, to support a "less-paper" bureaucracy.



New Applications

II

New Applications

The sheer volume of transactions and complexity of operations within the federal government sector demands a changing focus of applications to apply new developments to a range of information service problems.

EXHIBIT II-1

FEDERAL GOVERNMENT SECTOR NEW APPLICATIONS

- EDI - Networks and Services
- Computer-Aided Acquisition and Logistic Systems (CALS)
- End-User Computer Networks
- Automated Tax Processing
- Standardized Financial, Payroll and Personnel Systems
- AI Applied to Software Development and Simulation Modeling
- Speech Processing

Key among the emerging applications in Electronic Document Interchange (EDI) which accelerates the accurate interchange of procurement, logistics, data collection and funds transactions. Since EDI uses conven-

tional data processing and telecommunications capabilities, the emphasis in the federal sector will be development of vendor-furnished networks, software and services to facilitate EDI implementation.

The CALS (Computer-Aided Acquisition and Logistics Systems) Initiative of the Defense Department and NASA is a new application of automation of logistics to accomplish several goals:

- Integrate data life-cycle elements in a source-to-use network.
- Ensure compatibility of data interchange between logistic systems.
- Automate the acquisition elements of:
  - Stock order process;
  - Shipping document generation and handling;
  - Inventory analyses;
  - Technical order (repair) system;
  - Technical manual and documentation generation on demand basis.
- Demonstrate the initial design characteristics and criteria via selected projects.
- Involve industry and government in both the implementation and utilization of the systems.

The conventional approach of developing networks for I.S. centers to serve other centers and remote users is being invented by demand. Burgeoning end-user computing based on PCs is creating demand for sophisticated LANs for interconnection between users and links to data centers for data base access and software services. The I.S. facilities must comply with these demands or be by-passed in favor of commercial data sources.

Automated tax processing applications are being developed on several fronts:

- Internal automation at the IRS Regional Centers to provide enhanced capabilities for:
  - Rapid conversion of tax forms to electronic form;
  - Online retention of several year's returns;
  - Automated analyses to select returns that need detailed auditing (rather than sampling methods);
  - Automated preparation of refund payments.

- External automation of the tax return process on two levels:
  - Electronic filing of individual returns;
  - Electronic filing of small business returns, involving more forms;
  - Electronic fund transfers for tax payment and refunds.

After succession of GAO (General Accounting Office) audits that identified increasing incompatibility and decreasing accuracy of financial, payroll and personnel systems, OMB has directed conversion or replacement by all agencies:

- Financial systems must meet a single set of standards and produce compatible products by 1992.
- Payroll systems must meet new accuracy and timeliness standards, and be compatible within military and civilian agencies by 1990.
- Personnel systems must be upgraded to meet all of the EEO and privacy protection criteria by the early 1990s.

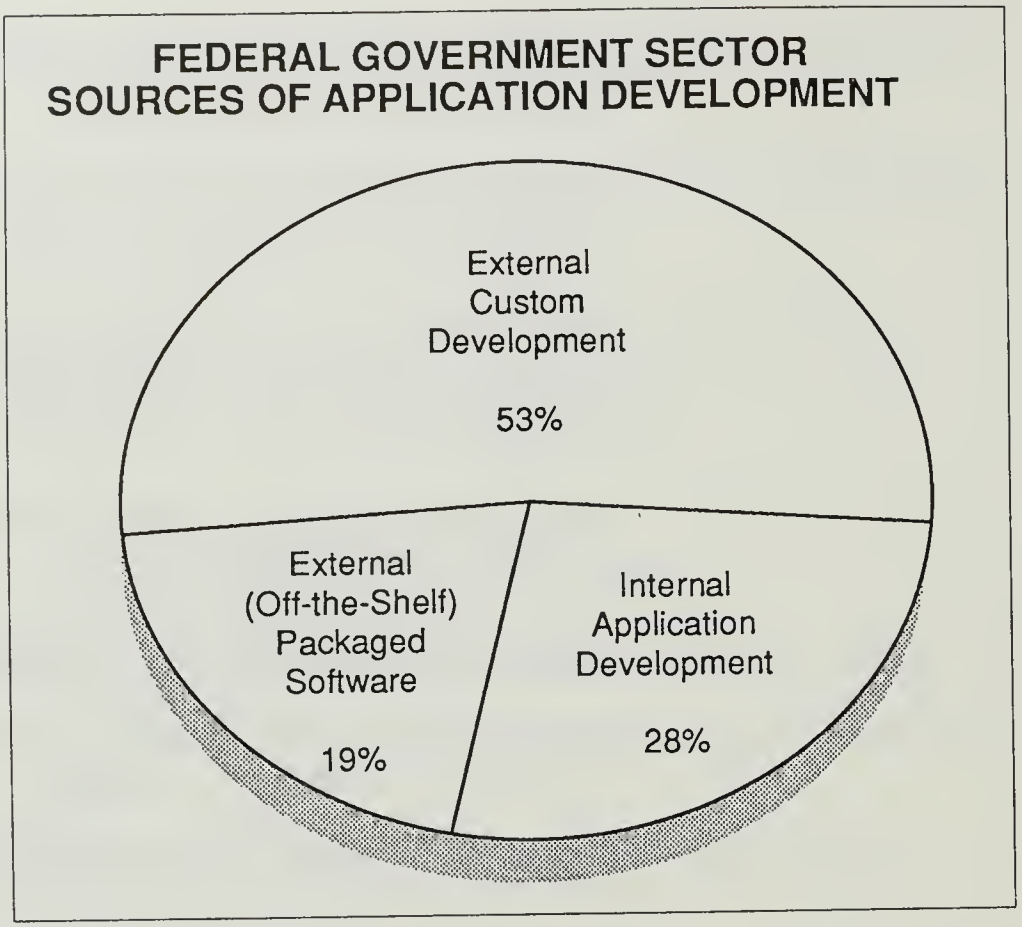
Artificial Intelligence/expert systems applications are moving to near-term implementation and availability in several areas:

- Defense has several pilot projects underway where AI can provide assistance to human control functions.
- AI is being employed to develop models for a number of applications, including the automated tax audit system, gaming for military training simulators, and automated logistics processes.
- AI is being tested for use in development of applications software, to include automated documentation generation and selection of alternatives that minimize future maintenance problems.

After several tests in cargo handling and customs identification problems, federal agencies are looking at a wide range of speech processing applications that go beyond the needs for voice encryption in security circumstances.

The federal government continues to be heavily dependent on custom development of new applications, partly based on a perceived need for government-unique solutions, and partly based on continuing dependence on a large inventory of early third-generation processors. This heavy dependence on outside development sources is illustrated in Exhibit II-2.

EXHIBIT II-2



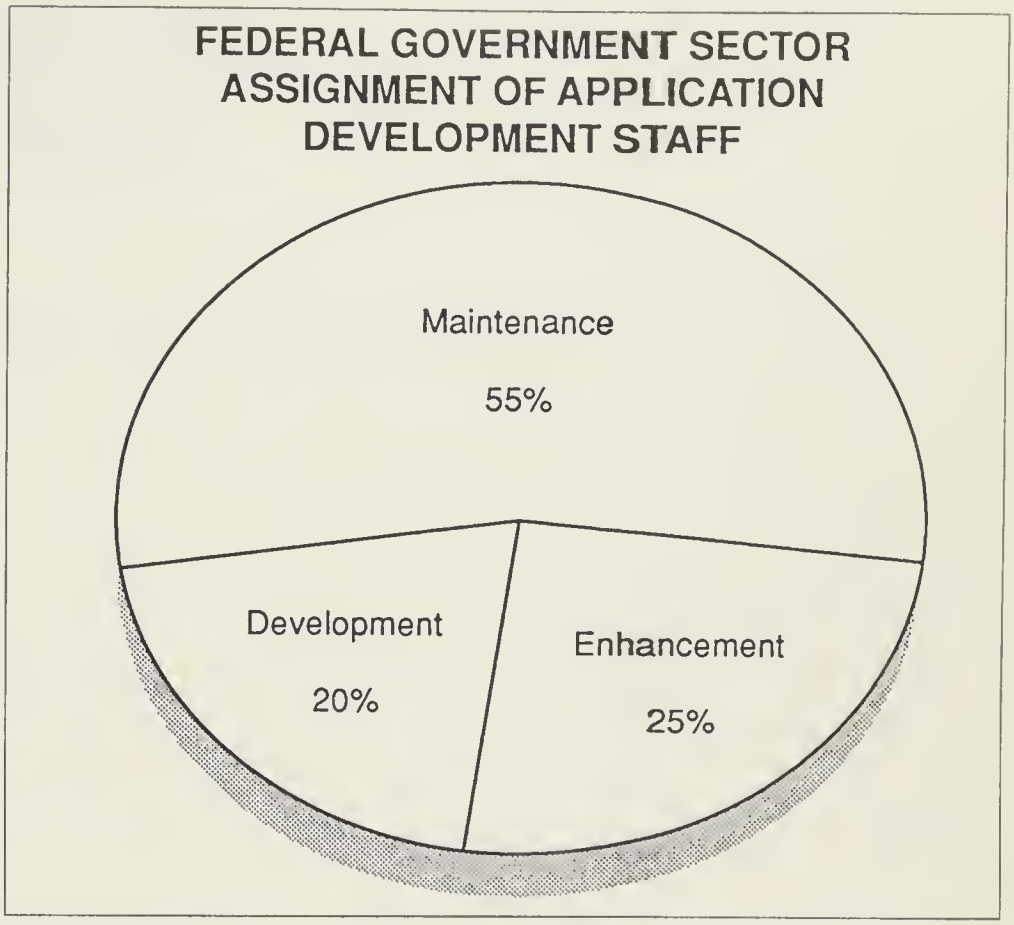
The externally developed, off-the-shelf software package source has been given a major impetus by the rapid growth of end-user personal computer usage. Packaged software has also become available for minicomputers, of which the government has a large inventory. The share of application development by this source is expected to continue to grow.

Demands on the internal (in-house) I.S. staff to maintain older but critical custom software prevents wider application to new developments by that staff. GAO and NBS surveys have demonstrated that more than 70% of the software life cycle costs are expended on maintenance and under-managed enhancements.

For now and the foreseeable future, the predominant source of major new application development will be external to the government. The majority of the development will come from professional services and software development firms. A smaller but very significant part of the development will come from universities and not-for-profit organizations, especially in AI, supercomputers, and automation applications.

Statistics regarding assignment of internal IS personnel to applications development assignments are approximations based on random interviews shown in Exhibit II-3. Excluded from the 126,574 manyears

EXHIBIT II-3

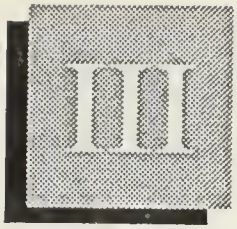


budgeted for 1987 and the 127,560 manyears for 1988 are personnel involved in data center operations, supervision, scheduling and data entry/report production functions.

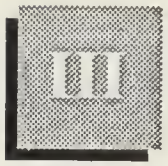
The National Bureau of Standards and General Services Administration software support studies indicated that 70-80 percent of the staff are involved in maintenance, but more recent investigations reveal that about a third of the effort is actually directed toward software enhancement. These reports noted an absence of appropriate management, including cost reporting and control procedures, that could have determined the cost benefit of replacement, rather than enhancement. Plans are being prepared whereby I.S. managers will be rewarded for making cost comparisons leading to increased software efficiencies, not currently recognized by the information resource managerial system.

The relatively small percentage of staff assigned to new applications development is crucial to the process of identifying the need for and acceptance criteria of new software and systems. Some applications are extremely sensitive to national security or protection of personal privacy, including the processing of general purpose data in secured enclaves. Internal staff are also needed for development of LTD (Live Test Demonstration) and benchmark test data that realistically reflect the most critical

requirements of new developments, without undue competitive risk to outside suppliers.



Budget Analysis



Budget Analysis

The 1987 budget of $16.9 billion represented an increase from 1.5% of the total federal budget in 1986 to 1.7%. The 1988 budget is expected to remain at 1.7%, at $17.4 billion. All of the federal I.S. budget categories have experienced strong growth in this decade, except personnel salaries and fringes. Beginning in 1986, however, with passage of the Gramm-Rudman-Hollings Act, that growth has slowed, while the personnel category has begun to grow. The budget distribution in 1987 and the projected 1988 changes are indicated in Exhibit III-1. Factors influencing growth include:

- Need to retain key I.S. personnel to operate new facilities and modernized current resources.
- Continued replacement of obsolete equipment to improve I.S. performance while reducing maintenance costs.
- Installation of higher-capacity, mass storage devices to increase availability of burgeoning data bases.
- Demand for standalone workstations and personal computers for support of military functions and civilian services.
- Emphasis on both custom and packaged software to meet interoperability, transportability and user-friendly requirements.
- Increasing demand for data communications for distributed processing, on-line data bases and service extension.

Despite the demand, some categories will decline in response to both expected and unplanned factors.

EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE FEDERAL GOVERNMENT SECTOR

BUDGET CATEGORY	1987 PERCENT OF I.S. BUDGET	1987-1988 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	22.5	3.6
Mainframe Processors	5.6	(3.1)
Minicomputers	3.7	(2.3)
Microcomputers	1.1	5.6
Mass Storage Devices	2.2	9.1
Other Hardware	9.3	(4.1)
Total Hardware	21.9	(2.9)
Data Communications	5.8	6.7
External Software	2.7	15.0
Professional Services	18.1	(1.6)
Turnkey Systems	3.9	(2.7)
Software Maintenance	2.7	(6.2)
Hardware Maintenance	6.9	(4.7)
Outside Processing Services	5.2	(1.8)
Other	10.3	2.5
Total	100.0	7.2

A number of replacement programs involving mainframe processors have been delayed, by:

- Re-evaluation of the overall replacement plans;
- Extension of the rate of implementation, to meet 1987-1988 Gramm-Rudman-Hollings cuts imposed in 1986;
- Changes or reductions in information processing needs of the agencies;

- Less demand for peripherals through increased I.S. center sharing of equipment.

- Reduction in hardware and software maintenance costs resulting from implementation of new systems.

- Less demand for outside processing services, as the result of:

  - Increasing availability of new in-house ADP resources;

  - Growing end-user computing employing personal computers and standalone workstations;

  - More competition from large federal data centers under revised OMB Circular A-76 policies.

- Response to agency budget restrictions includes some reduction of contractor operations support.

- Some reduction of investments in turnkey systems appears to be associated with indecisions about new federal language, protocol and network standards.

As of the writing of this report, the actual expenditure reductions to satisfy deficit control requirements had not been passed by Congress. I.S. is not expected to experience any severe cuts, but a number of approved programs may slip into another year. Present budget pressures have limited most non-operating obligations to replacement of high volume I.S. facilities that are becoming irreparable or increasingly expensive to operate.

The percent of agencies expecting their budgets to increase in 1988 versus those expecting a decrease from their 1987 budgets is shown in Exhibit III-2. None expected or requested unchanged budgets, for a variety of reasons.

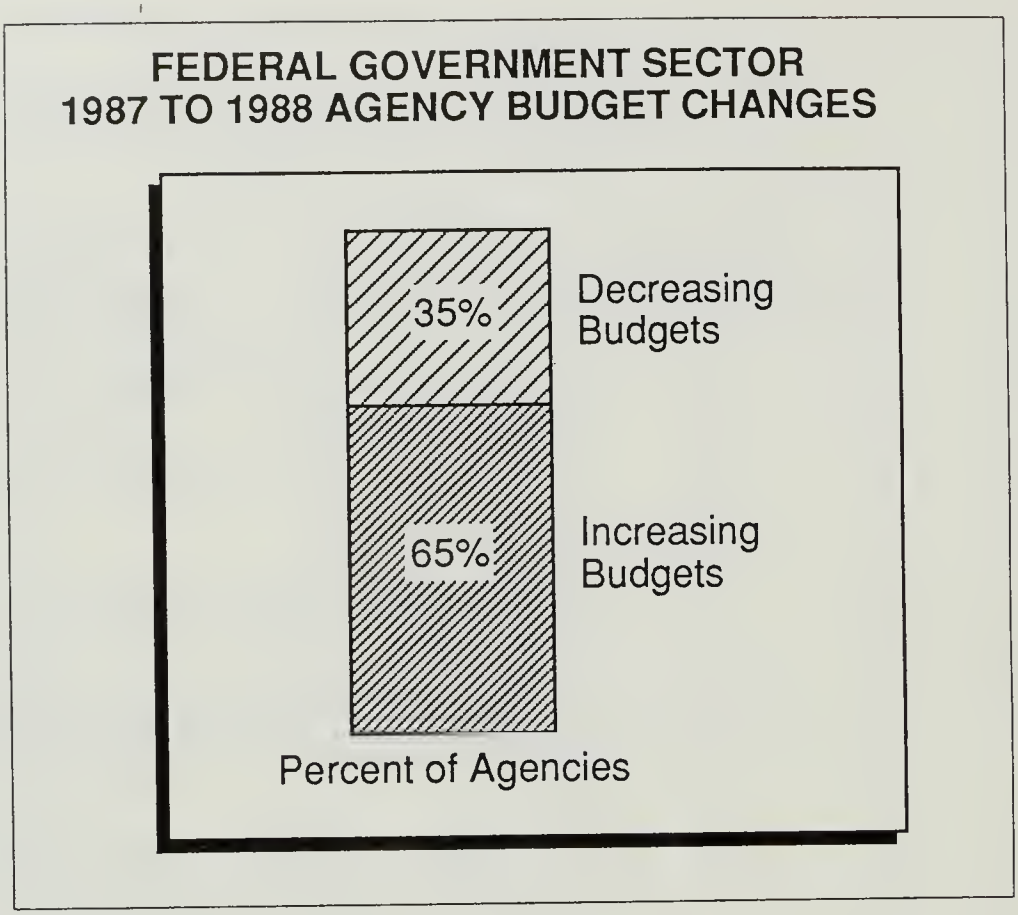
Factors that cause agencies to increase their 1988 budgets include:

- Ongoing ADPE replacement programs that have Congressional approval to proceed.

- Replacement programs being initiated that were previously delayed by budget cuts.

- Implementation of new software to replace systems that have become too expensive to maintain.

EXHIBIT III-2



- Increasing information processing demands mandated by Congress and the Administration.
- Support for improvements that directly affect revenue (tax) collection and services to the public.

Downsizing of budgets was not large for most of the agencies. Cuts were influenced by:

- Rejection of requests or directions to revise current system designs or estimates to complete.
- Completion of upgrade implementations and shift from procurement to operation and maintenance.
- Results of earlier budget reductions directed by Gramm-Rudman-Hollings or administration orders in training, telecommunications, and the use of contractor personnel.
- Expected cuts in defense spending determined as part of the administration's budget priorities.

The number of agencies experiencing budget cuts will be more evident when the federal government fiscal year 1988 budget, incorporating the joint Congress-Administration Compromise deficit control measures, becomes law. The majority of reductions are expected to occur in the commercial services sector.

About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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INFORMATION SYSTEMS PLANNING REPORT
INSURANCE SECTOR

NOVEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
INSURANCE SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
INSURANCE SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- The property/casualty segment of the insurance industry continues to face the problems caused by pricing policies of the past decade, current interest rates, and large settlements that have been awarded to claimants. This segment also faces:

  - Increased competition, including captive and self-insurers.

  - Elimination of or changes in agent relationships.

  - Setting of liability limits.

  - A push for cost reduction through automation.

- The life insurance segment has been impacted by diversification into financial areas and the resulting advent of interest-sensitive/variable life policies. This segment faces additional concerns which include the monitoring of investment rates in order to offer attractive and competitive products, a change from a product orientation to a customer orientation, and provision of information systems that will aid agents in constructing policies that fulfill individual customer needs.

- The health insurance segment is pressured by employers/customers and the federal government to contain costs while it faces increased competition from health maintenance organizations (HMOs), self-insurers (usually large corporations), and hospital or physician cooperatives. This segment continues its efforts to reduce costs through automation and to improve the efficiency of existing systems.

- The effects of the Gramm-Rudman law are not yet known. However, its implementation will impact the insurance industry.

- Exhibit I-1 summarizes the driving forces of the insurance sector.

B. ISSUES AND OBJECTIVES

- Large underwriting losses and severe price competition in the property and casualty segment have spurred cost reduction through automation. New or improved claims processing systems are actively pursued by several respondents in efforts to reduce one of the most significant cost areas in the insurance sector.

- The entry of new competition and new product lines has changed the relationship between insurance companies and independent agents. Insurance companies rely on agents to write a high-dollar volume of premiums in order to stay competitive. In turn, agents need automation to develop premiums and policies effectively and efficiently. Several insurance companies have developed or are developing agent support software or turnkey systems for their independent agents.

- The offering of interest-sensitive insurance products has placed pressure on IS to develop systems that support the marketing, administration, and processing of these complex policies.

INSURANCE
DRIVING FORCES

- Cost Containment
- New Competition
- Agent Relationship
- Interest-Sensitive Products
- New Legislation

- Respondents indicated the need to become a part of the product planning cycle. Until IS does gain a role in product planning, IS must attempt to anticipate system needs of new, undeveloped product lines.

- A related concern is system capacity. A few respondents expressed long-term (two- to five-year) needs for effective capacity planning, including the management of hardware growth and compatibility of systems.

- Personnel efficiency is another issue important to respondents.

  - In response to the push to reduce costs, some respondents are providing operations staffs with education/training classes as well as productivity tools in order to shorten application delivery schedules and to use hardware optimally.

  - Although a few respondents are adding IS personnel, other respondents are attempting to handle future growth with a stable or diminishing workforce by increasing efficiency.

- Other respondents are consolidating existing information systems and making better use of existing information for improved market planning and analysis by management.

- Exhibits I-2 and I-3 summarize the key issues and objectives identified by the respondents.

INSURANCE ISSUES

- Reduce Costs through Automation
- Provide Agent Support Systems
- Consider Systems Flexibility/Capacity
- Improve Operations Staff Efficiency
- Improve Management Effectiveness

INSURANCE OBJECTIVES

- Improve Claims Processing Systems to Reduce the Cost per Claim
- Build Infrastructure to Support Agent Systems
- Develop On-Line Systems for New Interest-Sensitive Life Policy Calculations
- Implement Upgraded or New Hardware
- Provide Education/Training and Tools for Operations Staff
- Consolidate Information Systems for Market Planning and Analysis

C. IMPACT OF NEW TECHNOLOGY

- Respondents indicated that new telecommunications technology will have a heavy impact on the IS department. Most respondents' present needs are not met with the products currently available.

  - Dissatisfaction with current products is exemplified by the complexity of PC-to-mainframe links and the ineffectiveness of local area networks.

- New technology will have a future impact on the following specific areas:

  - Communications between:

    . Home office and field sales force.

    . Remote offices/multiple locations.

    . Insurance company and its independent agents.

- Although the insurance industry was one of the first to use computer technology, it has been slow to establish data communications networks to field personnel, independent agents, and remote offices. The current low activity level in implementing telecommunications technology is due to a perception by users that existing products are unsatisfactory to meet company needs.

- The impact of end-user computing on the insurance industry is currently viewed as low. Some respondents ranked end-user computing as a strategic issue to be considered two to five years from now.

- Exhibit I-4 summarizes the areas of interest in new technology.

INSURANCE
AREAS OF NEW TECHNOLOGY INTEREST

- Telecommunications -- Improved Products For:
  - Wide Area Networks
  - Medium Area Networks
  - Local Area Networks
- End-User Computing -- Long-Term Issue

II NEW APPLICATIONS

- In response to the necessity of reducing costs per claim, insurance companies are developing new claims systems or upgrading existing systems to improve efficiency. The highest activity in application development is in the claims processing area.

- Another application with high development activity is agent support systems. With the stronger insurance company/independent agent relationships brought about by more complex products and the tight market, insurance companies, particularly the larger ones, are developing systems that address agent productivity, prospect tracking, customer history, and product tracking.

- There is moderate interest but low activity in development of customer data base systems. The insurance industry, however, is becoming more customer-oriented. This is reflected at the IS-level by an interest in systems that allow single-file access to all of a customer's policies, rather than access to the customer's policy within each product line file.

- The majority of systems development activity uses internal staff. In several cases, respondents indicated purchase of external software packages with any customization performed by internal staff.

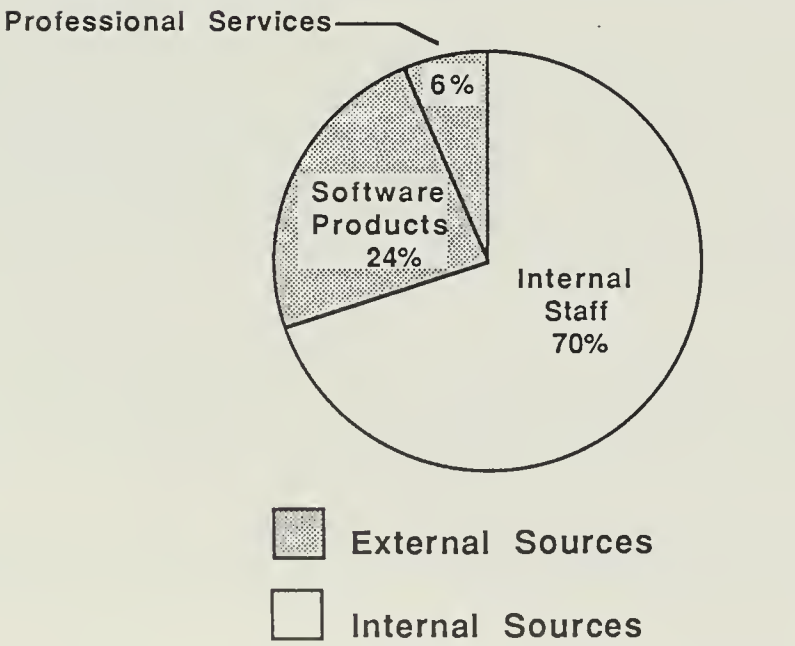
- Exhibit II-1 lists application areas in which respondents have development activity.

EXHIBIT II-1

INSURANCE
NEW APPLICATIONS

- Claims Processing
- Agent Support
- Policy Maintenance/Administration
- Casualty Rating
- Reinsurance Accounting
- Customer Data Base

Source of Development
(All New Major Applications)



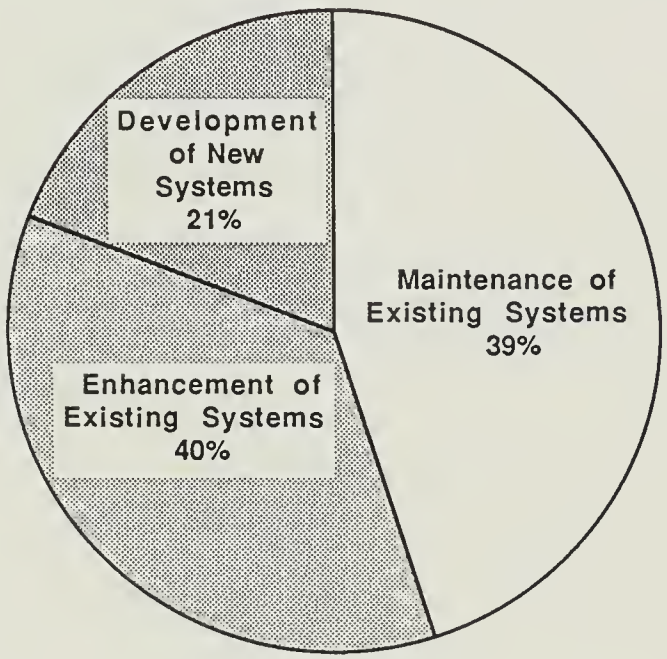
Cost Range: $20K - $7,000K

- INPUT's surveys indicate that, on average, 40% of the IS applications development staff is assigned to the enhancement of existing systems and 39% is assigned to the maintenance of existing systems. The remaining 21% is assigned to the development of new systems.

- Exhibit II-2 pictures the assignment of staff.

EXHIBIT II-2

INSURANCE
ASSIGNMENT OF APPLICATIONS DEVELOPMENT STAFF



- Comparing 1986 with 1985, the budget line for personnel expenditures has declined as a percent of the total IS budget (43.9% to 32.8%), while the total hardware budget line has increased (32.1% versus 22.8%). This reflects the industry's motivation to automate insurance functions by increasing the capacity of the hardware and anticipating the increased productivity of personnel.

- Approximately 91% of all respondents indicated that their 1987 IS budgets would increase over 1986.

  - Factors contributing to increases in the IS budgets include (in order of most frequently mentioned factors):

    . New or upgraded hardware.

    . Introduction of new products.

    . Personnel.

    . Inflation.

    . General business expansion.

  - Factors contributing to decreases in IS budgets include:

    . Purchase of hardware in previous years--capacity is sufficient.

    . Staff reductions.

III BUDGET ANALYSIS

- The insurance sector's IS department budgets are not heavily dependent on revenue or profits primarily because of the critical nature of projects to the long-term success of the company.

- Although insurance companies' IS budgets are growing at a slower rate than the previous year's, the 7.3% growth rate indicates the realization that spending now for automation will assist significantly with long-term cost reduction. Insurance companies cannot afford to lose market share or further depress profitability by deferring necessary but costly projects.

- Exhibit III-1 shows the 1986 budget distribution and projects the percentage growth of budget categories in 1987.

  - The largest budget growth areas include microcomputers and professional services.

  - The smallest budget growth areas include external software, other hardware, and mainframe processors.

  - Of the respondents that included voice communications in their IS budgets, voice communications represents 10.8% of their total IS budget.

EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE INSURANCE SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	32.8%	7.8%
Mainframe Processors	13.9%	4.5%
Minicomputers	2.2%	6.4%
Microcomputers	3.2%	20.6%
Mass Storage Devices	4.4%	6.9%
Other Hardware	8.4%	3.7%
Total Hardware	32.1%	4.1%
Data Communications	13.1%	10.0%
Voice Communications	6.6%	10.8%
Total Communications	19.7%	10.2%
Professional Services	1.2%	23.9%
Outside Processing Services	1.3%	9.1%
External Software	5.0%	2.8%
Software Maintenance	1.6%	8.3%
Hardware Maintenance	4.3%	10.0%
Other	2.0%	12.6%
Total	100%	7.3%

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INSURANCE SECTOR

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Information Systems Planning Report
Insurance Sector

INFORMATION SYSTEMS PLANNING REPORT
INSURANCE SECTOR

CONTENTS

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- The life insurance segment of the insurance industry is enjoying significant growth. Major contributing factors include:
  - Tax legislation permitting insurance companies to include life insurance-based investment vehicles in their product line.
  - The variable annuity and universal life products that allow the client to make investment decisions. Insurance companies are using this feature to initiate the transfer of a major portion of risk into the client's hands. Business is increased and risk to insurance companies is reduced.
- This segment continues to face:
  - The shift from a product to a customer focus.
  - The requirement for competitive agent support systems for proposal preparation, administration, client information, and tracking.
- The health segment of the insurance industry continues to be pressured by employers/customers to cut costs. It also faces increasing competition from

the health maintenance organizations (HMOs). In some cases, health insurers are implementing HMOs themselves.

- Additionally, new trends are causing significant change in the industry including:

  - Flexible benefit programs. No longer do employers buy packages and provide them for all employees. Today, more and more employers are providing a menu of benefits for their employees to choose from due to changing social and economic conditions; thus, the health industry must sell to the individual as well as the corporation. These changes are causing a substantial investment in information systems and procedures to support the entire product life cycle.

  - Medicare mandating fixed prices for outpatient care. Hospitals can no longer routinely bundle overhead into these charges. This is causing a review of processes and procedures for both hospitals and insurance companies.

  - Many health care providers are moving from an acute care orientation to a trauma, surgical, or accident center basis. The individual practice has completely given way to group and groupings of practices.

- The property/casualty segment of the insurance industry continues to experience problems due to pricing policies of the last decade, interest rate fluctuations, and large settlements awarded to claimants. This segment also faces:

  - Increased competition, including captive and self-insurers.

  - Elimination of and/or significant changes in the agent relationships.

  - Setting of liability limits.

- Cost reduction through automation of paperwork, consolidation of backbone systems, and replacement of older technologies and fragmented systems that do not meet functional or capacity needs.

- Extreme public relations problems due to increased premiums and refusals to insure.

- Exhibit I-1 summarizes the driving forces in the insurance industry sector.

B. INFORMATION SYSTEMS ISSUES AND OBJECTIVES

- Decreased profitability is the central issue for insurance firms due to a number of factors, including:

  - High administrative costs due to paperwork and/or very old systems.

  - Large underwriting losses.

  - Severe price competition.

  - Tax reform.

  - Interest-sensitive investments and continued lower interest rates.

  - Agent demand for on-line support systems.

  - Non-profitable insurance products that were based on technology rather than an ROI analysis.

- With the changing and very complex insurance products, newer technologies, and the information systems (IS) function at the core of the daily execution of

EXHIBIT I-1

INSURANCE
DRIVING FORCES

- Productivity and Cost Reduction
- Tax Reform
- Risk, Profitability, and Business Management
- Agent Relationship
- Flexible Benefit Programs
- Government Regulation of Costs

business, management is requiring new tools and procedures to effectively manage an accelerating rate of change and ensure that the IS dollar is allocated and used most profitably to meet the corporate objectives. To this end there is a focus on providing IS tools for:

- Product and business planning.
- Risk analysis and management.
- Minimizing the amount of administrative information stored and reducing administrative processes.
- Financial analysis.
- End-user access to client and product information.
- Single data bases (distributed eventually).
- PCs and/or other access/computational devices targetted for or in most end-users' hands.

- In the life sector, the 1986 tax reform has resulted in the investment insurance vehicle. Concurrently, the ability for a purchaser of insurance to personally direct the investment of his funds is both a draw for new business and a major profit risk reducer for the insurance companies. This has resulted in major IS support work.

- In life and health sectors, flexible benefit plans are changing the ways insurance is provided through employers. As individuals select custom benefit programs, both the sales and administrative processes must be revamped, including the related IS systems.

- IS staffing remains a major issue with retention of key personnel a serious concern. Several of the executives surveyed cited that candidates feel the insurance business just is not interesting to most computer professionals. Industry and technology changes cited above may reverse this trend in the next few years.

- Exhibits I-2 and I-3 summarize the key issues and objectives as identified by the respondents.

C. IMPACT OF NEW TECHNOLOGY

- Technologies that allow insurance companies to connect end-user terminals to central sites are key to current and future success. This area of computing is already fully integrated in a few very successful corporations using available technology and strict controls. All respondents agreed, however, that serious technology problems will remain, such as:

  - Lack of capability to easily integrate mixed vendors into LANs.

  - Problems of providing and controlling software release levels from the central site. Sending thousands of floppies without control of installation and use is confusing at best. Further, as larger regional centers are set up there is no satisfactory technology available to download the many megabytes of operating systems, applications, and data in a timely, controlled, and cost-effective manner.

  - Unattended operation of office or regional installations remains a user objective but not a technical reality.

- Distributed (or apparently so) data bases are not yet viable on a large operational scale. End-user data access is becoming increasingly critical for all sectors of the insurance industry.

INSURANCE
IS ISSUES

- Productivity Non-Profitability
- Competitive Agent Support
- Financial Risk on Investments
- Market Share
- Management Effectiveness
- Administrative Paperwork Bottlenecks

EXHIBIT I-3

INSURANCE
IS OBJECTIVES

- Provide Business Management of IS
- Develop Risk Reducing Products
- Expand Market and Client Base
- Improve Operational Efficiency and Customer Support

- Artificial intelligence and its applications were mentioned by all respondents. Recent developments from the artificial intelligence (AI) community are very interesting, but these solutions will not be available in the operational or tactical timeframes desired by most respondents. Applications of major interest include:

  - Risk and asset management.

  - Support for the field agent in customizing a policy to meet specific financial and subjective objectives of the client.

  - Medical review analysis as well as diagnostic services.

- A strong requirement was voiced by more than half the respondents for volume image processing of typed and, especially, handwritten documents. This remains a strategic technology but is not expected to be practically applicable in the near term.

- Reduction of paperwork remains a major issue. One medium-sized firm stated it prints two miles of paper every hour; another prints 100 pages per partner per day. This has to be brought under control from management, resource, and business perspectives.

- Information technology to assist the IS and corporate executives in business, product, asset, risk, and profit planning and management is available in bits and pieces but is still in the formative stages of development. Furthermore, due to the increased variety and complexity of financial instruments, fluctuating interest rates, and economic factors, there is an accelerating demand for sophisticated IS technology to manage portfolios and profitability.

- Exhibit I-4 summarizes the areas of new technology which are of high interest to the insurance industry.

EXHIBIT I-4

INSURANCE
AREAS OF NEW TECHNOLOGY INTEREST

- Data Bases - Distributed and/or Relational
- Networks - Integrated Mixed Vendor
- Artifical Intelligence - Risk Analysis
- Image Processing - Machine and Handwritten
- IS Integrated Business Management Tools
- Unattended Operation

II NEW APPLICATIONS

- Major applications development continues in agent support systems for proposal work, flexible benefit sales, client tracking, and administration.

- Procedures and systems applications are being developed to provide distribution and release level control of software that is downloaded to regional, end-user, and agent sites. Site support will include from 10 to 15,000 locations.

- Some relational and distributed data bases are in place, albeit mostly in pilot mode. Every account we talked with does not believe the management, technology, and control problems are satisfactorily solved. Continued development activity in the face of inadequate technical solutions testifies to the importance of these applications to the insurance industry.

- New systems are being developed to support new insurance products that allow the purchaser to manage his investment.

- AI programs and expert systems are in the initial stages of development for application in a number of areas including:

  - Financial investment management.

  - Premium calculations.

- Loss limits.

- Medical review.

- New product ventures and business ROI planning.

- Single premium products are being developed.

- There is continued development of new and completely reworked administration and claims systems for all segments of the industry. Old systems often cannot support capacity demands, nor do they provide the services and functions required in today's insurance world. These system replacements are unavoidable, essential to meeting the IS needs of the end users, and a current activity cited by all respondents.

- Exhibit II-1 summarizes major new applications as identified by the respondents. Exhibit II-2 summarizes sources of new application products, and Exhibit II-3 summarizes assignment of development staff.

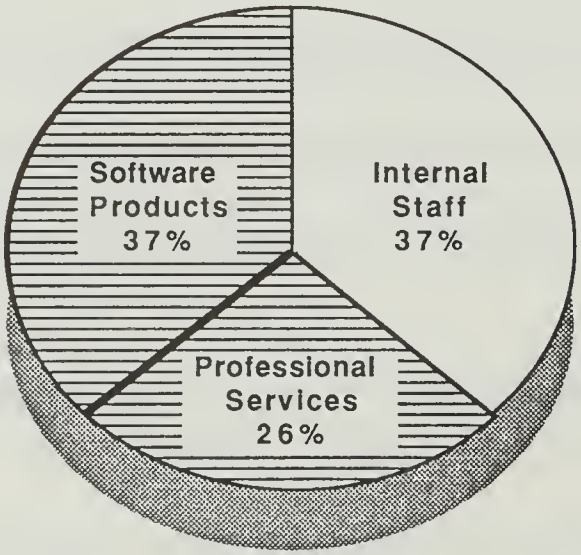
INPUT®

INSURANCE
NEW APPLICATIONS

- End-User Administration and Data Access
- Software Distribution and Release Control
- Risk Reducing and Business Management Tools
- Tax Reform and Customer-Managed Based Products
- Policy Administration and Claims Processing
- Distributed Data Bases with Central Control

INPUT®

INSURANCE
SOURCE OF DEVELOPMENT
ALL NEW MAJOR APPLICATIONS

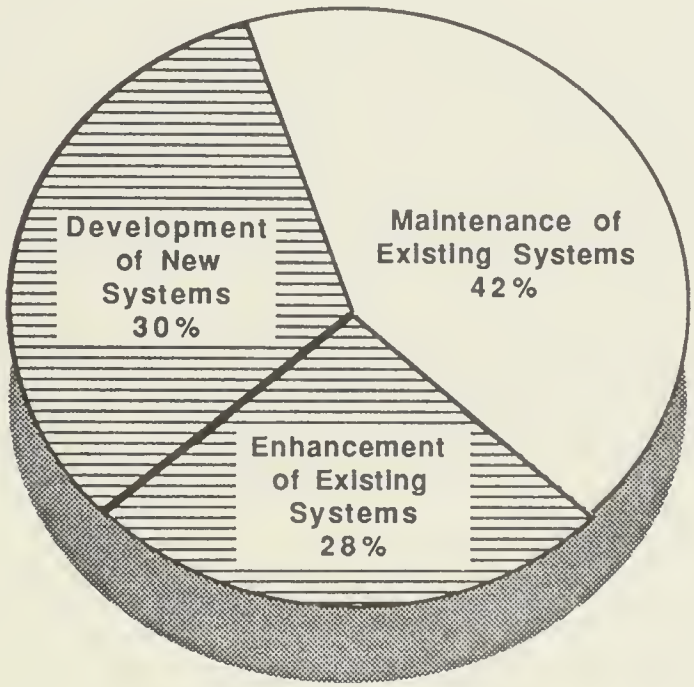


External Sources

Internal Sources

Cost Range: $60K - $13,000K

INSURANCE
ASSIGNMENT OF APPLICATIONS DEVELOPMENT STAFF



U-BRA-IN

III BUDGET ANALYSIS

- The insurance sector's IS department operating budgets are not primarily dependent on revenue or profits because of the critical nature of IS to the long-term success of the company. In growing companies, new products and applications are routinely justified using business case (ROI) analysis. Stabilized and downsizing companies continue to justify budget decisions using "keeping up with technology" as the primary decision criteria.

- Insurance companies' IS budgets are growing, overall, at a faster rate than last year, with 20% in the 50-100% range due to excellent growth. Another 10% are stabilized or actively downsizing, and the rest are growing at 5-15% a year. The average is 9.6%.

- Key factors impacting the budget are:

  - Continued investment in automation of paperwork for the long-term cost savings.

  - Investment in new insurance vehicles such as the single premium whole life, variable annuities, and universal life.

  - Rework or complete redevelopment of insurance administration systems to take advantage of new IS technologies and to replace worn out systems.

- Business management systems both for justification and tracking.

- Disaster planning.

- Exhibit III-1 shows the 1987 budget distribution and projects the 1988 budget growth for the industry's IS costs.

  - The largest budget growth areas include personnel, communications, and professional services reflecting the extensive applications development and support activities.

  - The smallest growth area is in overall hardware expenditures. This reflects adequate capacities and good price/performance from the primary vendors.

  - Personnel and hardware costs have stayed reasonably stable in the 32+% range and software costs have increased by more than 20%. In the personnel area, 1987 did not show a large percent increase, but hiring is ramping up, and while some companies are stabilized or downsizing, 20% expect a 1988 growth of at least 50%.

- Eighty percent of respondents indicated that their budgets would increase over 1986. Factors influencing both upward and downward trends include:

  - Increase:

    . Staffing.

    . Reworked or new administrative systems.

    . New product development.

    . Business expansion.

INSURANCE
1987 BUDGET DISTRIBUTION AND 1987/1988 CHANGES IN THE INSURANCE SECTOR

BUDGET CATEGORY	1987 PERCENT OF I.S. BUDGET	1987 - 1988 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	34.1	15.3
Mainframe Processors	14.3	1.3
Minicomputers	1.8	12.6
Microcomputers	5.0	15.1
Mass Storage Devices	5.1	3.0
Other Hardware	5.9	.6
Total Hardware	32.1	2.0
Data Communications	14.1	10.0
Voice Communications	4.2	11.1
Total Communications	18.3	10.3
Professional Services	2.4	2.3
Outside Processing Services	1.1	5.1
External Software	5.5	10.0
Software Maintenance	1.7	7.0
Hardware Maintenance	4.8	10.0
Other	--	9.6
Total	100%	9.6%

U-BRA-IN

About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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Information Systems Planning Report

Medical Sector

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INFORMATION SYSTEMS PLANNING REPORT

MEDICAL SECTOR

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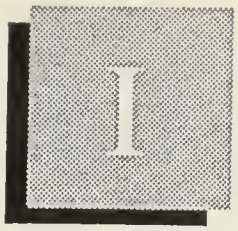
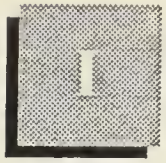
Exhibits



Major Issues



Major Issues

The underlying business pressures that have been facing the medical industry for the past few years continue in 1987 and 1988. Increased focus on costs, quality of care, and competition within the health care area all continue to drive major changes in the management processes of this sector.

- These changes have created numerous and difficult challenges for the Information Systems departments as they strive to bring automation to all areas of health care, including many areas that have not been previously automated.

- INPUT has observed that, in 1987, the medical industry has moved from talking of strategic planning and marketing to actual implementation of new and expanded services, many of which require new and creative information management solutions.

While IS remains under pressure to contain costs, it is also receiving the same high priority afforded it in other industries. IS is being recognized as and being asked to perform like a strategic contributor. For example:

- IS is often viewed as the only means to help hospital management deal with the federal government's DRG-based payments program. Payments programs are an area in which success by the hospital industry has brought additional and more stringent federal reporting requirements.

- IS is being drawn into and becoming a significant factor in the implementation of a cohesive marketing strategy.

- IS is a focal point for the evolution to cost-and-profit based management processes.

A Driving Forces

The dominant driving force in the medical and health care industry remains cost of delivery. Increasing costs in the face of growing competition and public and governmental pressure has drastically changed the focus of medical industry management and with it their information systems organizations. Being able to respond to changing government regulations and service offerings while maintaining the cost-effective delivery of services is a constant challenge for IS management.

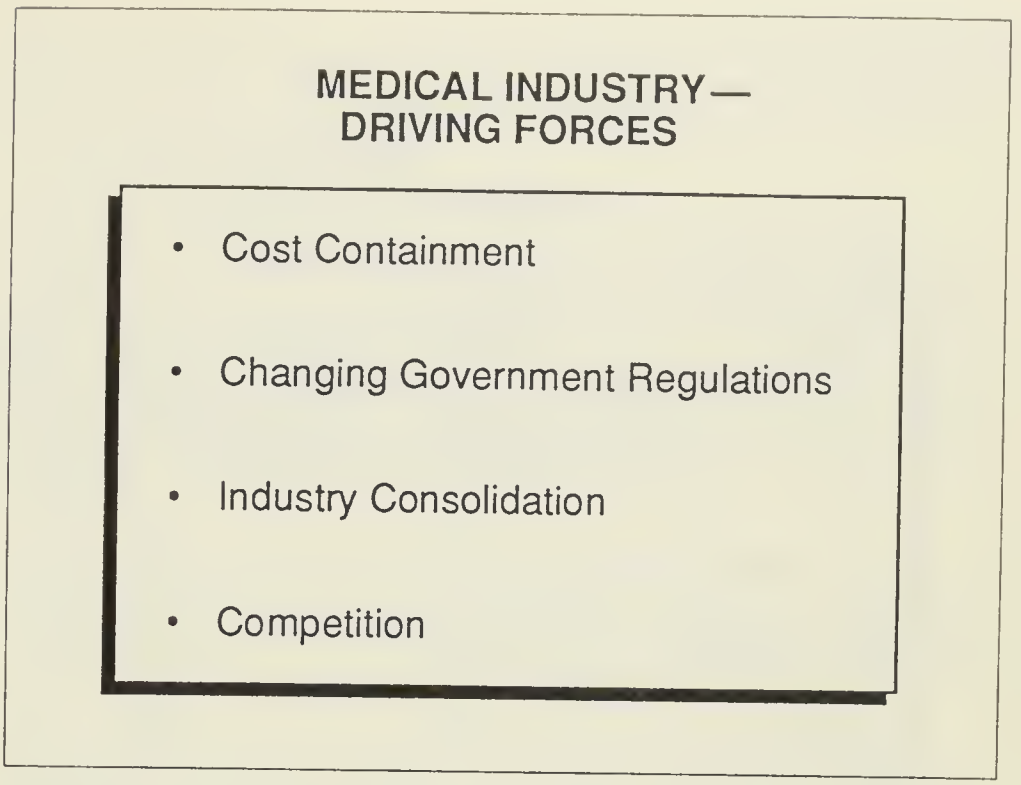
Government regulations continue to be a major force in determining the priorities of medical sector IS programs. The accounting and reporting systems required to meet regulatory needs are large, complex, and undergoing frequent change. Because of this they are a major draw on IS resources. There is a need for new applications and for ongoing maintenance and enhancement.

Mergers and acquisitions of acute-care hospitals, specialized clinics, nursing homes, and laboratories are bringing a new dimension to the IS challenge. In many instances IS is finding a need to centralize operations and standardize application software to gain the necessary efficiencies and cost reductions.

Competition and the related marketing of services remains a strong influence. The midsized hospital must strive to differentiate itself to maintain its position, while the large institution must meet its competitors head-on with quality, low-cost care. The large hospital is using specialized services such as helicopter and emergency trauma service to build relationships with small city hospitals as a means to underwrite the cost of the service and improve the flow of patients to specialized services.

These driving forces are summarized in Exhibit I-1.

EXHIBIT I-1



B

Issues and Objectives

Exhibit I-2 summarizes the primary challenges for IS management in the medical sector. These challenges are not significantly changed from last year's report. The changes to note are:

- The need to support end-user computing needs has been dropped, not because the challenge has gone away, but because it is an objective for IS in all industries and one that is seeing measurable progress.

- The objective of automating laboratory systems has been added. This is a need driven by government regulation and cost containment. Laboratory automation has remained an area relatively unaddressed by IS in the past. Lab automation is also a major issue in the pharmaceutical industry, where tracking the testing of new drugs is essential.

The principle IS issue and challenge is still to organize the information of the medical institution to meet cost-effective management and external reporting requirements. Meeting this challenge is driving IS management to further integrate patient, accounting, and operating (purchasing and inventory) systems.

EXHIBIT I-2

MEDICAL ISSUES AND OBJECTIVES

Issue \ Objective	Cost Containment	Implement On-Line Accounting for Regulatory Reporting	Improve Confidentiality of Patient Information	Attract Physicians with Technology Innovation	Implement Integrated Patient Care Systems	Implement Automated Laboratory Systems
Cost Pressure	High	Does Not Apply	Medium	Does Not Apply	Medium	Medium
More-Complex Accounting Systems	Medium	Does Not Apply	High	Does Not Apply	Medium	Low
Centralized Patient Information	Medium	High	Medium	Medium	Medium	Medium
Provide Automated Tools to Assist/Attract Physicians	Does Not Apply	Medium	Medium	High	Medium	Medium
Automated Manual Processes to Improve Productivity	Medium	Does Not Apply	Low	Low	High	High
Regulatory Reporting Compliance	Medium	Low	Medium	Low	Medium	Medium

The availability of software packages to address the DRG-based accounting requirements is helping. However, hospitals must decide whether to buy the solution or continue to develop an in-house, perhaps more integrated solution.

The focus on patient tracking and administrative systems continues as a key objective. These systems can contribute to the overall cost-effectiveness of the organization and simplify the interfaces with outsiders such as the insurance industry and the regulatory agencies. The underlying issues are confidentiality of patient information and the interfaces with supporting patient systems, such as the pharmacy and laboratory administrative systems.

There remain within this sector, in particular within hospital management, some processes that are still administered manually. These manual processes continue to offer IS an opportunity to contribute. In 1987 one area receiving much attention is laboratory testing.

The regulatory agencies continue to place significant pressure on the administrator and IS. To satisfy the reporting requirements in a timely fashion, end users are performing a growing part of the reporting process and are demanding significant support.

C

Impact of New Technology

Exhibit I-3 lists areas of computing technology currently having, or likely to have a direct impact on the medical sector.

End-user computing developed relatively recently within the medical sector. Now supported by organized and expanding support programs, end-user computing continues to be a focal point .

Distributed and departmental systems are a common and key element of hospital IS strategies.

- Many departments have existing processors used for scientific applications and in turn provide an opportunity for connection to office automation and electronic mail networks.

- End users are becoming involved with the local processing capability and, as in other industries, beginning to develop their own applications. This trend, which will develop over the next three years, will lead to a control problem for IS management.

EXHIBIT I-3

MEDICAL INDUSTRY AREAS OF INTEREST - NEW TECHNOLOGY

- End-User Computing
- Networking with Outside Organizations
- Scientific Computing
- Medical Technology
- Distributed and Departmental Systems
- LANs
- Relational Data Base Management Systems
- Voice/Data - Integration

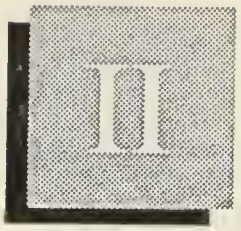
There is a growing interest in connecting information systems with outside organizations, including affiliated supporting clinics, private-physician offices, claims processors, and others. This new interest will create new telecommunications challenges for IS, while providing additional opportunities to contribute to cost-effectiveness.

Hospitals continue to have a high and pervasive interest in new medical technology. Today much of that technology is information systems related, thus offering IS an opportunity to contribute directly to the quality of health care. Senior management needs to draw IS management into this area to assure the compatibility of the medical-related technology and to gain the insights of IS.

Relational data base technology is gaining interest in the medical sector; however, less that 25% of those surveyed were planning to implement this technology in the near term. This situation was true for small, medium, and large hospitals.

LAN technology has a high level of interest in this sector, perhaps due to the existence of many professional users and departmental processors. However, the lack of standards is delaying progress. IS will need to take a proactive position to move this technology forward.

The merging of voice and data communications remains a low priority (less than 10% of respondents). A principle reason is that many medical-sector organizations are either in a single location or within a small radius.



New Applications

II

New Applications

A Application Areas

The focus of application development programs within this industry is in the areas listed in Exhibit II-1.

EXHIBIT II-1

MEDICAL SECTOR
PRIORITY APPLICATION AREAS
1987

- Accounting/Payment Systems
- Marketing Systems
- Patient Care Systems

1. Accounting/Payment Systems

Accounting remains the major application area in the medical field.

- Accounting systems must be tailored to meet the DRG reporting and payment requirements imposed by the federal government. Although the requirement for these systems became effective in October, 1986,

the lack of third-party software until recently has hampered the rate of installation.

- The goal of improving payment systems and the communication between payment sources (insurance companies and governmental agencies) is generating interest in Electronic Document Interchange (EDI) technology.

- INPUT noted a number of sites converting from Motorola/Four Phase Systems to DEC- and IBM-based integrated financial systems due to the age of the former systems and concern about their long-term viability.

2. Marketing Systems

Marketing is becoming the medical industry buzzword and is the area with the greatest unmet information needs. Medical organizations are now forced to develop and apply marketing techniques to more effectively compete. Access to demographic, utilization, and profit margin (by type of service) information has become essential.

- Hospitals are trying to better understand the demographics of their patient base and want to learn how to better serve the physicians who refer patients as well as physicians on staff. Application software that correlates demographic information with patient profiles, physician data, and facility utilization is an area of new focus. However, up-to-date accounting software must often be installed first because the data required for today's marketing systems is provided from these operating systems.

- Marketing information is also important to blood banks and specialized clinics where services are now aggressively marketed to affiliated hospitals and physicians. Understanding and "marketing" to the limited stock of blood donors is also an area of importance. Blood banks are also investigating automated testing and inventory-tracking systems to reduce costs and better manage their fragile product.

3. Patient Care Systems

Patient care systems continue to play an important role and demand a significant portion of IS development resources. This has been an area of opportunity for third-party software vendors, but seems to remain a priority of the in-house development staff. Rightly or wrongly the orientation to patient information tracking seems to vary significantly across the industry, making it difficult to purchase a system.

4. Other Application Areas

Other areas of priority include pharmacy, radiology, and materials management, including a growing use of personal-computer-based production systems in laboratories, in supply rooms, and on the hospital floor to track supplies and patient care.

A final factor in the application area is the move toward mergers and acquisitions. This move is causing a trend towards centralization of information processing to gain integration of accounting processes and access to economies of scale in processing.

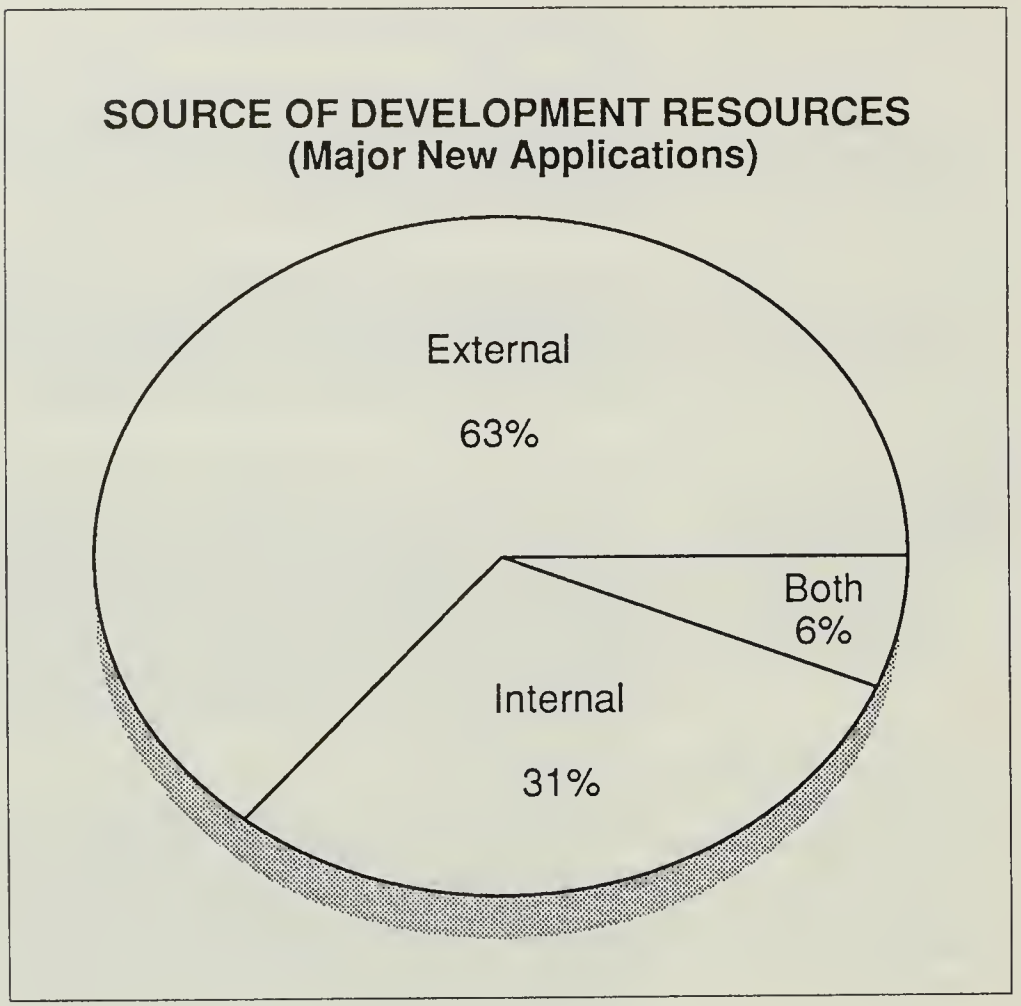
B

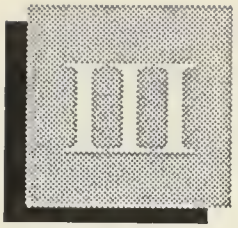
Development Resource Allocation

In 1987 nearly half all of large medical organizations began to move from custom development to the purchase of third-party software. These choices are dictated by changing economies of scale, the true cost of software enhancements and maintenance, the aging of existing systems, and the recent availability of more complete and integrated application software. These new systems are being developed by larger, financially stable vendors, whereas in the past third-party suppliers were smaller and less dependable.

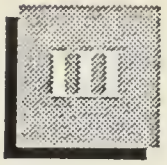
The emphasis on External Development Resources reflected in Exhibit II-2 has always been significant. Historically, due to the smaller size of health care industry IS functions and the specialized nature of many of the applications, there has been a dependence on outside development companies. Many of these firms are now moving to provide more-complete package solutions (versus customized solutions). The trend is projected to continue.

EXHIBIT II-2





Budget Analysis



Budget Analysis

Exhibit III-1 shows the distribution of IS budgets for those organizations interviewed, including the projected change by budget category in 1988 over 1987. The forecasted changes are modest in all categories.

IS budgets for medical organizations (including hospitals, physician practices, blood banks, and independent laboratories) are expected to grow by a modest 1.2% in 1988 over 1987. Cost-containment continues to pressure the IS budget in spite of the conflicting pressure for additional systems.

Planned expenditures in hardware exceed those expected in software and services. Hardware expenditures are rising because installed CPUs are at capacity and new, larger integrated applications are demanding more processing power and storage.

Within the hardware budget, the expenditures for microcomputers and mainframes are expected to grow faster than those for minicomputers. Consolidation among hospitals is one force affecting the growth in mainframe installations. When two or more medium-sized hospitals merge, two minicomputers are replaced by a mainframe to gain economies of personnel and consolidation of applications and data bases.

The 10.3% budget allocation to External Software supports the comments earlier about the use of outside developers and package software. The typical allocation in other industries is about 6%.

EXHIBIT III-1

1987 BUDGET DISTRIBUTION AND 1987/1988 CHANGES IN THE MEDICAL SECTOR

BUDGET CATEGORY	1987 PERCENT OF I.S. BUDGET	1987-1988 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	39.6	3.2
Mainframe Processors	7.7	2.9
Minicomputers	5.6	1.0
Microcomputers	2.5	3.6
Mass Storage Devices	3.4	2.7
Other Hardware	7.9	(1.5)
Total Hardware	27.1	1.3
Data Communications	8.3	2.1
External Software	10.3	3.4
Professional Services	0.9	0.9
Turnkey Systems	2.7	0.4
Software Maintenance	1.5	1.3
Hardware Maintenance	5.4	(2.8)
Outside Processing Services	0.1	0.0
Other	4.1	(2.2)
Total Software and Services	33.3	0.9
Grand Total	100	1.2

Exhibit III-2 shows the magnitudes and rates of budget change among the respondents.

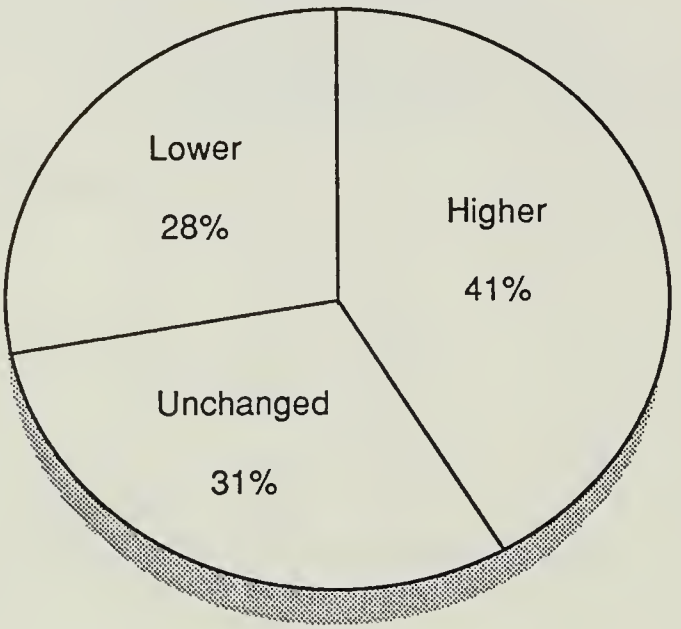
- The percentage of IS budgets projected to be higher in 1988 is only 41% compared to 79% in 1987's projection. This decline can be attributed to continued cost containment programs and to a focus on implementation versus launching major new programs.

- Of budgets that are growing, 57% are growing at a lower rate than last year's projection. Again this slower growth is a result of emphasizing the focus on costs.

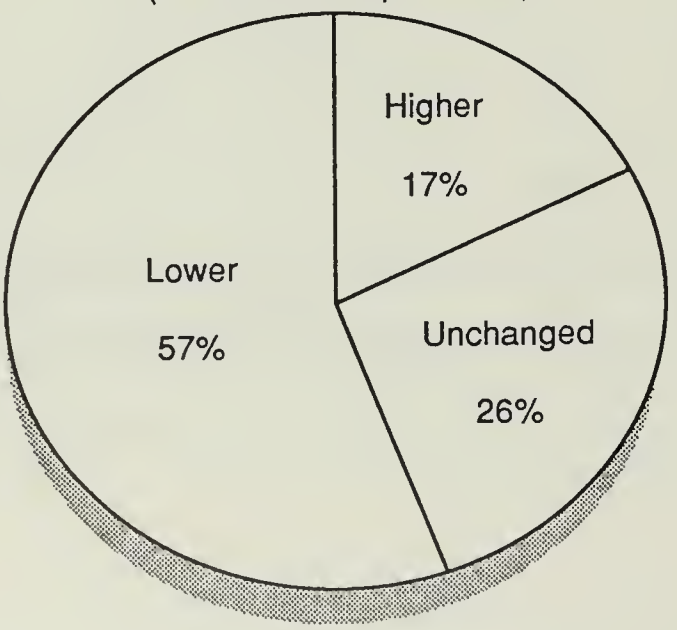
EXHIBIT III-2

MEDICAL SECTOR
BUDGET CHANGE ACTIVITY

Comparison of 1988 and 1987 IS Budgets
(Percent of Respondents)



Comparison of Changes in Growth Rates,
1988 - 1987
(Percent of Respondents)



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INFORMATION SYSTEMS PLANNING REPORT
MEDICAL SECTOR

DECEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
MEDICAL SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
MEDICAL SECTOR

EXHIBITS

I MAJOR ISSUES

- The medical and health care industry sectors have experienced massive changes over the past three to five years. Most of these changes have created equally difficult changes for Information Systems (IS) departments to respond to. The challenges to IS and to smaller organizations implementing automated systems for the first time are no longer simply automation or data processing based, they are now challenges to the core of the business, specifically centered on the institution's ability to compete for patients and for physicians.

- This is further complicated for IS management since the industry has cost pressures from all angles. Thus, IS is squeezed by the pressure to automate to cut costs on one hand and the current pressure to reduce costs, period, on the other. INPUT found a further compounding problem for IS management: a lack of confidence by senior management that IS could accomplish what was required, as well as doubts on the part of senior management as to the benefit or value of IS. This attitude was more prevalent in the smaller institutions than in the large ones.

- These issues and others are analyzed and discussed below.

A. DRIVING FORCES

- The dominant driving force in the medical and health care industry sector is cost. Increasing costs have changed the entire business environment and the pressures to contain costs, in response to both legislation and to market dynamics, are changing the way organizations operate and the way IS supports the organization. As shown in Exhibit I-1, this is one of the driving factors.

- Government regulations from the various regulatory agencies are significant factors in determining the information systems needed for operation. The accounting and reporting systems needed for reporting and reimbursement are large and complex, placing significant demand on IS and ranging from selecting new software to reprogramming old systems to meet the current requirements.

- Another driving force is competition within the industry. Hospitals and other health care organizations are, more than ever, competing for patients and for physicians. From an IS perspective, IS could be the determining competitive factor. For example, if a physician has a choice of using two institutions and one has a system that will allow retrieval of patient records, that institution will have a distinct advantage over the institution that would require bringing patient records from the office.

- This competitive thrust has also spawned increasing pressure on productivity at all levels. For IS this challenge could mean an enhanced role within the organization. However, IS must rise to the challenge and uncover ways to identify, design, and develop productivity improvement systems for all areas of the operation. IS must not react to the productivity pressure by retreating into narrow areas like programmer productivity which, although important, will be of little benefit.

EXHIBIT I-1

MEDICAL
DRIVING FORCES

- Cost Containment
- Government Regulations
- Changing Reimbursement Mechanisms
- Industry Competition
- Improving Productivity

B. ISSUES AND OBJECTIVES

- Exhibit I-2 summarizes the issues and objectives for IS management. The priority for IS organizations reflects the level of priority for the organizations' objectives relative to the issues. For example, the cost pressure issue results in a high-priority objective to contain cost. Additionally, the objective to implement on-line accounting systems is justified primarily to satisfy the regulatory requirements for more complex accounting systems. However, there is, at best, a medium priority objective for the accounting systems to address cost pressures, in this case to ensure receivables are processed and collected expeditiously.

- Nearly all the respondents felt a major objective is meeting budgetary constraints intended to contain costs.

- More complex and complete accounting systems that support DRG and other requirements are stated objectives. The issues surrounding this objective are the apparent lack of application software available from vendors. This further complicates the situation for IS because these systems are needed now.

- Development of ongoing enhancements to patient care systems continues to be a key objective for IS organizations. These systems contribute to the cost effectiveness and competitiveness for the organization. Issues cited regarding patient care systems are confidentiality of patient information and the need for multiple interfaces between patient systems and the pharmacy or the laboratories.

- One area in which IS can demonstrate productivity improvements is that of automating manual processes.

EXHIBIT I-2

MEDICAL
ISSUES AND OBJECTIVES

	Cost Containment	Implement On-Line Accounting for Regulatory Reporting	Improve Confidentiality of Patient Information	Attract Physicians With Technology Innovation	Implement Integrated Patient Care Systems	Support End User Needs
Cost Pressure	High	Does Not Apply	Medium	Does Not Apply	Medium	Does Not Apply
More Complex Accounting Systems	Medium	Does Not Apply	High	Does Not Apply	Medium	Low
Centralized Patient Information	Medium	High	Medium	Medium	Medium	Medium
Provide Automated Tools to Assist/ Attract Physicians	Does Not Apply	Medium	Medium	High	Medium	Medium
Automated Manual Processes to Improve Productivity	Medium	Does Not Apply	Low	Low	High	Medium
Regulatory Reporting Compliance	Medium	Low	Medium	Low	Medium	High

- The regulatory issues are placing a great strain on administrators and on IS. In order to satisfy the reporting requirements in a timely manner, the end users must be supported so they can more directly interpret the regulations into reporting documents for the compliance agencies.

- In summary, the challenges facing IS organizations are to organize the patient information more effectively to satisfy the regulatory and cost issues and to improve the level of integration of this data with the accounting and payment systems.

C. MANAGEMENT PERCEPTION AND ORGANIZATIONAL ISSUES

- Most respondents' management are unaware of the benefits that IS can provide. They perceive IS as solely a cost, primarily because of the late entry of most of these institutions to automation of their nonmedical functions.

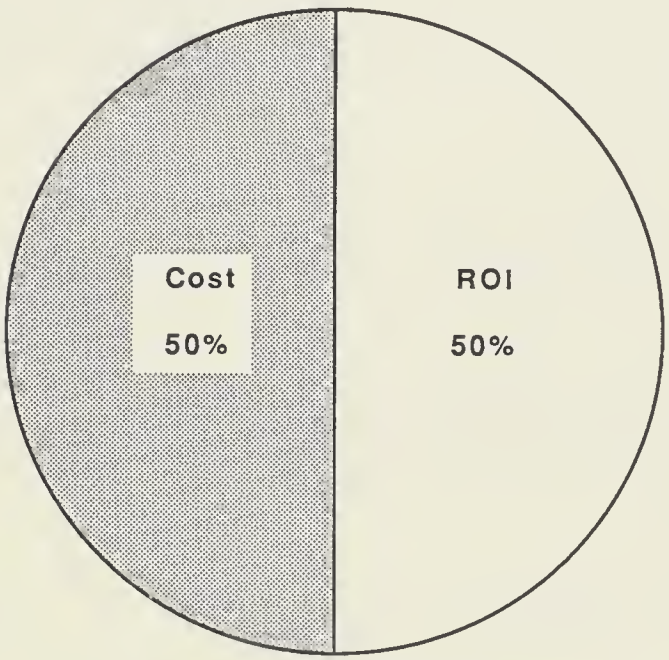
- Respondents measure their performance by performing cost/benefit analyses on major projects and comparing budget expenditures to similar institutions' IS departments. None of the respondents believed that these measurements convinced management that IS is of strategic importance to the institution. Exhibit I-3 shows the measurement techniques used by the respondents.

- The IS departments in the medical sector have become more proactive to user needs. Previously, IS was totally reactive to user demands and poorly funded to meet the information systems needs of the organization. Respondents believe that in the next two years their role will become more consultative and they will provide more end-user access to authorized computer-based information.

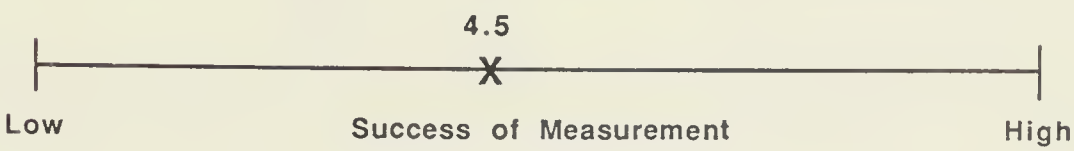
- IS has become part of the corporate planning process in many institutions. It is the first indication that IS' role and status is increasing.

EXHIBIT I-3

MEDICAL
I.S. MEASUREMENT TO MANAGEMENT



Percent of Responses



- The respondents believe IS can be used to improve the institution's competitive position, primarily by providing new, technology-based tools for physicians.

- Exhibit I-4 shows that IS is highly centralized in this sector. Corporate IS controls over 80% of the information expenditures. In 1987, respondents project that there will be a slight shift in IS funding from corporate IS to end users, primarily for microcomputers and end-user systems that are part of the end-user budget.

D. IMPACT OF TECHNOLOGY

- End-user computing has reduced the workload in many respondent institutions. In most cases, however, end-user computing support has existed for only one year.

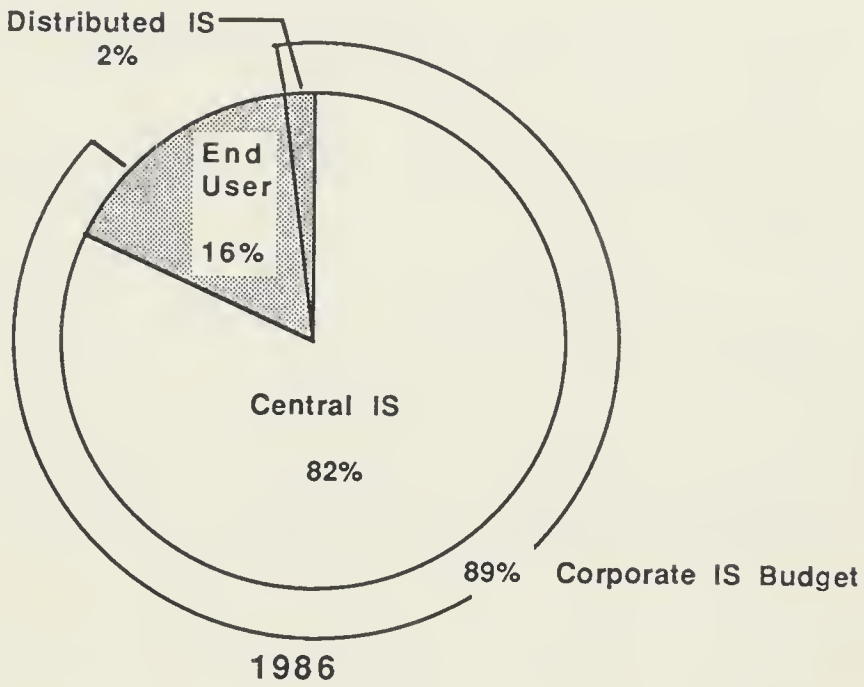
- Departmental processors have a high impact on the medical sector's IS departments. Many hospital departments have their own processors to run scientific applications which, in turn, have the greatest potential for linking with corporate information systems to provide local office automation and administrative support.

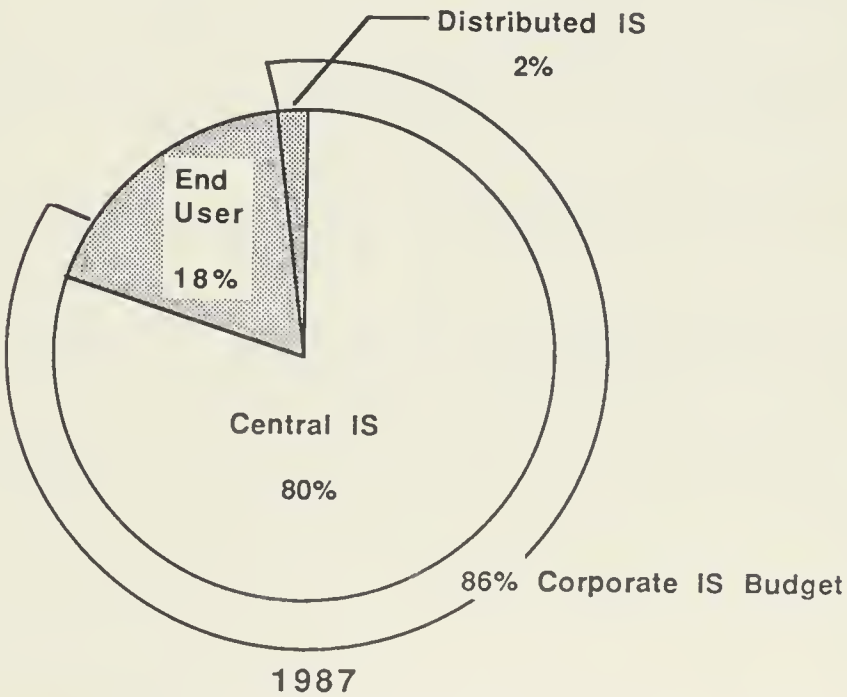
  - Some respondents cited the need for interfaces outside the hospital; for example, the need for a link to the physician's office that would allow the doctor to schedule patients or transfer medical records.

  - Hospitals continue to be more interested in new technology for medicine than for information systems. This is a challenge for IS.

EXHIBIT I-4

MEDICAL
DISTRIBUTION OF CORPORATE COMPUTING EXPENSES





Percent of Corporate and Company-wide IS Budgets

- Distributed systems development should also have a high impact on this sector. The availability of departmental processors provides the opportunity to develop local systems that can be used by other units. Coordinating and controlling these efforts is a major management challenge. Most respondents are beginning to plan for distributed systems development; however, implementation of this concept is at least three years away.

- Very few institutions in the medical sector are planning to use relational data bases.

- Merging voice and data is being considered by some respondents, but is a low priority.

- There is a high demand for LANs in this sector. Networks must be established linking corporate and departmental systems. Implementation has been delayed due to a lack of LAN standards.

- Exhibit I-5 summarizes the impact of the above technological issues on IS for the medical and health care sector.

- Additionally, there are indications of the increasing application of existing technology. Among examples cited were:

  - Systems for forecasting cost and supporting cost control programs.

  - Systems that provide more detailed data that, in turn, can be used to justify higher billings.

- INPUT does not expect this sector to be a leader in adopting technology.

EXHIBIT I-5

MEDICAL
IMPACT OF TECHNOLOGY

	IMPACT	COMMENTS
End-User Computing	Low/ Medium	Potential to reduce IS workload. Most just beginning to support end users.
Departmental Processing	Medium/ High	Many departments have their own processors - strategic need to integrate, support, and optimize benefits.
Distributed Systems Development	High	Heavy DDP environment with specialized computing needs.
Relational Data Bases	Low	Low activity.
Voice/Data Integration	Low	Not an immediate priority.
LANs	Medium/ High	Lack of standards is delaying implementation, but the DDP environment requires a well-planned LAN strategy.

E. END-USER COMPUTING

- End-user computing has great potential in this sector. The user community is well versed in the capabilities of computing. Departmental processing is being planned, as is the integration of departmental processors with corporate mainframes.

- End-user support is just beginning in this sector. IS is doing some end-user training through the information center. The emphasis on training is underpinned by the fact that nearly all respondents reported increasing their budgets for training. Typically, respondent IS organizations are training the trainers in the end-user organization.

- Exhibit I-6 summarizes IS' role in microcomputer support.

  - IS establishes guidelines for microcomputer acquisition.

  - The respondent IS departments do very little micro systems development, acting primarily in an advisory capacity.

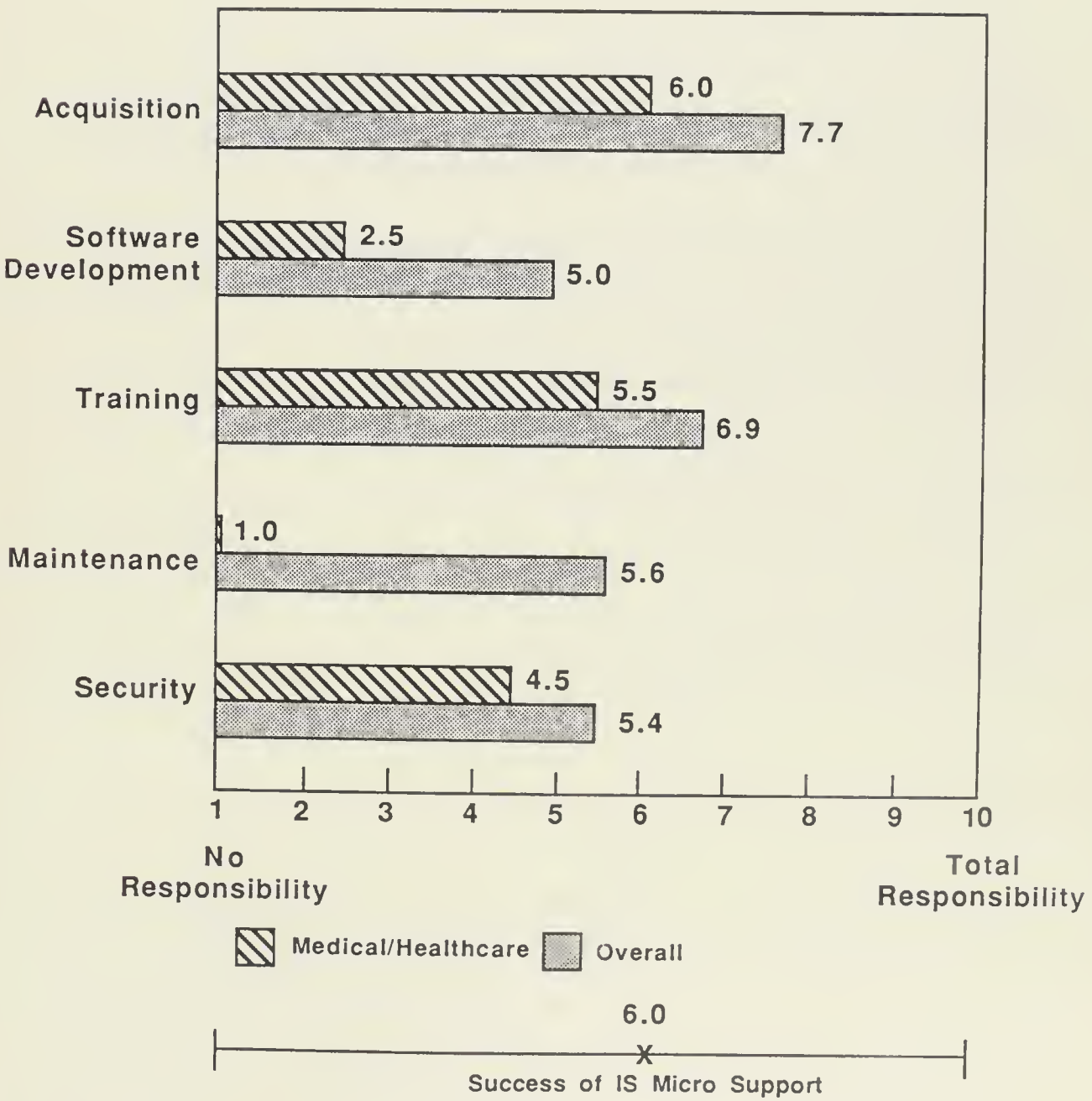
  - IS primarily trains the trainers in the end-user departments.

  - IS takes no role in microcomputer maintenance in the respondent organizations.

  - IS establishes security standards for the institution but takes no role in enforcement.

  - Although microcomputer support is just beginning, respondents believe they are providing adequate microcomputer support.

MEDICAL
I.S. ROLE IN MICROCOMPUTER SUPPORT



II NEW APPLICATIONS

- The major new applications identified by respondents centered on building a patient information data base and enhancing payment-related systems (e.g., billing, claims, and finance and accounting).

- Contrary to other sectors, the medical and health care sector primarily uses external resources for development since most patient information and payment systems are complex packages. As shown in Exhibit II-1, most institutions interviewed have relatively small development staffs and rely on purchased software packages for major applictaions.

- Exhibit II-1 also lists the most important applications identified by the respondents.

- Most of the new applications planned for 1987 fall within the broad application systems cited above and include:

  - Admissions.

  - Transfer/discharge.

  - Financial planning and forecasting.

  - Patient accounting.

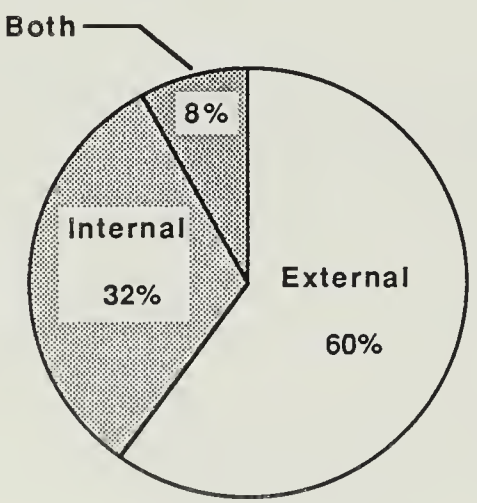
EXHIBIT II-1

MEDICAL
NEW APPLICATIONS IN 1986

Most Important Applications

- Patient Care Systems
- Accounting Systems
- Decision Support Systems
- Payment Systems

Source of Development
(All Major New Applications)



Percent of Responses

Cost Range: $20K - $1,500K

III BUDGET ANALYSIS

- The medical and health care sector's IS budgets grew slightly slower than IS budgets in general in 1986 and are projected to grow at a slightly slower rate in 1987. The mix of the expenditures has shifted. For example, some of the upward pressure is a result of organizations planning fairly large increases in their training budgets.

- Although there is an interest in end-user computing and a recognition of the important role microcomputers can play in this sector, the planned expenditures have leveled out after several years of high growth.

- The increasing budget allocation for education and training is part of the professional services budget category which is also budgeted to grow at a greater rate than recent years.

- The leading budget categories in terms of growth from 1986 to 1987 are personnel, external software, and hardware maintenance.

  - Exhibit III-1 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

  - Exhibit III-2 compares this sector's IS growth in 1986 and projected growth in 1987 to the growth rates of IS budgets in general.

EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE MEDICAL SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	38.2%	7.5%
Mainframe Processors	7.9%	3.1%
Minicomputers	5.5%	3.0%
Microcomputers	2.6%	6.5%
Mass Storage Devices	3.3%	4.8%
Other Hardware	8.8%	1.0%
Total Hardware	28.1%	3.0%
Data Communications	8.1%	7.3%
External Software	9.2%	6.5%
Professional Services	.4%	8.0%
Turnkey Systems	2.9%	0.0%
Software Maintenance	1.0%	5.2%
Hardware Maintenance	5.8%	7.0%
Outside Processing Services	0.1%	2.1%
Other	5.2%	7.0%
Total	100.0%	5.7%

- Specific accounting, e.g., general ledger, accounts receivable.
- Order entry.
- Patient scheduling and modeling.
- Outpatient abstracting.
- Budgeting and budget planning.

- Additionally, several other new applications are planned, including:
  - Nursing schedules.
  - Nursing specialties/training.
  - Materials management.
  - Pharmacy.
  - Radiology inventory control.
  - Dietary system.

- As evidence of the concern regarding having the systems to support the business, one respondent reported they were developing a complete new integrated system for the hospital.

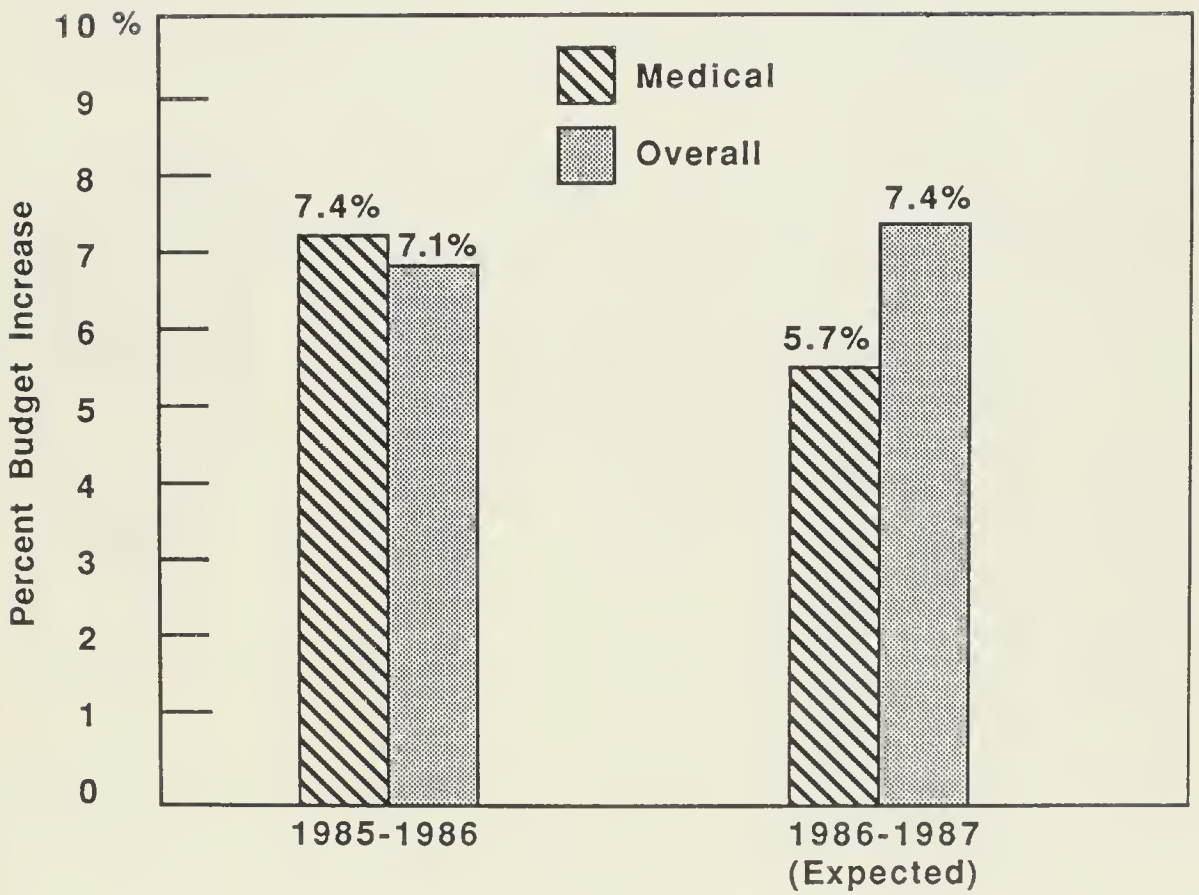
- While hospitals are increasing their expenditures for the purchase of application packages, they are still planning substantial development activities particularly for more complex systems.

- Respondents cited that vendors do not offer comprehensive patient management sytems necessitating them to build their own.

- Systems are being purchased to meet the minimum requirements for regulatory reporting and other requirements, but users are not satisfied with these systems and many expect to develop their own.

EXHIBIT III-2

MEDICAL
I.S. BUDGET GROWTH



- Although the data is not conclusive, it appears the size of the institution plays a role in budget growth. The very large institutions are providing substantial increases to IS. The medium to large are managing on relatively flat budgets, and the small organizations, responding from sheer necessity, are budgeting IS at slightly increased levels.

- The budget pressure also appears to be contributing to a rift between IS and management. More respondents mentioned "lack of management support" as a factor than in recent years. Given the competitive environment, IS should expect that vendors approaching senior management directly will get a more receptive ear than in the past.

- Nearly 80% of respondents project their IS budgets will increase in 1987, but most believe the budget will grow at a lower rate than 1986 (see Exhibit III-3).

  - Factors contributing to increases in the IS budget include (in order of most frequently mentioned factors):

    . Personnel expense.

    . Hardware.

    . Regulatory requirements.

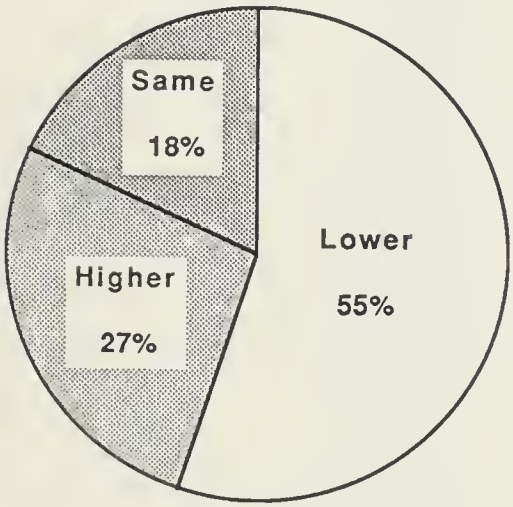
  - Personnel expense has shifted from previous years as a contributing factor to being the dominant factor contributing to increases in IS budgets.

  - The main factor contributing to decreasing the IS budget is management pressure to reduce costs. There are wide variations regarding how organizations achieve budget reductions.

EXHIBIT III-3

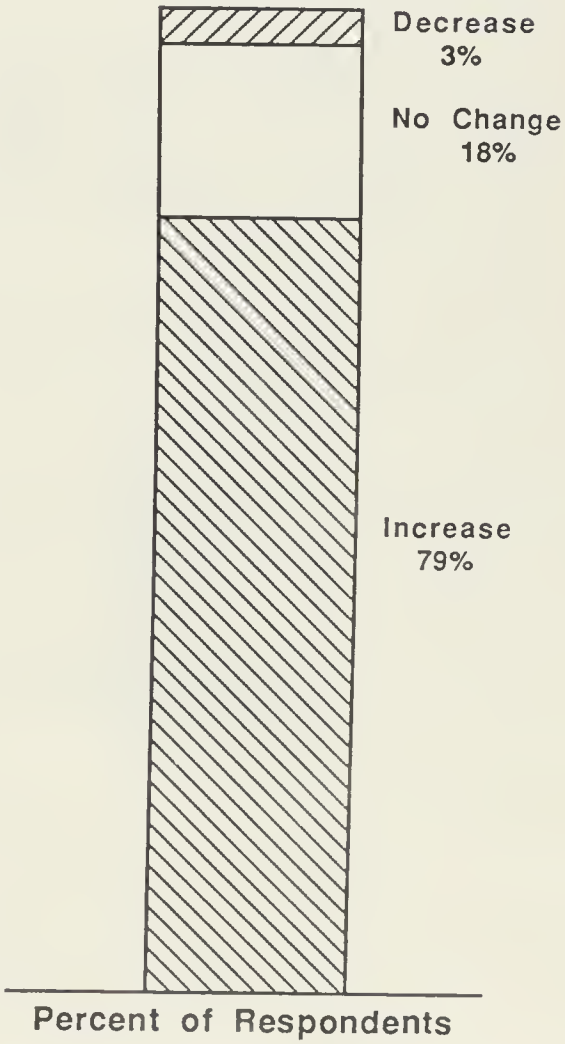
MEDICAL
MOST BUDGETS ARE INCREASING AT A LOWER RATE

1987 Budget Growth
versus
1986 Budget Growth



Percent of Respondents

1987 Budget
versus
1986 Budget



Percent of Respondents

- The medical and health care sector's IS budgets continue to be more dependent on the institution's revenue and profit than are IS budgets in general. This also continues to create barriers regarding the implementation of new technology.

- As shown in Exhibit III-4, the majority of the budget responsibility is at the corporate IS level.

  - Seventy percent of the respondents have the total IS budget and only 30% have allocated any budgets to the end user.

  - Nearly 99% of the total IS budget dollars are under control of corporate IS, with only 2% actually being distributed.

- Additional analysis of IS budgets reveals the following:

  - The very large users are planning major hardware upgrades as evidenced by substantial increases in their hardware maintenance budgets.

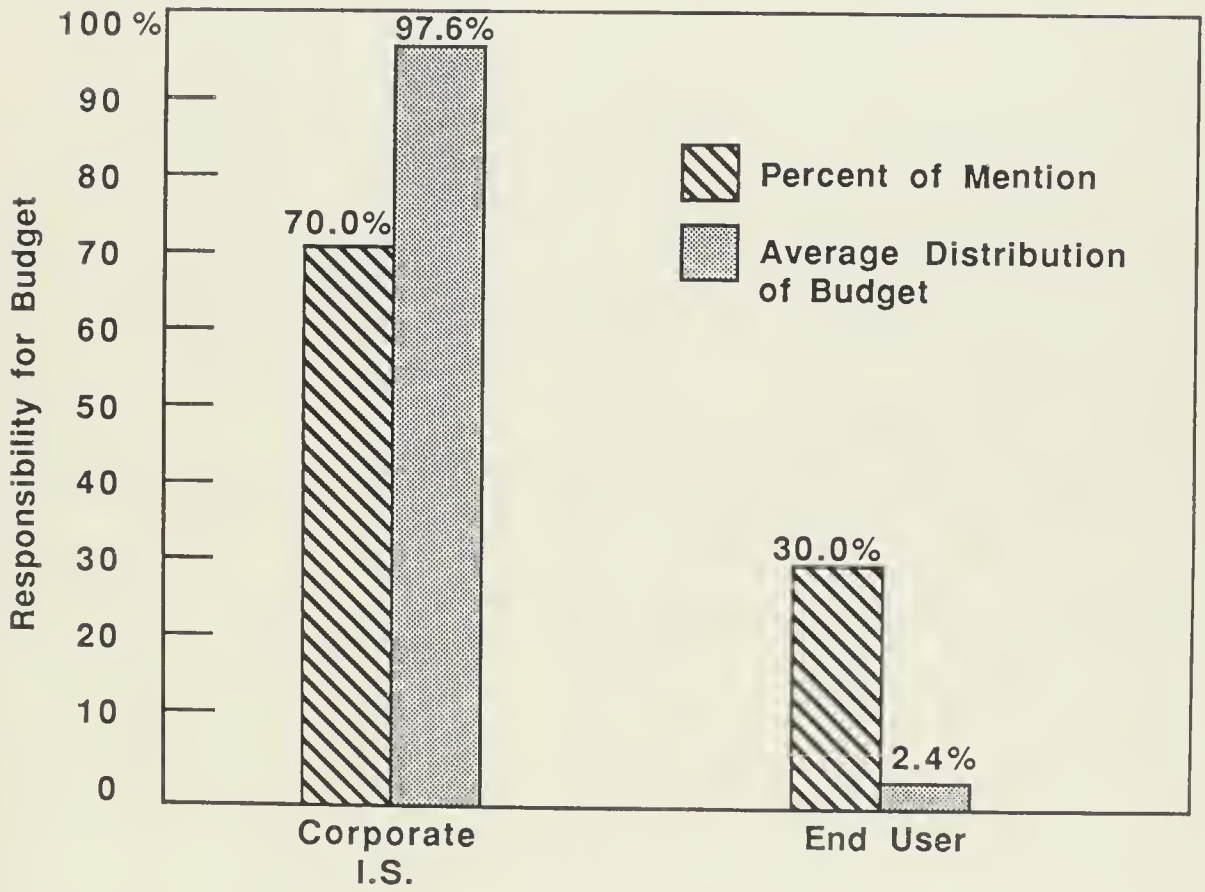
  - Increased software maintenance budgets for many IS organizations also is a signal of increasing expenditures for packaged software.

  - Increased budgets for data communications are substantial when planned. Most IS departments are budgeting for flat levels for voice communications.

- The distribution of the internal applications development staff shows that 32% of the resource is dedicated to developing new systems while 68% is for enhancement and maintenance, equally divided between the two. The range of this distribution shows wide fluctuations between these three major categories. For example, in some cases maintenance accounted for 60-75% of the budget for the applications development staff.

EXHIBIT III-4

MEDICAL
PRIMARY BUDGET RESPONSIBILITY IS AT CORPORATE LEVEL



IV UNFULFILLED NEEDS

- The major need identified is for a comprehensive patient management system. Financial cost/cost forecasting was also mentioned as a need that IS would like to see vendors satisfy.

- Several respondents also indicated a need for better laboratory testing systems. Many indicated the belief that artifical intelligence could benefit these systems in some way.

- Discussion regarding the direction of IS in this sector reveals some additional insights for what the industry would like to see:

  - Wireless terminals to preclude the cost and difficulty of "networking" a facility.

  - Understandable standards for patient care.

  - Small departmental systems (want to get system operating quickly and easier to justify).

  - Far better program development tools.

- The information systems needs within the medical/health sector will continue to be dynamic and will continue to be difficult to satisfy, at least for the next two years.

Information
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Information Systems Planning Report

Process
Manufacturing
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PROCESS MANUFACTURING SECTOR

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Process Manufacturing Sector

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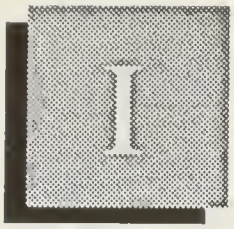


Major Issues

I

Major Issues

A

Driving Forces

Managing changing growth patterns is one of the key challenges for the process manufacturing segment. Depending on the specific company, challenges include:

- Serious downsizing due to foreign competition, mergers, government controls, and general economic conditions. Twenty percent of the respondents are in a downsizing situation.
- Stabilization with companies maintaining a fixed expense line. This causes better cost control and more productive use of technology.
- Wild and almost uncontrolled growth exists in some high technology process businesses. These must manage an exploding demand for IS resources and protect the confidentiality of proprietary processes.

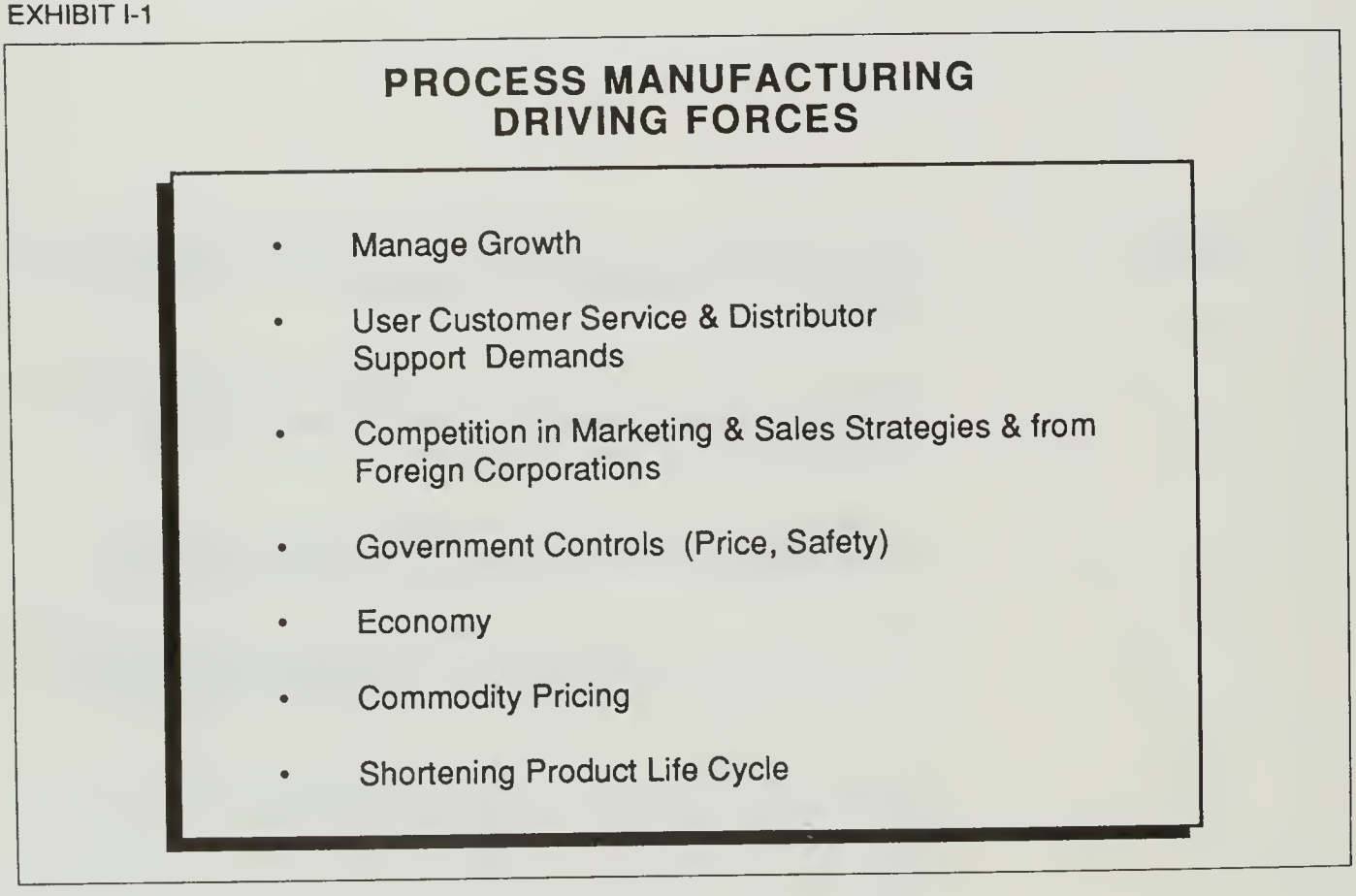
Strong competition is occurring in process industries as some companies use computer tools to gain a competitive edge in hitherto unorthodox areas such as pricing and advertising. A few companies are being very innovative in this area, some are reverse engineering their competition's methods, and some are ignoring it all and hoping it will go away. Notably, these last are among the ones in the more serious economic trouble. Other factors influencing the process manufacturing sector include:

- Many process products have become commodity items over time and are subject to new competition from both domestic and foreign sources.
- Customers and end users are making their demands felt in the areas of service and support. On-line access is becoming standard and considered, if not a necessity, at least a strong differentiation factor.

- The product development cycle is shortening noticeably. Firms can simulate new processes prior to developing a prototype. Proposals and progress can be evaluated faster and more reliably by using new IS and other technology-based products. The elimination of paperwork through EDI also significantly contributes to the shortening of the development cycle.

Exhibit I-1 summarizes the driving forces for the process manufacturing industry.

EXHIBIT I-1



B

Information Systems Issues and Objectives

Paperwork, its timeliness, volume, and accuracy, continues to be a major issue for the process industry. Electronic Document Interchange (EDI) was mentioned by all except one respondent and is being taken very seriously as the answer to this growing problem. Many solutions and approaches are being studied, piloted, and put into production. All feature a corporate center and distributed users at various levels. PROFs enjoys a narrow lead among the larger users for handling electronic mail but no one vendor or system has yet made available a system that is a "winner" in the EDI sweepstakes.

Most established process companies already have in place business applications of all types (accounts payable, inventory, general ledger, etc.) that are so old that they no longer meet the functional or availability requirements of the corporation. Most respondents indicated that these are in some stage of complete replacement. This is usually done with a vendor's package that is customized (if necessary) to meet current business requirements. Dealing with the remaining older systems is a large headache due to continual operational problems and the difficulty of making modifications to meet changing user needs.

Newer process manufacturing companies are looking to outside DATA PROCESSING service bureaus to provide business administration processing. These firms concentrate on using their in-house IS technology to maintain a competitive edge in product technologies, development and support systems, supplier and distributor interfaces, and marketing and sales support systems. These companies view IS as having a "make it or break it" impact on their business. Significantly, those of the older process industry firms that are continuing to grow are taking this same position.

Integrity and confidentiality of data has been and remains a major issue. In companies where the process is the business, a plethora of PCs, LANs, and (historically) short-term and not very loyal IS staffers have created a major problem to be addressed. Solutions are just starting to be identified and controls put in place. Unorthodox, unusual, and substantial efforts are being made to integrate IS people into being long-term corporate team players rather than mercenaries. These are not small challenges and reflect only the tip of a large iceberg of potential risk.

As IS continues to be more and more critical to business success in the process industry, and with the rapidly expanding and diverse population of hardware and software, IS must standardize, control, and manage the information resource. This is being done via:

- Centralized purchasing of IS hardware and software.
- Centralized distribution and control of all software systems and tools (including PCs).
- Implementation of central (or at least controlled) corporate data bases.

Today's automated/computerized manufacturing application software tools were primarily designed and targeted for the discrete manufacturing industry. Automating the process industry has proven much more difficult. Key deterring factors include:

- Many very large process manufacturing businesses have very small investments in IS resources. A multi-million dollar business often

boasts an S36 or other relatively small machine. These firms often neither want, believe they need, nor can afford expensive IS technology.

- The larger and/or growing process manufacturing businesses tend to acquire tools that were designed for the discrete manufacturing world and customize them to serve process manufacturing. Availability of process manufacturing specific tools is a major limiting factor in this area.

- Poor economic conditions.

- Governmental controls (pricing and safety).

The shortened product life cycle for process industry products is driving some companies to use IS technology to improve productivity.

Exhibit I-2 summarizes information systems issues affecting the process manufacturing industry. Exhibit I-3 summarizes current IS objectives across the process manufacturing industry.

EXHIBIT I-2

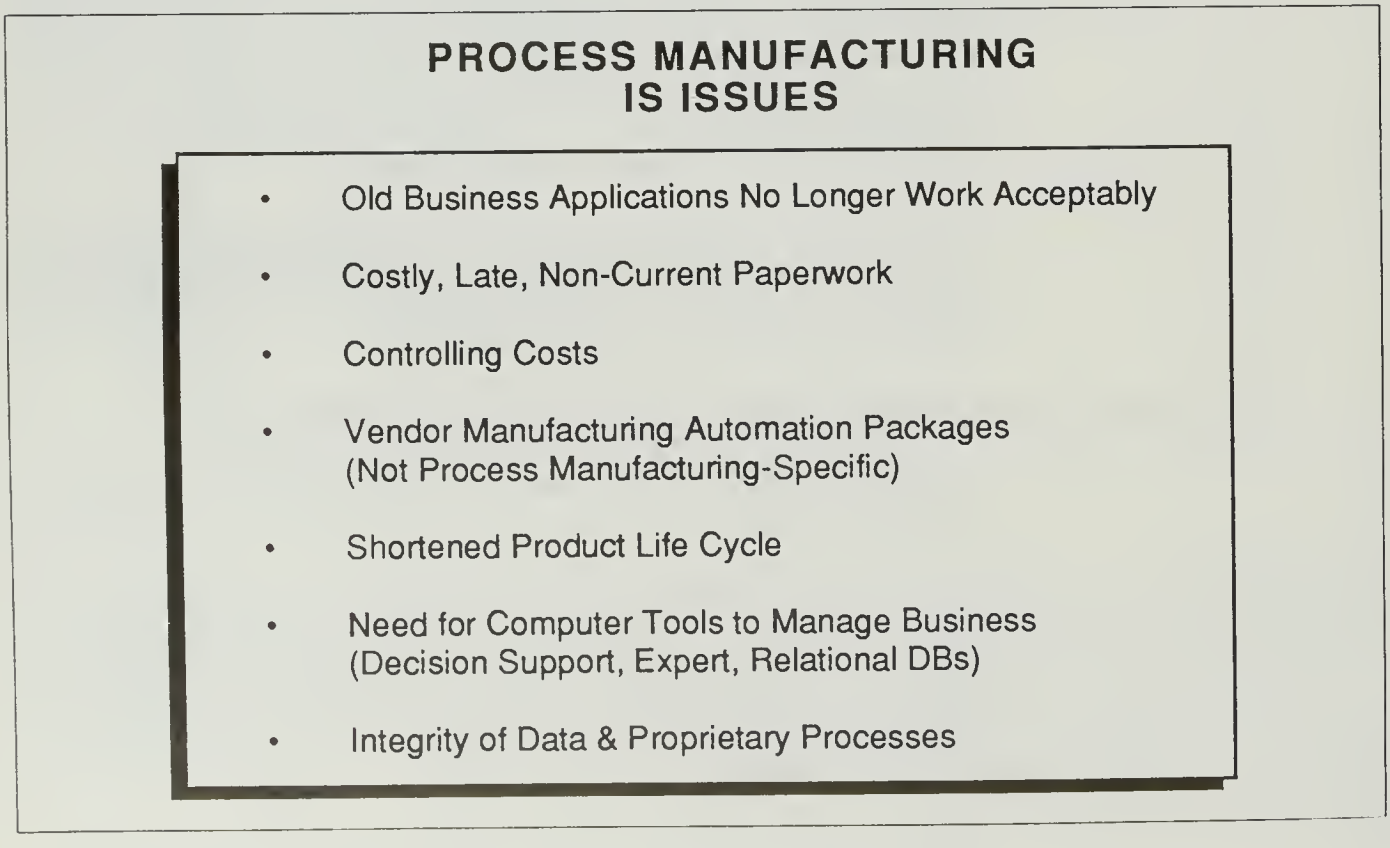
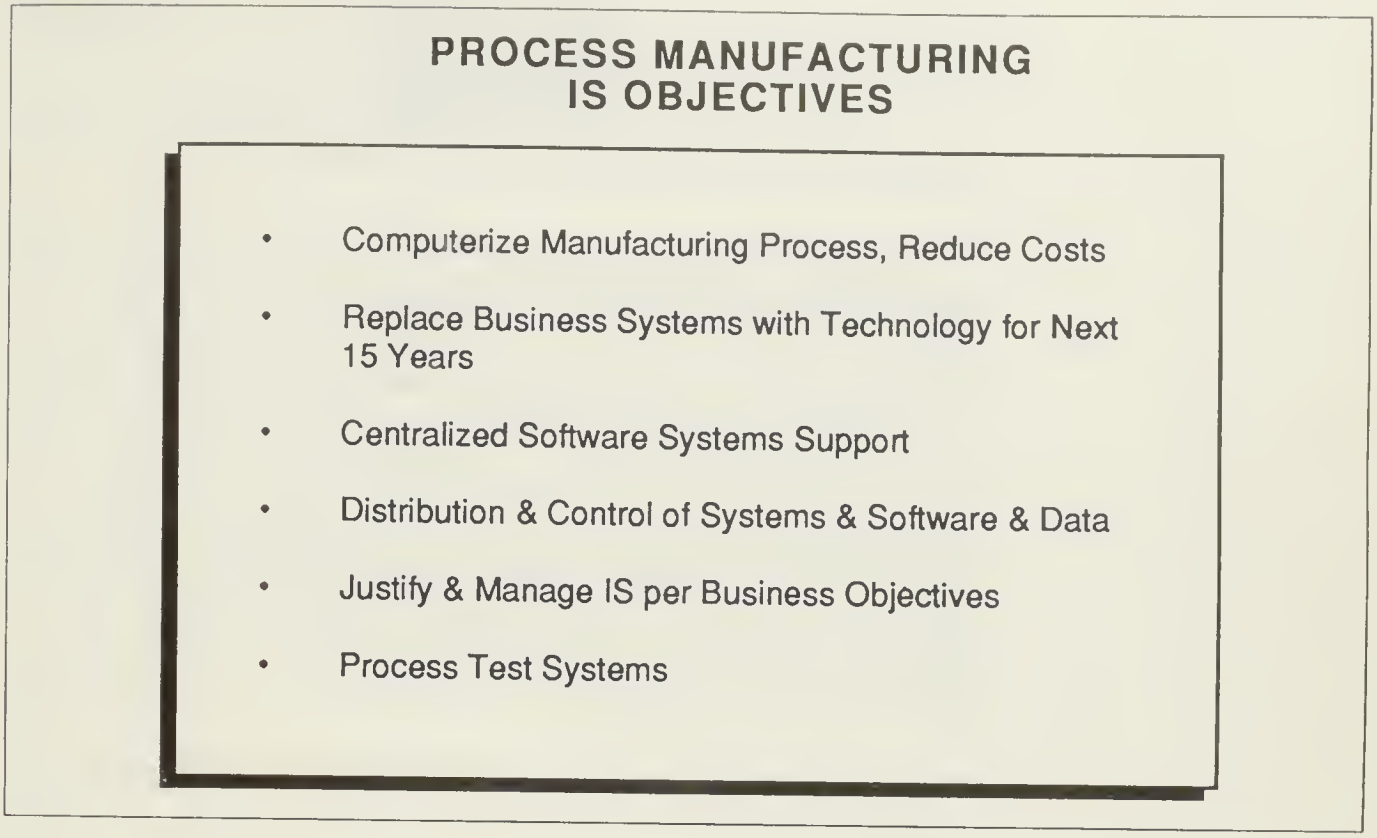


EXHIBIT I-3



C

Impact of New Technology

Relational data bases were mentioned by all respondents as being important to success. Some pilots are in place, a few are in full production, and much study and strategizing is being done for the two- to five-year time frame.

Integration of systems of all sizes from the PCs to large mainframes is becoming more and more critical. The lack of cross-vendor integration and support is a continued problem. More and more corporations are legislating one hardware vendor except where a specialized solution is available from only one source. In the larger process manufacturing companies there seems to be a consensus that IBM is the vendor most likely to take care of their entire range of needs. Many are waiting for systems from IBM that are expected in the two- to five-year time frame despite partial solutions available from other vendors today. Finally, some process manufacturing firms stay one generation behind in both hardware and software technology to maintain stability, or for purposes of containing costs.

Some cost-conscious and (self-declared) mavericks refuse to spend the dollars any vendor asks for their full-service solutions and are investing in home-grown and custom software to integrate the best available func-

tion, price, and performance from a variety of vendors. While this has some obvious merit, a problem exists in that many of these firms will get stuck with old custom systems as newer off-the-shelf integrated solutions become cheaper and more available. This is a challenge the financial and insurance communities faced a number of years ago when they learned the extraordinary cost and negative profit impact of home-grown systems.

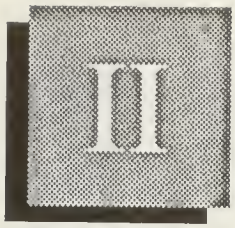
In recent years technology advances have led to special purpose processors at reasonable prices such as the CRAYettes and a-frame-a-second movie quality graphics processors. These are being used primarily to gain a competitive advantage. AI and expert systems are mentioned routinely as a wave of the future. Unlike the discrete manufacturing segment, which has a significant percentage of installations putting in pilot or test projects, not one was identified by the INPUT survey in the process sector. This may be because the current software tools for process manufacturing industries are still not fully functional or readily available. Production implementations of AI and Expert systems technologies are not expected in the two- to five-year strategic horizon in the eyes of this segment. Almost certainly this area will grow rapidly at some point, and those companies that are positioned to take advantage of these technologies may gain a strong competitive edge.

Exhibit I-4 summarizes areas of new technology of interest to the process manufacturing industry.

EXHIBIT I-4

PROCESS MANUFACTURING
AREAS OF NEW TECHNOLOGY INTEREST

- Centralized IS Management in Distributed Environment Integration of Software, PCs, Mainframes, Etc.
- Ignore It for a Generation to Minimize Cost, Maximize Availability
- Relational and/or Distributed Data Bases
- Process Design Equipment
- Low-Cost and Special Processors (CRAYettes, Graphics, etc.)
- AI and/or Expert Systems
- EDI



New Applications

II

New Applications

Many new application development efforts are aimed at replacing fifteen- to twenty-year-old business and administrative systems. Some are process automation applications designed to speed up the development and support cycles, as well as to lower cost, and to protect quality and proprietary interests of the firm. Even EDI is primarily an effort to improve productivity, information control, and accuracy. Exhibit II-1 summarizes major applications areas as identified by the respondents.

EXHIBIT II-1

PROCESS MANUFACTURING
NEW APPLICATIONS

- Extensive End-User Computing
- Pricing, Promotion, Graphics & Marketing
- Business Administration Systems Rework
- EDI - Internal & Supplier Links
- Reverse Engineering
- Process Simulators
- Process Design Center
- Business Management Tools
  (Decision Support, Expert, Relational DBs)

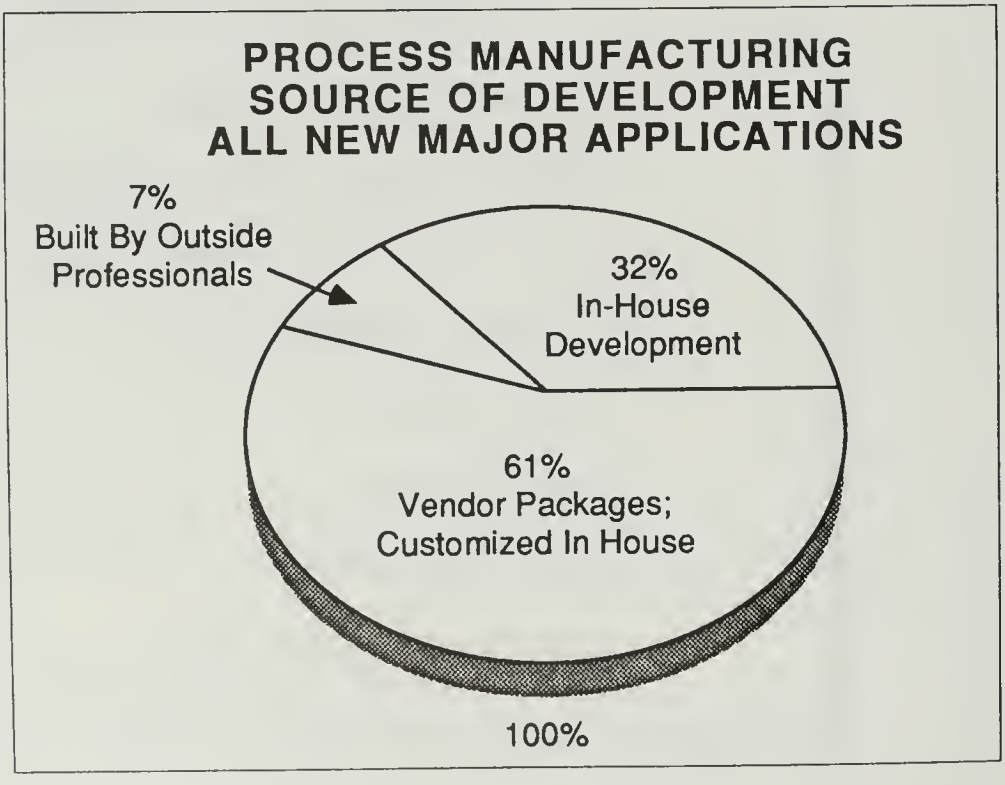
Two interesting application areas identified in the survey are reverse engineering and proprietary software/hardware systems. Companies now routinely acknowledge that they reverse engineer everything from software to user interfaces and service systems. Additionally, companies are now protecting data as an asset rather than just specifications or drawings maintained in paper form. These protections are taking several forms such as:

- Golden hand cuffs.
- A single corporate data base.
- Very serious and complex security systems and controls for hardware, software, and data.

Ten percent of the respondents indicated that they are investing in key process design, IS-based tools and will sell these tools through an in-house DP service organization to recoup the very high costs.

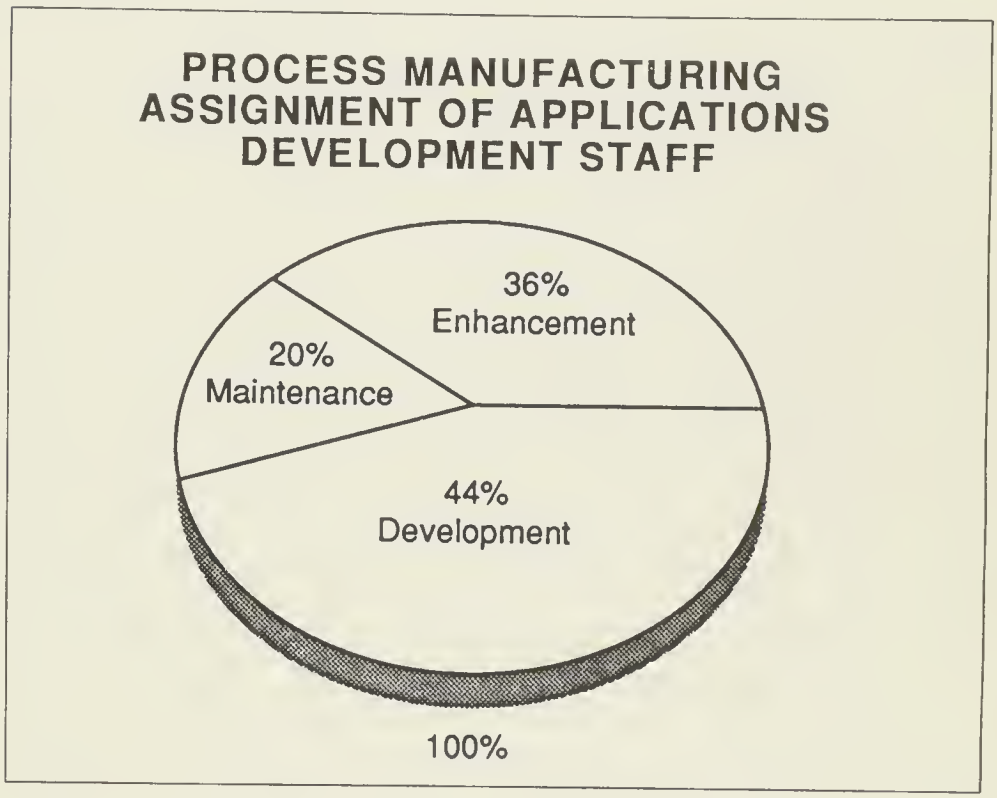
Application product development is being done primarily through acquisition of vendor software. The exception is software that is proprietary and essential to a firm's competitive position. Thirty-two percent of the applications being done are entirely developed in-house, and sixty-one percent are purchased products. Only seven percent are currently being built by outside professionals. Exhibit II-2 summarizes sources of new applications products.

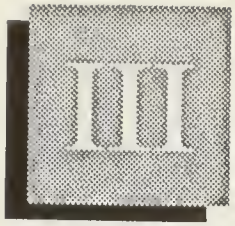
EXHIBIT II-2



Applications development staff are currently allocated 44% to development, 36% to maintenance, and 20% to enhancement. Most of the development staff are focused on installing third-party packages and customizing them to the process manufacturing environment. Exhibit II-3 summarizes assignment of development staff. Contractors are being used very little for several reasons; cost is cited as one. However, the primary factor discouraging the use of contractors is concern over the proprietary nature of technology solutions and the need to keep key technical knowledge within the company.

EXHIBIT II-3





Budget Analysis

III

Budget Analysis

Exhibit III-1 shows the 1987 budget distribution and projects the 1988 budget growth for IS costs. Distribution of expenses has not changed substantially in the last year. Factors influencing budget growth include:

- Growth of high-technology process industries.
- Competitive demands of users, distributors, and suppliers.
- Rewriting of basic business systems.
- Buying and customizing manufacturing automation systems to the particular needs of the process sector.

Factors influencing budget stabilization include:

- Cost control to maintain profits.
- Business approach to information systems.
- Attempts to recover costs by selling process services such as a high-technology process design center.

Factors influencing budget decreases include:

- Price controls.
- Foreign competition.
- Economic conditions and mergers.

EXHIBIT III-1

PROCESS MANUFACTURING
1987 BUDGET DISTRIBUTION AND 1987/1988 CHANGES IN THE PROCESS MANUFACTURING SECTOR

BUDGET CATEGORY	1987 I.S. BUDGET (Percent)	1987-1988 EXPECTED BUDGET GROWTH
Staff	39.8	5.2
MF CPU	10.3	12.1
Minicomputers	4.2	9.0
Microcomputers	4.6	12.2
Storage	5.0	8.0
Other	1.8	2.0
Total Hardware	25.9	9.0
Data Communications	7.7	4.6
External Software	7.7	4.5
Professional Services	1.9	(1.0)
Software Maintenance	3.0	1.0
Hardware Maintenance	8.0	10.0
Other	6.0	9.2
TOTAL**	100.0	7.2

Exhibit III-2 shows the percent of respondents expecting their budget to grow, stabilize, or downsize in 1988. Seventy percent expect to see budget growth in the eight percent range. (Of these, five percent expect fifty to one-hundred percent growth due to their business base being

state-of-the-art, high-technology processes.) Factors influencing budget growth include:

- Upgraded hardware.
- Reworked administrative systems.
- Corporate growth.

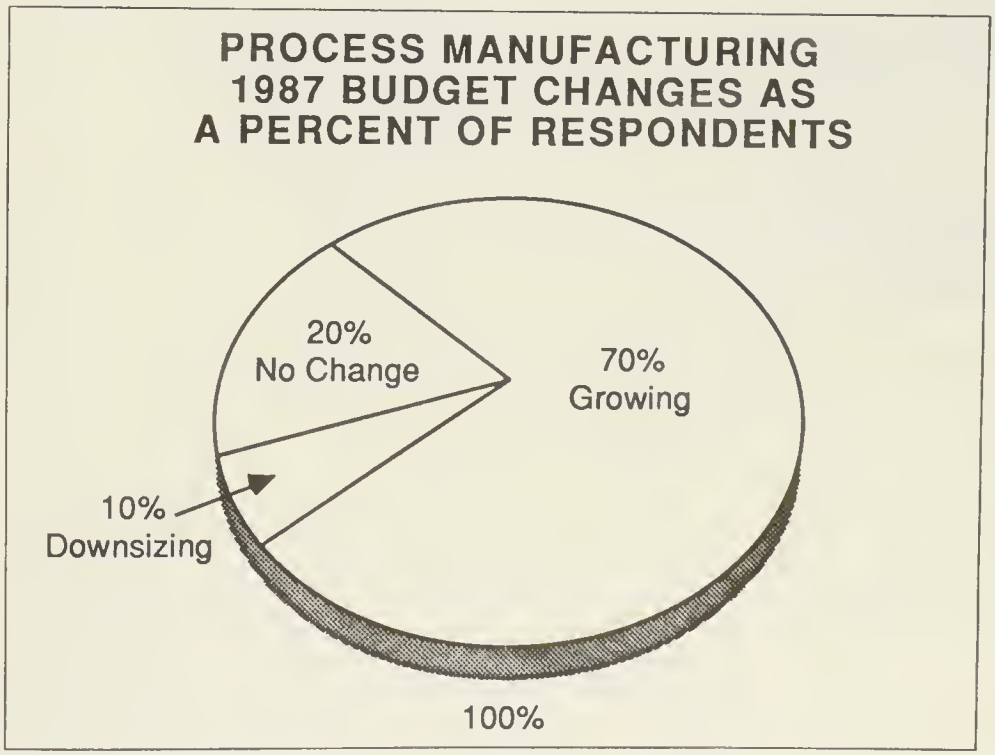
Ten percent expect serious downsizing of the IS operation and budget. Factors influencing budget decrease include:

- Corporate mergers.
- Foreign competition.
- Price controls (due to profit pressure and/or government regulations).

Twenty percent expect their costs to remain at the same level as this year. This implies a real decrease in expenses as they all expected inflation to raise actual costs. Factors influencing budget stabilization include:

- Profit pressures.
- Stabilized hardware and software technology to maintain the expense line and maximize IS service availability.

EXHIBIT III-2



About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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INPUT®
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INFORMATION SYSTEMS PLANNING REPORT
SERVICES SECTOR

DECEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
SERVICES SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
SERVICES SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- The services sector is composed of a number of widely varying types of businesses with the common characteristic that they all provide services for a fee or on a contractual basis rather than producing tangible goods. Another common characteristic is that they are all participating in a massive transition in the U.S. from an industrial- to a service-oriented economy. The segments covered in this report include the following:

  - Accounting.
  - Legal services.
  - Architectural and engineering services.
  - Real estate.
  - Business services.
    - Business consulting.
    - Advertising.
    - Data processing and computer-related professional services.

- The services industry has seen higher than average growth over the last decade with employment increasing 250% from 1974 to 1984.

- This sector is driven by people and their ability to render services, so computer applications focus on improving or speeding personal productivity.

- Since the sector is composed of diverse segments, the forces determining the relative prosperity and disposition to automation vary from one segment to the next within the services sector.

  - Accounting. The general economic climate has a relatively small impact on accounting since all businesses need auditors in good times and bad. But the profession is changing due in large measure to the personal computer. The accountant's role is changing to a more sophisticated analytical and advisory role than was the case before personal computers. It will continue to change in this direction as new applications and new hardware configurations make new services possible.

  - Legal services. The legal profession is a well established, conservative occupation and is largely immune to the peaks and valleys of economic cycles. It is being both pushed and pulled by the liability insurance crisis and the current "sue-if-it-isn't-perfect" trend. Lawyers as a group are conservative with respect to technology and often do not perceive the benefits of automating to reduce their unwieldly volumes of paperwork, even though the tasks of keeping legal records and filling out forms are excellent candidates for automation.

  - Architectural and engineering services. Architectural and engineering services are dependent on the general economic climate. Currently, vacancy rates in urban and suburban office space are high, but developers continued to build in 1986 to take advantage of low interest rates and to beat tax reform which they fear will make real estate

development more expensive in the near future. Residential building was also up in 1986, albeit only 6%. In many cases, engineering services include development of software or complete computer systems intended to perform engineering tasks. Demand for these services, like demand for all computer services, is high and growing rapidly.

- Real estate. This segment covers a number of activities related to the management, financing, buying, and selling of real estate. Each of these activities has its own set of automation requirements. Property management firms need to track the status and billing of all leases, while commercial and residential real estate brokers, as well as developers, need to follow the marketplace. What properties are available? Is the market expanding or contracting? Is this the proper time to purchase and develop a particular lot? A few on-line data bases devoted to information on the real estate market are currently available to help answer these questions. The other major market for computer services in real estate is property management software for commercial and residential property. These packages include modules for tracking tenant information and lease status as well as billing and accounting modules.

- Business services. The business services segment is also affected relatively little by cyclical changes in the economy. This segment includes data processing services which is a weak spot in an otherwise thriving sector. The demand for processing services has dropped as the price of hardware has dropped, making in-house computing feasible for nearly all companies. The slack in this area, however, has been taken up by increases in demand for software development and systems integration. Major computer services markets in the other two segments of business services--business consulting and advertising/PR--include on-line data bases containing general business and news information, spreadsheets, and graphics/desktop publishing systems.

- The current liability insurance crisis is affecting all segments of the service sector. Many companies are taking, or will take, the defensive action of curtailing high risk services in which an error or omission could lead to a lawsuit (e.g., in architectural and engineering services--faulty design leading to unsafe buildings or products; in legal services--errors in recordkeeping leading to missed statute of limitations deadlines). This results in an environment hostile to innovation and risk and affecting computer services in at least two ways--companies will implement proven applications to minimize human error and will avoid new technology and new products that have not been thoroughly proven by practical use.

- Exhibit I-1 summarizes the driving forces of the services sector.

B. ISSUES AND OBJECTIVES

- Again, the relative importance of certain issues and objectives varies from one segment of the services sector to the next, but we can make the generalization that the primary goal of automation in this industry is to improve the productivity of individuals and groups of individuals performing services in the company markets.

- The fundamental IS department issues are as follows:

  - Obsolescence. It is generally accepted that computer hardware becomes obsolete every three years. IS managers should take this into consideration and realize that budgeting for IS is a continuous task rather than a one-shot effort.

  - Hardware connectivity and software integration. Connected hardware facilitates communication of information throughout an organization or

SERVICES
DRIVING FORCES

- Growth of Services Industry
- Personal Productivity
- New Technology
- Liability Insurance Crisis

between organizations. Integrated software makes data available to a number of applications without duplicated data entry. Perfect connectivity and integration are rare, and the shortcomings of current technology are obstacles to full implementation of the ideal connected system.

- Education. The support and training provided by vendors should be a major consideration in selecting a system. There is always a learning curve with implementation of a new system, and managers must expect an initial decrease in productivity before the benefits of a new system begin to show. The period of decreased productivity can be minimized by effective training and good support.

- Technology. Technology is changing so quickly that it is difficult for partners, principals, and managers to keep up with the options available to them, but it is important that they be versed in the general direction of developments in computer systems for their industries. This will enable them to understand and identify the possible benefits of new systems.

- Attitude of management. In many well established companies, management is an obstacle to successful implementation of computers. Some managers simply do not see the potential benefits of automating or do not believe computers can be cost-effective.

- In addition to the above issues, there are some that apply to individual service segments.

  - Accounting, legal services, real estate, and business services all use on-line data bases to speed research. A common complaint among those companies using more than one data base is the lack of a standard command language for conducting searches. Each data base has its own command language, making it necessary for users to relearn each

set of commands for each session. This is a problem for all users except those who use a wide variety of data bases frequently.

- Exhibit I-2 summarizes the major IS issues and objectives for the services sector.

C. IMPACT OF TECHNOLOGY

- In all service segments, technology has drastically reduced detail work, eased administrative duties, and provided managers with a firmer grasp of the company's activities. In addition, it has made possible certain kinds of analysis (e.g., computer simulation, statistical analyses requiring large numbers of calculations) that were not possible or were extremely tedious and inaccurate in the past.

- New technology will have its greatest impact on those segments of the services industry which will benefit from sharing large volumes of data without having to reenter it. Business consultants, accountants, and lawyers will be the biggest benefactors as routine exchanges of information with clients will increase in speed. The increase in speed will be due to new developments in communications, hardware connectivity, and software integration. For example, accountants typically travel to clients' sites frequently to look at the books and pick up data for later analysis. With the accounting firm's computers fully connected to the client's computers and with spreadsheets ready to accept new data over data lines, accountants will use the time they save to interpret the results of spreadsheet analysis and to take on a more advisory relationship with the client. Accountants will also be able to increase their client base since they will devote less time to each individual client.

SERVICES
ISSUES AND OBJECTIVES

- Obsolescence
- Connectivity and Integration
- Education
- Attitude of Management

- In the legal services business huge volumes of paperwork can be made more manageable by computers. Standard word processing improves productivity in this text-intensive field, but computers can also be applied to recordkeeping, scheduling, and production of legal forms. In some cases, the liability insurance crisis has been the impetus for implementing automation. Lawyers can be sued for liability if they should miss a statute of limitations deadline or misplace records. Automated office systems including scheduling and record-keeping functions can help legal offices defend themselves against this.

- Architectural and engineering services companies use computers for both administrative and technical tasks. CAD systems improve the quality of work while project management systems simplify the otherwise overwhelming job of tracking the status of all projects in progress.

- Property management software enables large property management firms to track the status of all leases. The real estate business will also benefit from on-line data bases and spreadsheet applications. On-line data bases will help them watch the market and keep up with what properties are available. Spreadsheet applications will enable brokers to perform extensive and complex analyses involving many properties and will make it possible to present statistics to potential clients quickly and accurately.

- Exhibit I-3 summarizes the major technology trends in computer services and their impact on the services sector.

EXHIBIT I-3

SERVICES
IMPACT OF TECHNOLOGY

TECHNOLOGY TREND	IMPACT
Software Integration and Hardware Connectivity	Reduces Redundant Data Entry Increases Efficiency of Data Analysis
On-Line Data Bases	Simplify and Speed Research

II APPLICATIONS

- Implementation of new systems in the services sector will involve new configurations of hardware and new ways of structuring software as opposed to development of entirely new applications.

- Micro/mainframe links are being implemented by some companies in the services sector to improve personal productivity. The effect is to combine the flexibility and consistently quick response of a personal computer with the storage capacity of a mainframe.

- Project management applications assist architectural/engineering firms by scheduling the various component tasks of a larger job and by tracking the status of all projects in progress.

- Property management applications maintain tenant information and provide billing and accounting functions for commercial and residential real estate managers.

- On-line data bases are widely used in the services sector. Currently, on-line data bases are available with information relevant to almost any profession or discipline. Most are delivered through telephone modems or dedicated terminals, but many data base providers are considering adding optical disks as an alternative delivery format. Disks would be delivered to clients for use on their own or rented hardware and would be updated periodically.

- Applications for the legal services sector include, in addition to on-line data bases, recordkeeping applications and modified word processing programs which store legal forms electronically and allow lawyers to simply fill in the blanks when preparing legal documents.

- The primary function of data bases in services is to speed the process of locating sources of information on a particular topic. In the cases of real estate, and sometimes law, the data base is itself the needed source, but it is more often used as a tool to compile lists of sources to be found elsewhere.

- Advertising firms are using desktop publishing to prepare ad copy. Although the Apple Macintosh is the most popular vehicle for desktop publishing, this is a rapidly expanding market with many new entrants, so competition will be stiff. The development of the laser printer has broken open the desktop publishing market by making very high quality print and graphics available through microcomputers.

- Exhibit II-1 lists the major applications used by the services sector.

SERVICES
APPLICATIONS

- Micro/Mainframe Links
- Project Management
- Property Management
- Desktop Publishing
- Billing and Recordkeeping
- On-Line Data Bases

III BUDGET ANALYSIS

- The services sector's IS budgets are expected to show stronger than average growth in 1987. This is consistent with stronger than average growth in employment and revenues for the services sector.

- Exhibit III-1 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

- The categories expected to show the greatest growth in 1987 are communications and hardware. This reflects the industry's drive to bring computing in-house and to connect and integrate applications both internally and externally to provide better service to clients.

- The areas of smallest growth are outside processing and minicomputers. Companies are bringing, or have already brought, data processing in-house and are apparently finding no place for minicomputers in their hardware configurations. Micro/mainframe links, local area networks, and increasing power of PCs are squeezing the mini out of its mid-ground niche.

- No respondents in this sector expected IS budgets to decrease, although the majority (57%) expected only slight growth or no growth at all.

- Over 45% of the 1986 budget was devoted to purchasing new hardware. Personnel costs followed hardware, capturing 27.9% of overall expenditures.

EXHIBIT III-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE SERVICES SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	27.9%	2.7%
Mainframe Processors	26.3%	18.8%
Minicomputers	.5%	0%
Microcomputers	8.9%	18.8%
Other Hardware	9.6%	17.8%
Total Hardware	45.3%	18.2%
Data Communications	3.1%	10.9%
External Software	14.1%	8.8%
Professional Services	.9%	2.4%
Turnkey Systems	1.3%	4.2%
Software Maintenance	4.0%	4.5%
Hardware Maintenance	2.7%	0%
Outside Processing Services	.7%	1.7%
Total	100.0%	10.8%

- Approximately 65% of software development staff in this sector will be assigned to developing new applications while the other 35% will be assigned to maintaining and enhancing existing systems.

Information Services Program (ISP)

Information Systems Planning Report

State and Local Government Sector

INPUT®

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INFORMATION SYSTEMS PLANNING REPORT
STATE AND LOCAL GOVERNMENT SECTOR

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State and Local Government Sector

INFORMATION SYSTEMS PLANNING REPORT
STATE AND LOCAL GOVERNMENT SECTOR

CONTENTS

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- Factors driving the state and local government sector include the current administration, funding, increased demand for information services, changing information services requirements, and governmental bureaucracy (see Exhibit I-1).

- The overall direction of current administration affects information services departments of state and local government agencies. Depending on the administration, the emphasis shifts from law enforcement to education and then to other areas over the years.

- Funding for state and local government information services is affected by many factors:

  - Availability of funds from federal, state, county, and city government. Some cities, for example, have worked with level funding over the past several years.

  - Approval of information services budgets.

  - Cutbacks in planned expenditures.

EXHIBIT I-1

STATE AND LOCAL GOVERNMENT DRIVING FORCES

- Changing Emphasis of Current Administration
- Funding Availability/Cutbacks
- Rising Demand for Information Services
- Legislated Changes in Requirements
- Bureacracy Resistance to Technological Advancement

- Information services managers are concerned that the increasing number of state and local government employees are outgrowing current software and systems capabilities. INPUT found that some respondents planned to increase information services budgets for only one year to acquire hardware and develop applications, for example, and then cut back to previous levels.

- The following are examples of how information services requirements continuously change for state and local government:

  - Changes in tax laws require modifications in assessment and taxation software.

  - Florida state legislature changed building requirements and, through a comprehensive planning act, city planning requirements.

  - In the past year, there have been state-mandated data base management systems, accounting systems, and personnel systems put into effect.

- Information Services managers in state and local government deal with governmental bureaucracy, which serves to slow technology advancement.

B. ISSUES AND OBJECTIVES

- State and local government information systems organizations reported that the key issue confronting them was connectivity. Information services managers want integrated software as well as more capability to connect hardware of different architectures.

- There are rising concerns about volume. Information services managers reported that existing data base management systems are frequently

incapable of dealing with the massive volumes of information they must manage.

- Demands for more sophisticated technology to process and store images, such as fingerprints, are cost prohibitive.

- Lack of standards on such tools as fourth generation languages, both inter- and intra-agency, create significant inefficiencies in the ability of state and local government systems organizations to meet increasing demands for rapid response.

- For a summary of these key issues, see Exhibit I-2.

- The primary objective of state and local government information services managers is to meet user needs through new systems development and enhancement of existing applications and tools. Projects include the following:

  - Computerizing state and local government end user departments for data base access and data sharing.

  - Acquiring or developing management decision support systems and tools.

  - Converting to internal data bases from outside agencies.

  - Managing departmental taxation/assessment systems.

  - Installing law enforcement systems.

- California's Department of Motor Vehicles plans to complete automating all field offies for access to its data base in 1987 (five-year project).

EXHIBIT I-2

STATE AND LOCAL GOVERNMENT KEY ISSUES

- Hardware Connectivity
- Software Compatibility
- Skyrocketing Data Volumes
- High Costs of State-of-the-Art Technology
- Lack of Standardization

- Other objectives include:
  - Placating users during one-to-two year application development periods.
  - Determining hardware requirements for current and future projects.
  - Stabilizing or reducing costs.
  - Completing documentation.
- A summary of the major objectives of state and local governments is shown in Exhibit I-3.

C. IMPACT OF NEW TECHNOLOGY

- Development and implementation of new technology will require unanticipated levels of funding for state and local government organizations.
- From a staffing standpoint, new technology will effect changes in the types of employees that will be needed and will generally raise skill requirements and costs.
- New technology will enable state and local government organizations to provide better levels of service and allow for a reduction of paper flow, but only if the issue areas can be resolved.
- New technology will also allow network communication on a state level while allowing diversified departments with microcomputers to keep independent records not involving other departments.

EXHIBIT I-3

STATE AND LOCAL GOVERNMENT OBJECTIVES

- Computerization of End-User Departments
- Conversion from External to Internal Data Bases
- Shortening the Development of Cycle
- Determining New Hardware Requirements
- Completing the Documentation Backlog

- New technology creates an opportunity for municipal government to become more entrepreneurial by being on the leading edge in providing services and by finding new ways to generate revenue.

- State and local governments may also form joint ventures with private companies to bring new technologies to state departments and other government agencies.

- The impact of new technology is summarized in Exhibit I-4.

EXHIBIT I-4

STATE AND LOCAL GOVERNMENT IMPACT OF NEW TECHNOLOGY

- New Staffing Requirements
- Better Levels of Service
- Reduction in Paper Flow
- Network Communication on a State Level
- Entrepreneurial Municipal Governments
- Joint Ventures with I.S. Companies in Private Sector

II NEW APPLICATIONS

- Of the new applications projects planned by respondents, 44% will utilize internal development staff without outside professional services or off-the-shelf applications software products (see Exhibit II-1). In other words, the new application will be developed from scratch.

- An additional 11% of the new projects will involve the use of internal development staff as well as off-the-shelf applications software products. The software product will be used as a starting point and modified for the group's particular needs.

- Seventeen percent of the projects planned by respondents will involve internal development staff in combination with external professional services people and applications software products.

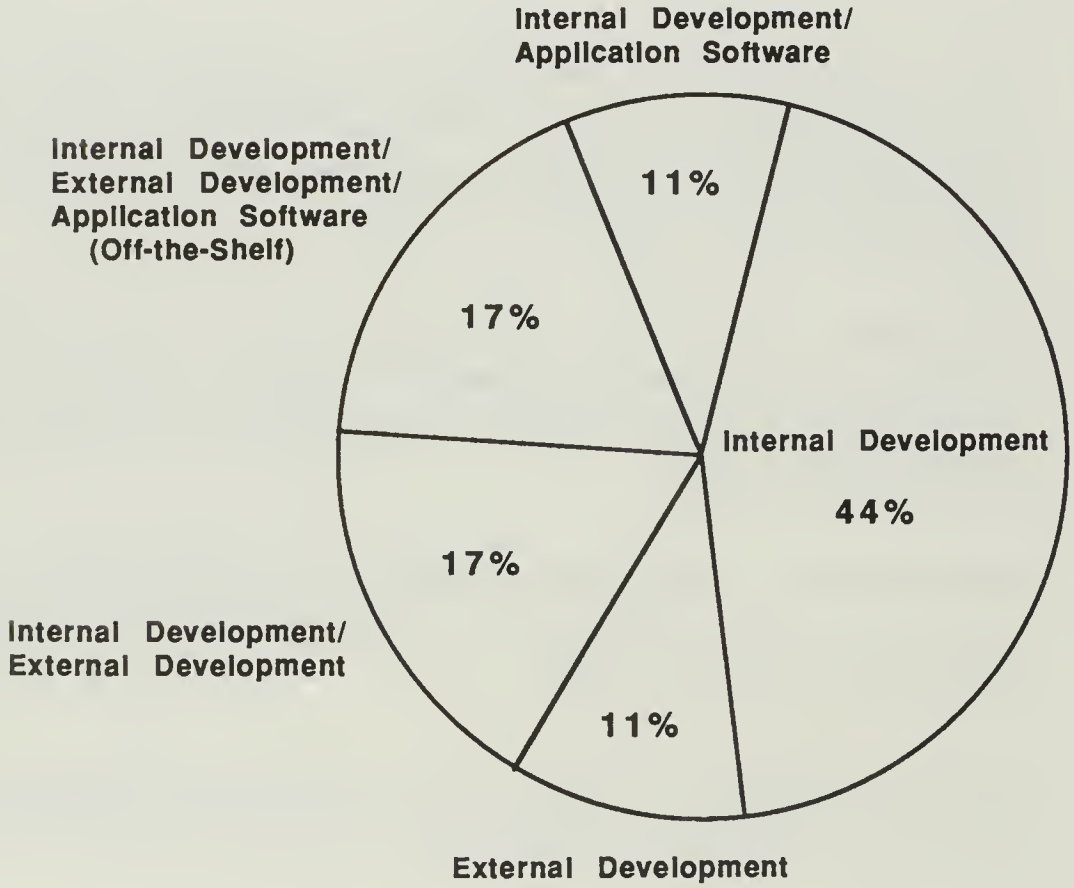
- Significant is the fact that none of the new projects identified involve the purchase of an application software product alone with no customization or modification.

- Respondents expressed a concern that not much software was currently available specifically for state and local government. The following were identified as areas of interest:

  - Integrated systems that include financial and business planning functions.

EXHIBIT II-1

STATE AND LOCAL GOVERNMENT
SOURCE OF DEVELOPMENT FOR NEW APPLICATIONS



Percent of Response

COST RANGE: $12,000 - $8.8 MILLION

- Integrated fixed assets, purchasing, financial, and payroll systems.
- Financial budgeting and accounting systems for state departments.
- Better acounting and management reporting systems.
- Law enforcement systems.
- On-line fingerprint systems (costs currently prohibitive in many cases).
- District attorney and case tracking systems.
- Public works systems.
- Vehicle and building maintenance systems.
- Inventory management systems.
- Project management systems for tracking state and local government workers.
- Data base management systems that can handle massive amounts of information.

- Industry-specific external products and services purchased in the past year included the following professional services and applications software products:
  - State accounting systems.
  - Custom software development of a utilities application.
  - Public safety systems for fire and police departments.

- Human resources packages for specific city, county, and state departments.

- Custom software development of integrated systems for city governments, including general ledger, purchasing, payroll, real estate, personal property tax, utilities, motor vehicle excise tax, and other applications.

- According to respondents, 35% of application development staff are assigned to the development of new systems, 41% are assigned to the maintenance of existing systems, and 24% are assigned to the enhancement of existing systems (see Exhibit II-2).

- Applications respondents will be implementing in 1987 are shown in Exhibit II-3.

- Implementation costs per year for the development of new applications for respondents in the survey ranged from $12,000 to $8.8 million.

EXHIBIT II-2

STATE AND LOCAL GOVERNMENT I.S. PERSONNEL ASSIGNED TO DEVELOPMENT, MAINTENANCE, AND ENHANCEMENT OF SYSTEMS

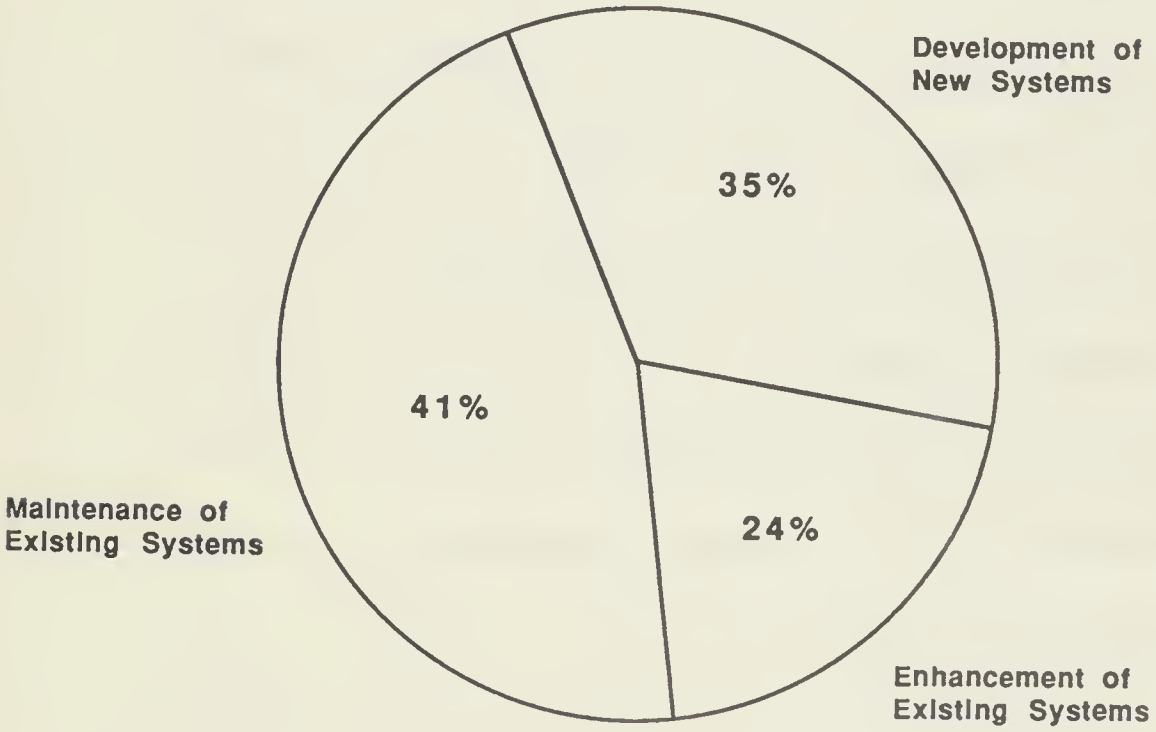


EXHIBIT II-3

STATE AND LOCAL GOVERNMENT
NEW APPLICATIONS FOR 1987 - 1988

- Replacement of Personnel and Payroll Systems
- Fourth Generation Data Base Management Systems
- On-Line Quality Control Systems
- New and Enhanced Financial Systems
- Felony Processing
- Dependent Tracking Systems
- Permit Issuance and Tracking Systems
- Election Systems
- Integrated Systems for Financial and Project Management

III BUDGET ANALYSIS

- Expected growth for information services budgets in 1987 averaged 4.2% for the state and local government respondents.

- As shown in Exhibit III-1, 70% of the respondents are increasing information services budgets in 1987; 30% are decreasing budgets in 1987.

- Increases in 1987 were attributed to the following: personnel, reflecting additional personnel and/or salary increases; hardware, especially mainframes and mass storage devices; data communications; and applications and systems software for mainframes (see Exhibit III-2).

- Budget decreases for this sector are related to hardware and professional services expenditures: 1986 budgets had been increased to include expenditures for computer systems, mass storage devices, terminals, and peripherals as well as for consulting and custom software development.

- In some cases, respondents reported that total information services budgets include information services expenditures as well as end-user department expenditures. Responses showed that information services expenditures represent, on average, 86% of the total information services budget, while end-user departments represent the remaining 14% (see Exhibit III-3).

- Exhibit III-4 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

EXHIBIT III-1

STATE AND LOCAL GOVERNMENT
1987 BUDGET VERSUS 1986 BUDGET

30 Percent Decreasing Budgets

70 Percent Increasing Budgets

Percent of Respondents

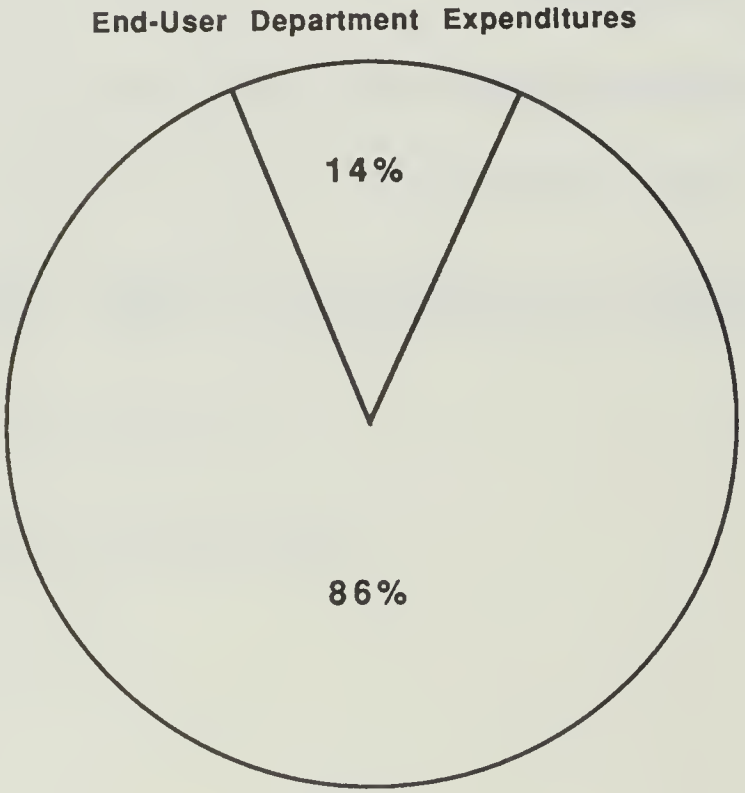
EXHIBIT III-2

STATE AND LOCAL GOVERNMENT INCREASING I.S. BUDGETS

- Personnel
- Mainframes and Mass Storage Devices
- Data Communications
- Mainframe Application and Systems Software

EXHIBIT III-3

STATE AND LOCAL GOVERNMENT TOTAL I.S. BUDGET



PERCENT OF TOTAL I.S. BUDGET

EXHIBIT III-4

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN STATE AND LOCAL GOVERNMENT

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 PERCENT OFEXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	29.5	2.9
Mainframe Processors	10.0	5.0
Minicomputers	8.9	-0.6
Microcomputers	18.7	1.3
Mass Storage Devices	5.5	19.2
Other Hardware	.2	65.6
Total Hardware	43.3	4.3
Data Communications	6.1	8.0
Voice Communications (If Part of I.S. Budget)	3.8	0
Total Communications	9.9	5.0
Professional Services	1.1	-9.1
Processing Services	.4	0
Mainframe/Minicomputer Application Software	2.6	9.7
Microcomputer Application Software	.5	2.1
Systems Software	2.6	8.6
Hardware Maintenance	1.2	2.6
Software Maintenance	.3	3.2
Total External Services/Products	8.7	4.8
Other	8.6	6.5
Total All Categories	100.0	4.2

- The largest projected growth categories in 1987 are mainframes, mainframe applications and systems software, mass storage devices, and data communiations.

  - Mainframes are being purchased so that data processing can be provided in-house.

  - Mass storage devices are required to handle the enormous volume of data associated with state and local government operations.

  - Data communications are used to connect hardware and bring applications to the end user level.

- Also increasing are budgets for the following:

  - Personnel to support new application development and the maintenance/enhancement of existing systems.

  - Microcomputers that have been purchased over the last few years and that will be purchased in 1987 to be used for office automation and to extend applications to end-user departments.

  - Hardware maintenance, due in part to new acquisitions of hardware.

- None of the state and local government respondents reported purchasing turnkey systems in 1986, nor do they plan to purchase any in 1987.

- Approximately 30% of the respondents stated that hardware and/or software maintenance expenditures were bundled into the purchase price of the software or hardware; therefore, overall percentages shown for these expenditures are slightly lower than actual.

About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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INFORMATION SYSTEMS PLANNING REPORT
TELECOMMUNICATIONS SECTOR

JANUARY 1987

INFORMATION SYSTEMS PLANNING REPORT
TELECOMMUNICATIONS SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
TELECOMMUNICATIONS SECTOR

EXHIBITS

I INTRODUCTION

A. OVERVIEW

- The breakup of AT&T continues to create upheaval in this segment, with new network services and new competitive players creating new demands on information services (IS) departments.

- Lowering costs of long-haul communications and the growing importance of linkages have led to increasing traffic volumes domestically and internationally. This, in turn, has led to the requirement for tools to plan and manage new communications channels such as satellites, fiber optics, and new types of data networks.

- The industry continues to change. Merger and acquisition consolidations, new technologies, and deregulatory actions are creating both chaos and opportunity for IS departments.

B. DEFINITIONS

- The telecommunications market is a diverse one. This analysis focuses on AT&T, the Bell Operating Companies (BOCs), independent local exchange carriers (LECs), the long-distance interexchange carriers (IXCs), long-distance

resellers, and cellular telephone operators--in short, telephony telecommunications.

- Currently excluded from the analysis are the broadcasting and cable television industries, fiber optic and satellite networks, and the domestic operations of the international record carriers.

II MAJOR ISSUES

A. DRIVING FORCES

- IS managers at telecommunications companies were asked to identify their most important strategic, tactical, and operational issues, the definitions of which are provided in this report's introduction. This section reports the specific issues identified by survey respondents, but first, some general directions are presented.

1. GENERAL DIRECTIONS

- An industry association's research found telecommunications companies realizing revenue increases of 7.6% between March 1985 and March 1986 while employment dropped over 6%. Increased productivity per employee is due in part to the use of automated systems.

- However, INPUT's research found that in most cases, the IS department is expected to grow to meet increasing demands, although in the longer term, new technologies are expected to reduce personnel needs. In addition to anticipated larger staffs in most firms, higher IS budgets are being requested due to increasing vendor costs.

- In some cases, IS departments at telecommunications entities have been overloaded due to the demands of divestiture, a more competitive environment, and regulatory agency requirements for accurately reported data.

- This has sometimes led units within the company to seek independent solutions to departmental problems.

- For example, the marketing department of one BOC signed with a computer services vendor for a marketing application which incorporates vendor software on a minicomputer tied to the remote computing service for additional capabilities. IS was involved in selecting the solution but does not support the service in any manner.

- Not surprisingly, all telecommunications companies interviewed identified deregulation and divestiture as the two key drivers of change within the industry.

  - Deregulation has led to more competition. As one respondent said, "We have to get out there and hustle for customers."

  - Further, IS is being asked by marketing departments for more customer information to identify prospects for new services and for planning purposes.

- IS departments reported that management of their own internal telecommunications systems has become more important, incorporating all media--voice, data, facsimile, and video. This is an indicator of the continuing merger of voice and data responsibilities into one department, although there is a question about the amount of voice/data integration that will actually take place.

- One respondent reported analyzing the activities of companies outside the industry to identify models for using information services to competitive advantage, citing an airline and a medical supplies distribution firm as examples.

2. STRATEGIC ISSUES

- Among identified strategic issues telecommunications firms anticipate facing in the two- to five-year time period is the amount of centralized data processing the company will have during that period and how to manage decentralization while maintaining control of their systems.

- Another strategic issue relates to the regulatory environment and how the company, as a whole, will determine what activities will be allowed under the rulings of agencies overseeing deregulation of the industry and, specifically, how IS can plan its response in support of new activities.

  - Some users expressed concern and confusion over the sometimes conflicting roles of the various governmental agencies and individuals involved in deregulation.

- Due to deregulation, telcos are anticipating they will need to address often undefined nontelephone areas and will need to become more marketing oriented.

3. TACTICAL ISSUES

- Several users said that their tactical plans relevant to IS are still evolving, delayed by more pressing present needs. One anticipated issue is the degree of functional data processing and telecommunications integration and how much of this integration will actually occur.

- One independent telco reported facing tactical issues relative to the company's investments, both in the company itself and external investment opportunities fitting corporate goals. IS anticipates being called upon to provide systems and services supporting these activities.

- Another independent telco said that by order of the state public utilities commission, the firm must reduce its costs. One way of doing this will be to reduce its dependence on outside contractors and programmers while improving the quality of internal data processing specialists through higher salary levels and education.

4. OPERATIONAL ISSUES

- "Staying alive" was what one independent telephone company IS director reported as his immediate key operational issue. This comment is interpreted as reflecting real and potential challenges from competitive firms in some services the telco provides.

- The same company reported that staffing issues and the ability to manage change were central operational issues facing the firm.

- Marketing new services were mentioned as operational issues by another independent, who said the company was planning to offer new services such as point of sales and stock quotation services to its customers and IS was being called upon to support these areas.

- Another immediate operational issue described was IS' ability to meet demands from its users for tools leading to increased departmental productivity and the attendant needs for additional IS capabilities.

- A respondent at AT&T reported the company is completely reorganizing its data processing functions. With the exception of officials at the chairman of the board level, IS personnel have no idea what they will be doing in the immediate future.

- These directions are summarized in Exhibitl II-1.

EXHIBIT II-1

TELECOMMUNICATIONS I.S. DIRECTIONS

GENERAL	STRATEGIC	TACTICAL	OPERATIONAL
Increasing Productivity per Employee Functional Units Seek/ Implement Own IS Solutions Deregulation/ Divesture Demands Internal Systems Become More Important Modeling Based on Nontelecom Industry Examples	New Technologies Lead to Staff Reductions Centralization versus Decentralization Issues IS Support of Allowable Activities IS Support of Unfamiliar Activities	Level of Functional Voice/ Data/Image Integration Investment Activities Cost-Cutting Mandates Increased Internal Dependence; Reduced External Resources	Facing Competition Managing Change Staffing Issues Marketing New Services Meeting User Needs With Increased IS Capabilities Reorganization Issues

B. IMPACT OF NEW TECHNOLOGIES

- In addition to reducing staffing needs and reducing costs, new technologies are being investigated to permit telecommunications companies to provide not just better but more rapid and new services to customers.

- Respondents are anticipating that technological developments will have a significant impact, particularly as data processing and telecommunications functions are merged. Over time, this will lead to a restructuring of the business.

- Being technologically driven will have an influence on how telcos will approach the market. Rather than being merely a franchised system, new technologies will require telcos to get into marketing situations. The threat of more technologically flexible competitors is changing attitudes in the formerly monopolistic environment.

- The impact of new technologies is shown on Exhibit II-2.

TELECOMMUNICATIONS
IMPACT OF NEW TECHNOLOGIES

- Reduced Staffing, Costs
- Improved, New Services
- Data Processing/Telecommunications Integration
- Technological Competitiveness

III NEW APPLICATIONS

- New applications being implemented by respondents over the next 12 months include:
  - Billing and toll systems to replace outdated ones and fitting the requirements of deregulation.
  - Cable records management systems.
  - Streamlining in investment-oriented applications.
  - Customer service and service order systems.
  - Engineering applications.
  - Productivity improving applications.
  - Outside plant facilities inventory systems.
  - Digitized mapping systems.
- It is important to note that these applications were described by IS managers. INPUT has found that functional departments often implement systems meeting their own unique needs in a decentralized manner. IS may or may not be involved in or be knowledgeable of these initiatives.

- The anticipated costs of these new applications range from $100,000 up to $14 million for complicated systems, with the high range related to systems developed by the parent company in support of its regional telcos. In this case, the individual telco will be responsible for approximately 10-12% of the final cost.

- Costs are divided between internal staff expenses and the purchasing of applications software packages, with the emphasis placed on internal development. In a few cases, professional service firms will be contracted to develop the needed application.

- New applications are listed in Exhibit III-1.

TELECOMMUNICATIONS
NEW APPLICATIONS
(Next 12 Months)

- Billing/Toll Systems
- Facilities/Plant Management
- Investment Support
- Customer Service
- Engineering
- Productivity
- Digitized Mapping
- Non-IS Departmental Applications

IV BUDGET ANALYSIS

- This analysis is based on information collected from telephone company IS managements. It does not cover the entire spectrum of the telecommunications industry, as described in Chapter I, Section B, and does not include expenditures in departments other than IS.

- It is important to note that the data gathered from IS managers often represented budget requests. In many cases, actual budgets received will vary from these requests and actual expenditures will vary from the received budget.

- Exhibit IV-1 shows the 1986 budget distribution and the projected budget growth for 1987 in this segment.

- The largest budget growth areas are in hardware, processing services, software, professional services, and turnkey systems.

  - Overall, hardware budgets, now accounting for approximately 27% of the IS budget, are expected to increase by nearly 26%.

  - Processing services, now accounting for approximately 12% of the IS budget, are expected to increase nearly 25%.

  - Externally purchased applications and systems software, representing slightly over 7% of the budget, are expected to increase 19%.

EXHIBIT IV-1

1986 BUDGET DISTRIBUTION AND 1986-1987 CHANGES IN THE TELECOMMUNICATIONS SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	32.1%	3.7%
Mainframe Processors	5.4%	15.7%
Minicomputers	5.2%	17.2%
Microcomputers	2.8%	11.5%
Mass Storage Devices	1.5%	4.6%
Other Hardware	12.0%	22.3%
Total Hardware	26.9%	25.2%
Data Communications	3.4%	-12.0%
Voice Communications	1.9%	-11.0%
Processing Servcies	12.2%	24.6%
External Applications & Systems SW	7.2%	19.0%
Professional Services	5.6%	14.1%
Turnkey Systems	5.9%	14.0%
Software Maintenance	1.6%	0.6%
Hardware Maintenance	1.3%	16.1%
Other	1.9%	-3.3%
Total	100.0%	12.0%

- The categories expected to decline are data communications, voice communications, and other services expenditures.

- Exhibit IV-2 shows that approximately 83% of the respondants expect their IS budgets will increase or remain the same for 1987, while 17% expect lower budgets.

- Factors contributing to the increases in 1987 IS budgets were:

  - Increased purchasing in support of planned data communications services and for more effective corporate information management systems.

  - Increased use of specialized applications and services available from third-party processing vendors.

  - Expected increases in needs to maintain newly purchased hardware, in some cases due to reduced staffing.

- Factors contributing toward decreasing or modest increases in IS budgets were:

  - Increased use of corporate facilities for data communications.

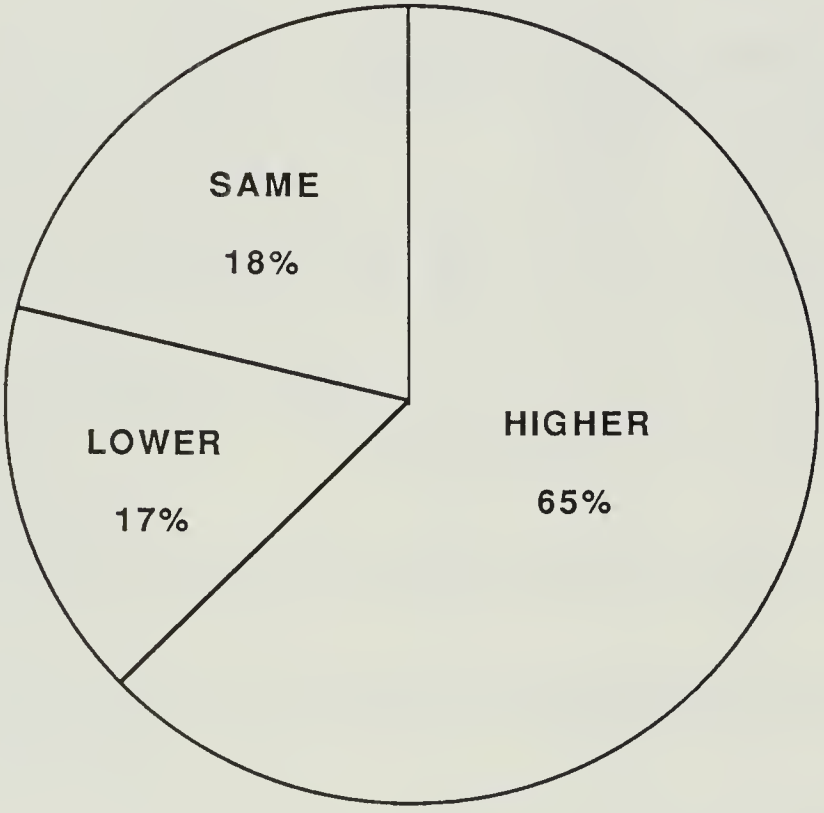
  - Lower costs and more effective management of voice communications services.

  - Increased reliance on internal capabilities for software maintenance.

- Overall, IS departments expect a 12% budget increase for 1987.

EXHIBIT IV-2

TELECOMMUNICATIONS BUDGET CHANGES, 1986-1987



V NEEDS, OPPORTUNITIES, AND CONCLUSIONS

A. UNMET NEEDS

- Several users indicated that vendors have yet to adequately adapt standards which accommodate an open systems environment.

- Others stated that vendors do not have the expertise to interface the computer information industry into communications industry services and do not understand how the telecommunications industry operates, either technologically or internally as a business.

- One firm required more reliable, and economical, fault-tolerant systems, reporting this technology will be implemented increasingly in the future due to user demands for on-line systems operating full time.

- These identified unmet needs are shown in Exhibit V-1.

B. OPPORTUNITIES FOR TELECOMMUNICATIONS I.S. DEPARTMENTS

- Increasingly, telcos are becoming market participants themselves, offering other firms applications and services developed for internal use to recover costs and generate revenues. These other firms may be other telcos or large telecommunications users managing their own networks.

EXHIBIT V-1

TELECOMMUNICATIONS
UNMET NEEDS

- Open Systems Standards
- Vendors Lack Technological, Business Understanding of Industry
- Fault-Tolerant Systems

- One challenge facing BOC-affiliated vendors is to secure business with other industry companies who may consider the vendor a rival.

  - This factor is a market inhibitor, based on both emotional and business grounds.

  - Partnering with or acquisition of independent companies may be colored by the affiliation. It is uncertain if such alliances will be beneficial or detrimental to the parties involved in attempts to sell in the telecommunications environment.

  - However, the motivation for such partnering is usually to enter broader information service markets, not merely telecommunications itself, in which case benefits accrue by giving BOC partners the ability to provide software and services to their customers, becoming a one-stop source of IS solutions.

- INPUT believes that telco entry into broader information services markets is slowly subsiding, in part due to the rapid involvement of the BOCs and the need for an evaluation period.

  - Fewer "independent" firms selling solutions to telecommunications companies will maintain a presence into the 1990s.

  - Those that will remain will often do so because they have found profitable and highly specific market niches and have entered into successful marketing and distribution agreements with telco subsidiaries.

- With merger and acquisition activities at a high level, the IS departments of telecommunications firms may have new, unfamiliar responsibilities:

- The IS departments of merging companies may need to work together to functionally merge their units, and there can be difficult technological and business issues to be overcome.

- IS departments may be called upon to evaluate the "fit" of a candidate acquisition company's technologies into the acquiring firm's business strategy.

- Technological change is creating new opportunities in the telecommunications segment. Many of the BOCs are installing local packet switching networks and are positioning themselves to offer protocol conversion services when the regulatory climate permits. These new networks will require tracking and bill accounting systems, and systems developed by one company may be sold to others with similiar needs.

- Software and systems supporting security functions within data and voice services are needed. Software is being developed to spot "hackers" attempting to test access codes against long-distance exchanges. Once detected, the next attempt is permitted, the line trapped, and the call traced to the violator.

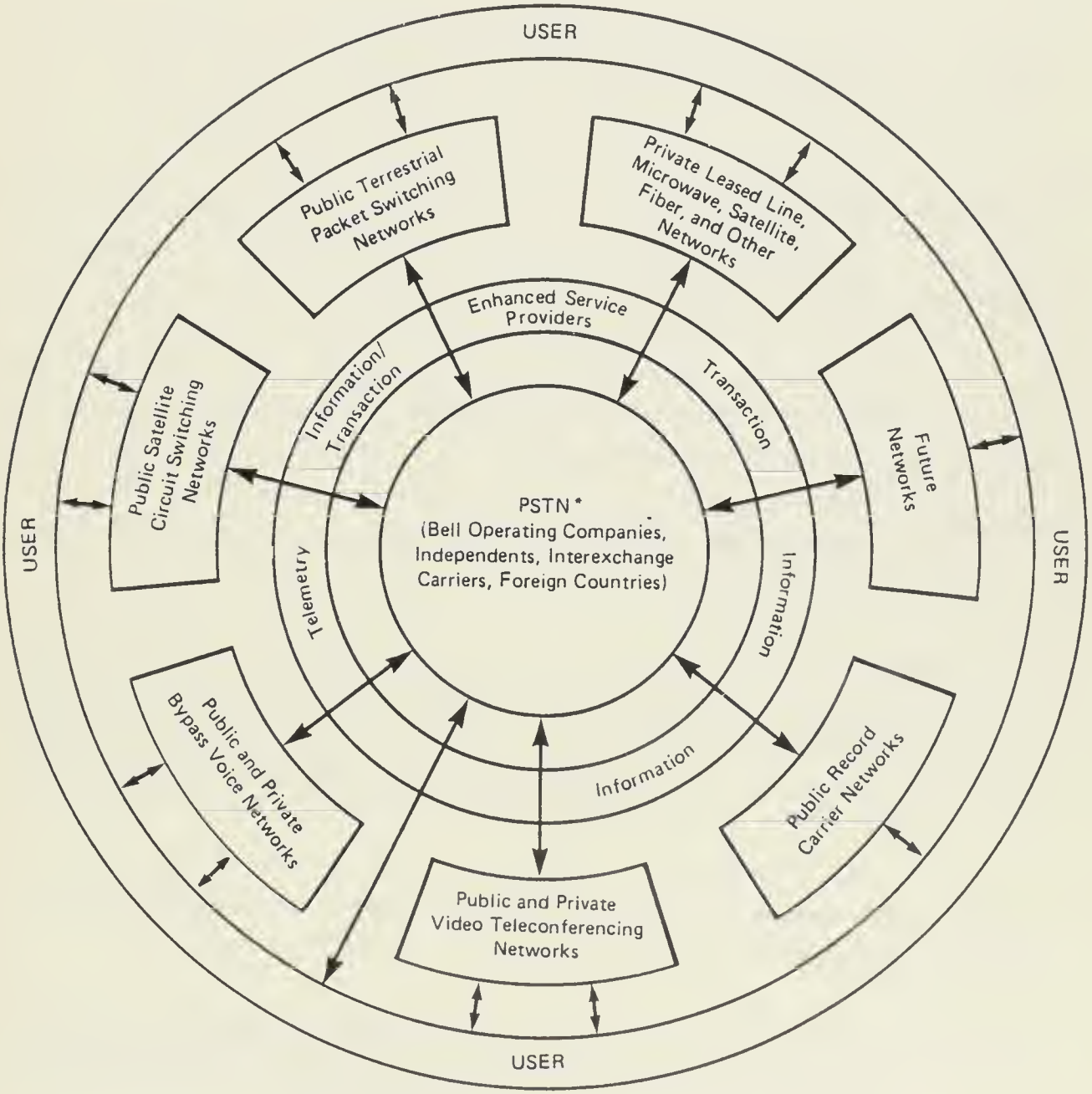
- The Integrated Services Digital Network (ISDN) is currently being tested. When implemented, ISDN-related applications will be developed by industry participants, their vendors, or, more likely, jointly.

  - Examples include messaging, teleconferencing, data base information services, transactions, and telemetry applications for alarms, equipment monitoring, and utility management.

  - ISDN thus represents opportunities for software development, professional services, information providers, and third-party services. Exhibit V-2 represents the range of ISDN distribution services.

EXHIBIT V-2

ISDN DISTRIBUTION SERVICES



* PSTN = Public Switched Telephone Network

- Opportunistic enterprises in information services (such as 976-exchange audiotex services), cellular telephone, long-distance, reselling, shared tenant services, and satellite services have arisen.

  - The BOCs are currently prohibited from actually providing information services directly, but are permitted to provide the facilities for delivering information services.

  - These newer participants often approach business with financial and marketing concerns overriding information service concerns, creating opportunities as well as risks for telcos with software, systems, and services to offer.

  - Unproven new enterprises may fail, and telcos may be left without an opportunity to benefit from an ongoing relationship after an expensive sales and development effort.

  - Cautious approaches are particularly recommended for shared tenant services which have thus far failed to generate significant interest.

- Cellular systems are operated by either independent firms or subsidiaries of the LECs. Due to regulatory and business requirements, these subsidiaries will often use remote computing services firms or internal systems to handle their billing rather than the bill processing facilities of the affiliated telco.

  - The cellular industry is characterized by volatile pricing driven by competitive influences, requiring the ability to rapidly change price schedules.

  - There are billing format inconsistencies between the regular telephone system, cellular billing, and "roamer" billing (for users outside their primary service area) which need to be addressed.

- In addition to billing services, cellular operators require value-added services such as traffic pattern analysis, channel usage statistics, and equipment efficiency reports, functions similiar to those handled by telco IS departments.

- Professional services opportunities are significant, and telecommunications firms with the surplus of resources necessary are offering these services to both customers and other industry members.

- Fiber optic networks, for the most part, are being designed as bulk service providers to other carriers. As end-to-end, switched services (including the local loop) via fiber cables are introduced by the local telcos, information systems to implement and then manage them will be needed.

- Other emerging areas in telecommunications are mobile data applications (using cellular, paging, or other radio common carrier frequencies) for field personnel and other requirements, digital radio-based rural telephone systems, proposed mobile satellite communications services, and radio positioning/messaging systems.

- These opportunities are shown in Exhibit V-3.

C. RECOMMENDATIONS AND CONCLUSIONS

- The first and foremost recommendation for telecommunications firms is to address their immediate needs appropriately; in other words, "mind the store."

- IS departments should survey end-user departments to determine anticipated needs and realistically evaluate their capabilities to support them.

EXHIBIT V-3

TELECOMMUNICATIONS I.S. OPPORTUNITIES

- As Vendors
  - To Other Telecom Firms
  - To End-User Telecom Departments
- As Acquisition Evaluators
- As Innovators of New Systems Supporting New Services: Data Networks, Cellular, Fiber Optics, Mobile Data

- It may be necessary for IS managers to surpress the tendency to attempt to bring all corporate IS functions under IS control.

- It is often desirable to loosen the IS ties in a decentralized approach, shifting responsibility to the functional departments for either developing, or contracting for, the application or service needed to support the department, particularly when needs are pressing and competitive opportunities are "now."

- Firms with additional capabilities and the backing of management should address external opportunities with other industry firms and end users.

- There are necessary cautions. For users considering product or service development in this market (and thus becoming vendors in their own right), INPUT recommends:

  - Recognition be made of the long lead times and planning cycles characteristic of the industry, leading to long sales cycles, particularly in regulated segments. This sluggishness, a holdover from the regulated environment, also means facing the fact that telco commercial activities may be developmentally hindered.

  - Firms be aware of the fact that needed systems are often massively complex and interrelated, a fact that can heavily influence service or software design. This suggests that systems developed to meet internal needs be the first priority for commercialization.

  - Firms recognize that the levels of automation can be significantly different among entities related to specific segment, prospect size, location, culture, and requirements.

  - Examination of ways of adapting software, systems, and services to large telecommunications users who are operating and managing their

own facilities and for international (particularly developing) markets where telecommunications infrastructures are being developed.

- Recognition that the marketing function can be expensive and that alternatives are available. For example, McDonnell Douglas Communications Systems Company is selling applications developed by the Southern New England Telephone Company.

- It is important for telecommunications companies to recognize their primary responsibility is to current customers. Resources directed toward ancillary activities must be available, the regulatory implications considered, and the business plan realistic before incursions into other, nontelephone (and, therefore, unfamiliar) activities are undertaken.

- INPUT's recommendations are shown in Exhibit V-4.

EXHIBIT V-4

TELECOMMUNICATIONS RECOMMENDATIONS

- MIND THE STORE!
- Realistically Evaluate Departmental Needs and Decentralize Responsibility if Appropriate
- Address External Opportunities to Commercialize Solutions, Considering Necessary Cautions

Information
Services
Program
(ISP)

Information Systems Planning Report

Transportation Sector

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DECEMBER 1987

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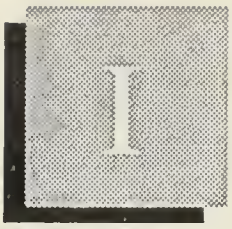
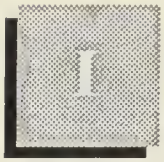


Major Issues



Major Issues

A

Driving Forces

The transportation industry sector comprises the airline, railroad, trucking, and other transportation segments. Deregulation and economic conditions have contributed to increased competition and consolidation within each of the segments, as well as competition between the modes of transportation and the development of intermodal transportation offerings.

The U.S. airline industry is highly concentrated, with twelve major carriers accounting for 84% of all revenue passenger miles at the end of 1986. Although passenger traffic increased in 1986, operating profits for the year were below previous years' levels due to increased airfare discounting. The industry continued to benefit from lower fuel prices, and in some cases, lower labor costs. However, these post-deregulation airlines are struggling to restrain costs further, in order to remain both competitive and profitable.

In recent years, a restructuring of the freight railroad industry has occurred. The result has been fewer and larger railroads and more intermodal companies. For the year 1986, rail revenue ton miles were approximately equal to 1985 levels because of to improved industrial production in the fourth quarter. During most of the year, however, operating revenues were below 1985 levels due to fuel cost savings being passed on to customers and increased competition from other modes of transportation. One area of the rail industry—rail piggyback traffic—has grown dramatically since deregulation in 1981.

Financial pressures have increased for trucking firms operating in the highly competitive deregulated environment. While fuel costs have decreased, labor costs and insurance premiums have increased. The more progressive trucking companies have been able to offset the effects of intense price/service competition by implementing successful marketing

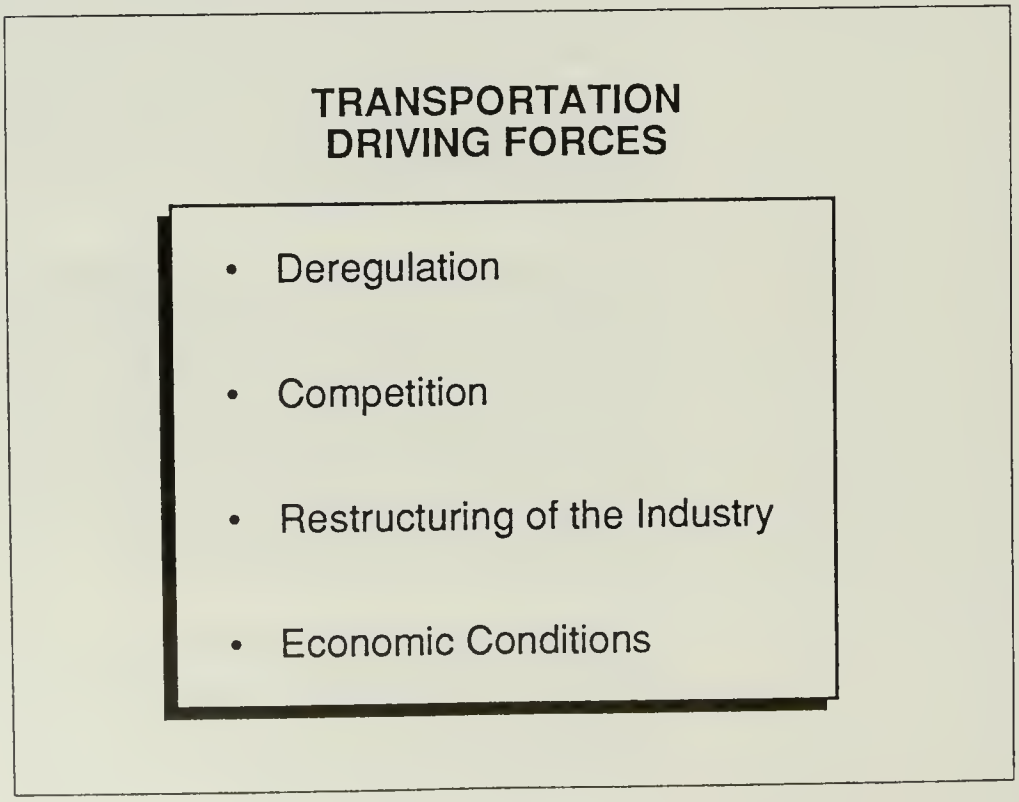
strategies and improving efficiencies in operations. Marginal carriers, on the other hand, have been marked by failures, bankruptcies, reorganizations, acquisitions, and mergers.

Delivery services on shipments by single-mode trucking or intermodal air and trucking operations have become very competitive and reliable. The fast-growing air cargo and air express markets have increased competition among surface carriers and intermodal surface and air carrier operations in meeting just-in-time inventory and other requirements. The air cargo industry segment is showing signs of a shakeout similar to that experienced by the passenger airlines since deregulation. Of the largest U.S. air freight carriers, only three or four are expected to survive the next few years.

Future growth in the domestic water transportation industry segment is tied closely to domestic economic conditions. U.S.-flagged foreign trade lines are dependent on domestic and international economic conditions and foreign trade.

Exhibit I-1 outlines driving forces in the transportation industry.

EXHIBIT I-1



B

Issues and Objectives

Key issues for transportation company IS departments include cost control and profitability, company productivity, information access, communications, and improved services to end-user departments as well as to customers.

- Cost control is essential for transportation companies operating in the deregulated environment. IS managers are searching for ways to improve productivity in developing and implementing information services as well as in providing transportation services.

- IS departments are acutely aware of the need for information. Managers need information to make decisions quickly. For example, the airlines use information systems to determine how much discounting must be done in order to maximize revenues. LTL trucking operations use information systems for packing and routing shipments to improve productivity and maximize revenues.

- Communications needs are especially high in the transportation industry due to the many remote sites involved. These sites are often mobile, a situation that presents additional challenges.

- Customers in the transportation industry increasingly expect new services. IS departments must find ways of providing these services so that their companies remain competitive. For example, IS departments implement systems that permit customers to pinpoint the location of goods being shipped at any given time. Other customers require the electronic transfer of data for billing, orders, and routing (EDI).

The following objectives, identified by IS managers, center on profitability and the need to remain competitive:

- Reducing costs, including equipment maintenance and personnel costs, while maintaining the resources needed to develop new systems and maintain existing systems.

- Developing new applications, while improving the application development process. This process involves obtaining better tools for the application development staff.

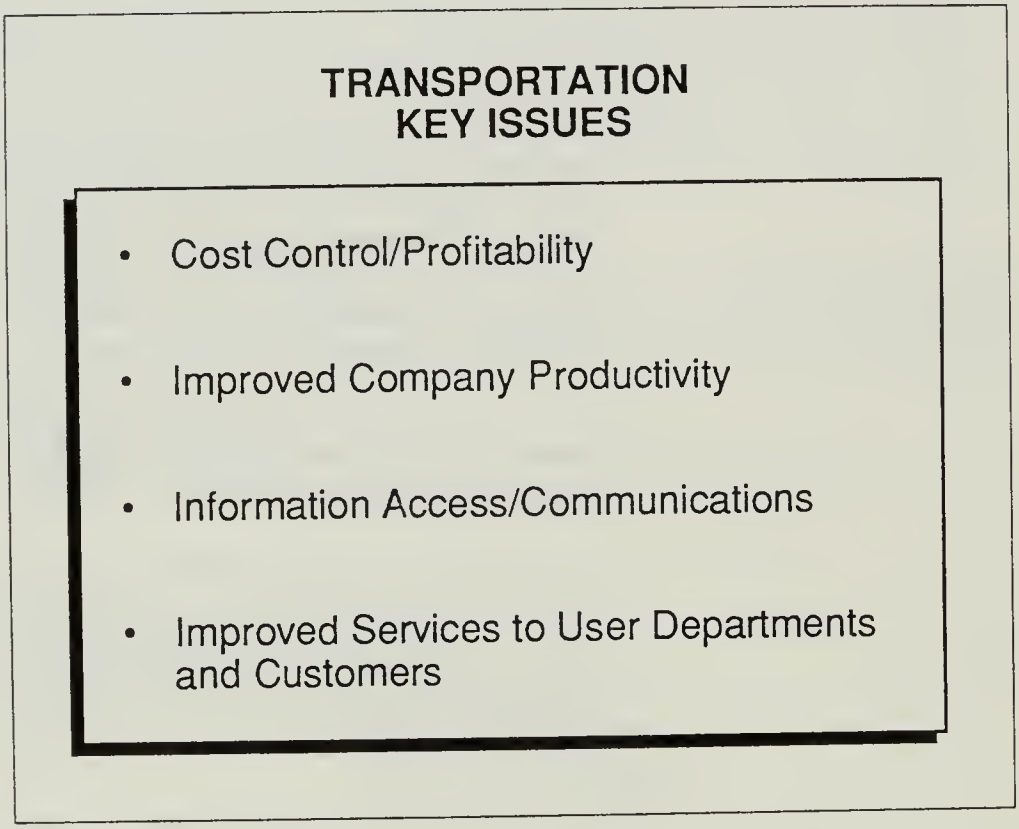
- Develop efficient data communications networks to improve data transfer between various points of transaction involving customers, as well as within their organizations.

- Selecting and implementing software products and other information services that will fulfill the requirements of end-user departments and improve service offerings to customers.

- Purchasing hardware that will meet IS needs and be most reliable and cost-effective in the long run.

Key issues and objectives for IS managers in the transportation industry are shown in Exhibits I-2 and I-3.

EXHIBIT I-2



C
Impact of New Technology

Transportation companies gain their respective competitive advantages through the use of information technology and by increasing productivity, decreasing costs, and improving customer services. Often, in the deregulated environment, these items are essential for a company to even remain in operation.

Information technology, such as data communications, is especially important to transportation companies due to the volatile and very competitive nature of the industry. In addition, innumerous points of transaction are characteristic of the industry. Data communication networks relay essential, current information to managers for decision making in areas such as pricing. These networks also provide ways to offer additional customers services, such as shipment tracking and electronic billing.

EXHIBIT I-3

TRANSPORTATION OBJECTIVES

- Reduce Costs/Increase Profitability
- Increase Transportation System Productivity
- Increase Programmer Productivity
- Improve Application Development Process
- Develop/Implement Applications for Improved Customer Services
- Improve Data Communications Networks
- Purchase Hardware

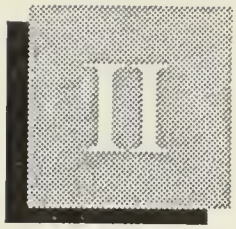
Electronic Document Interchange (EDI) is becoming a major information technology within the transportation sector. EDI was pioneered by the trucking sector and has grown in importance with the major companies. In the railroad sector, also one of the early users, it is becoming a requirement of doing business with the major railroads for bills of lading. Because the transportation industry interacts with all other industries, this sector continues to be a driving force for EDI.

Exhibit I-4 outlines the impacts of new technology on the transportation industry.

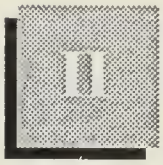
EXHIBIT I-4

TRANSPORTATION IMPACT OF NEW TECHNOLOGY

- Increased Productivity
- Lower Costs
- Improved Customer Services
- Data Transfer within Organization
- Data Communication between Points of Transaction
- Applications at User Department Levels



New Applications



New Applications

INPUT's respondents reported that 50% of major new applications planned for 1988 will be developed internally. Eleven percent (11%) of the major projects planned will be contracted out fully to professional services (External) organizations. The remaining 39% will be combination efforts involving both internal application development staff and external professional services (Both) organizations (see Exhibit II-1).

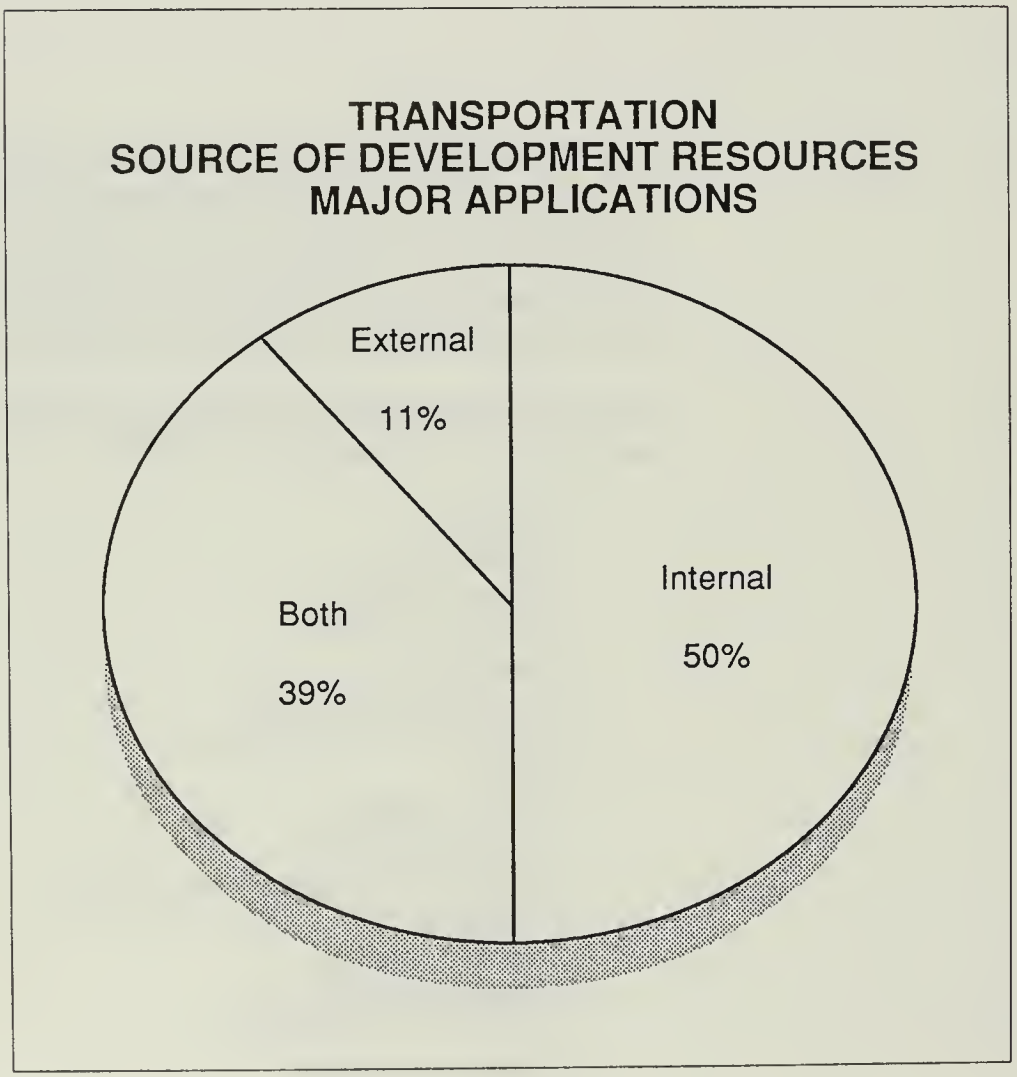
Respondents identified the following cross-industry and industry-specific applications to be implemented in 1988:

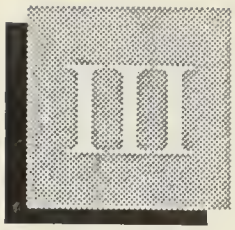
- Budgeting
- General Ledger
- Accounts Payable
- Accounts Receivable
- Fixed Assets
- Integrated Accounting
- Frequent Flyer Accounting
- Payroll
- Flexible Benefits
- Crew Management
- Enhancements to Reservation System
- Scheduling
- Logistics Control
- Materials Management
- Maintenance Management
- Shipping/Invoicing
- EDI
- Sales Tax
- Simplified Rating
- Sales Analysis
- Yield Management
- Exception Reporting
- Flight Operations

- Database Management
- Desk-top Publishing
- Image Processing
- Private Network

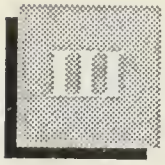
The breadth of this list reflects the diversity of the subsectors within transportation, the level of competitiveness brought on by deregulation, and the value of information systems technology to this information-intensive industry.

EXHIBIT II-1





Budget Analysis



Budget Analysis

IS budgets as a percentage of total corporate revenue averaged 1.0% for transportation respondents in 1987. During 1987, IS spending increased an average of 2% over 1986. This modest increase compares with a 10% increase that had been projected by those companies surveyed about one year ago. Plans to increase spending for information systems were modified due to increased price competition, resulting in less than expected revenue levels, and because of continued restructuring of the industry, leading to consolidation.

Respondents whose IS budgets increased in 1987 attributed increases to corporate growth, IS personnel expenses, computer hardware, communications, and the implementation of new applications. IS managers in the transportation industry expect to increase spending for information services by 7% in 1988. Exhibit III-1 shows the 1987 budget distribution and projects the growth of budget categories in 1988. As in 1987, the most significant budget increases for 1988 will be in the areas of IS personnel, computer hardware, and communications.

IS personnel will be involved in developing and implementing new applications, as well as enhancing and maintaining existing systems. Thirty percent of application development personnel within IS organizations are assigned to the development of new systems, thirty-three percent are assigned to the enhancement of existing systems, and thiry-seven percent are assigned to the maintenance of existing systems (see Exhibit III-2).

Increases in hardware budgets for 1988 were consistent (5-6%) across all categories of hardware—mainframes, minicomputers, microcomputers, mass storage devices, and other hardware, including peripheral devices—although allocation of the total IS budget to each of these categories of hardware varies.

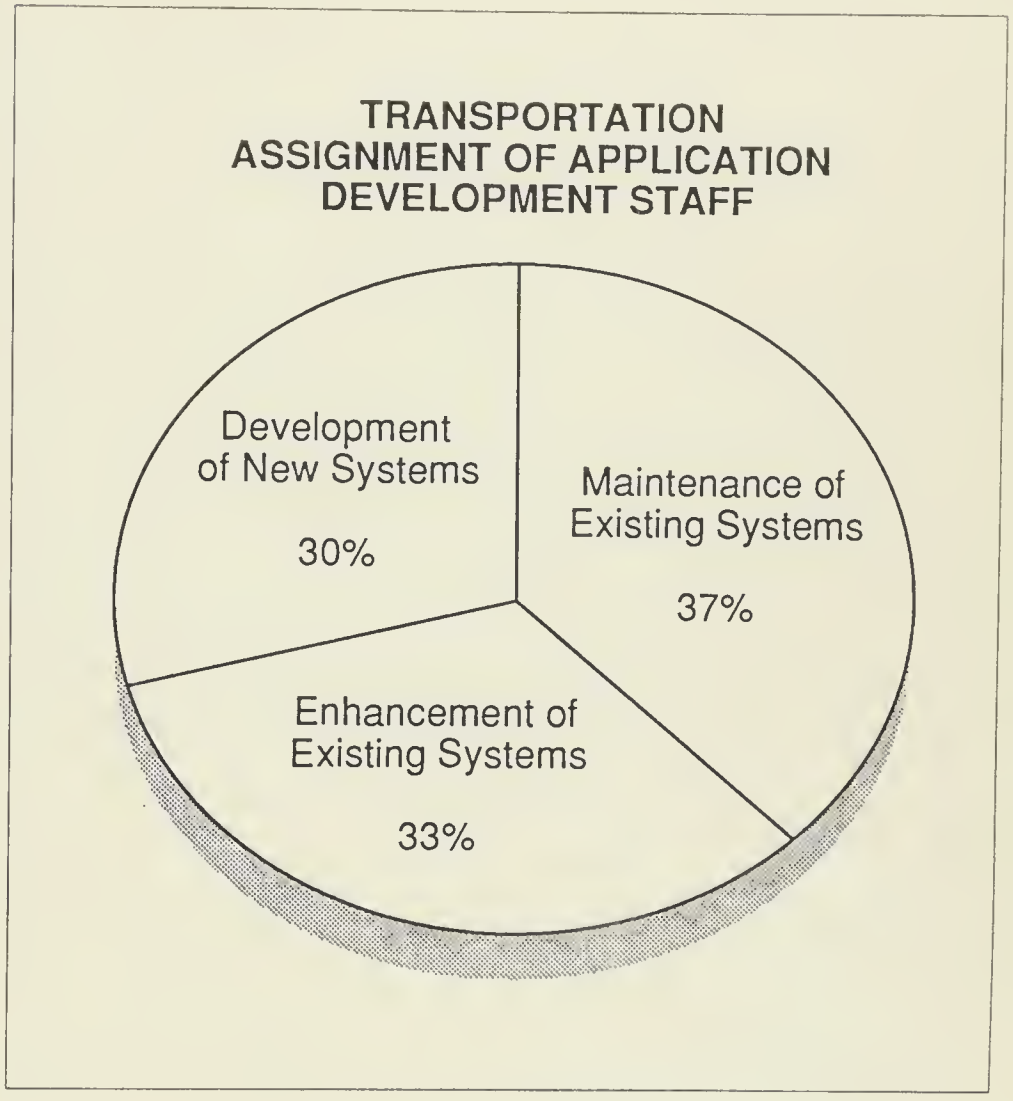
EXHIBIT III-1

TRANSPORTATION
1987 BUDGET DISTRIBUTION AND
1988 PROJECTED GROWTH

BUDGET CATEGORY	PERCENT OF 1987 I.S. BUDGET	1988 PROJECTED GROWTH (Percent +/-)
Personnel Salaries and Fringes	43	8
Mainframes	10	6
Minicomputers	3	5
Microcomputers	1	5
Mass Storage Devices	3	6
Other Hardware	5	6
Total Hardware	22	6
Data Communications	7	6
Voice Communications	5	5
Total Communications	12	6
Professional Services	5	2
Processing Services	0*	10
Application Software	1	2
System Software	3	3
Hardware Maintenance	8	1
Software Maintenance	2	4
Total External Products/Services	19	5
Other	4	4
Total	100	7

*Less than 1%.

EXHIBIT III-2



Many companies currently handle voice communications separately from the IS budget. Respondents with IS budgets that include both data and voice communications plan to increase spending in both areas during 1988.

Respondents reported that total corporate IS expenditures included the corporate IS budget as well as some information systems expenditures of end user departments. However, user departments are generally responsible for purchasing PCs and other related items. Processing services, such as on-line data base access, are also often purchased directly by user departments. In addition, some IS expenditures are charged back to user departments. IS managers indicated a trend toward charging more of their services back to the user departments.

About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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INPUT®
Planning Services for Management

INFORMATION SYSTEMS PLANNING REPORT
TRANSPORTATION SECTOR

NOVEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
TRANSPORTATION SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
TRANSPORTATION SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- The transportation industry has undergone many changes in the past five years due to deregulation.

  - Since deregulation, the largest airlines have remained in the forefront of the airline industry; however, their market shares have declined as smaller carriers capture more business.

    . Airlines are interested in systems such as those for airline reservation and parts inventory tracking to help them compete against other airlines.

  - Entrance into the railroad segment is expensive; therefore, players have remained basically the same since deregulation. Railroads have managed to become more profitable by assembling trains carrying piggyback truck trailers and ship containers. Information systems are used to facilitate these operations.

  - Easy entrance into trucking makes this industry segment very diverse. Profit margins, which are no longer protected, have decreased substantially. Successful trucking companies are those finding a market niche, such as those specializing in less-than-truckload (LTL) business. (LTL

business requires many terminals and freight consolidation centers to sort shipments and load trucks by destination. The high cost deters competition.) Companies specializing in LTL are looking for software that meets very specific requirements.

- Transportation companies are highly dependent on overall economic conditions.

  - Currently, the economic outlook is better for the airline industry segment than for the railroad and trucking segments. At least moderate growth is expected for the airlines, although increased labor costs and fare discounts are lowering profitability. Traffic has decreased for railroads and trucking, resulting in lower revenue and profit levels. Demand and rates have improved in the past year for Pacific containership trade and for tankers in the Middle East.

    - Trucking and railroad companies are looking at information systems to make the difference. For example, on-board computers installed in trucks result in higher productivity, better security, and reduced operating costs.

- Transportation companies are also directly affected by other industries' performances.

  - Trucking, for example, is tied closely to agriculture. The decline in the farming business, with attendant falling crop prices, lower grain sales, and the value of the dollar in foreign markets, has impacted the trucking segment significantly.

- The transportation sector has experienced restructuring over the past few years.

- Airlines operating at a law profit margin or at a loss, such as Frontier, cannat survive in the long run.

- Others, like People Express, that have acquired a significant market share, are merging with or being acquired by larger airlines.

- In same cases, parts af businesses are sold aff, exemplified by Pan Am's sale af its Pacific routes to United.

- Although the railroad segment camprises basically the same companies as in past years, there has been consolidation amang the graup.

- Failures in the trucking segment are estimated to be at levels 50% higher than U.S. businesses in general.

- Many af the larger airlines, such as American Airlines, have developed their own applicatians internally rather than purchasing from outside vendars. In additian, these companies will pravide infarmatian services ta companies they acquire ar merge with as well as affer these services to autside customers.

- Praviding computer services to the trucking segment presents a challenge due ta the diversified nature af the segment and the fact that many af the campanies will came and go within a relatively shart periad af time.

- Driving farces in the transpartatian industry are autlined in Exhibit I-1.

B. ISSUES AND OBJECTIVES

- Key issues include cast control, accessing better infarmation mare quickly, and technalagy.

EXHIBIT I-1

TRANSPORTATION
DRIVING FORCES

- Deregulation
- Economy
- Competition
- Restructuring of Industry

- Cost control.

  - IS managers are faced with trying to keep personnel costs down while improving programmer productivity.

  - Cost and revenue measurements are critical in maintaining profitability.

- Information access/communication.

  - Unique to the transportation industry is the need to communicate with many remote, moving sites such as trucks, buses, ships, trains, and airliners.

  - Because there are so many points of transaction in the transportation business, timely information exchange between these companies and their customers is important. Information exchange would include electronic transfer of data for billing, orders, and routing.

  - Management needs to be able to access information, make decisions, and communicate rapidly.

- Technology.

  - As systems become more complex, the ability to increase capacity and make system modifications becomes increasingly complex.

  - IS managers want to know what hardware, including communications equipment, will be viable in the long run and remain cost effective.

- Objectives are focused on profitability and remaining competitive. They include:
  - Reducing costs, including equipment maintenance and personnel costs.
  - Increasing programmer productivity.
  - Improving data transfer among remote sites, customers, and management.
  - Installing new hardware.
  - Developing new applications.
- Key issues and objectives for IS managers in the transportation industry are shown in Exhibits I-2 and I-3.

C. IMPACT OF NEW TECHNOLOGY

- Advances in technology provide communication capability with operating entities such as trains, buses, ships, and airliners, as well as with branch offices, customers, and management.
  - Telecommunications provides the capability to control operations at the vehicle level.
  - Computerized reservation systems allow seat discounting and improved loading.
  - Increased use of microcomputers as part of a computerized network provides more timely cost and revenue information to management.

TRANSPORTATION
KEY ISSUES

- Cost Control/Profitability
- Rapid Communication with Remote Sites, Customers, and Management
- Future Directions in Technology

EXHIBIT I-3

TRANSPORTATION OBJECTIVES

- Reduce Costs
- Increase Programmer Productivity
- Improve Data Transfer
- Implement New Systems
- Develop New Applications

- As the unit cost of collecting and transmitting data decreases, more information can be collected at the point of transaction. Since in the transportation industry there are so many locations involved, being able to transmit and collect information to and from these points is critical in decision support for cost effectiveness, profitability, and competitiveness.

- The impact of new technology is outlined in Exhibit I-4.

EXHIBIT I-4

TRANSPORTATION
IMPACT OF NEW TECHNOLOGY

- Competitive Advantage through Higher Productivity and Lower Costs
- Quick Access to Information
- Communication with Remote Sites, Customers, and Mangement

II NEW APPLICATIONS

- In the area of new applications planned for IS departments in 1987, 54% of the new applications projects identified by respondents involve external development resources paired with either internal development staff or an application product, or both (see Exhibit II-1).

- New applications requiring only internal development resources accounted for 37% of the responses.

- Only 9% of new applications planned include off-the-shelf application software alone. These included financial reporting software and general ledger and accounts receivable software.

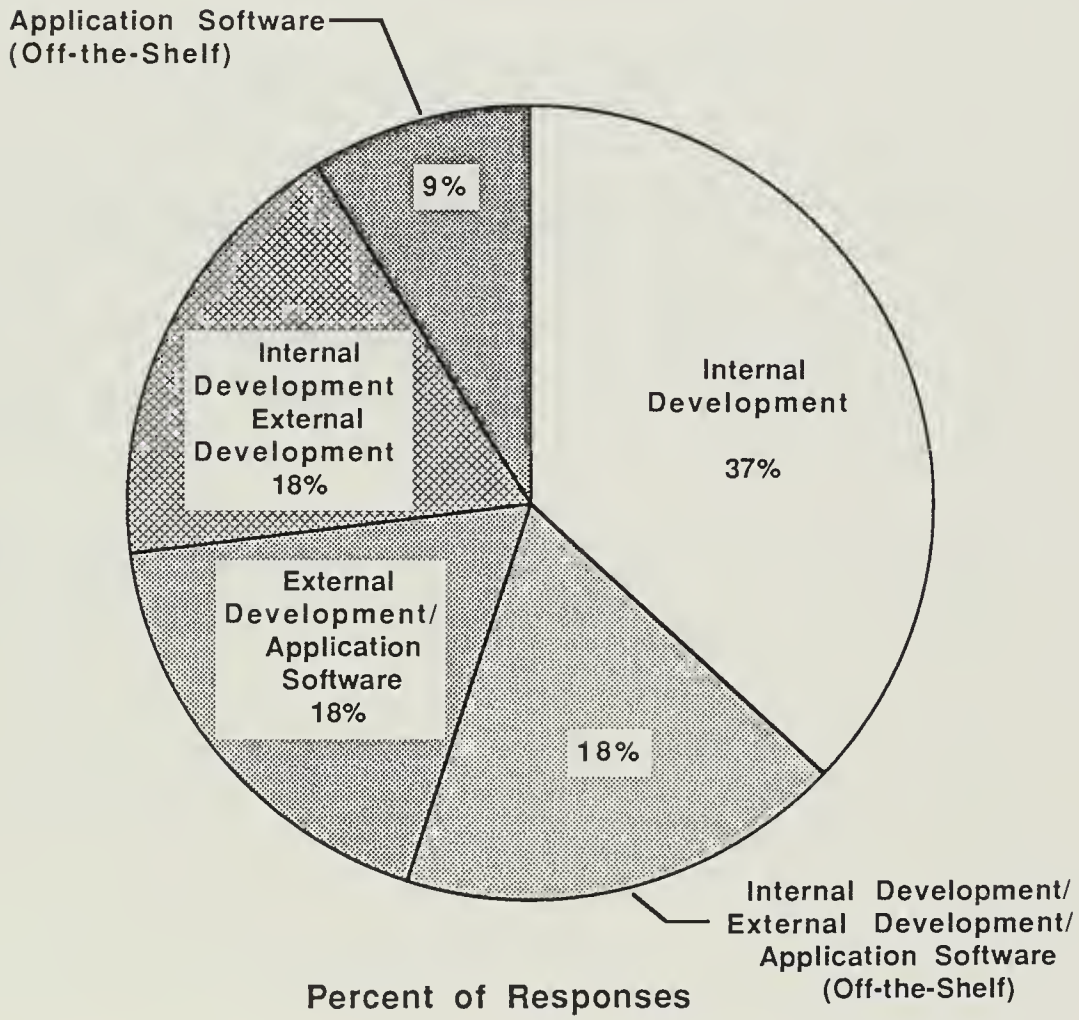
- Very few industry-specific external products and services, including processing services, turnkey systems, professional services, and application software products, were purchased in 1986.

  - An example of industry-specific professional services procured in 1986 was the development of a fuel allowance system for a trucking company.

  - One processing service used in 1986 was an aircraft parts inventory system.

EXHIBIT II-1

TRANSPORTATION
SOURCE OF DEVELOPMENT FOR NEW APPLICATIONS



Percent of Responses

Cost Range: $18,000 - $2.0 Million

- According to respondents, 45.5% of applications development personnel are assigned to the development of new systems, 31% are assigned to the maintenance of existing systems, and 23.5% are assigned to the enhancement of existing systems (see Exhibit II-2).

- The most important applications respondents will be implementing in 1987 are shown in Exhibit II-3. In addition to those applications, the following were also identified:

  - Installation of a communications network linking minicomputers at agency sales locations.

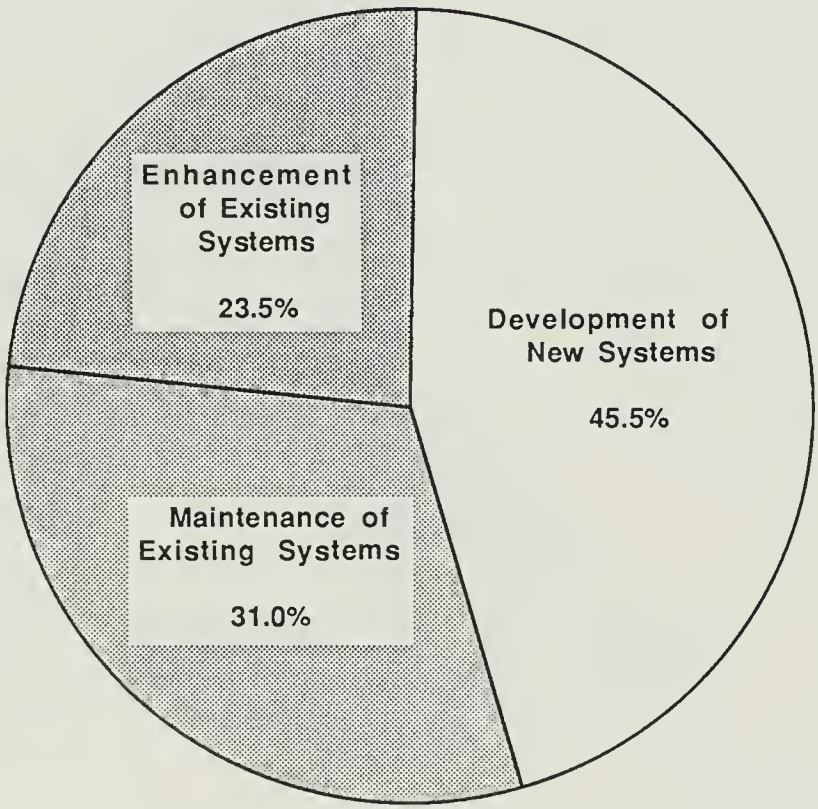
  - Installation of increased mainframe processing capacity.

  - Image processing system for accounts payable that records on a laser disk.

- Implementation costs for new applications ranged from $18,000 to $2 million.

EXHIBIT II-2

TRANSPORTATION
I.S. PERSONNEL ASSIGNED TO DEVELOPMENT, MAINTENANCE, AND ENHANCEMENT OF SYSTEMS



Percent of I.S. Personnel

TRANSPORTATION
NEW APPLICATIONS FOR 1987

Most Important Applications

- General Ledger/Accounts Payable
- Financial Reporting System
- Revenue Allocation System
- Materials Management System
- Project Tracking and Management System
- Railcar Accounting System
- Aircraft Parts Inventory Tracking System
- Yield Management System for Airline Reservations

III BUDGET ANALYSIS

- Expected growth for IS budgets in 1987 averaged 10.3% for the transportation industry respondents.

- Increases in 1987 were attributed to corporate growth , the installation of new application programs, IS salary increases, and the acquisition of new computer hardware (see Exhibit III-1).

- Decreases were generally related to hardware.

  - Some companies are purchasing rather than leasing equipment.

  - Some are purchasing new equipment with one-year service warranties to reduce maintenance costs for the year.

  - Some are moving to third-party maintenance providers to cut costs.

- Companies with budgets remaining the same reported that personnel and equipment costs had to be held constant due to a decline in business. As mentioned earlier, the trucking industry segment is heavily affected by the farming business. Since no significant improvement is forecasted for farmers in 1987, transportation companies tied to farming must control costs while they look at other markets for their service.

EXHIBIT III-1

TRANSPORTATION
INCREASING 1987 I.S. BUDGETS

- Corporate Growth
- Installation of New Application Programs
- Wage Increases
- New Equipment Acquisitions

- As shown in Exhibit III-2, 60% of respondents are increasing IS budgets in 1987, budgets remain the same for 30% of respondents, and for 10% of respondents, budgets are decreasing in 1987.

- For respondents increasing IS budgets in 1987, 50% will increase at the same rate as in 1986, 33% will increase at a rate lower than in 1986, and 17% will increase at a rate higher than in 1986.

- IS budgets for transportation industry respondents averaged 1.5% of total corporate revenue in 1986.

- Respondents reported that total corporate IS expenditures included the corporate IS budget as well as other IS organizations within the company. Responses showed that the corporate IS budgets represent, on average, 90% of total corporate IS expenditures, while other IS organizations expenditures represent the remaining 10% (see Exhibit III-3).

- Exhibit III-4 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

- The largest projected growth categories in 1987 are personnel, mainframes, and data communications.

  - Personnel are required for internal applications development.

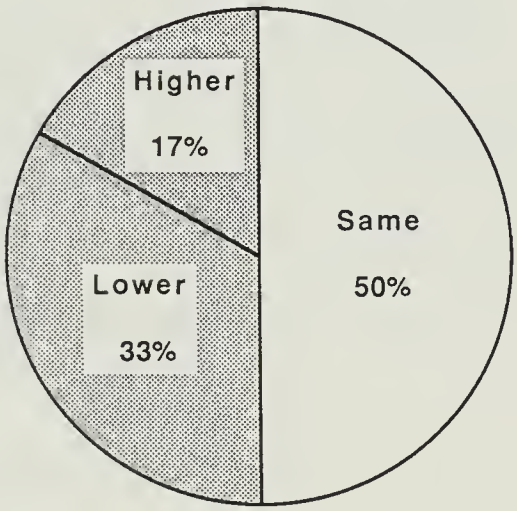
  - Mainframes are required to provide processing that is being moved in-house.

    - For those transportation industry respondents that have been using outside processing services, there is a trend to move these types of services in-house.

EXHIBIT III-2

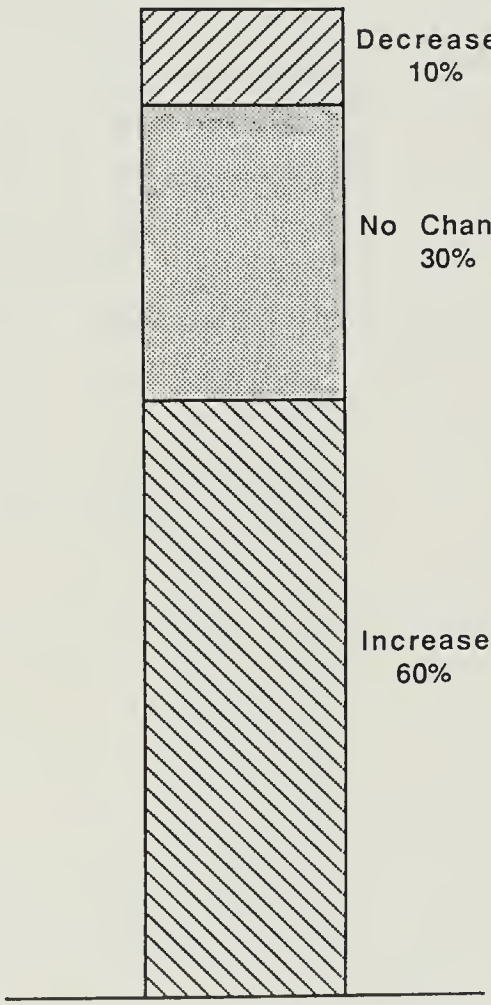
TRANSPORTATION
MOST BUDGETS WILL INCREASE AT THE SAME RATE AS IN 1986

1987 Budget Growth versus 1986 Budget Growth



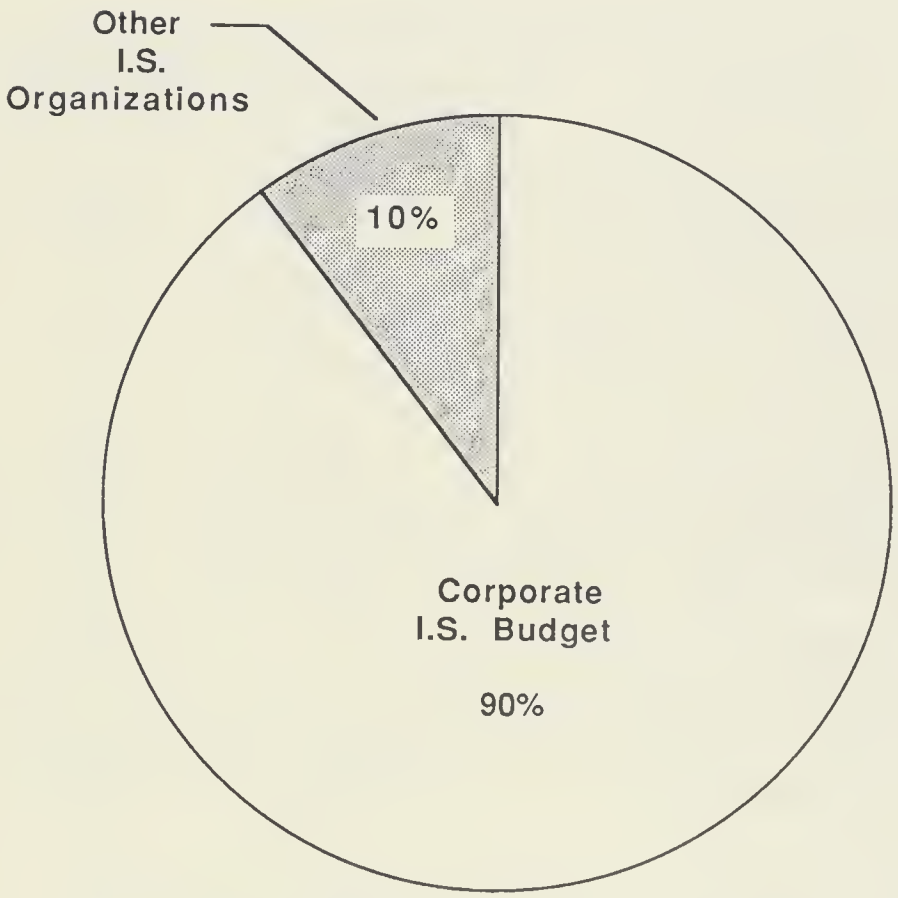
Percent of Respondents Increasing I.S. Budgets

1987 Budget versus 1986 Budget



Percent of Respondents

TRANSPORTATION
TOTAL CORPORATE I.S. EXPENDITURES



Percent of Total Corporate I.S. Expenditures

EXHIBIT III-4

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE TRANSPORTATION SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	47.2%	10.2%
Mainframe Processors	14.9%	16.4%
Minicomputers	1.1%	8.5%
Microcomputers	1.3%	7.1%
Mass Storage Devices	.7%	0.0%
Total Hardware	18.0%	21.6%
Data Communications	4.9%	9.6%
Voice Communications (If Part of I.S. Budget)	17.9%	2.5%
Total Communications	22.8%	4.0%
Professional Services	0.4%	8.4%
Processing Services	0.4%	-86.4%
Application Software	0.7%	3.1%
Systems Software	3.0%	6.6%
Turnkey Systems	0.5%	0.0%
Total External Services/ Products	5.0%	-1.8%
Other	7.0%	11.1%
Total All Categories	100.0%	10.3%

- Data communications are required for the type of connectivity that transportation companies are looking for. In fact, connectivity is the most important issue that information service vendors can address at present.

  - Transportation companies want to link vehicles and depots to corporate offices, and sales locations to corporate headquarters.

  - Electronic Data Interchange (EDI) can be used to transmit shipment and delivery information to carriers providing intermodal transportation.

  - Transportation companies will be looking at private and public networks accessed via phone lines and satellite dishes. Some projected future technologies, such as installing satellite dishes on trucks, have met with initial skepticism.

  - Transportation companies typically dedicate a significant portion of IS resources to data communications because of the diverse nature of the industry.

- The respondents in the transportation sector reported that software and hardware maintenance was either bundled into the cost of the software/hardware or provided by their own staff.

  - In a few cases, the respondents will be changing over to third-party maintenance providers for hardware and software support to effect cost savings in 1987.

IV COMPANY PROFILES

A. COMDATA NETWORK

1. PRODUCTS/SERVICES

- Comdota Network, Inc. provides funds tronsfer services to the trucking industry and offers check verificotion processing services for retail estoblishments.

- Comdoto's processing services for the tronsportation industry include Comchek ond Express Comchek Funds Tronsfer Services, Fuel Purchose Progrom, Permit Tronsfer Program, ond COMVOY Shipment Interchonge Program.

  - With Comchek, a request for tronsfer of funds is mode through o Comchek Service Center to Comdoto. Comdota verifies the truck compony's credit ond notifies the Service Center os to the omount ond recipient of the requested droft. The driver provides identification, Comdota issues on outhorization number, ond the driver endorses the droft in exchonge for cosh.

  - Express Comchek increoses the speed ond reduces the communicotion expense of money tronsfers. The driver is furnished with a supply of blonk Comchek drafts. Upon request, on express code is given by his

dispatcher. A completed draft is presented to the Service Center, an authorization is obtained, and the driver receives cash in exchange for the draft.

- The Fuel Purchase Program permits trucking companies and other transportation customers to obtain cash discounts on fuel purchases through an identification card system.

- Comdata also offers its Permit Transfer System to clients requiring special regulatory permits to transport goods within certain states.

- The COMVOY Shipment Interchange Program allows shippers and carriers to electronically match shipments with available cargo space on trucks going to the required destination.

- Funds transfer services are provided to individual credit card holders through Comdata Service Centers located at truckstops, gambling casinos, motels, hotels, and college campuses.

2. MARKETS SERVED

- Comdata markets its services to the trucking industry, credit card holders, and retail establishments.

3. COMPANY STRATEGY

- Comdata's acquisition of Cashex in 1983 provided a growth opportunity for the company in the check authorization and guaranty service business.

- Comdata has increased the credit requirements of its trucking customers who were feeling the effects of price competition resulting from deregulation.

- The company attributes its success to the unique systems design of its electronic funds transfer system.

4. RECENT ACTIVITIES

- The company has developed a new marketing team which has been assigned the responsibility of increasing Comdata's presence in the business of public money transfer.

5. FUTURE DIRECTIONS

- Deregulation produced the need for increased vehicle utilization. Comdata's COMVOY system is used to schedule fleets and electronically transfer shipments that must be rescheduled to Comdata's main data base, where they are immediately available to all participating trucking customers. Comdata will continue to develop new services like these for the trucking industry.

B. FUNDSNET, INC.

1. PRODUCTS/SERVICES

- FundsNet, Inc. provides electronic funds processing and transfer services to the transportation industry and the consumer public and provides credit card processing services to retail establishments and the travel and entertainment industry.

- Dial-a-Check offers trucking companies a method of transferring funds to their drivers while en route.

- Action Check is an enhancement to the Dial-a-Check service. With this service, the trucking company provides its drivers with preauthorized coded vouchers for presentation at service centers.

- National Purchasing System makes use of the Dial-a-Check via FundsNet plastic identification cards that are issued by transportation companies to their drivers.

- Cashcall services are offered at over 125 resort hotels, race tracks, casinos, and campgrounds across the U.S., as well as in Puerto Rico and the Bahamas. Consumers can obtain a cash transfer by utilizing their VISA or MasterCard on FundsNet or other terminals located at the establishment's service center.

2. MARKETS SERVED

- FundsNet's revenue is derived from the transportation industry, credit card holders, and retail distributors.

3. COMPANY STRATEGY

- FundsNet considers itself to be an innovator in the funds transfer service business.

- In 1984, the company invested substantially in a new and upgraded technology used in the services provided to the transportation industry. The decline in operating costs of 5.5% as a percentage of revenue in 1985 demonstrates the success of the investment.

4. RECENT ACTIVITIES

- Transportation services grew 7% in transaction volume in 1985; however, revenue increases were small due to price competition.

5. FUTURE DIRECTIONS

- Management plans to take advantage of new expansion opportunities in the financial services industry.

Information
Services
Program
(ISP)

Information Systems Planning Report

Utilities
Sector

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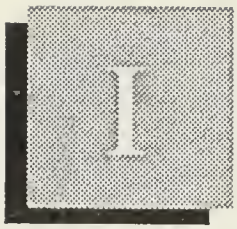


Major Issues

Major Issues

A

Driving Forces

Merger and acquisition activities among utilities are increasing and will result in larger, but fewer, utilities, especially electric.

- Pacific Lighting Corporation (Los Angeles, CA) acquired drugstore chain Thrifty Corporation (Los Angeles, CA) in an effort to diversify its operations.

- Pacific Gas & Electric Company (San Francisco, CA) has made an offer to merge with the Sacramento (CA) Municipal Utilities District.

The cost of building new nuclear power plants continues to force budget austerity. While building nuclear power plants may be necessary to provide sufficient capacity, building costs for such plants have escalated in the last few years to where a new plant costs $4 - $6 billion.

State utility commissions are separating power generation from power distribution activities. Rate changes are divided into the cost of power production and the cost of power transmission.

The federal government is gradually deregulating prices for electricity and natural gas, adding pressure on utilities to learn how to effectively market its products. Further pressure comes from certain state governments, which are permitting utilities in their state to sell electricity or gas to customers in neighboring states.

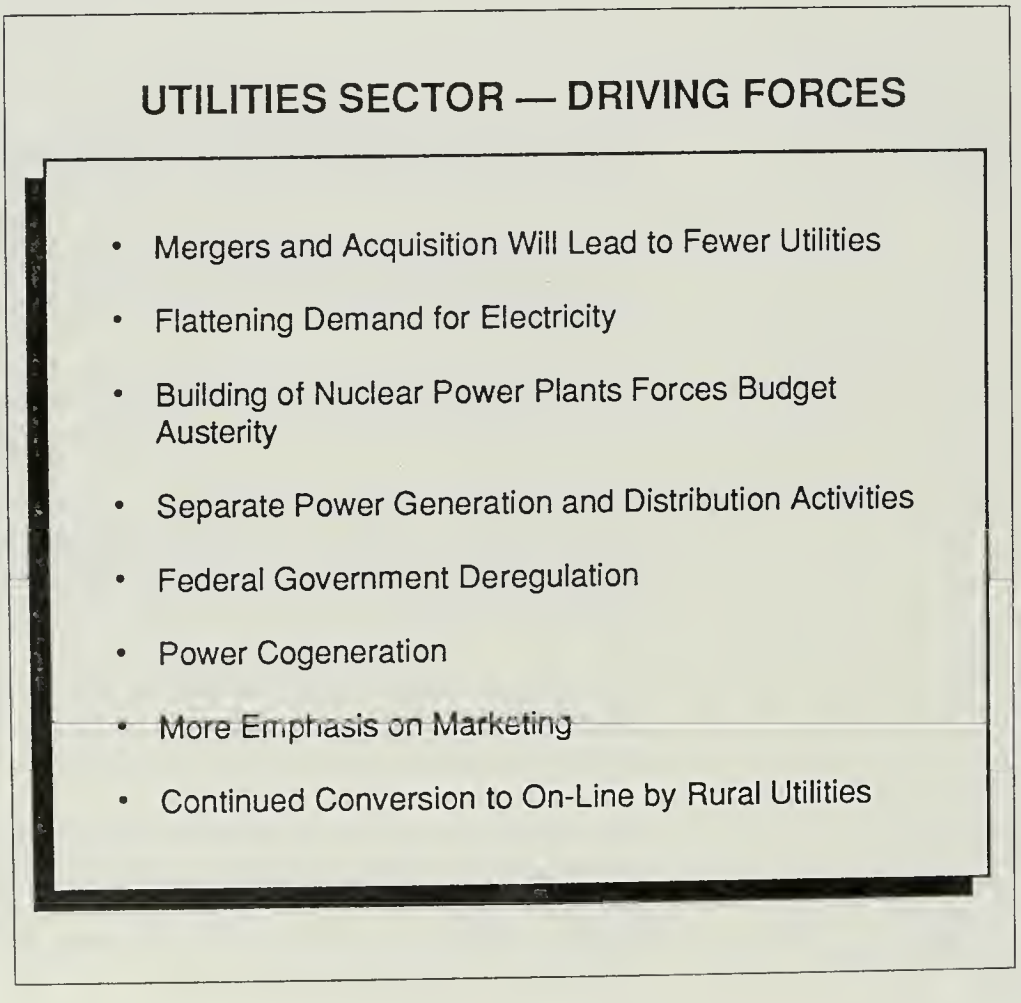
Cogeneration is now a reality in the power business. Large industrial customers can purchase generators capable of providing internal capacity and excess power. The excess power must, by law, be purchased back by the local electric utility at comparatively high rates.

As a result of deregulation and cogeneration, utilities face more competition. New systems to address market-based requirements must be estab-

lished. To prosper, utilities must learn marketing. Marketing efforts will be directed mainly at the largest customers, which are necessary to retain in order to spread the fixed costs across a wider user base. Please refer to Exhibit I-1.

As part of an improved service orientation, smaller, rural utilities are continuing the conversion from batch to on-line systems. Department managers strongly influence the operations of smaller utilities. In the past, near-monopoly rural utilities spent as little as possible on technology. Now, they must invest in new systems to meet a changing economic and regulatory environment.

EXHIBIT I-1



B

Issues and Objectives

Cost containment has always been a major issue in this industry. Service requirements must be balanced against funds available for increases through rate hikes and the need to pay shareholders of investor-owned utilities a fair return on their investment.

More regulatory changes means more changes to the existing software to accommodate the wishes of state legislatures or other governmental bodies. Minor changes are not a problem; however, major regulatory changes mean major software rewrites and testing and debugging.

Interestingly, a few large utilities have installed and tested Local Area Networks (LANs). Now that users have seen what they can do, virtually every user wants to be part of the network, whether or not the network is relevant to that person's job.

Utilities are coping with the problem of how to structure the organization's data processing operation. Should it be centralized, distributed, or a "hybrid" in order to best accomplish necessary tasks? Decentralization is being discussed as a means to delay the purchase of an additional mainframe, since the existing mainframe is already burdened by the growth of applications/power needs.

Office automation, especially in IBM environments, is being implemented slowly with calendar functions and electronic mail as the primary applications.

Utilities are buying used computers to help stretch their budgets. While the purchase of used disk and tape drives is relatively commonplace, buying used CPUs is a major, but necessary, step for many utilities.

IS managers appear to have a broader organization perspective than many utility company senior managers. They want to use IS to improve customer service — through on-line inquiry, on-line posting, and relational database management system-based customer information systems, providing vital marketing information.

Senior management must begin to use information for a strategic or competitive advantage. While one electric company does not compete with another, many factors influence a developer's choice of gas or electric heat for a new shopping center or office building.

In a couple instances, IS managers wanted to use IS to foster better organizational teamwork and cooperation. The utility industry may be the last business where department managers ran the company, rather than senior management providing organizational leadership and direction.

Please refer to Exhibits I-2 and I-3 for details.

EXHIBIT I-2

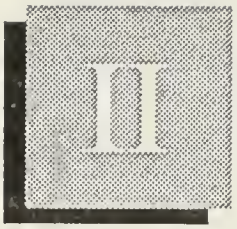
UTILITIES SECTOR – ISSUES

- Cost Containment
- More Regulatory Changes
- Control Growth of LANs
- Centralized/Distributed/Hybrid Processing
- Office Automation
- More Used Computers

EXHIBIT I-3

UTILITES SECTOR – OBJECTIVES

- Use IS to Improve Customer Service
- Get Senior Management to Strategically Use Information
- Use IS to Foster Organizational Teamwork and Cooperation



New Applications

C

Impact of Technology

Exhibit I-4 highlights four key aspects of what technology has done for end users in the utility industry.

EXHIBIT I-4

UTILITIES SECTOR — IMPACT OF TECHNOLOGY

- Office Automation Helps Daily Operations
- New Technology Results in Decreasing Maintenance Costs
- Users Get More Hardware Power for the Money
- Routine Work Moves from Programmers to End Users
- IBM PS/2 will Increase User Expenditures

First, office automation helps manage the daily operations in electric, gas, and water/waste utilities. Better communications are a must for improving customer service and becoming more competitive.

Second, new hardware technology has resulted in steadily decreasing maintenance costs over the past two years. While manpower requirements to operate an IBM mainframe have not changed much, IBM decreased its direct changes for maintenance under its CSA program.

Third, for the same amount of money spent three years ago, a user now gets ten times the raw hardware power. However, increases in the number of applications supported and the increasing memory required to support each application results in a minimal overall gain. More robust software continues to help sell more hardware.

Fourth generation application development software helps move more routine work from programmers to end users, enabling programmers to catch up on the applications backlog.

Finally, IBM's new PS/2 system will have the effect of forcing end users to spend more money to adapt and integrate this new technology into existing IBM PC/XT/AT-based operations. This comes at a difficult time for utilities, when management would rather watch all IS spending.

II

New Applications

Application development within the utilities sector continues its focus on asset management and customer-oriented systems. Exhibit II-1 highlights the specific applications to be started or continued in 1988.

EXHIBIT II-1

UTILITIES — NEW APPLICATIONS IN 1987

- Shareholder Systems
- Repetitive Maintenance for Nuclear Facility
- Distributed Work Information Power Plant Maintenance System
- On-line Financials (AP/AR/GL/Billing)
- Conversion from Batch to On-line Systems

Better utilization of people's time and the capital assets in place represent a major means of improving overall financial performance. The installation of customer-oriented systems may be the result of:

- A different regulatory environment.
- The financial community's perception of what makes for a "better" investor-owned utility.
- Utilities' responses to increased competition.

Shareholder systems are also being updated to foster better relations with shareholders, in the increasingly likely event of a takeover offer. Better relations should result in increased loyalty to the organization and, indirectly, to current management.

People and asset management applications include:

- Repetitive maintenance for nuclear facility.
- Distributed work information systems.
- Power plant maintenance system.

Medium-sized gas, electric, and water/waste utilities are continuing to convert financial systems from batch to on-line operations.

The utility sector has few IS needs which respondents believe are not well-served by vendors. Specifically, users want:

- More networking options available through each vendor.
- More involvement by vendors to help hold costs down.

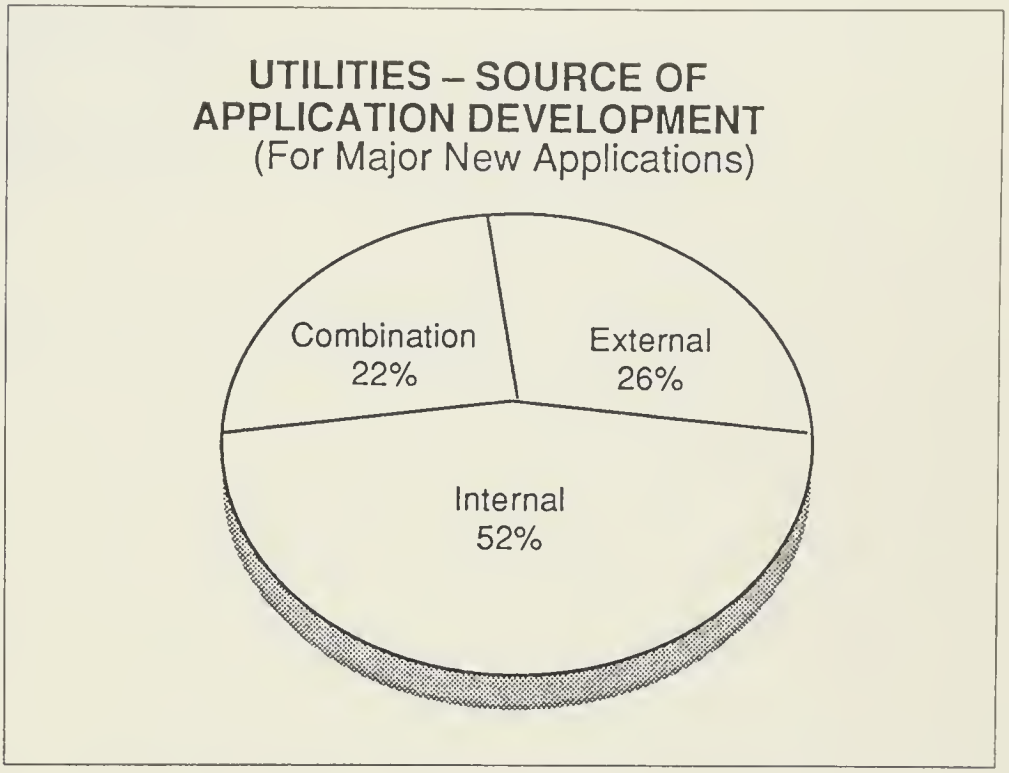
Without prompting by INPUT interviewers, users remarked favorably about the decreasing mainframe hardware maintenance costs under IBM's new Corporate Service Amendment (CSA). However, the CSA is designed generally for large accounts which must meet such requirements as: setting up a first-line of contact for internal users (to minimize "no fault found" service calls); agreeing to a long-term contract with heavy cancellation penalties; and having staff members trained at certain IBM-determined levels of competency for the user's computer system.

However, users believe that, in general, vendors are trying to sell too much technology too fast.

According to the information depicted graphically in Exhibit II-2, the utilities sector is divided in its approach to software development.

- Larger utilities tend to develop new applications in-house while smaller organizations generally rely on third-party software vendors for new applications.
- Maintenance and enhancement of existing applications takes far greater resources than developing new applications. Larger utilities devote approximately 50% of software development staff to developing new applications. Smaller utilities devote less than 30% of their software development staff to developing new applications.

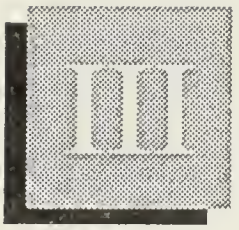
EXHIBIT II-2



One respondent expressed a caveat for third-party software vendors. Specifically, although utilities must accomplish the same basic tasks, no two utilities approach the problem in the same way. Therefore, some level of software customization is necessary to help make the sale. Customization requirements can be minimized by offering menu-driven choices within the application software package, and thereby simplifying user support requirements.

Cost Range of New Applications, whether developed in-house or purchased from a third-party:
- Mainframe Based: $90,000 - $2,000,000
- Minicomputer Based: $18,500 - $950,000
- Microcomputer Based: $165 - $9,300

Average Cost of Purchased Application Software:
- Mainframe Based: $550,000
- Minicomputer Based: $67,500
- Microcomputer Based: $1,175



Budget Analysis

Budget Analysis

In 1987, respondents experienced limited growth in their IS budgets, due primarily to increases in salaries and fringe benefits and the negative effects of nuclear power plant construction cost overruns.

- Overall IS spending in 1988 is projected to decrease 0.2%.
- Exhibit III-1 shows the 1987 budget distribution and projects the growth in specific budget categories in 1988.

In general, IS budgets at large utilities are growing faster than those at medium and smaller utilities. The unique staffing and equipment requirements at nuclear power plants account for the difference. If nuclear plants are deleted from the analysis, then budgets at medium and small utilities are increasing 0.7% faster than those of large, investor-owned utilities.

A comparison of data from 1985, 1986, and 1987 indicates that 1987 was an unusual year. Generally speaking, more utilities took one of the following actions than in either of the two previous years:

- Purchased new equipment.
- Leased more equipment.
- Upgraded existing equipment.
- Bought used equipment.

Nearly 60% of the respondents project that their IS budgets will decrease or remain the same in 1988 as in 1987. Please see Exhibit III-2.

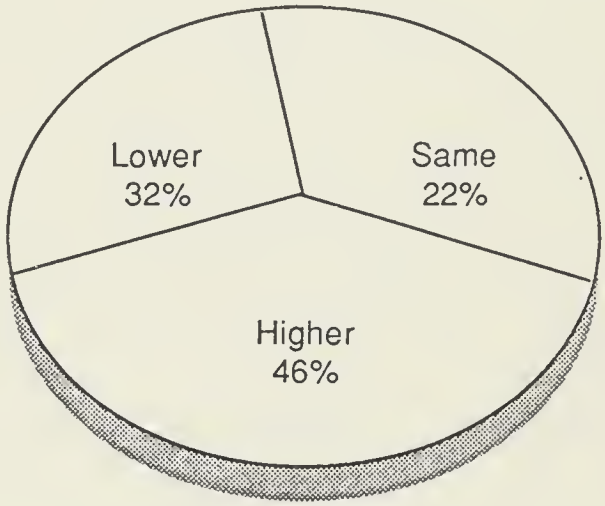
EXHIBIT III-1

1987 BUDGET DISTRIBUTION AND 1987-1988 CHANGES IN THE UTILITIES SECTOR

BUDGET CATEGORY	1987 I.S.BUDGET (Percent)	1987-1988 EXPECTED BUDGET GROWTH
PERSONNEL (Salaries & Fringe Benefits)	36.3	2.5
HARDWARE		
Mainframes	12.2	(9.7)
Minicomputers	6.6	(4.2)
Microcomputers	4.3	2.5
Mass Storage Devices	2.9	3.0
Other Hardware	2.2	(2.4)
TOTAL HARDWARE	28.2	(2.2)
Data & Voice Communicatons	4.8	4.9
External Software	6.5	8.3
Professional Services	4.5	(6.6)
Turnkey Systems	2.1	0.2
Software Maintenance	3.4	3.5
Hardware Maintenance	9.3	(11.2)
Outside Processing Services	0.1	2.3
Supplies	3.5	2.1
Travel; Subscriptions; Etc.	1.3	(6.8)
Subtotal - Maintenance, Services, & Other	35.5	(1.3)
TOTAL	100.0	(0.2)

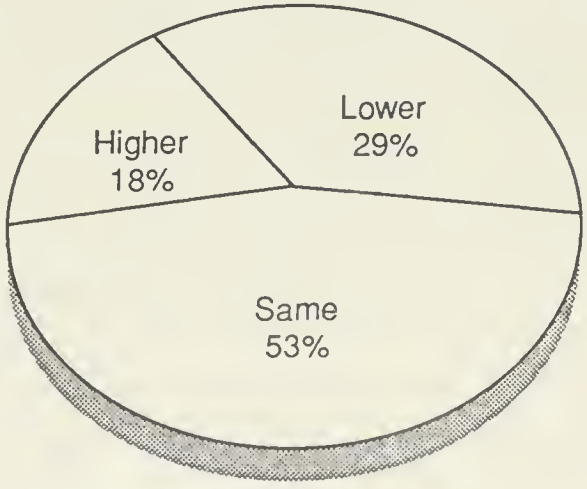
EXHIBIT III-2

UTILITIES SECTOR — MOST BUDGETS WILL REMAIN FLAT OR WILL DECREASE



Comparison of
1988 and 1987
I.S. Budget

UTILITIES SECTOR — MOST BUDGETS WILL REMAIN FLAT OR WILL DECREASE



Comparison of
Changes in Growth Rates of
1987 and 1988 I.S. Budgets
(Among Sites with Increasing Budgets)

Indirect factors contributing to decreases in the IS budget include:

- The effects of nuclear power plant construction.
- Managing reported "earnings per share."

Factors directly contributing to increases in the IS budget include:

- Personnel Expenses.
- New Application Software Development Projects.

Four factors were listed as the major contributors to decreases in the IS budget, namely:

- Declining state/local economy (resulting in a smaller customer base for services).
- Significant reductions in the purchases of software development (professional services).
- Declining hardware maintenance for IBM mainframes, resulting from adoption of IBM's Corporate Service Amendment (CSA).
- Less travel to conferences and seminars, especially from rural locations.

Headcount from 1986 to 1987 within utilities sector IS departments decreased somewhat. Larger utilities tended to add personnel, while headcount in smaller utilities decreased. These decreases can be attributed to increased efficiency resulting from automation or not replacing employees who quit or retire.

- 17% reported headcount increased.
- 56% reported headcount remained the same.
- 27% reported headcount decreased.

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INFORMATION SYSTEMS PLANNING REPORT
UTILITIES SECTOR

NOVEMBER 1986

INFORMATION SYSTEMS PLANNING REPORT
UTILITIES SECTOR

CONTENTS

INFORMATION SYSTEMS PLANNING REPORT
UTILITIES SECTOR

EXHIBITS

I MAJOR ISSUES

A. DRIVING FORCES

- Most utilities have completed major capital projects resulting in up to 50% excess capacity in many utility operations. Demand has slowed, increasing at a 2-3% rate annually. Nuclear power plant cost overruns have forced budget austerity. Thus, no new major construction projects will be required until the 1990s.

- Utilities have always dealt with government regulations. However, "enlightened" utilities are learning to work with regulatory agencies in an effort to get necessary rate increases and receive these increases in a timely manner.

- The economy has improved. Lower inflation and interest rates are usually good news to a capital intensive industry like utilities. Unfortunately, most of the major building programs were financed during periods of high inflation rates. Thus, the combination of excess capacity, slower growth in consumer demand, and high debt servicing requirements have placed most utilities in a major cost reduction program.

- Readily available excess electricity, made possible by cogeneration, has greatly lessened the need to expand capacity.

- Hardware and software obsolescence will impact many utilities. Basic commercial applications (e.g., billing, financial reporting, etc.) need to be upgraded. New billing and payment systems that take advantage of technological advances such as pay-by-phone and frequency emitting meters will need to be developed. Engineering and operation systems will require more integration with modeling systems to project capacity.

- Senior management at utility companies, selected generally for good day-to-day operations backgrounds, must begin using information as a competitive and strategic weapon.

- Exhibit I-1 summarizes the driving forces for the utilities sector.

B. ISSUES AND OBJECTIVES

- IS key issues for this sector focus on solving the paradox of containing costs while upgrading obsolete systems. In addition, management looks to IS to produce systems that improve productivity throughout the organization while applying the same cost constraints on IS as on other departments.

- Utilities that are under less severe cost pressures have issues and objectives encompassing data administration, formalizing end-user support organizations, and taking a more active role in the corporate planning process.

- Marketing and customer service improvements are playing a larger role in IS decisions. Utilities have become more marketing oriented in their efforts to provide services to more homes and businesses without increasing overall plant capacity.

- Regulatory reporting will continue to place a burden on information systems resources.

EXHIBIT I-1

UTILITIES
DRIVING FORCES

- Regulation
- Economy (Inflation and Interest Rates)
- Excess Capacity
- Slower Growth in Demand
- Strategic Senior Management Orientation

- As large utilities broaden their business bases, corporate IS plans should be integrated with the overall strategic plan.

- Since marketing's role in utilities is increasing, strong consideration should be given to relational data base systems for marketing information. The challenge: Must MIS persuade senior management that installing a marketing information system is necessary before marketing's role can be increased? The challenge is increased by the fact that senior management of utilities comprises good day-to-day managers, not necessarily those with a strategic orientation.

- End-user computing will grow in a more competitive environment since each department must have specialized systems to support the overall effort. A "plain vanilla" approach through batch-oriented corporate MIS will not provide timely and complete information to individual departments.

- The purchase of departmental minis and fourth generation application development tools by end-user departments is changing MIS' role to one of data manager and coordinator. Additionally, corporate MIS can continue to help with cost justification of systems for end-user departments.

- Asset management is a logical outgrowth of utilities becoming more competitive. Cash management, vehicle management, and facilities management systems have relatively high installation priorities.

- Exhibits I-2 and I-3 summarize the issues and objectives of the IS respondents for this sector.

- Management in the utility sector perceives IS as a technical asset, not a business asset. They are just beginning to see the advantage of IS as a strategic tool, but management is most concerned with cost containment and IS' role in achieving that goal by improving corporate-wide productivity.

EXHIBIT I-2

UTILITIES
ISSUES

- Cost Containment
- Hardware and Software Obsolescence
- Customer Service Improvements
- Regulatory Reporting
- Productivity Improvements
- Integration of IS Plan with Corporate Strategic Plan
- Establishment of a Data Base of Marketing Information
- Increase in Organizational End-User Computing

EXHIBIT I-3

UTILITIES
OBJECTIVES

- Change from Internal Application Development to User-Driven Data Administration
- Continue Cost Justification for End-User Computing
- Install Capital Management System

- IS measures its success in terms in which management is most interested--cast. Casts are compared to ather departments and to IS departments af similar arganizatians. Same respandents do perform cast benefit analysis an majar prajects and cammunicate the results to management, but very little post-implementation analysis is performed. Mast respandents believe they have maderate success in cammunicating their measurements to management.

- Mast respondents have very minor involvement in corparate planning, but same see their rale in this area increasing. One respandent is part of the corparate strategic planning graup.

C. IMPACT OF TECHNOLOGY

- End-user camputing has had a significant impact on this sectar's Is department. It has braadened IS' scape and required it ta become service ariented.

- Departmental pracessing has had little impact in this sector. The highly centralized appraach ta processing caupled with severe cast canstraints has relegated the study of departmental pracessing ta a very law priarity in many campanies.

- The majar thrust in distributed systems develapment is micro-based end-user applicatians. One respandent is developing twa systems using this technique.

- The respandents felt that the learning curve far relatianal data base use is very high. Hawever, some respondents are developing applications using relational data bases and athers are using relational-like faurth generatian languages.

- Fiber optics techology is of interest to IS managers, since it will permit transmission of graphics-based information due to its support of increased bandwidth.

- Most of the respondents believe that merging voice and data will be required in their organizations. This belief is based on the concept that voice communications costs would be reduced once voice and data are merged. The respondents are planning for merging voice and data, but believe it will be at least two years before it can be implemented.

- The lack of LAN standards is delaying the wide spread use of LANs in respondent companies. Respondents state that they cannot make an educated decision on which architecture to use, so most companies are taking a tentative, cautious approach to LAN implementation.

- Although not directly IS-related, new technologies are making available alternative energy sources at competitive rates.

- Exhibit I-4 summarizes the impact of the above technological issues on IS for the utility sector.

- The utility sector has had great success with its end-user computing support. One respondent has increased staff in this area at an annual rate of 10% since 1984 and now has a staff of over 60 people supporting end users. In other organizations, end-user computing has forced IS to become more business- and service-oriented. Ancillary benefits to establishing the end-user support organization have been to increase user understanding of the complexities of IS and heightened management awareness of the capabilities IS can provide.

- As in other sectors, the information center (IC) has been the focal point for end-user training. The more advanced end-user organizations have a separate training group that performs the following functions:

EXHIBIT I-4

UTILITIES
IMPACT OF TECHNOLOGY

	IMPACT	COMMENTS
End-User Computing	High	Relatively constant staff levels; 5% AAGR 1986-1988. Broadened IS scope.
Departmental Processing	Medium	Result of competition and deregulation of energy sources.
Distributed Systems Development	Low/ Medium	Causing IS architectural problems. Some using 4GL for this.
Relational Data Bases	Low/ Medium	Learning curve is higher than anticipated. Primarily using 4GLs.
Voice/Data Integration	Medium	Most in planning phase. High potential for cost savings.
LANs	Low	Cautious approach. Lack of standards is precluding action.

- Trains other IS personnel.
- Develops computer-based training programs.
- Conducts seminars for user groups.
- Arranges vendor presentations.
- Conducts on-site classes.
- Conducts classes in the IC.

II NEW APPLICATIONS

- The major focus of the utilities sector for applications development has shifted from accounting-oriented applications to customer-oriented and asset management systems.

- Other new asset management applications include hand-held meter reading systems and automated mapping.

- A rate refund system will be implemented by an electric utility serving a large midwestern city.

- Exhibit II-1 lists major new applications being developed by the respondents in this sector.

- According to Exhibit II-2, application development staff concentrates on enhancing and maintaining existing applications. Development of new applications is held back by budget constraints.

- Users want certain hardware products such as networks for mainframes and laser printers. Software needs were divided into desirable utilities and specified industry-oriented applications software (see Exhibit II-3).

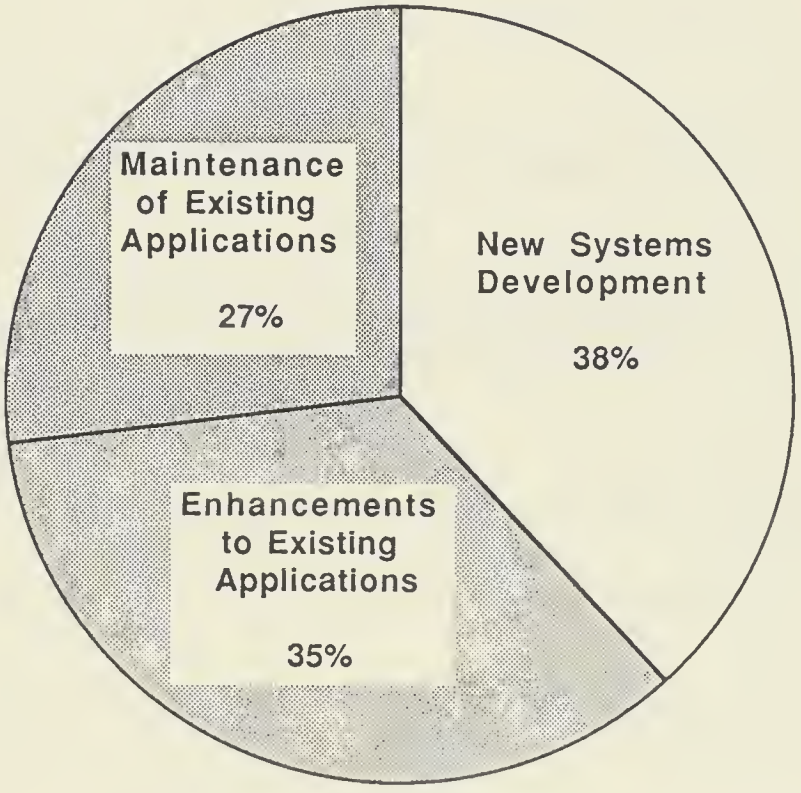
EXHIBIT II-1

UTILITIES
NEW APPLICATIONS IN 1986

- Customer/Marketing Information System
- Inventory Control/Materials Management
- Work Order Control System
- Power Distribution Information System
- Equipment Maintenance System

EXHIBIT II-2

DIVISION OF APPLICATION DEVELOPMENT STAFF



Percent of Respondents

Cost Range: $100,000-$7,500,000

UISA-UTJz

USERS' COMPUTING NEEDS

- Laser Printers
- Linking Mainframes
- Application Development Tools Optimized for Developing Applications
- Packaged Software, Especially Accounting

III BUDGET ANALYSIS

- Exhibit III-1 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

  - The largest projected growth categories are data communications, external software, and microcomputers. This is consistent with the desire to reduce communications cost and the acceleration of end-user computing.

  - The smallest growth areas are mass storage devices and minicomputers, reflecting relatively large equipment purchases before the tax law changes (and reduced ITC) take effect.

- One-half of the respondents in the utilities sector indicated that their IS budgets will increase in 1987; however, only one-fourth of the respondents said their budgets will increase at a higher rate than 1986 (see Exhibit III-2).

  - Factors contributing to increasing the IS budget include (in order of most frequently mentioned factors):

    . Hardware.

    . Software conversion.

    . Personnel expenses.

EXHIBIT III-1

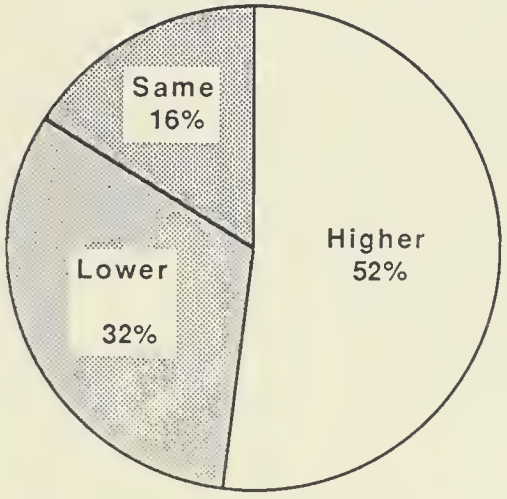
1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE UTILITIES SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	35.1%	1.4%
Mainframe Processors	11.5%	4.5%
Minicomputers	1.4%	0.0%
Microcomputers	6.3%	6.2%
Mass Storage Devices	5.8%	-1.1%
Other Hardware	8.1%	0.3%
Total Hardware	33.1%	0.8%
Data Communications	4.4%	11.2%
External Software	6.1%	9.8%
Professional Services	4.4%	3.2%
Turnkey Systems	2.2%	5.1%
Software Maintenance	2.7%	6.6%
Hardware Maintenance	8.0%	9.1%
Outside Processing Services	1.8%	0.9%
Other	2.2%	1.1%
Total	100.0%	3.7%

EXHIBIT III-2

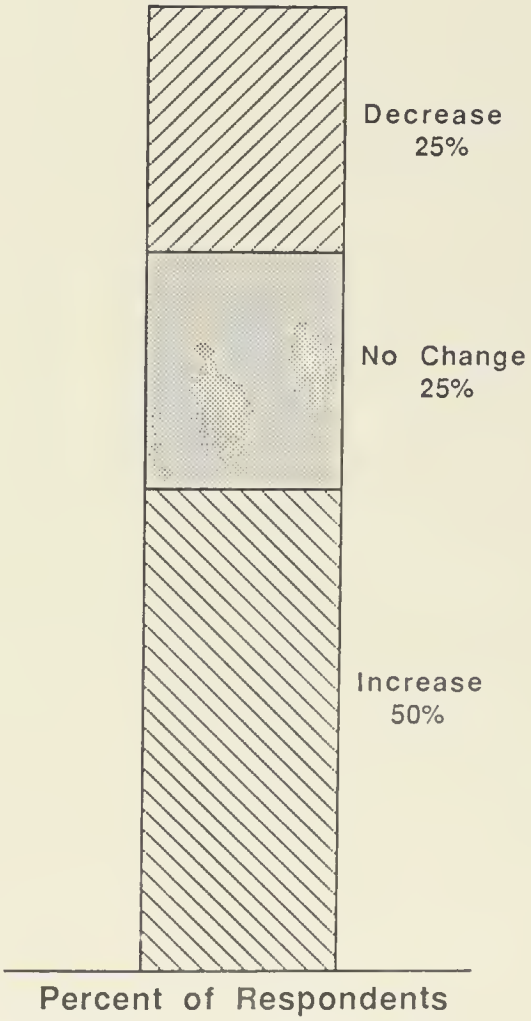
UTILITIES
BUDGETS WILL INCREASE MAINLY AT A LOWER RATE

1987 Budget Growth versus 1986 Budget Growth



Percent of Respondents

1987 Budget versus 1986 Budget



Percent of Respondents

- The following factors were mentioned as contributing to decreases in the IS budget:

  . Cost containment.

  . Reduced hardware purchases.

Information
Services
Program
(ISP)

Information Systems Planning Report

"Other"
Industry Sector

INPUT®

1280 Villa Street, Mountain View, CA 94041 (415) 961-3300

SEPTEMBER 1987

INFORMATION SYSTEMS PLANNING REPORT

"OTHER" INDUSTRY SECTOR

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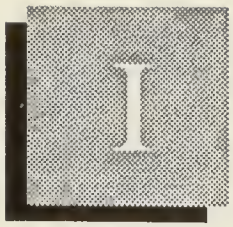
Exhibits



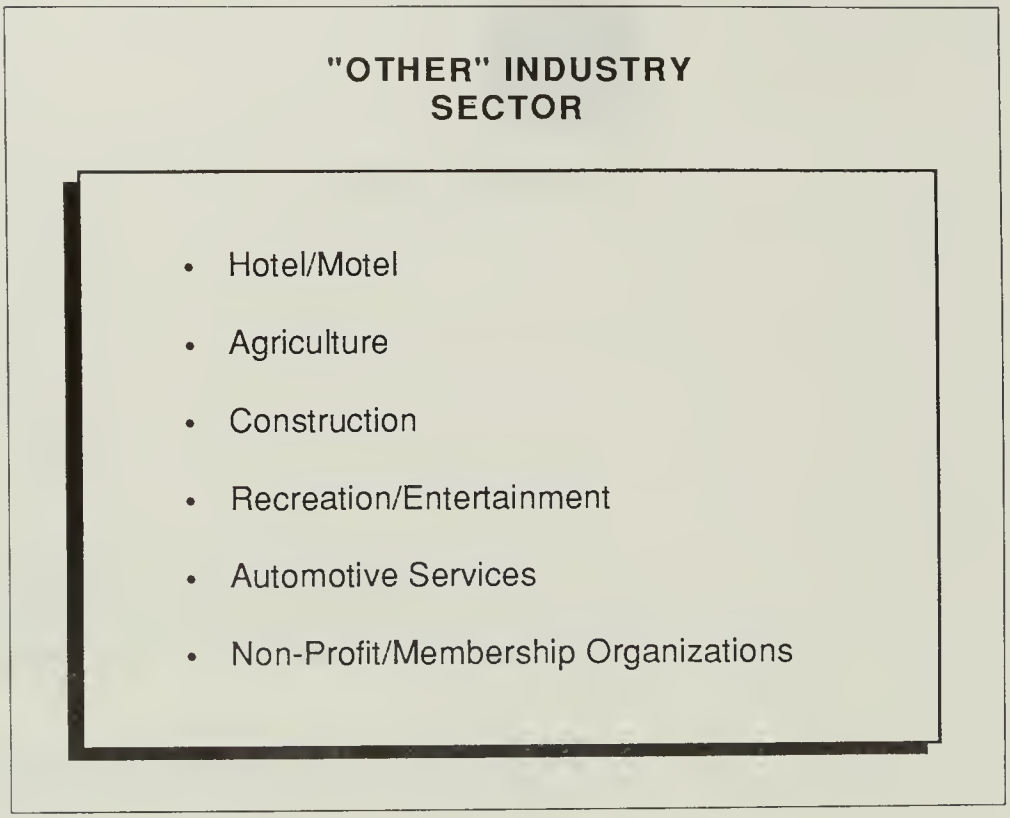
Introduction

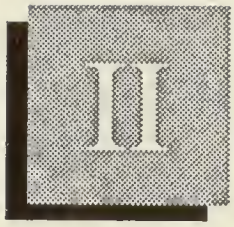
I Introduction

The "Other" Industry sector includes a number of industry segments which do not fit conveniently into any of the vertical market sectors INPUT reports on. This report covers six distinct segments as follows (see Exhibit I-1).

- Hotel/Motel includes lodging chains, inns, and resorts but not restaurants; the retail distribution industry sector report covers restaurants.
- Agriculture includes grain, produce, and livestock farms but not farm suppliers.
- Construction includes specialized construction firms as well as land developers and contractors.
- Recreation and entertainment includes theaters, sports, motion pictures, TV, and radio.
- Automotive services includes automobile rental agencies as well as automotive repair services.
- Non-profits and membership organizations includes non-profit philanthropic organizations, associations, and membership clubs.

EXHIBIT I-1





Major Issues

II

Major Issues

A

Driving Forces

Driving forces for this segment are varied because of the variety of industry segments covered (see Exhibit II-1).

EXHIBIT II-1

"OTHER" INDUSTRY DRIVING FORCES

Hotel/Motel
- Stiff Competition
- Saturated Market

Construction
- Industry Cycles
- Complexity of Construction

Agriculture
- Weak Farm Economy

Recreation/Entertainment
- Changing Consumer Preferences

Automotive Services
- Competition for Repeat Customers

Non-profits
- Special Financing Challenges

Tax reform is changing accounting policies and procedures. This forces Information Systems departments to adapt existing accounting systems to the new rules.

Advancing network technology and ever more powerful personal computers are driving change toward decentralized systems in all industries.

1. Hotel/Motel

This industry is driven by a need to attract customers and cultivate chain loyalty. The market for hotel/motel services is nearly saturated, so growth for individual companies depends on their ability to develop a base of loyal repeat customers and to woo customers away from other chains. IS for the hotel/motel industry is focusing on improving customer service.

2. Construction

The construction industry is on the down side of its current cycle and is likely to continue on that course throughout 1987. As a result, IS departments are working particularly hard to help minimize corporate as well as IS costs.

Perhaps the most important factor influencing IS in construction is the nature of construction management. Job sites change frequently, and use of subcontractors makes organizing a construction project very complex. Coordinating computer systems under these conditions is difficult.

3. Agriculture

The sagging farm ecomony makes cost reduction a top priority in this segment. Most survey respondents claimed to be feeling pressure imposed by the weak farm ecomomy. The need to be competitive in an unhealthy market is the primary motivating force for IS managers in agriculture.

4. Recreation/Entertainment

Consumer tastes and preferences drive the recreation/entertainment industry, and providing the means for monitoring tastes and preferences is a key job of the IS department.

5. Automotive Services

Like the hotel/motel segment, the automotive services segment is driven by the high level of competition for customers. In auto rentals and auto

repair, convenience and service differentiate rental agencies and garages from their competitors.

6. Non-Profit/Membership Organizations

Financing is a constant driving force for non-profits. Since the sources of income for non-profits are usually not direct benefactors of their services, there is an unusual challenge here to raise money through means outside of the principal activity or objective of the organization.

Although associations derive a large portion of income from dues from their direct benefactors, sources of income such as investments and unrelated business activities are more important to associations than to for-profit businesses. Running on a trim budget and managing information are chief concerns for associations.

Membership organizations are driven by the need to provide services and maintain member records.

B

Issues and Objectives

While most issues and objectives are segment-specific, a few are common to IS departments in all the segments covered in this report (see Exhibit II-1).

Adjusting accounting systems to changes imposed by tax reform is an immediate objective for all IS departments.

Distributed systems and large numbers of isolated PCs provide a new management challenge for IS directors. With the number of end users increasing all the time, managing a company's information systems is increasingly a job of managing people. For some IS directors, the attitudes of upper management are an obstacle to implementing effective computer systems. Management's resistance to change was a recurring peeve of IS management in most of the sample.

1. Hotel/Motel

IS supports the entire company, so its objectives mirror those of the company as a whole. The basic objectives of any hotel/motel are:

- Keep occupancy high
- Keep operating costs down
- Protect and entertain guests

System integration is an important objective of hotel/motel IS departments. Many IS departments have installed automation of various functions, one piece at a time, without much concern for forming an integrated system. Two problems have arisen from this lack of integration:

a. Data entry clerks may have to enter one set of data to several different systems. For example, payroll and hotel security applications both require information about employees' working hours, but the systems are seldom integrated.

b. The uncoordinated mass of automation is difficult to manage.

Both of these problems can be alleviated by integration. Since integration after the fact is difficult, IS managers are approaching this problem in two ways.

a. System overhaul - design and implement a completely new integrated system, usually with the aid of outside consultants and system designers.

b. Gradual replacement - replace old applications one at a time with new ones which can eventually become part of a well integrated whole.

2. Construction

Conversion to distributed or decentralized systems is an immediate objective for IS departments in those segments which can afford such luxuries (single-family residential and public works), but a low priority for firms in the office and multi-family housing segments.

3. Agriculture

Respondents in the agriculture segment cited a wide variety of issues and objectives, including integration of applications, utilization of strategic capabilities of information systems to improve marketing, and optimization of cost efficiency in order to survive the poor farm economy. Controlling costs and optimizing efficiency are common threads among a large majority of responses.

4. Recreation/Entertainment

Improved data collection and analysis techniques to increase effectiveness of sales and demographic analysis and marketing are primary objections.

For movie, TV, and theater productions, maintaining the technical quality of the finished product is an important objective. IS can contribute to

achieving this objective with scheduling and production automation systems.

5. Automotive Services

With customer service a top priority, rental agencies and garages seek to maintain or install reservation systems, fleet maintenance systems, and computer diagnostic systems that will provide competitive customer service and vehicle reliability.

In the automotive repair business some shops can claim significant differentiation or services through computer diagnostics. For example, for its newest cars Ford has developed an on-board computer that can connect with diagnostic systems in dealers' service bays to provide instant diagnostics in some cases. Ford also provides an on-line data base to assist with more complex diagnostics and repairs.

6. Non-Profit/Membership Organizations

There has been some controversy in the non-profit segment over a financing strategy called "piggy-backing." Non-profits establish peripheral, profitable businesses to help finance their mainline non-profit operations. The controversy is that the profitable businesses of a non-profit organization may have an unfair advantage in the marketplace due to tax-exempt status.

The fundamental objectives of IS in the non-profit segment are:

- Provide basic accounting and office applications
- Facilitate fund raising

Association management is somewhere between for-profit and non-profit management. A large portion of income is derived from membership dues and fees for services provided directly to members, but associations must also tap other income sources. Associations are sources of information for an industry, and must manage and dispurse that information through data bases and other information management systems.

EXHIBIT II-2

"OTHER" INDUSTRY DRIVING FORCES

General
- Adjust Old Accounting Systems to New Tax Laws
- Encourage End-User Computing

Hotel/Motel
- Integrate Systems

Construction
- Coordinate Field Systems With Corporate Systems

Agriculture
- Control Costs and Optimize Efficiency

Recreation/Entertainment
- Pursue Improvements in POS for Data Collection

Automotive
- Improve Customer Service

Non-Profit/Membership Organizations
- Manage Fundraising
- Manage Information

B

Impact of New Technology

1. Hotel/Motel

Video conferencing has two opposing effects: It diminishes the need for business travel, and thus diminishes demand for lodging facilities, but if hotels and motels become providers of video conferencing services, they may make up for some of the business lost to the technology.

Property management systems act as information system hubs, tying disparate functions into one system.

Electronic locking systems are a relatively recent development which reduces theft and significantly eliminates the cost of re-keying rooms.

Energy management systems are essential for large properties since a 10 percent reduction in energy costs can represent significant savings. Energy management systems optimize air-conditioning and heating by automatically shutting them off in vacant rooms and by turning certain lights off automaticaly at appropriate times.

2. Construction

Computer technology has been slow to take hold in the construction industry because of the unusual nature of construction projects: no construction site is permanent, and the organization or labor changes constantly as subcontractors come and go. Automation of field operations is the area of most rapid development in IS in construction.

Until recently, IS for construction consisted almost entirely of accounting and office applications. The change is due to increasing functionality of project management packages and software that integrates the various operational aspects of construction.

Some construction companies have begun to integrate field and corporate applications in order to reduce duplicated data entry, and eventually, to feed expert system data bases.

- To a limited extent, construction companies are integrating CADD systems with estimating. Dimensions and materials specified in a design can be tied directly to estimating systems to avoid re-keying these data.

- Ultimately, data concerning building methods, as well as materials and dimensions, could be moved from a CADD system directly to an expert system for estimating. The expert system would then complete the estimate based on costs of materials and labor.

Integrating field applications with corporate applications adds to the responsibilities of the IS department.

The impact of technology will be significant. When critical path scheduling techniques can be effectively automated and integrated with cost control and corporate applications, improvements in speed and adherence to budgets and schedules will improve markedly. However, users and consultants to the construction industry agree that functional packages for these applications are simply not yet available.

3. Agriculture

Three to five percent of farmers will go under each year for the next four to five years, according to *Duns Business Monthly* (9/86). Large farms with the capital and economies of scale to weather lean times will be the survivers, and automated systems will play a major role in their marketing and operations strategies.

4. Recreation/Entertainment

The combination of point of sale (POS) and telecommunications technologies enables theaters and movie production and screening companies to monitor consumer preferences and deomgraphics with a speed not possible five years ago. Continuing improvements in POS for data collection and telecommunications for data transfer make sales forecasting even simpler and faster.

IS is also being used as a production tool in the TV and motion picture segments. Scheduling applications helps automate the most labor-intensive aspects of production, which, according to one respondent, provides "drastic cost reductions."

5. Automotive Services

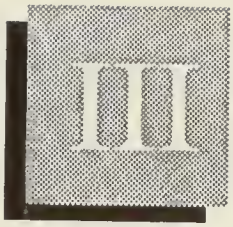
Communication technology has provided the tools by which auto rental agencies have been able to offer drastic improvements in customer service. As rental agencies continue to seek new ways to differentiate their services, they often turn to technology for increasingly sophisticated reservation systems and reliable tracking of fleet maintenance records.

The most obvious impact of technology on auto repair services is faster, more accurate diagnoses of car problems. In addition, mechanics will have on-line data bases available for them to look up information on repair procedures or unusual makes and models.

6. Non-Profit/Membership Organizations

Non-profits and associations are often small organizations running on limited budgets. For this reason they employ very little expensive, highly advanced technology. Basic office functions, data base, and fund raising applications comprise the bulk of their data processing activities.

Membership organizations vary so greatly in size, function, and wealth that it is impossible to assess the impact of technology on membership organizations in general. Applications that are specific to the membership aspect of these organizations are essentially specialized data base packages which will continue to become easier to use over time, but there are no major changes on the horizon for IS in membership organizations.



Applications

III

Applications

A

Hotel/Motel

A property management system often acts as the hub or a large integrated hotel or motel system. It helps coordinate security, accounting, reservations, and personnel applications. Central reservation systems for hotels and motels make it possible for customers to book reservations at any of a chain's locations from any of its other locations. Reservation networks are likely to be available soon so independent hotels and motels will be able to take advantage of the communications technology. Independents would belong to a network and might submit to a code of standards and inspections set by the administering organization.

Other hotel/motel applications can be divided into two groups: Sales and Marketing, and Guest Services.

- Sales and Marketing

  Registration and billing systems keep track of guests' tabs and collect point of sale information for forecasting and sales analysis.

  Booking of conference facilities should be automated to allow sales people to schedule conferences and close sales while clients are on the phone.

- Guest Services

  A variety of electronic locking systems are available to help reduce theft of all kinds and to virtually eliminate employee theft.

  In-room entertainment can be managed and billed by computer. Guests will select movies or other video services via an in-room terminal, and the charges will automatically be billed to their account.

Concierge services will also be available through the television set or in-room terminal. Such services are already available in many hotel lobbies.

In-room microcomputers with network hookups will be a welcome perk to business travelers.

Hotels will provide video conferencing services in order to retain some of the business they would otherwise lose to the technology.

B

Construction

Project management is the most important industry-specific application in construction. Project management packages play a vital role in scheduling and cost control on-site, but are usually not well integrated with corporate systems and other on-site applications.

Other industry-specific construction applications include estimating, CADD (computer aided design and drafting) applications, and a variety of specialized engineering applications.

C

Agriculture

Applications for agriculture facilitate management of various kinds of farming and help optimize costs and productivity.

- Livestock management systems track geneology, health records and productivity of cows, sheep, chickens, and other livestock.
- Feed optimization packages analyze the nutritional value and cost of feed mixes.
- Fertilizer packages do the same thing to optimize cost-effectiveness of fertilizing.
- Orchard and crop management systems track costs of production for grains and produce.

Some agricultural banks provide crop selection services for their farming customers. They use microcomputers to analyze individual factors and price information from Dow Jones, CompuServe, and the AgriData Network to determine the most profitable mix of crops to plant *(ABA Banking Journal: 11/86).*

D

Recreation/ Entertainment

Large recreation/entertainment systems focus on market research and sales analysis.

- Point of sale (POS) systems provide data collection to feed sales analysis and forecasting applications.
- Telecommunications plays an important role in this segment since data must be transferred from the point of sale to corporate computers to analysis.

Other applications for recreation/entertainment include sports statistics packages, league management packages, production scheduling for movies and TV, and a wide variety of specialized packages for theater and sports facility management, radio and TV station management, and movie, TV, and radio production.

E

Automotive

Networked reservation systems work the same way for auto rental agencies as for hotels and motels: A customer can reserve a car at any of an agency's outlets from any of its other outlets. The quality of a rental agency's reservation system is particularly important in drawing customers since customers have closer contact with it than with any of an agency's other systems.

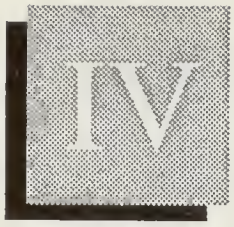
Fleet management systems enable auto rental agencies to track maintenance records on all their cars and to schedule routine maintenance.

Auto mechanics are increasingly using computerized diagnostic tools and on-line data bases to assist in auto repair.

F

Non-Profit/ Membership Organization

Applications for this segment include on-line legislative data-bases for associations and non-profit tax exempt organizations, specialized fund-raising packages, and specialized member record-keeping packages.



Budget Analysis

IV

Budget Analysis

The results of the annual budget analysis are contained in Exhibit IV-1. Personnel is by far the largest category, accounting for 44 percent of IS budgets. Hardware follows at around 20 percent.

- Mainframe systems account for the largest share of the hardware budget at 29 percent.
- Microcomputers are the fastest growing item in the hardware budget.

"External Software" and "Hardware Maintenance" are the fastest growing items on the entire budget, both growing at 22 percent.

"Software Maintenance" is the second fastest growing item with a growth rate of 19 percent.

Companies in the "Other" Industry sector developed 70 percent of all their software in house. They purchased the rest as packaged software, or had it developed outside (see Exhibit IV-2). And; 60 percent of the programming staffs of "Other" Industry companies provide maintenance and enhancements to existing systems, while the other 40 percent develop new software (see Exhibit IV-3).

EXHIBIT IV-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE "OTHER" INDUSTRY SECTOR

BUDGET CATEGORY	1986 I.S. BUDGET (PERCENT)	1986/1987 EXPECTED BUDGET GROWTH (PERCENT)
Personnel	44.0	7
Mainframe Processors	13.0	7
Minicomputers	6.0	8
Microcomputers	6.0	1
Mass Storage Devices	4.0	10
Other Hardware	11.0	13
Total Hardware	40.0	11
Data Communications	4.0	10
External Software	4.6	22
Professional Services	1.4	8
Software Maintenance	1.5	19
Hardware Maintenance	1.5	22
Other	3.0	5
Total	100.0	10

EXHIBIT IV-2

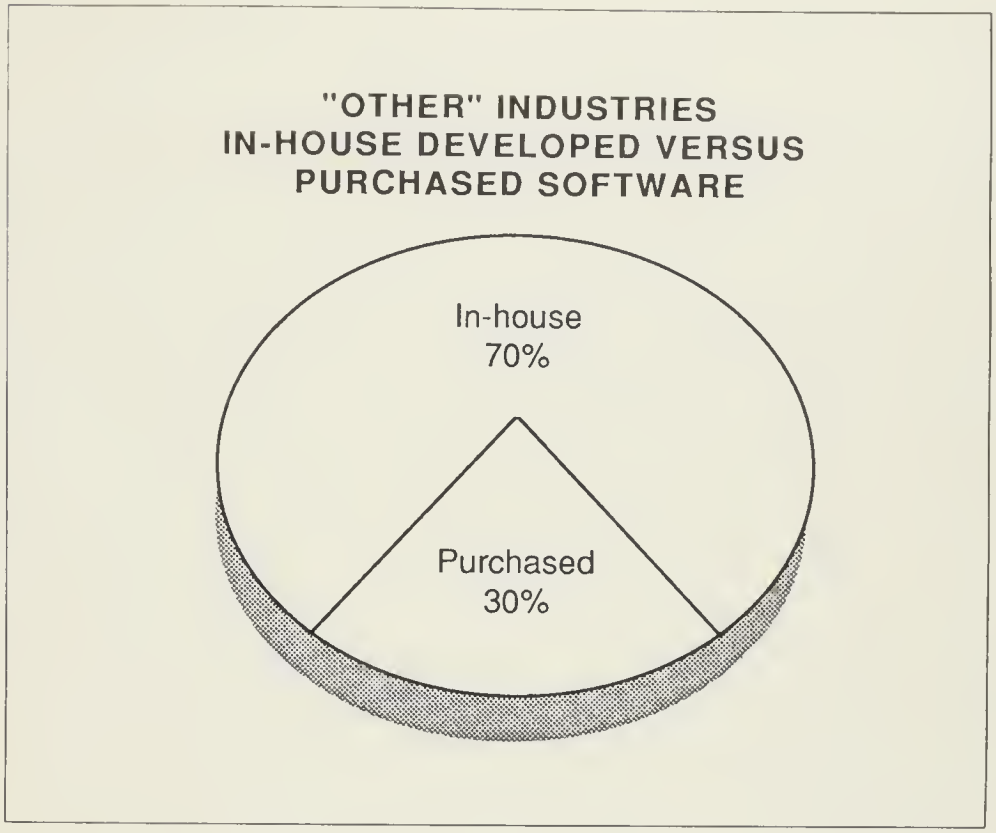
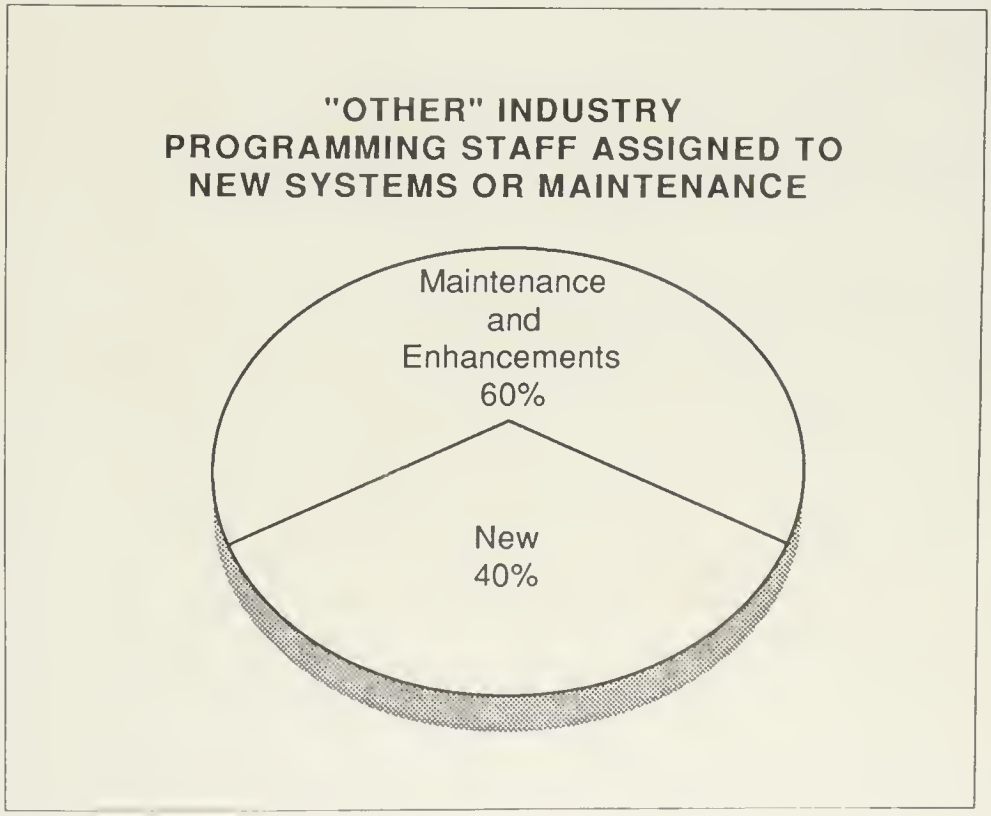


EXHIBIT IV-3



About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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ABOUT INPUT

Company Profile

Faunded in 1974, INPUT has became a leading international planning services firm. Clients include over 200 of the world's largest and most technically advanced companies.

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INPUT is a service company. Through advisory/research subscription services, multiclient studies, and proprietary consulting, INPUT serves clients' on-going planning information needs.

INPUT Planning Services

INPUT offers five continuous infarmation services addressing U.S. markets and two pragrams covering Western European markets:

- **Market Analysis and Planning Service (MAPS)** provides up-to-date market analyses, five-year forecasts, trend analyses, and sound recommendations far action. MAPS is designed to satisfy planning and marketing requirements af information services vendors.

- **Company Analysis and Monitoring Service (CAMS)** is a camprehensive reference service covering more than 4,000 U.S. information services vendor organizations. CAMS is often used far campetitive analysis and pre-screening of acquisition and jaint venture candidates.

- **Information Systems Program (ISP)** is designed far executives af large infarmation systems organizations and provides crucial infarmatian far planning, procurement, and management decision making. The program examines new service offerings, technalogical advances, user requirements far systems and services, MIS spending patterns, and mare. ISP is widely used by bath user and vendar arganizatians.

- **Custamer Service Program (CSP)** pravides senior custamer service arganizatian management with data and analysis needed far marketing, technical, financial, and arganizational planning. The pragram pinpaints user perceptions of service received, presents vendar-by-vendor service camparisons, and analyzes and farecasts the fallawing markets:

- Large systems service.
- Small systems service.
- Telecommunications systems service.
- Software maintenance.
- Third-party maintenance.

- **Federal Information Systems and Services Program (FISSP)** presents highly specific information on federal procurement practices, identifies vendor opportunities, and provides guidance from INPUT's experienced Washington professionals to help clients maximize sales effectiveness in the government marketplace.

- **Western European Customer Service Program** parallels the U.S. Customer Service Program, dealing with comparable issues in European markets.

- **Western European Software and Services Planning Service (SSPS)** analyzes and forecasts information for European information services markets. Clients receive timely planning information through research-based studies, conferences, client meetings, and continuous client support.

Proprietary Services

The combination of INPUT's planning services and staff expertise provides clients with a uniquely qualified resource for custom research. These proprietary studies take two forms: **multiclient research services,** or in-depth analyses of common issues; and **custom consulting** for a single client. Some of the recent and more frequent topics are:

- Strategy planning and support.
- Product evaluation.
- New market identification.
- Distribution channels.
- Due diligence analysis and support.
- Customer attitude surveys.
- Acquisition research and support.
- Sales and marketing audits.

Clients also benefit from secondary research performed by INPUT for other programs and from INPUT's concentration on the information services industry in general.

Staff Profile

INPUT's professional staff have backgrounds in marketing, planning, information processing, and market research. Educational backgrounds include both technical and business specializations, and many INPUT staff hold advanced degrees.