BANKING AND FINANCIAL SERVICES:

THE NEXT DECADE, 1985-1995

VOLUME I

STRATEGIC ANALYSIS: THE NEXT DECADE

INPUT

Digitized by the Internet Archive
in 2014

BANKING AND FINANCIAL SERVICES:
THE NEXT DECADE, 1985-1995
VOLUME I
STRATEGIC ANALYSIS: THE NEXT DECADE

BANKING AND FINANCIAL SERVICES:
THE NEXT DECADE, 1985-1995
VOLUME I
STRATEGIC ANALYSIS: THE NEXT DECADE

ABSTRACT

This report consists of three volumes. This first volume analyzes the strategic direction of the banking and finance industry and the impact of technology and security issues on the industry as a whole and the information services segment in particular. A ten-year forecast is included.

The subsequent volumes will cover the market opportunities in wholesale banking and the information systems requirements in commercial banking.

This report contains 194 pages, including 64 exhibits.

INPUT

BANKING AND FINANCIAL SERVICES:

THE NEXT DECADE, 1985-1995

VOLUME I

STRATEGIC ANALYSIS: THE NEXT DECADE

CONTENTS

INPU

INPUT

BANKING AND FINANCIAL SERVICES:

THE NEXT DECADE, 1985-1995

VOLUME I

STRATEGIC ANALYSIS: THE NEXT DECADE

EXHIBITS

INPUT

INPUT

INPUT

I INTRODUCTION

I INTRODUCTION

A. OBJECTIVE

- The objective of this multiclient study is to identify new and emerging product service opportunities primarily for banks and other financial institutions and for vendors in related financial information markets, including hardware, software, telecommunications, data bases, turnkey systems, and network services.

- The study will attempt to qualify these opportunities and provide marketing and strategic insight on successfully entering and expanding the financial information services market through the next decade (1985-1995).

B. SCOPE

- The study focuses on U.S. market opportunities. By the U.S. market it is meant U.S. corporations (including multinationals) operating in the United States through U.S. banks and other financial institutions and, to a limited extent, foreign banks' and other financial institutions' U.S. operations.

- The market is based on expenditures from corporate, bank, and other financial institutions users derived through U.S. operations only. The study does not include markets in Canada, Mexico, Japan, and Western Europe.

- 1 -

INPUT

- The final report has been divided into three volumes:

    This volume (Volume I), entitled <u>Strategic Analysis: The Next Decade</u> includes the strategic analysis of the banking and other large financial institutions marketplace over the next decade with respect to changing market structure; government regulation (deregulation); money center, regional, and large independent banks; and, to a limited extent, U.S. federal institutions (i.e., the FRB and the FDIC). The analysis considers the impact of technology from hardware, software, turnkey systems, data bases, information services, and telecommunications sectors, including technology such as fiber optics, digital voice, and voice/response and financial systems innovations such as check truncation, EFTS, consumer information services (home banking and investment), etc. The analysis gives special attention to information security, distributed processing, and international (multinational) corporate banking.

    Volume II, <u>Market Opportunities in Wholesale Banking</u>, provides a detailed analysis of the information products and services necessary to support corporate relationship banking from the viewpoint of both money center, regional, and large independent banks and multinational, national, and "middle-America" U.S. corporations.

    Volume III, <u>Information Systems Requirements Analysis in Commercial Banking</u>, presents a needs/requirements analysis from data gathered through interviewing both commercial banks and corporate end users for the retail, wholesale, trust, administration, data processing, and bank card services operations of money center, regional, and large independent banks.

- A summary economic forecast of user expenditures for commercial banks, S&Ls, security and commodity firms, and other financial institutions in

- 2 -

INPU

current dollars for the 1985-1995 timeframe is provided in the Executive Summary of Volume I.

● A detailed economic forecast of user expenditures for banking and financial information services for the 1985-1990 timeframe by bank size in current dollars is provided in Volume III.

● Delivery modes covered are:

  - Remote computing services (RCS).

  - Facility management.

  - Professional services - programming analysis.

  - Turnkey systems.

  - Systems software on mainframes/minis/personal computers.

  - Applications software on mainframes/minis/personal computers.

● An aggregate economic forecast for total user expenditures for related financial information services for commercial banks, S&Ls, security and commodity firms, and other financial institutions for the 1991-1995 timeframe is provided in Volume III to complete the decade forecast.

C. METHODOLOGY

● The determination of institution size for the banking and finance industry is shown in Exhibit I-1.

INPUT

EXHIBIT I-1

DETERMINATION OF INSTITUTION SIZE
FOR BANKING AND FINANCE INDUSTRY

INSTITUTION	SIZE DETERMINATION ($ Millions)			
SIZE DESIGNATION	VERY LARGE	LARGE	MEDIUM	SMALL
Commercial Banks (Deposits)	>$1,000	$500-1,000	$100-500	<$100
Savings and Loans (Assets)	>$1,000	$100-1,000	$25-100	<$25
Security and Commodity Firms (Capitalization)	>$50	$10-50	$2-10	<$2
Federal Reserve Banks (Assets)	>$15,000	$8-15,000	-	-
Credit Unions (Assets)	>$20	$5-20	$1-5	<$1
Finance Companies (Credit Outstanding)	>$100	$25-100	$1-25	<$1
Mortgage Banking Companies (Service Portfolio Values)	>$1,200	$400-1,200	$100-400	<$100

INF
MMB.

- The data and analysis gathered for this report consisted of almost 300 interviews conducted from the period August 1985 through January 1986. The interview profile is shown as Exhibit I-2.

- The data for Volume I came from an extensive on-site and interview program with senior banking executives and consultants nationwide, including banking executives in money center, regional, and large independent banks; executives in the Federal Reserve System and S&L industry; noted consultants in the banking and S&L industry; senior executives in banking associations; and top executives in the federal and legislative bureaucracy.

- The data in Volume II was derived from an extensive interview program with planning, financial, marketing, and MIS executives in commercial banks; corporate executives (particularly financial) from an electronic information search; and from INPUT's extensive library of data and information on the banking and financial services industry.

- The data for Volume III came from a combination of some 260 on-site, telephone, and mail interviews with banking MIS, planning, and financial executives; from 30 vendor interviews; from INPUT's extensive report (see Volume I, Appendix C); and from the library of information about both banking users and vendor products/services.

- All forecasts in this report are in current dollars. A factor of 5% annual price increase has been included to allow for inflation. It is assumed that the price increase for inflation beyond 5% is offset by improved efficiency resulting from advanced technology.

- Definitions used throughout the report are contained in Volume I, Appendix A.

- A summary data base may be found in Volume I, Appendix B.

- Related INPUT reports are shown in Volume I, Appendix C.

INPUT

EXHIBIT I-2

INTERVIEW PROFILE

INSTITUTION	FUNCTION OF EXECUTIVE INTERVIEWED	INTERVIEWS	
		Telephone	On-Site
Banking Money Center Regional Independent	Information Systems Marketing Planning		
Total Interviews		170	28
Corporate Manufacturing Transportation Utilities Communications Distribution Financial, Insurance and Real Estate Other	Treasurer/Controller Information Systems Operations		
Total Interviews		70	–
Vendors Hardware Software Communications Turnkey Facility Management Services	Marketing Planning Research and Development		
Total Interviews		20	10
Grand Total		260	38

INPUT
WBAN

- The five questionnaires which formed the basis of the market research are shown in Volume I, Appendix D. They are:

  - Strategic Analysis Executive Questionnaire - Volume I.

  - Corporate MIS User Questionnaire - Volume II.

  - Banking MIS Director Questionnaire - Volumes II and III.

  - Marketing/Planning Questionnaire - Volumes II and III.

  - CEO/Cashier Questionnaire - Volumes II and III.

- Questions and comments from the subscribers to this study are welcomed by INPUT.

INPUT

II EXECUTIVE SUMMARY

II. EXECUTIVE SUMMARY

- This executive summary is designed to be a summary of Volume I in order to help the busy reader quickly review key research findings.

- Key points of this volume are summarized in Exhibits II-1 through II-10.

- A complete executive summary of Volume I, II, and III will be provided at the conclusion of the project.

A. BANKING AND FINANCIAL INFORMATION SERVICES—A $55 BILLION MARKET OPPORTUNITY BY 1995

- Sizable industry-specific information services opportunities exist for virtually all market segments and all modes of delivery. As shown in Exhibit II-1, the minimum forecast is $40 billion by 1990.

  - The commercial banking sector is by far the largest, comprising over 60% of total user expenditures.

  - Bundled with industry-specific delivery, value-added network (VAN) services separately priced will become over a $2 billion market opportunity.

INPUT

EXHIBIT II-1

BANKING AND FINANCIAL SERVICES
A $55 BILLION MARKET BY 1995

INPU
WBAN
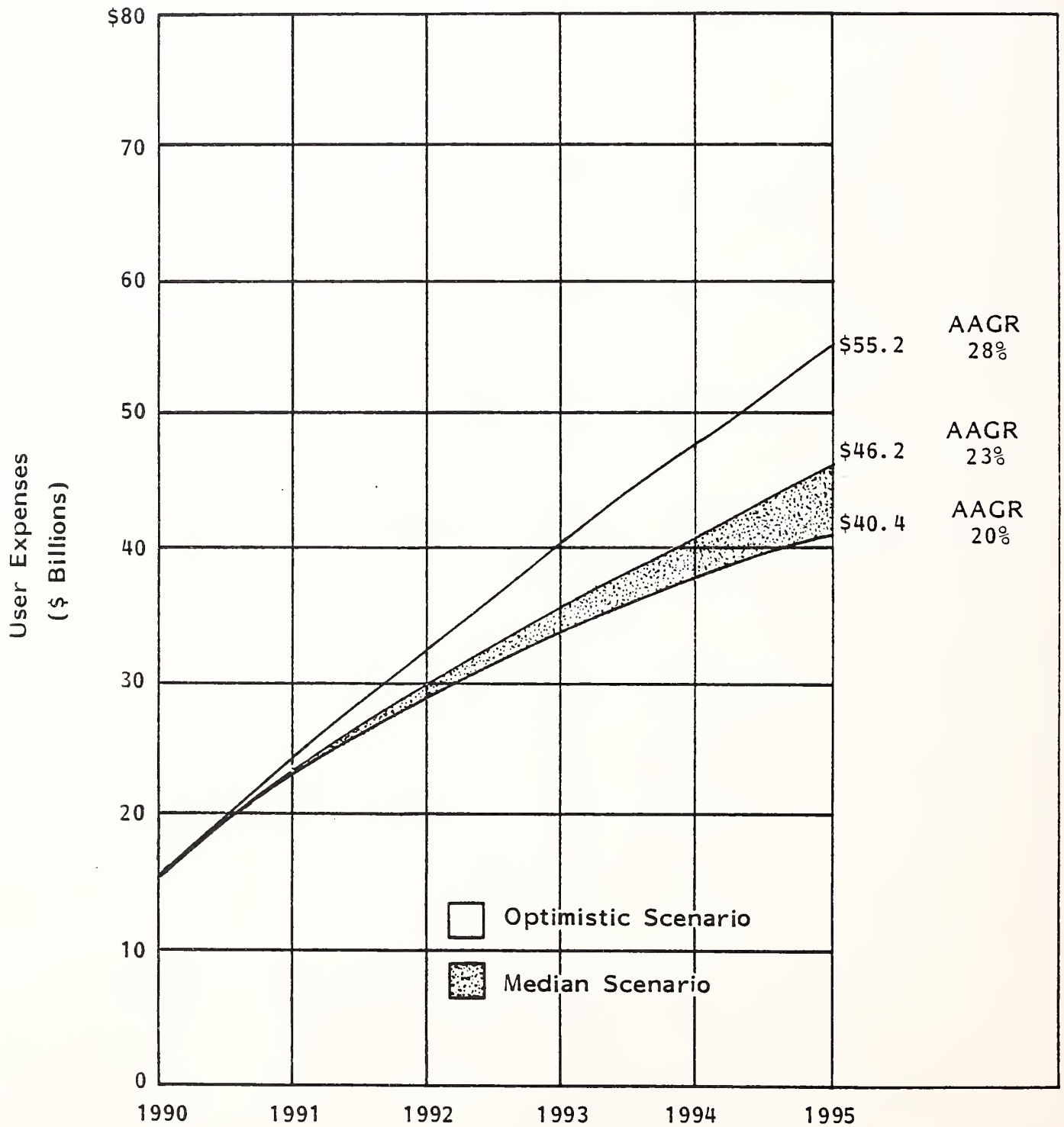
- For the 1985 to 1990 period, the market will grow from $6.1 billion to $15.9 billion, a 21% average annual growth.

  - The largest sector will be processing services, which will reach $7.5 billion by 1990.

- Applications software products, a $3.5 billion market in 1990, will continue to grow as the top 300 banks prepare for full relationship banking with corporate financial executives, proprietors, and consumers.

- The market is shifting to the cost side of the delivery equation.

  - Providing total solutions to product lines of business would be warmly greeted.

  - Industry-specific applications which show bottom line profitability will be the order of the day.

- Facility management and system integration arrangements are forecast to be particularly attractive for medium to large institutions across all sectors during the decade.

- Medium to very large bank holding companies are excellent targets for offering information services and for strategic partnering arrangements.

- The shift to merchant banking (investment banking in disguise) is a business line requiring new and innovative financial information system products and services.

- Not to be overlooked is the opportunity for professional services. By 1990 that sector will be a $3.5 billion market growing at a 20%+ rate.

INPUT

B.   BANKING AND FINANCE—AN INDUSTRY IN TURMOIL

- Exhibit II-2 highlights some of the driving forces behind the industry in turmoil.

- Pricing deposits at competitive rates (formerly prohibited by Regulation Q) set in motion much of the turmoil currently being experienced in the banking and finance industry.

  - The spread between the price of deposits (funds) and loans greatly narrowed (became negative for the S&L industry), forcing financial intermediaries to price services more realistically in relation to cost.

  - With the "fat" gone, poorly managed financial institutions (particularly S&Ls) failed by a factor of 10 greater than in the previous decade.

  - Financial institutions having control over costs, primarily through advanced technology, are coming through relatively unscathed.

- Following the Continental Illinois debacle and the forced fire sale in the S&L industry, the political institutions drew a degree of re-regulation in attempting to restore stability to financial institutions.

  - The FED and now the Federal Home Loan Bank are requiring banks (S&Ls) to increase working capital and equity.

  - The federally-backed capital note programs are removing negative net worth from financial institution balance sheets.

  - Congress is benignly neglecting further deregulation, promising to eliminate nonbank banks, closing the existing Bank Holding Company Act loophole.

INPU

EXHIBIT II-2

BANKING AND FINANCE - AN INDUSTRY IN TURMOIL

- Deregulation: it all started with regulation Q.

- Return to stability: the body politic.

- Bank Consolidation: first regional, then national.

- National Banking: against a grid of independents.

- Merchant banking: the wave of the future.

- The FED wants nonbank financial operations to be classified as financial institutions, falling within the reserve in capital requirements which the central bank utilizes to control the money supply.

- The industry is in a progressive state of consolidation.

  - State legislation, supported by the Supreme Court, is permitting rapid regional consolidation while preventing money center banks from being overly dominant.

  - Independent banks are forming multi-bank holding companies or some new form of operational association to better handle electronic financial transactions.

- Full national banking will be in place toward the end of the decade and into the 1990s.

  - Some 5,000 to 7,000 banking entities will remain, about 35% of the 1985 total.

  - One hundred or so very large money centers and regionals will operate against a grid of independent banks.

- The "Chinese Wall" separating commercial banking and investment banking, whose new name is "merchant banking" (as in England), will erode away or be circumvented (through perpetual legalese challenges). Money center banks will arrange for loans, then sell them off to participants, taking the differential and loan servicing fees in an operation quite similar to that in residential and commercial mortgages.

  - The loan participation will become a marketable security to pension funds, regionals, and foreign and domestic investors.

- With loan risk insured, the participation securities will carry ratings similar to those for commercial paper.

- Liquidity, reducing uncertainty, is added to the financial transaction, opening up new opportunities for financial information products and services.

C. COMPLEX SUPPLIER AND COMPETITOR RELATIONSHIPS IN THE FINANCIAL SERVICES MARKET

- Exhibit II-3 illustrates the overall interrelationships in the financial services marketplace.

- Five major groups participate in this marketplace, most of whom carry out customer as well as supplier relationships with each other.

  - Customers are primarily businesses or consumers.

  - Key Industry Components consist of banks, securities firms, consumer financial companies, credit unions, and, more recently, retailers—all of whom directly provide financial services to customers.

  - Equipment and Services Vendors provide the tools to aid banks and others in offering individual financial products and services.

  - Information Providers such as market quotation companies, shared ATM neworks, and credit bureaus provide specialized financial services to banks and sometimes directly to customers.

  - Government Agencies together with associations oversee the entire marketplace at various levels.

INPUT

EXHIBIT II-3

SUPPLIER AND COMPETITOR RELATIONSHIPS - FINANCIAL SERVICES MARKET

Equipment Supplies

Computer
Communications
Office
ATM
Security

EDP Services

Software
Remote Processing
FM
Turnkey Systems
Communications Services

Professional Services

Consulting
Maintenance
Personnel
R&D
Market Research
Audits
Training and Education
Appraisal

Information Providers POS

Credit/Debit Cards
Check Authorization
Loan

ATM Networks

Shared
Proprietary

Commercial EFT

Cash Management
Automated Clearing

Home Services

Electronic Trading

Government/Regulations

Federal and State
Associations
Other

Key Industrial Components

Banks/S&L
Security Firms
Retailers
Consumer Financial
 Customers
CPA
Insurance
Credit Unions
Other

Customers

Business
Consumers

Data Bases

Market Quotations
Francial News
Credit Bureaus

INPU
WBAN

- This complex structure for the financial services market, once tracked and understood, opens several levels of market opportunities for those wishing to provide information products and services.

    - For example, vendors who sell credit card processing software find markets among banks, third-party information providers, and super-markets which choose to operate their own credit card program.

    - Credit bureaus may sell creditworthiness information to banks for making loans, to credit card services companies for new credit card accounts, and to independent retailers for extending retail credit.

D. FINANCIAL TRANSACTION NETWORKS—KEY TO FUTURE BANKING VIABILITY

- Exhibit II-4 illustrates some of the issues that will spur the growth of trans-action networks.

- Although the private sector could well operate the funds payment system (both electronic fund and check payment), the FED will, in spite of the administration's protestations in favor of private enterprise, retain admini-strative control of the fund payment system, primarily as a means of control-ling some combination of interest rates and the money supply.

- Unlike Europe, the U.S. is seeing the development of POS systems in which the terms are under negotiation between the banks and the retailers.

    - U.S. retailers such as Safeway, Kroeger, and Southland Corporation (7-11 stores) are willing to install their own ATM/POS systems.

INPUT

EXHIBIT II-4

- 18 -

FINANCIAL TRANSACTION NETWORKS - KEY TO FUTURE BANKING VIABILITY

- Federal government will retain administration of the funds payment system as a means of controlling the money supply.

- Banks and retailers will vie for control of consumer financial transaction networks.

- Bank debit cards will replace bank credit cards for initiating consumer financial transactions.

- Electronic transaction growth is staggering.

- Electronic interchange will be followed by shared electronic ATM/POS electronic network consolidation.

INP
WBAN

- What is really under attack is the high discount rate retailers have to pay for having their accounts receivable, including credit card financing, purchased by the bank and the lucrative bank income coming from the high interest spread on consumer accounts receivable.

- The bank debit card is in the long term the key to offering a wide range of financial and other consumer services through consumer (including home) financial transaction networks.

    - The number of bank debit cards outstanding is expected to exceed the installed base for credit cards in the 1990s.

    - The transition will occur when consumers are adequately charged for the convenience of credit, including float.

- Over 20 billion electronic transactions were processed in 1985. The annual volume is seen to exceed 65 billion transactions within the next decade.

    - Electronic payments will significantly reduce the growth but not the absolute number of paper checks during the forecast period.

    - Check truncation will alter the character of the payment system.

    - It is difficult to see how current batch-oriented retail processing systems can successfully operate under the projected volume of electronic payments.

- Creation of new electronic transaction networks is on the wane. Electronic switches permitting interchange are being implemented between critical services (i.e., VISA, MasterCard, and oil company credit cards).

    - Significant electronic network consolidation is seen through the 1990s.

INPUT

E. TECHNOLOGY—THE WAY TO LOW-COST PRODUCT DELIVERY

- While technology has many potential benefits for low cost product delivery, there are equally as many technology issues to be understood. Exhibit II-5 highlights some of the issues that are discussed in the following section.

- There is more than adequate technology available. The problem is its proper application to the banking industry's commerce.

  - The era of centralization to achieve data and information system control is rapidly giving way (with some cause) through the proliferation of intelligent terminals and personal computers to the danger of data being unvalidated and uncontrolled.

  - The rapid development of technology has created a confrontation between "top down" systems analysis and programming and "bottom up" application definition and implementation.

- Within the banking and finance industry, and particularly in commercial banks, IBM, the dominant mainframe vendor, generally controls the advancement of computer/communications technology in order to maintain an orderly market (and incidentally high profit margins) for its products and services.

- Among IBM's evident strategies is defining "distributed processing" as meaning just that. Processing power only is distributed to the end point (user).

  - Data is controlled by the host in a hierarchical configuration.

  - Minicomputers containing distributed data bases and operating in a multi-processing environment are not, and are not expected to be, in IBM's plans for future systems.

- 20 -

IN

EXHIBIT II-5

TECHNOLOGY - THE WAY TO LOW-COST PRODUCT DELIVERY

- Data distribution without control - a present danger

- IBM dominates in controlling advancement of computer/ communications technology.

- Distributed Processing means just that.

- Optical memories first used in local environment.

- Check truncation using optical memories in the 1990s.

- Pattern recognition effective in certain applications.

INPUT
WBAN

- Optical memory technology (even though set back by Burroughs' withdrawal from the marketplace) is finding first use in local environments for specific applications (but certainly not by IBM in the mainframe environment).

    - Coupled with microprocessor technology, optical memories permit cost-effective distribution of primarily inactive or sparsely changing data in very large data bases, for at least reference to the local environment.

    - In the early 1990s IBM can expected to endorse optical technology for office systems, especially when the data is static.

- Check truncation using optical memory technology will be in widespread use in the 1990s.

    - Optical memory systems will first be used at the first entry point in the clearance process.

    - The technology will finally spread to capture check transaction data at the point of first presentation of the check into the payment system.

- Optical and voice data conversion systems are seen in selected applicational areas on a cost-effective basis in the 1990s.

    - Voice/digital data conversion will be applied to telemarketing, credit authorization, letters of credit, and other industry-specific applications.

    - Optical data conversion will find its heaviest use in text and image processing applications.

INP

F.   SECURITY—THE HIDDEN ICEBERG

- Exhibit II-6 shown some of the main security issues that await the unaware. While security is not unique to financial systems, it appears some of the risk/reward tradeoffs will be very significant and difficult decisions.

- Fraud on the part of determined criminals, store personnel, and an occasional card user is seen to be an increasingly important problem in the management of consumer accounts receivable.

  - Over 15% of the total losses, well over $3 billion in 1984, were attributable to fraud.

  - The portion related to fraud is rising at a considerably greater rate (over 13% annually) than total credit card losses (approximately 4% annual growth).

  - By 1990, fraud losses in credit and debit cards are estimated to be in excess of $1.5 billion annually.

- Validation of the message originator and authentication of message itself coupled with adequate encryption are seen as the only viable way to secure electronic transaction networks in the wholesale environment.

  - The DES algorithm is seen to be no longer effective from attack by powerful 32-bit microprocessors.

  - Public key systems are seen to be effective, but are vulnerable in the "people sense" as related to key management and distribution.

  - Consumer validation and message authentication requiring on-line operation are seen as the only viable ways of securing consumer

- 23 -

INPUT

EXHIBIT II-6

SECURITY - THE HIDDEN ICEBERG
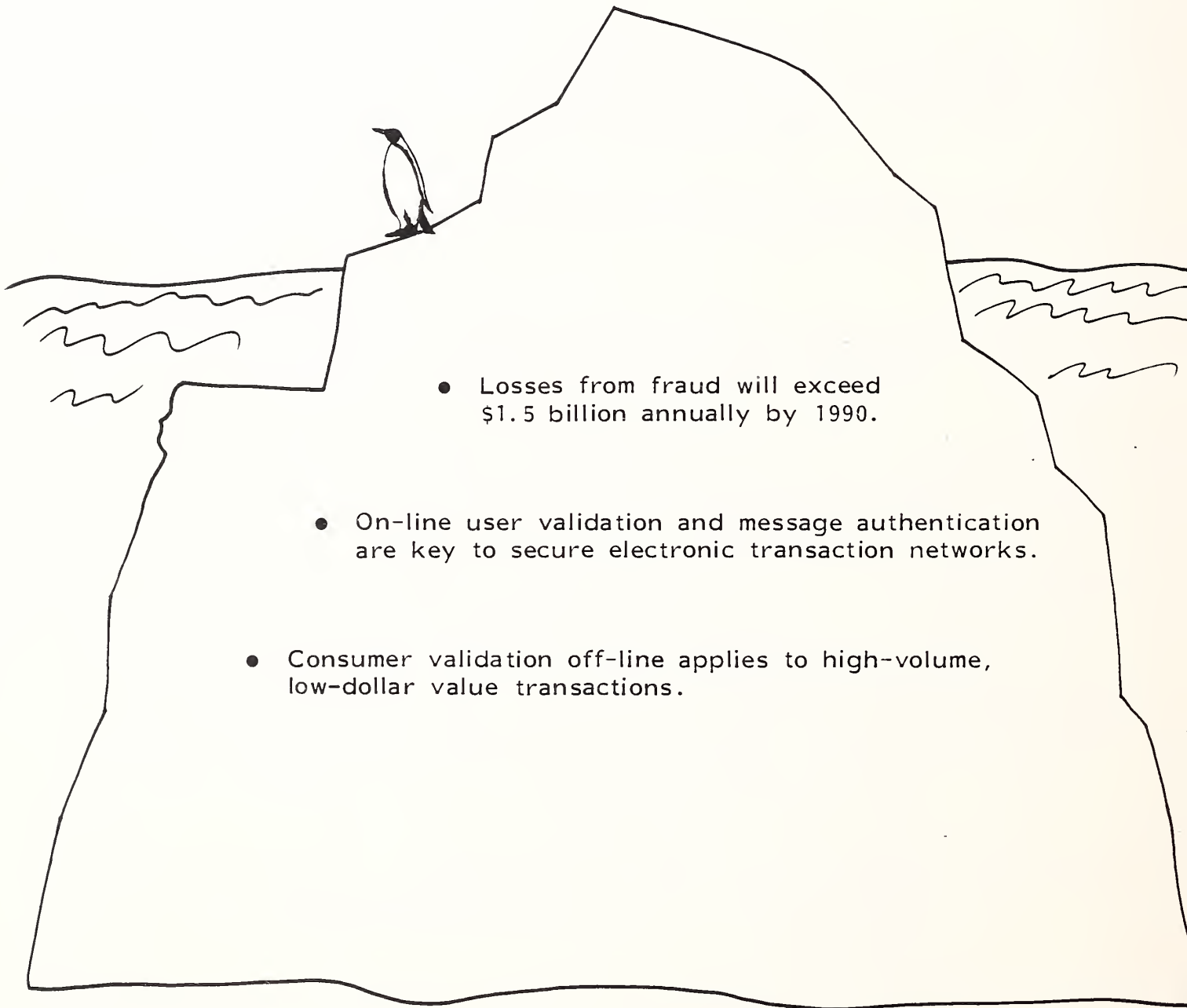
- Losses from fraud will exceed
  $1.5 billion annually by 1990.

- On-line user validation and message authentication
  are key to secure electronic transaction networks.

- Consumer validation off-line applies to high-volume,
  low-dollar value transactions.

INP
WBAN

transaction systems involving large dollar amounts (i.e., home banking, CMA accounts, etc.).

- The volume of consumer credit and debit card transactions require a search for a user validation solution that can operate off-line to the consumer financial transaction network.

  - The "smart card," while offering the possibility of handling additional financial and other information services, is not seen as economically viable during the forecast period. For complete user validation and message authentication, on-line operation is required.

  - Other technologies appear to be more viable in the off-line mode. Primary among these is that of Light Signatures, Inc. Their process creates a unique image or signature, the encoded key of which can be verified by an inexpensive terminal in an off-line mode.

- As shown in Exhibit II-7, secure systems require a three-sided approach-- people, technology, and systems.

- Personnel are the most vulnerable part of any secure financial information host system.

  - Fully half of all employees are expected to be "computer versant" by the end of the decade. This is both one of the benefits and one of the drawbacks of the "user friendly" operating environment afforded by personal computers.

  - Attention to "human factors" will produce, to a point, higher payoff than the continual addition of security technology.

- These and other factors mandate the need to specific management and organizational strategies. Among other considerations, these strategies must include:

INPUT

EXHIBIT II-7

SECURITY WILL REQUIRE SPECIFIC STRATEGIES

Management
and
Organization
Strategies

Administrative
Strategies and
Risk/Reward
Tradeoffs

Secure
Financial
Information
Systems

Technology
Strategies
the Core Defense

INP
WBAN
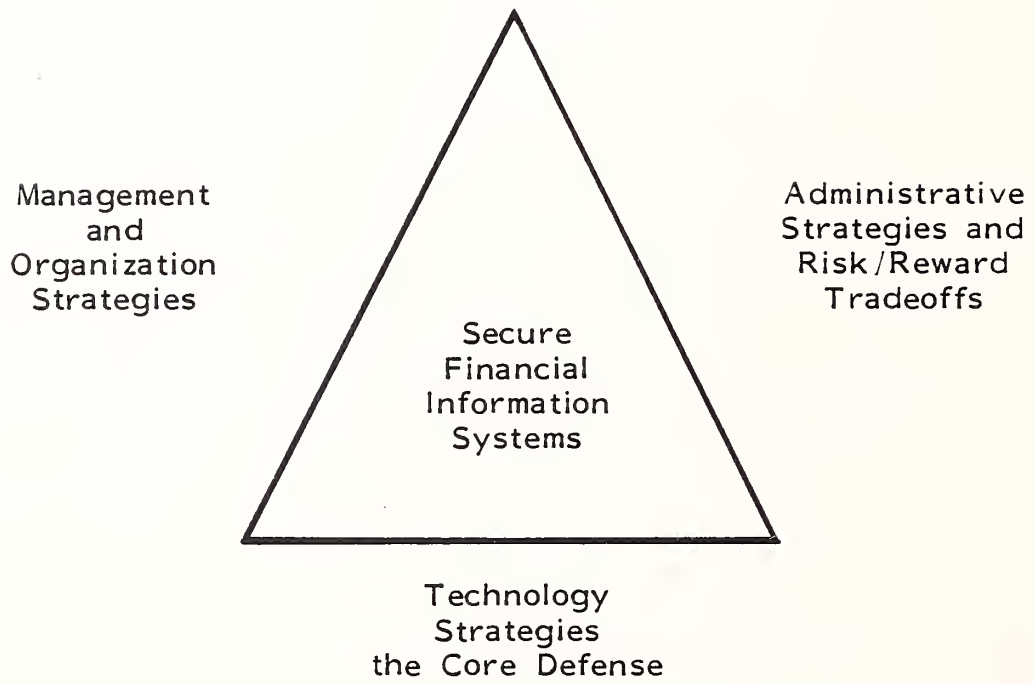
- Top management attention and responsibility.

- Background investigations, hiring, and termination policies.

- Corporate level security policy.

- Education through the organization.

- Administrative strategies will be important to proceduralize policy as well as to address issues such as:

    - Documentation control.

    - Fire protection.

    - Disaster recovery.

    - Legal and insurance requirements.

- Finally, a technology strategy is needed to ensure the "core defense" is implemented in line with the "risk/reward" tradeoffs. In this instance, risk/reward simply means the tradeoff of providing "absolute" security to the cost of protecting against the potential for fraud or other loss.

- Security is a real issue. For vendors, this means providing security and offering new services such as disaster recovery or technological advances in secure networks to address the requirements that will be emerging, such as signature verification.

- The baseline defense of host financial information systems is seen to be selectively layering available technology to prevent both external and internal end users and computer systems operation and programming personnel from

INPUT

gaining unauthorized access to software, micro code, and corporate and consumer data bases which are part and parcel of commercial banks' wholesale and retail operational activity.

G. MARKET FORECAST, 1985-1990

- Banking and financial institutions account for more expenditures on information services than any other industry group. Banks and financial institutions also spend a larger share of their total EDP expenditures on information services than most groups.

- Banking and finance has led the way since the early 1960s, and the average annual growth rate of 21% will maintain this position through the 1990s and beyond.

- As shown in Exhibit II-8, commercial banks represent about two-thirds of the expenditures of all financial institutions and also show the fastest expenditure growth.

- Exhibit II-9 forecasts banking and financial industry services by delivery mode.

  - Applications software is the most rapidly growing delivery mode at 30% per year and will account for over 20% of expenditures by 1990.

  - Professional services also will grow in excess of the average expenditure rate and will account for more than 20% of user expenditures by 1990.

- 28 -

INPI

EXHIBIT II-8

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL INFORMATION SERVICES
EXPENDITURES FOR THE BANKING AND FINANCE INDUSTRY BY
MARKET SUBSECTOR, 1985-1990

MARKET SUBSECTOR	USER EXPENDITURES ($ Millions)		AAGR (Percent) 1985-1990
	1985	1990	
Commercial Banks	$3,914	$10,432	22%
Savings and Loans	767	1,902	20
Security and Commodity Firms	768	1.971	21
Other Financial Institutions	687	1,617	18
Total	$6,136	$15,922	21%

INPUT
WBAN

EXHIBIT II-9

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES
FOR THE BANKING AND FINANCE INDUSTRY BY DELIVERY MODE, 1985-1990

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)		AAGR (Percent) 1985-1990
	1985	1990	
PROCESSING SERVICES			
Remote Computing/Batch	$2,411	$5,583	18%
Facilities Management	898	1,900	16
Total Processing Services	$3,309	$7,483	18%
APPLICATIONS SOFTWARE			
Mainframe/Mini	845	2,989	29
Micro	94	477	38
Total Applications Software	$939	$3,466	30%
PROFESSIONAL SERVICES	1,254	3,500	23
TURNKEY SYSTEMS	644	1,473	18
Total	$6,146	$15,922	21%

IN
WB

H.   TEN HIGH-POTENTIAL OPPORTUNITIES

- Exhibit II-10 lists ten high-potential opportunities for financial information services. Within each of these areas multiple niches are available. The following section will elaborate on these areas.

- The financial market has always been the largest purchaser of applications software. Given the demand for new systems and the time requirements for these systems, banking and finance companies will continue to elect the buy side of the make/buy decision. All the trends support the growth of this practice. Vendors will also find financial institutions willing to jointly fund or partner particularly large projects such as financial transition software and network development

- On-line data base services opportunities exist for selling to banks and partnering with banking and financial institutions. Consumer credit reporting is already the largest on-line data base market, yet it has great potential remaining. Check and credit data bases will continue to expand, as will securities.

- As financial institutions become increasingly competitive, they will also need more access to marketing and demographic data bases. Obviously, the best data bases for vendors are dynamic since they are less susceptible to optical technologies like CD-ROM.

- The opportunities for professional services appear to be constrained only by a vendor's ability to hire and train a qualified staff. Specific opportunities will exist in developing programs to educate personnel on security and security procedures, in system development, and in the implementation of new systems and the replacement of old systems.

INPUT

EXHIBIT II-10

TEN HIGH-POTENTIAL OPPORTUNITIES

- Applications Software

- On-Line Data Base Services

- Professional Services

  - System Implementation

  - Education and Training

  - Consulting

- Third-Party ATM/POS Services

- Systems Integration

- Nonstop Turnkey Systems

- Personal Services Support Systems

- Security Systems and Software

- Electronic Data Interchange (EDI)

- Strategic Partnering

INF
WBA

- All of these industry institutions will not develop their own ATM/POS networks nor will they wish to align themselves with potential competitors. Therefore, opportunities for network services vendors to offer third-party selections will exist and prosper.

- System integration opportunities will be plentiful throughout the banking and finance sector. The complexity of transaction processing systems, expanded networks, and increasing transaction volume will all contribute. System integrators need to understand the technology in depth and form alliances to build and implement these complex systems.

- As the industry becomes more dependent on automation, the need for nonstop architectures and turnkey opportunities will emerge for vendors in selling to independent banks currently using outside services. Other turnkey opportunities will emerge at the departmental level for systems to handle transaction processing and network management.

- Industry competition is creating demand for decision support systems beyond those used in the corporate environment. In the personal services area, brokers, retailers, and other nonbank financial groups will require financial data and services to address customer needs. Products included will be portfolio analysis systems, market analysis systems, and many more, including on-line data bases.

- In the area of security, new software will be needed to protect from fraud in financial transaction systems and networks. Also, the application of pattern recognition technologies will be an opportunity, as will disaster recovery services for these highly time and data sensitive applications.

- EDI services to handle the transfer between participants and the payment system is one example of an EDI market. This segment will grow rapidly in the 1990s as the growth of ACH transactions accelerates.

INPUT

- Many of the emerging opportunities will require sophisticated solutions, often multidisciplinary. Hardware and other vendors will require partners and subcontractors to provide complete solutions. This will continue to create opportunities for smaller and highly-specialized vendors.

III STRATEGIC ANALYSIS

III   STRATEGIC ANALYSIS

A.   INDUSTRY STRUCTURE

1.   FINANCIAL INSTITUTIONS

- The institutions involved in the banking and finance marketplace are shown in Exhibit III-1. Commercial banks with assets just over $2 trillion approach 40% of the total market and are the primary focus of the strategic analysis presented in this chapter.

- Other financial intermediaries are considered but only as they impact commercial bank product and services offerings. For example:

    - Attention is given to the impact of deregulation on the changing structure of the savings and loan market segment which comprises some 14% of total institution assets.

    - Pension funds, nearly 11% of the total, are managed in Master Trust Management Plans through very large commercial banks.

    - Finance companies, nearly 4% of the total, and mortgage banking companies handling mortgage pools are frequently part of multi-bank holding companies.

INPUT

EXHIBIT III-1

COMPARATIVE ASSET SIZE OF
BANKING AND FINANCIAL INSTITUTIONS IN 1983

$761.3 Billion
Savings & Loans
14.3%

$652.9 Billion
Life Insurance Companies
12.2%

$573.4 Billion
Pension Funds
10.7%

$442.8 Billion
Federally-Sponsored
Credit Agencies and
Mortgage Pools
8.3%

$250.8 Billion
Mutual Savings Banks
4.8%

$195.0 Billion
Finance Companies
3.6%

$179.3 Billion
Money Market Funds
3.4%

$113.1 Billion
Open-End Investment
Companies
2.1%

$2,088.0 Billion
Commercial Banks
39.1%

$81.8 Billion
Credit Unions
1.5%

Total: $5,338.4 Billion

- 36 -

IN
WBA

- Commercial banks still, as shown in Exhibit III-2, dominate what is generally called the depository institution marketplace, holding over 65% of total depository assets.

- Focusing on commercial banks, as shown in Exhibit III-3, shows that assets are heavily concentrated in the top 300 banks, banks which hold nearly 65% of the aggregate asset base.

    - It is the top 300 commercial banks that are the primary focus of both the strategic analysis and the rest of the research related to this report.

- There is a direct correlation between employee productivity and bank size. The data shown in Exhibit III-4 indicates there are two sharp breaks in employee productivity—one between the start-up bank or the closely held family bank (assets under $5 million) and another where very large banks can achieve increased productivity through a combination of specialized function-ality and increased automation. This data together with data as presented below indicates that automation is effective in increasing productivity.

2. SEEDS OF CHANGE

    a. Deregulation

- Until recently the banking industry was the most heavily regulated industry in the country and one of the most decentralized. Banks are chartered by both the federal and state goverments. All are inspected and regulated by multiple governmental agencies.

- There are three federal agencies primarily concerned with regulating banks:

    - The Office of the Controller of the Currency (which regulates national banks).

INPUT

EXHIBIT III-2

COMMERCIAL BANKS STILL DOMINATED THE FINANCIAL MARKETPLACE IN 1983
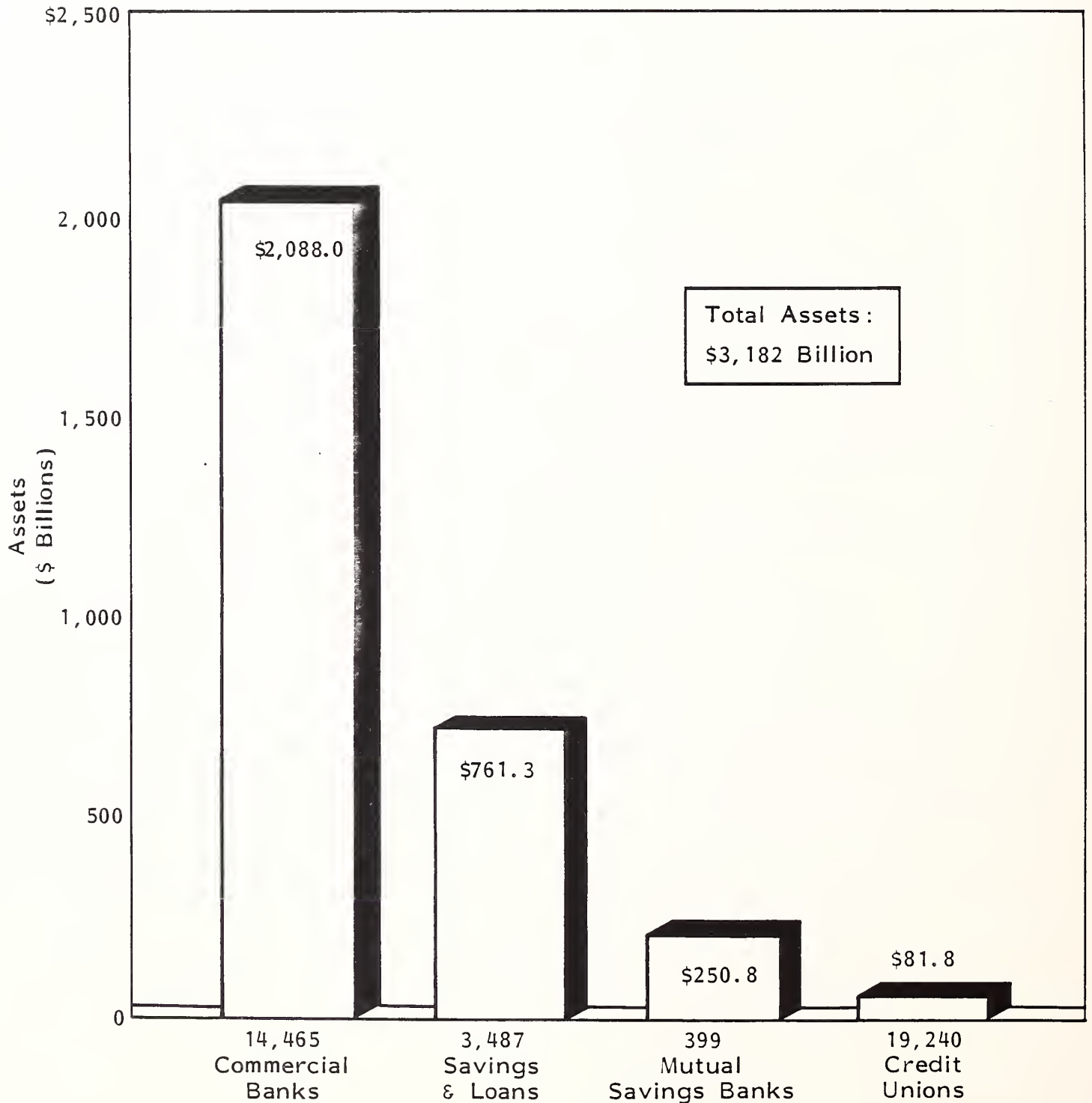
EXHIBIT III-3

U.S. COMMERCIAL BANKS BY ASSET SIZE IN 1983

SIZE	ASSET SIZE RANGE ($ Millions)	BANKS	PERCENT	AGGREGATE ASSETS ($ Millions)	PERCENT
Small	Under $25	6,077	42.0%	$ 87,696	4.2%
Small	25 to 50	3,733	25.8	139,896	6.7
Small	50 to 100	2,536	17.5	183,744	8.8
Medium	100 to 500	1,717	11.9	338,256	16.2
Large	500 to 1,000	177	1.2	129,456	6.2
Very Large	1,000 and Over	239	1.6	1,208,952	57.9
Total		14,479	100.0%	$2,088,000	100.0

85.3% of all banks are "small," with assets of under $100 million. Of all bank assets, they represent . . . **19.7%**

11.8% of all banks are "medium-sized," with assets of between $100 million and $500 million. Of all bank assets, they represent **16.2%**

2.9% of all banks are "large," with assets of more than $500 million. Of all bank assets, they represent. . . **64.1%**

INPUT
WBAN

EXHIBIT III-4

DISTRIBUTION OF BANK EMPLOYEES BY BANK SIZE IN 1983
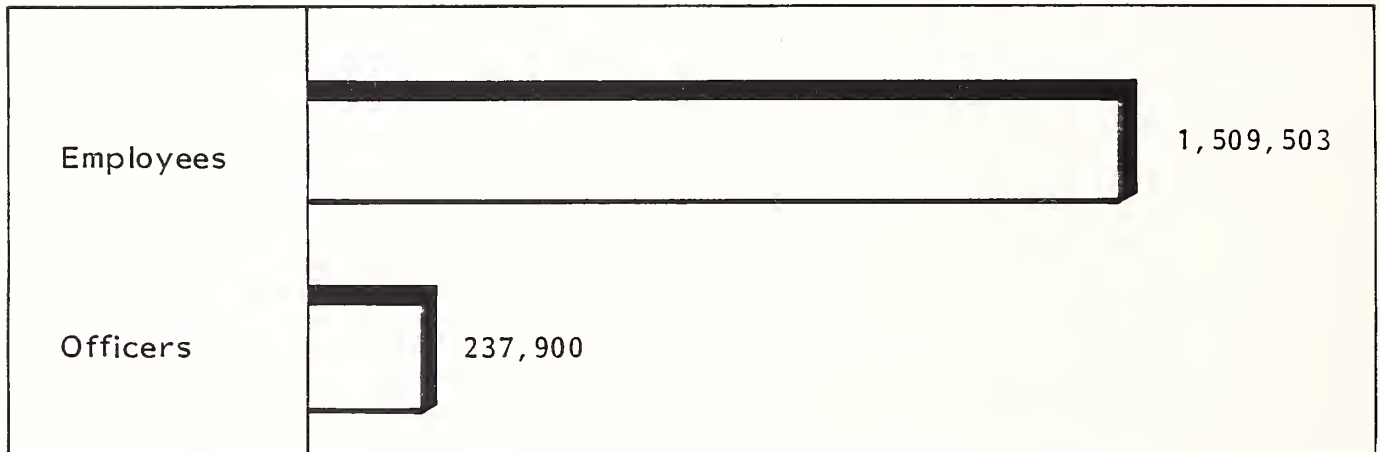
SIZE	ASSETS (\$ Millions)	EMPLOYEES PER \$ MILLION
Small	Under \$5	1.53
Small	\$5 to \$10	1.15
Small	\$10 to \$25	.97
Small	\$25 to \$50	.93
Small	\$50 to \$100	.93
Medium	\$100 to \$500	.99
Large	\$500 to \$1 Billion	.99
Very Large	Over \$1 Billion	.61

*As a rule of thumb, calculate one employee per million dollars of assets.

INI
WBA

- The Federal Reserve Board (which regulates bank holding companies and state banks which are members of the Federal Reserve System).

- Federal Deposit Insurance Corporation (which regulates insured state banks that are not members of the FED).

- Until recently, and still in many areas, states with the federal government's approval have prevented out-of-state banks from competing against locally owned and mostly independent banks.

- The McFadden Act of 1927 still bans interstate banking by restricting national bank activities to by and large the state in which the national bank is chartered.

- The Douglas Amendment (1956) to the Bank Holding Company Act applied similar restrictions to bank holding companies.

- Finally, the Glass-Steagall Act (1933) continues to restrict services banks can offer (i.e., prohibits underwriting stock offerings, insurance, etc.) and established a "Chinese Wall" between investment (such as corporate and personal trust) and banking (wholesale and retail), effectively creating a separate investment-banking industry.

- The above restrictions, lasting for over 40 years, spawned various groups (i.e., The Independent Bankers Association, State Banking Associations, Independent Insurance Agents, etc.), each interested in something to protect.

- Equilibrium was attained by the checks and balances afforded powerful special interest groups. Both the state and federal bureaucracies acted as bulwarks against change.

INPUT

- The FED, through Regulation Q, afforded banks (S&Ls and other regulated financial institutions) access to low interest deposits.

  - Banks paid market interest on certificates of deposit of $100,000 or more.

  - Free or well-below-cost services to small depositors included free checking, several branches, many tellers, no service charge for bad checks, and monthly statements that included cancelled checks.

- Until recently, a great majority of banks, local in nature, existed as much to exercise power as to make money.

  - Most small banks are owned by their management (i.e., chairman, CEO, and local directors).

    By controlling credit, local banks often control entry and expansion of small businesses.

- The dramatic oil price increases in 1973 and 1979, with resultant inflation, are seen as the precursors of the now accelerating change in the banking and finance industry.

  - The spread between the average deposit rate and money market rate so widened that investment firms began offering money market funds.

  - Money market funds (themselves not insured) grew from just under $4 billion in 1977 to nearly $200 billion by 1981, a 50-fold increase in four years.

- The Depository Institutions Deregulation and Monetary Control Act of 1980, which ordered Regulation Q to be abolished by 1986, is seen as a major influencing factor in changing the structure of the banking and finance industry.

INF

- The character of commercial bank deposits changed radically beginning in 1975.

    - Savings deposits, once the mainstay of total deposits, have, as shown in Exhibit III-5, fallen as a portion of total deposits in face of a money supply (M2) which has grown by a factor of 2.5 over an eight year period.

    - In 1975, less than one-third of total deposits were at near-money market rates (primarily certificates of deposit), whereas by 1983 over two-thirds of total deposits (primarily certificates of deposit and money market accounts) are at rates which offer a thin spread between interest cost and loan pricing.

- It is the narrowing (at times negative) of the spread between the cost of deposits and the price of loans that is seen as forcing the banking and finance industry to reluctantly, and at times radically, alter its method of doing commerce.

    - The aggregate interest rate paid on consumer deposits (a subset of total deposits) has, as shown in Exhibit III-6, nearly tripled over the past 20 years.

- "Narrowing interest rate spread" is seen to have forced bankers to shift management attention to the cost side of doing business, including profitability analysis of all product lines.

    - The days of brick and mortar branching are over. Even after pricing retail services closer to cost, Bank of America is still closing over 200 branches in California. Citibank has begun testing automated banking units (no tellers) including Citibank's CAST (Customer Activated Service Terminals) system.

INPUT

EXHIBIT III-5

DISTRIBUTION OF TOTAL DEPOSITS IN COMMERCIAL BANKS, 1975-1983
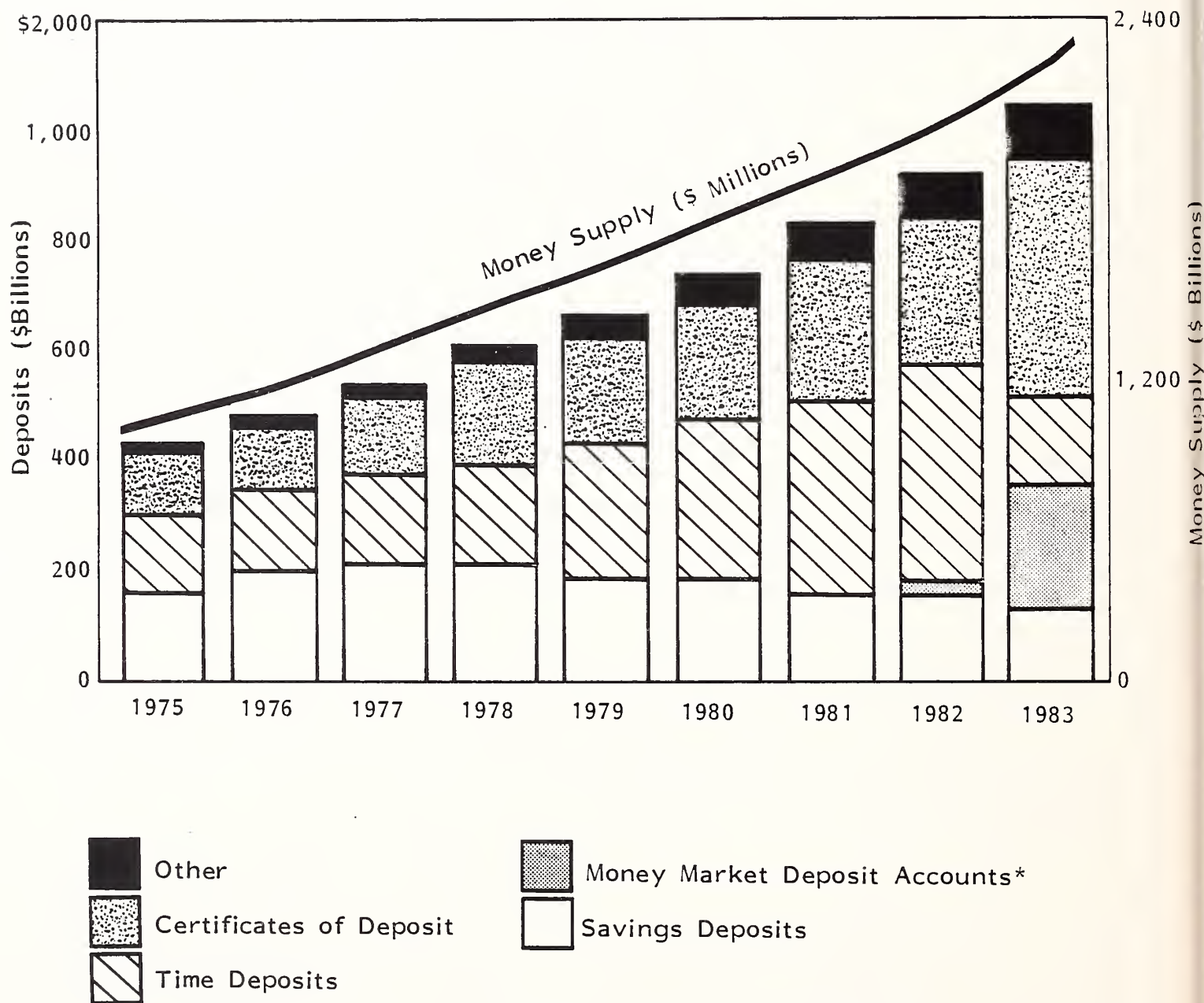
Note: Banks were permitted to offer Money Market Accounts in December 1982

Source: Federal Reserve Board.

INPUT
WBAN

EXHIBIT III-6

AGGREGATE INTEREST RATE PAID ON CONSUMER DEPOSITS
COMMERCIAL BANKS, 1964-1984

Source: Federal Reserve Board.

INPUT
WBAN
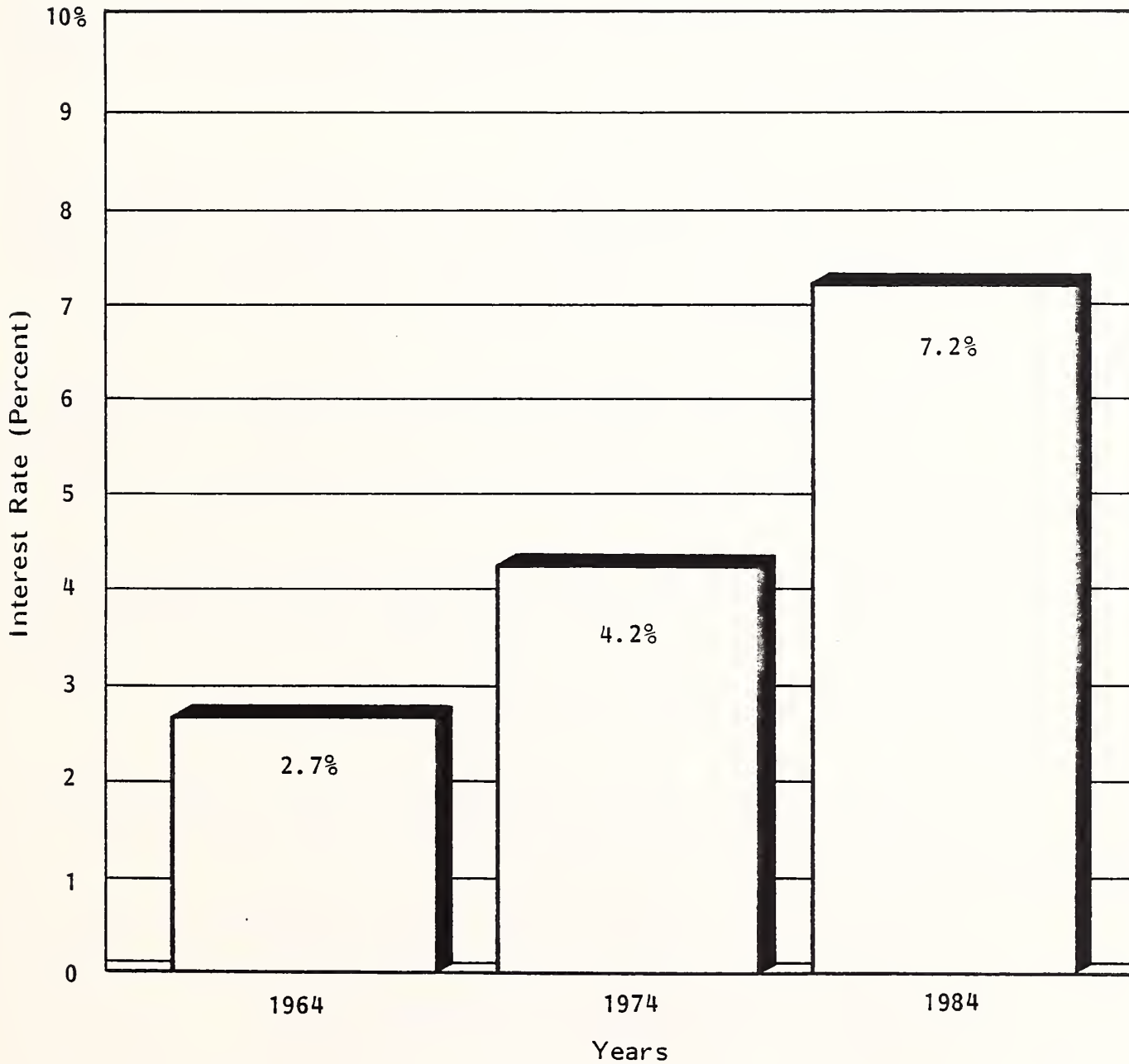
- The shift toward low cost delivery and monitoring of product profitability is seen as offering myriad opportunities to hardware and computer services vendors offering new, cost-effective products and services.

b.   Competition

- Competition on the lending side is seen as another major determinant of the ways financial institutions (more specifically commercial banks) accomplish their corporate business.

    - Through the commercial paper market, industrial corporations (i.e., IBM, General Motors, etc.) can obtain financing at better money market rates than commercial banks can offer their most credit-worthy customers.

    - Money market instruments marketed by investment bankers (including "junk-bonds") often result in money market rates well below those which can be profitably offered by financial institutions.

- National companies, nonbank in nature (primarily free of regulation), are seen as applying national communications technology in offering consumer financial services at a cost base considerably lower than can currently be offered by even money center banks, let alone regionals and independents.

    - Sears Roebuck has been offering credit, consumer loans, insurance, brokerage, and most recently its "Discover" financial services card.

    - Merrill Lynch, perpetrator of the "money management" account, has signaled its intention of entering the banking business through acquisition of a state bank charter in New Jersey.

INP

- Other corporations with national distribution presence involved in bank-like financial services are Shearson-American Express and Prudential-Bache.

- Control of the delivery system (increasingly electronic) is seen as key to maintaining, if not expanding, market presence and profitability in the banking and finance industry.

- Commercial banks and the FED still have a firm control on the wholesale marketplace, controlling the money supply through clearance, discount, and reserve operations.

- Retailers such as J.C. Penney, supermarkets such as Safeway Stores, and third-party network vendors such as GEISCO and TYMNET are seen as gaining significant control over consumer point of sale (POS) financial transaction networks. If not checked, the eventual result is seen as narrowing the spread between money market and consumer lending rates for credit card receivables.

- The movement of consumer financial transactions into the retail marketplace will offer hardware and computer services vendors significant opportunities in offering financial institutions (particularly multi-bank holding companies) new and expanded products and services.

- Invasion of U.S. international lending markets will not be a significant threat to U.S. financial institutions.

  - As shown in Exhibit III-7, U.S. banks control nearly 80% of corporate and industrial (C&I) loans to U.S. companies involved in international trade.

  - Foreign ownership of U.S. banks is seen as a necessary and beneficial condition to the orderly conduct of international financial markets.

INPUT

EXHIBIT III-7

FOREIGN BANKS' SHARE OF THE U.S.

COMMERCIAL AND INDUSTRIAL LENDING MARKET IN 1984

U.S.-Owned U.S. Banks
79.6% ($361.5 Billion)

Japan
7.4%

Foreign Bank-
Owned
U.S. Banks
20.4%
($92.9 Billion)

U.K.
3.3%

All Other Foreign
9.7%

Total: $454.4 Billion
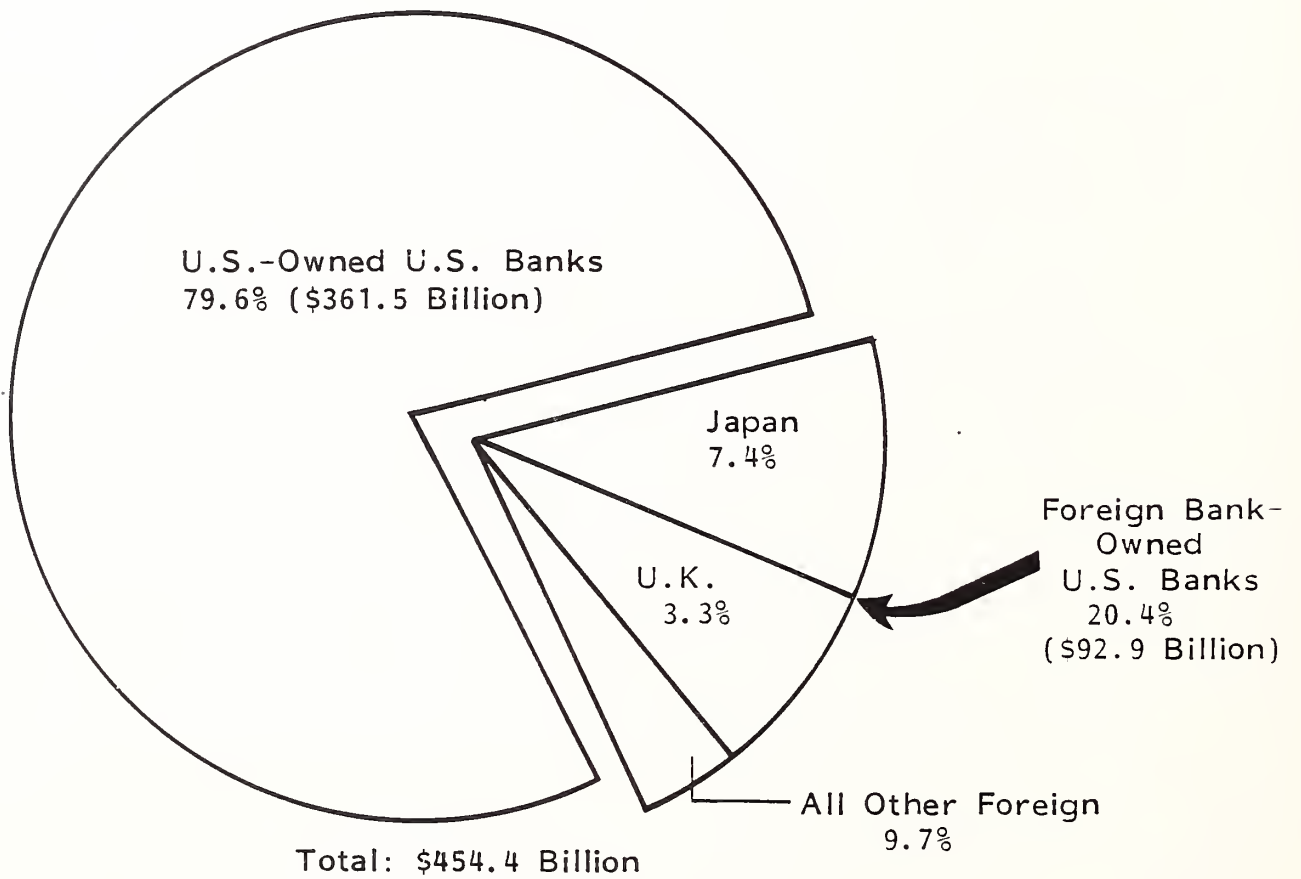
Note: Based on 6/30/84 C&I Loans at all Banking Offices Excluding
Finance Companies.

Source: American Banker.

- 48 -

- The presence of large international banks (i.e., Bank of Shanghai) in the U.S. can provide an opening for hardware and computer services vendors offering new products and services to international financial markets.

c.   Automation

● Increased automation is seen as a primary method of containing product cost and analyzing product profitability of banking and finance industry wholesale and retail product offerings.

● The fact that banks are increasing their spending for automation is clearly shown in Exhibit III-8, where the growth of system cost over the past three years is, on average, approximately three times greater than asset growth, the basic indicator of the health of the banking and finance industry.

- The data clearly indicates the continually growing opportunities open to both hardware and computer services vendors offering products and services to the banking and finance industry.

3. STRUCTURAL CHANGES IN COMMERCIAL BANKING, 1985-1990

a.   Regulation

● The pendulum favoring deregulation within the political process is seen to have run its course. The Congress and the nation, having suffered the effects of Continental Illinois National Bank's near failure and a tenfold increase in "problem banks" and bank failures over the last decade (see Exhibit III-9), have with Federal Reserve urging become much more conservative.

- The departure of William Isaac from the FDIC is viewed as a sign that the deregulation cycle has run its course.

INPUT

EXHIBIT III-8

COMMERCIAL BANK INFORMATION SYSTEMS EXPENSE GROWTH
AS A PERCENTAGE OF ASSET GROWTH, 1982-1984
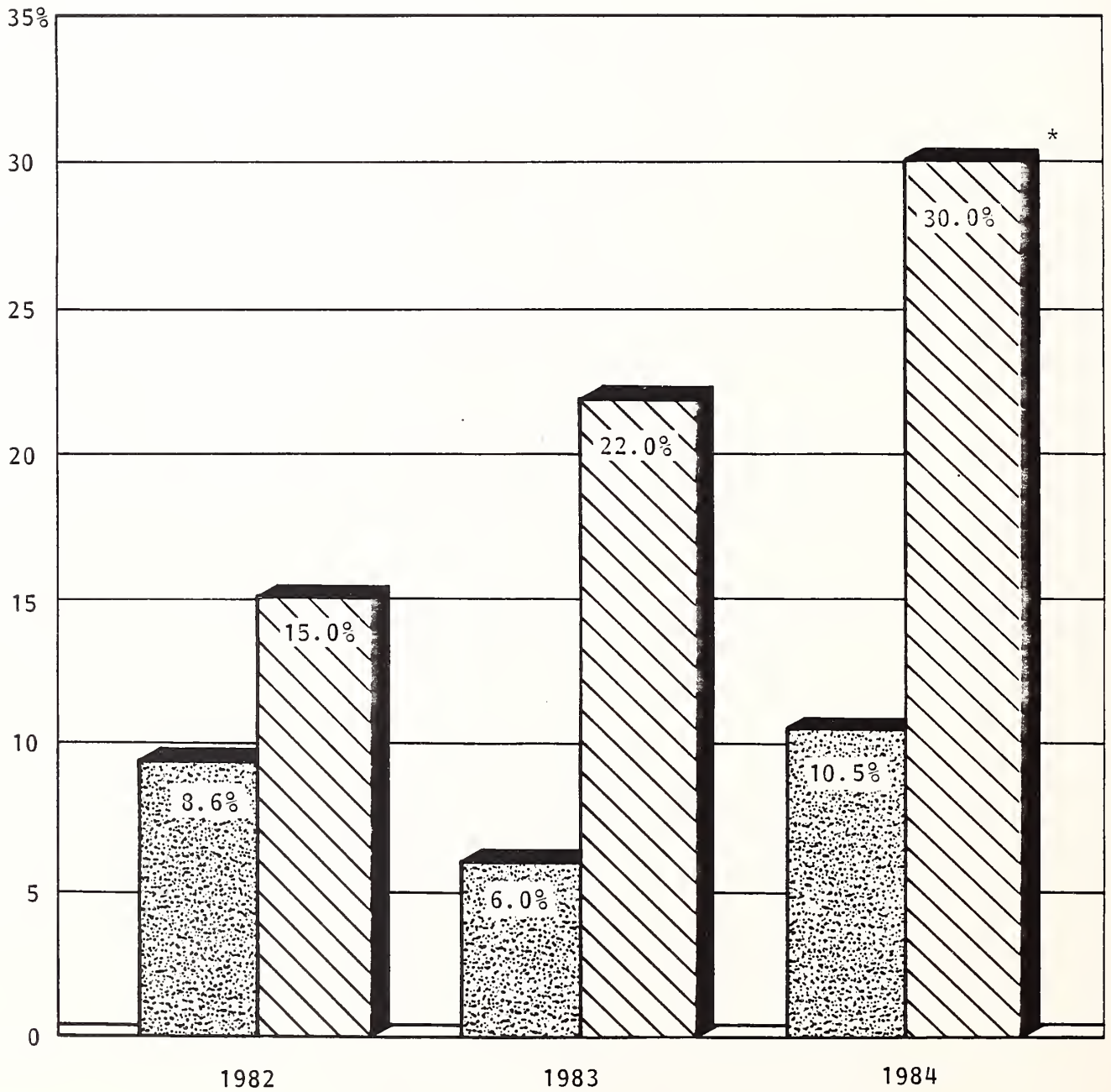
* Excludes Continental Illinois

Source: Salomon Brothers Inc.

- 50 -

INI
WBA

EXHIBIT III-9

DISTRIBUTION OF FDIC-INSURED PROBLEM BANKS AND BANK FAILURES
1974-1984
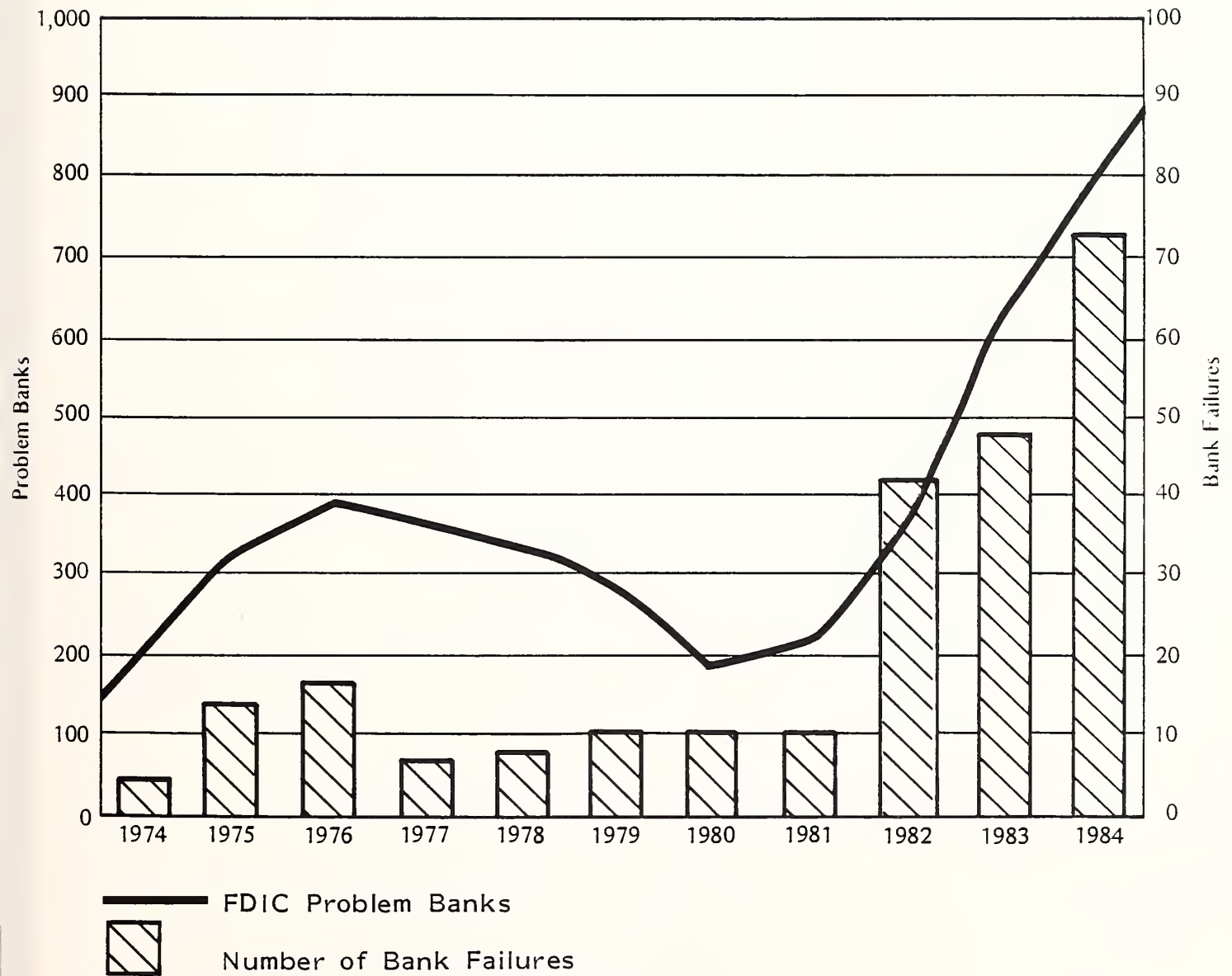
Source: Federal Deposit Insurance Corp.

INPUT
WBAN

- In response to political demand for greater stability, the FED will increase administrative regulation of bank holding companies in particular:

    - In 1984, the FED required commercial banks (particularly multi-bank holding companies) to increase working capital as a buffer against uncertainty in wholesale loan portfolios.

    - As shown in Exhibit III-10, growth and working capital almost doubled through the sale of assets (bank headquarters), stocks, and debt.

    - In the absence of a new round of inflation, further regulation is expected to close loopholes and to extend the power of the Federal Reserve over new financial institutions which are currently for all intents and purposes commercial banks.

b. Consolidation

- The banking industry is seen as just beginning a significant phase of consolidation, which will be carried on over the next decade.

    - The first phase is seen as an acceleration of merger and acquisition and the formation of multi-bank holding companies in local (intra-state) and regional (adjacent states) areas.

    - The Supreme Court recently upheld the legality of regional interstate banking and the exclusion of money center banks from entering a regional area.

- State legislatures have and are considering legislation that:

    - At least permits some form of county if not statewide banking.

    - Permits operation in adjacent states on at least a reciprocal basis.

- 52 -

INP

EXHIBIT III-10

GROWTH IN WORKING CAPITAL AT THE TOP 300 COMMERCIAL BANKS
1983-1984

Growth in Capital Funds for the top 300 Banks
(Percent)

1983   1984

INPUT
WBAN
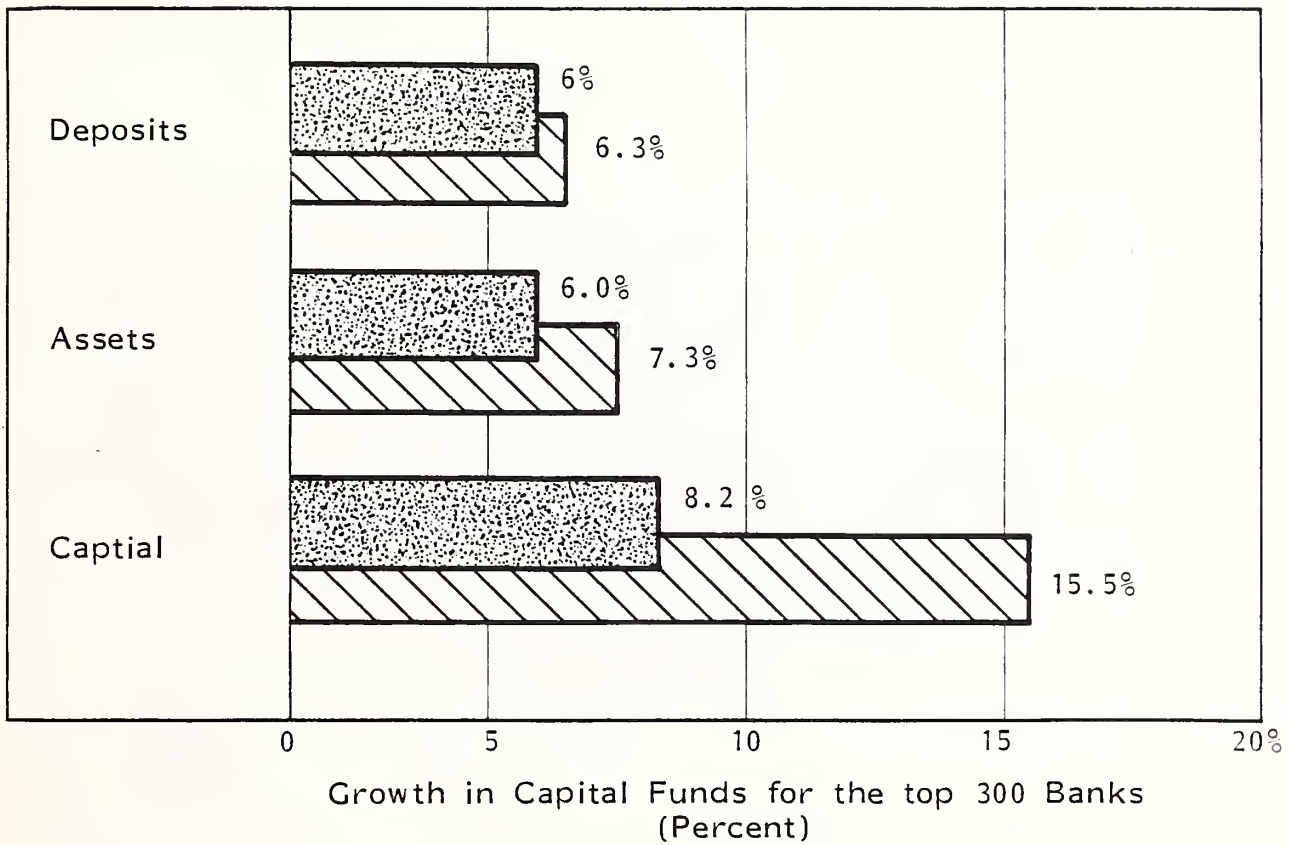
- As shown in Exhibit III-11, some form of enabling legislation has occurred in some 26 states.

  - Legislation is pending in six populous states: California, Pennsylvania, New Jersey, Illinois, Michigan, and Wisconsin.

- In 1985, the 11 top mergers, including the latest of First Atlanta combining with Wachovia to form an extremely strong southern regional, have, as shown in Exhibit III-12, combined total assets exceeding $510 billion or approximately 25% of total bank assets. Clearly the industry continues to consolidate in preparation for interstate banking on a national basis.

- Accelerated combinations (primarily multi-bank holding companies) or some new form of organization sharing information system resources are likely to occur for independent banks in all but the most recalcitrant unit banking states, primarily those in the Midwest.

- The net result will be a rapid reduction in the number of selling points for banking, hardware, and computer services vendors. The number of banking entities is expected to decrease from its current level of approximately 10,000 (14,000 individual entities) to between 5,000 and 7,000 over the next five years, a period where the formation of new small independent banks, primarily start-up and temporary in scope, will still be possible.

c.   Interstate Banking

- Of course money center banks are not standing idly by. Innovative banks such as Citicorp and Bankers Trust are busily engaged in finding loopholes in banking laws, or, in effect and, until prevented otherwise, circumventing banking legislation (for example, the Glass-Steagall Act which prohibits banks from directly engaging in investment banking).

INP

EXHIBIT III-11

- 55 -

A KEY TO INTERSTATE ACQUISITION LEGISLATION

Legislation passed   Legislation pending   No legislation.   * Legislation defeated in 1985

INPUT
WBAN
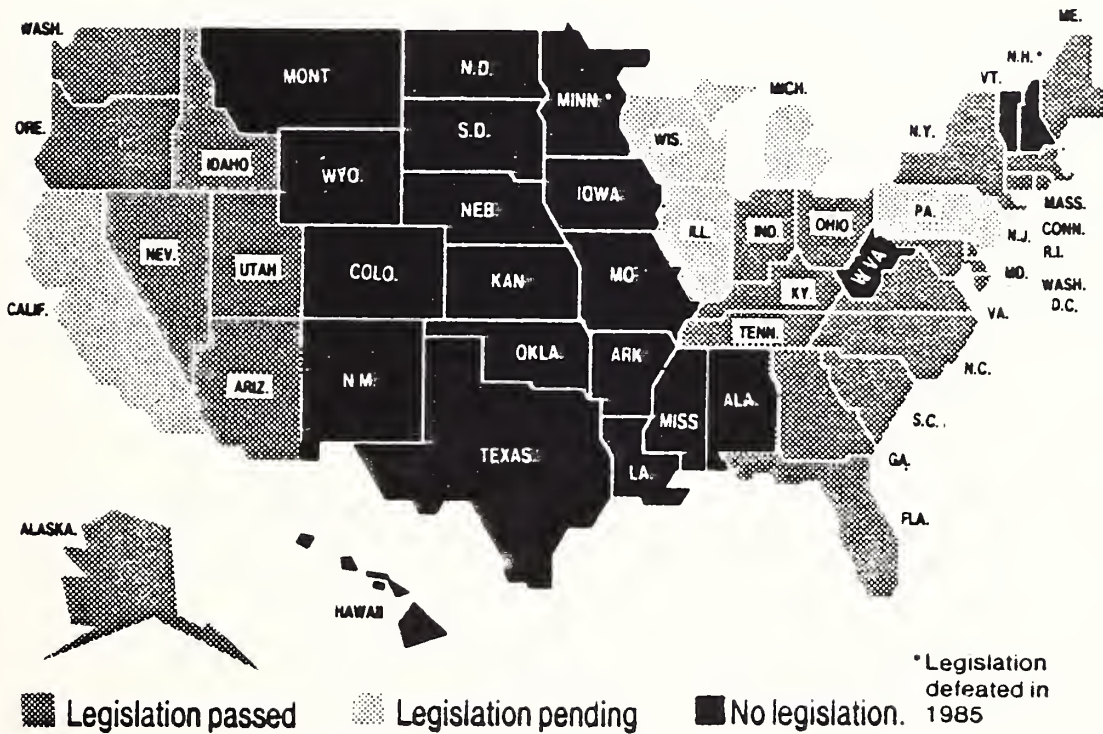
EXHIBIT III-12

1985's LARGEST INTERSTATE BANK ACQUISITIONS *

DATE ANNOUNCED	PROPOSED MERGER	COMBINED TOTAL ASSETS ($ Billions)
Sept. 26	Citicorp with Great Western Financial Corp.	$160.2
April 19	Bank of America with Oregon Bank	118.8
Oct. 17	Chase Manhattan wtih Continental Bank in Arizona	86.8
Aug. 20	Security Pacific Corp. with Arizona Bancwest Corp.	51.4
Sept. 3	Bank of Boston with Rhode Island Hospital Trust	26.7
July 3	NCNB, North Carolina with Banker's Trust in South Carolina	19.0
July 24	NCNB, North Carolina with Pan American Banks, Inc., in Florida	
Dec. 10	First Atlanta Corporation with Wachovia Corporation	15.7
Sept. 24	Sovran Bank, N.A. in Virginia with Suburban Bancorp Maryland	11.8
Feb. 22	Citizens and Southern Georgia Corp. with Landmark Banking Corp. of Florida	11.8
Sept. 17	Citizens and Southern Georgia Corp. with Citizens and Southern National Bank of South Carolina	11.0
	Combined Total Assets	$513.2

*Ranked by combined assets, in billions of dollars.

Source: American Banks.

- 56 -

INP
WBAN

- Most of the major money center banks have been testing interstate banking through the establishment of a limited number of "nonbank banks" as another method besides acquiring "sick" S&Ls to gain interstate presence.

  - The recent Supreme Court decision related to Dimension Financial Corporation of Denver limiting the Federal Reserve's regulatory power over limited service banks is seen to open the gate for a deluge (well over 500) of bank holding company applications for limited services banks.

  - Political conflicts between Congress and the President and within the Congress between the House and the Senate are seen to prevent the successful passage of limiting legislation until at least the new congressional session (1987-1988).

d.   Merchant Banking

- Money center banks are changing both their lines of business and the way business is conducted and are moving toward investment or merchant banking.

  - Selected, very large banks such as Northern Trust (Chicago) and Irving Trust (New York) are concentrating on providing investment advisory and pension plan management services.

  - As shown in Exhibit III-13, the portion of Master Pension Fund Trust deposits of the top five banks have risen nearly fourfold over the past decade.

  - Access to pension funds through new forms of financial instruments (i.e., insured loan pools through Dimension Corporate Finance, insured equity pools of mid-size publicly traded corporations through Equity Funding Corporation) are examples of new financial instruments which increase liquidity in capital markets.

- 57 -

INPUT

EXHIBIT III-13

GROWTH IN COMMERCIAL BANK MASTER PENSION FUND TRUST MANAGEMENT
DEPOSITS, 1973-1983

INI
WBA
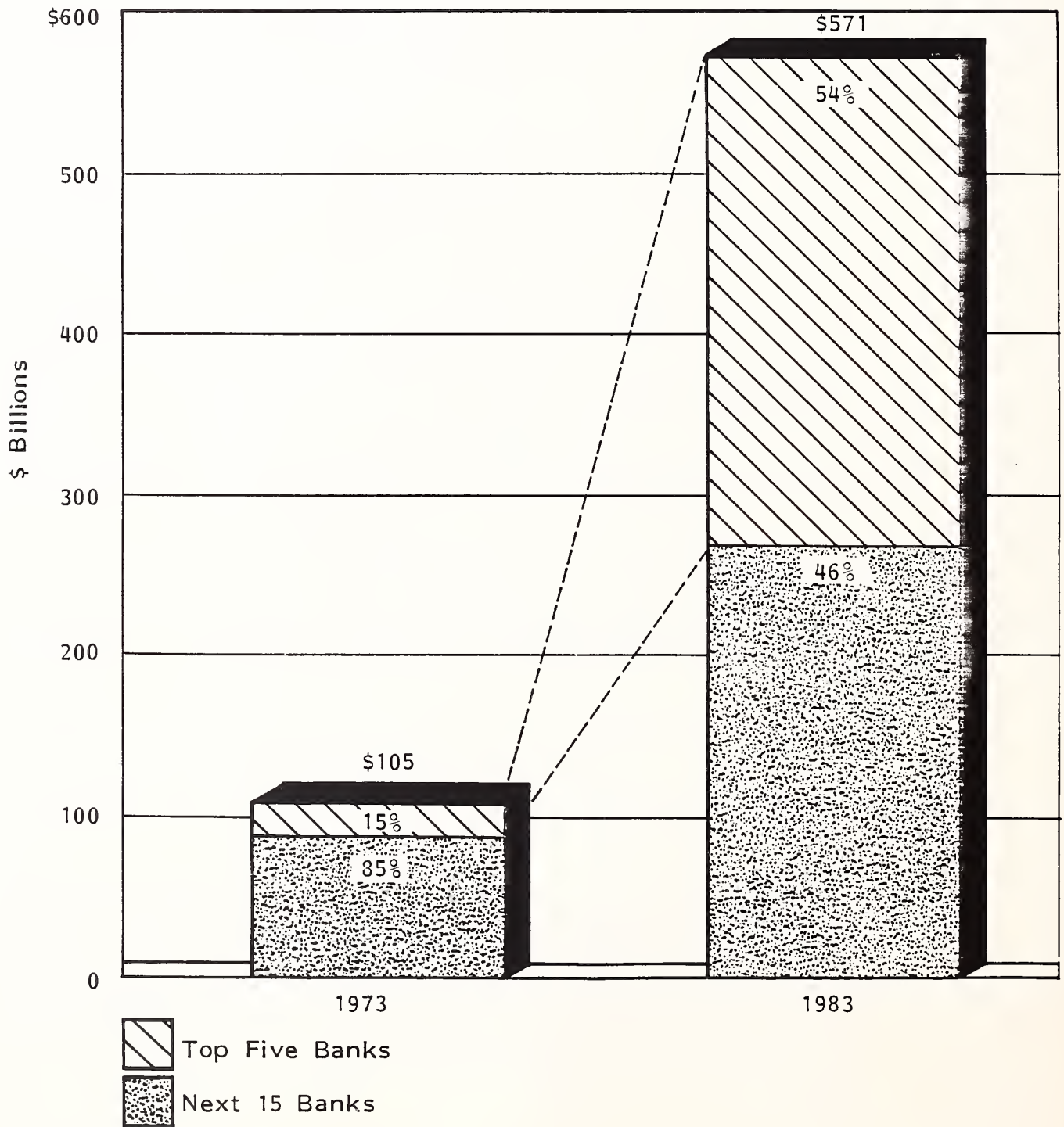
- Citicorp, under its new chairman John Reed, has reorganized Citibank to better concentrate on international investment banking, assigning Thomas Theobald as Vice-Chairman and Senior Executive of the Investment Banking Division.

- Led by chairman Charles Stanford, Bankers Trust is seen to be concentrating primarily on merchant banking, running up to and possibly around the provisions of the Glass-Steagall Act.

• The rapid growth of merchant banking activities is clearly illustrated in Exhibit III-14. Total commercial and industrial loans outstanding have increased 15% over the past two years whereas the amount of loan sold has increased by a factor of six with the number of banks involved tripling over the same period.

• Money center banks will be increasingly involved in marketing U.S. Treasury Department debt in international markets. The data shown in Exhibit III-15 highlights the recycling nature of OPEC-held treasury debt and the rapidly increasing demand for U.S. Treasury debt in Europe beginning in 1982.

• The structural changes both as to the composition and number of commercial banking entities and the many changes in the ways commercial banks are doing and will do their commerce will offer hardware and computer services vendors opportunities for developing and offering products and services over the next five years.

4. STRUCTURAL CHANGES IN COMMERCIAL BANKING, 1991-1995

a. National Banking

• Full-scale interstate national banking will emerge in the marketplace either supported by or in spite of federal legislation and regulation.

INPUT

EXHIBIT III-14

GROWTH OF MERCHANT BANK ACTIVITIES IN U.S. COMMERCIAL BANKS
1983–1985
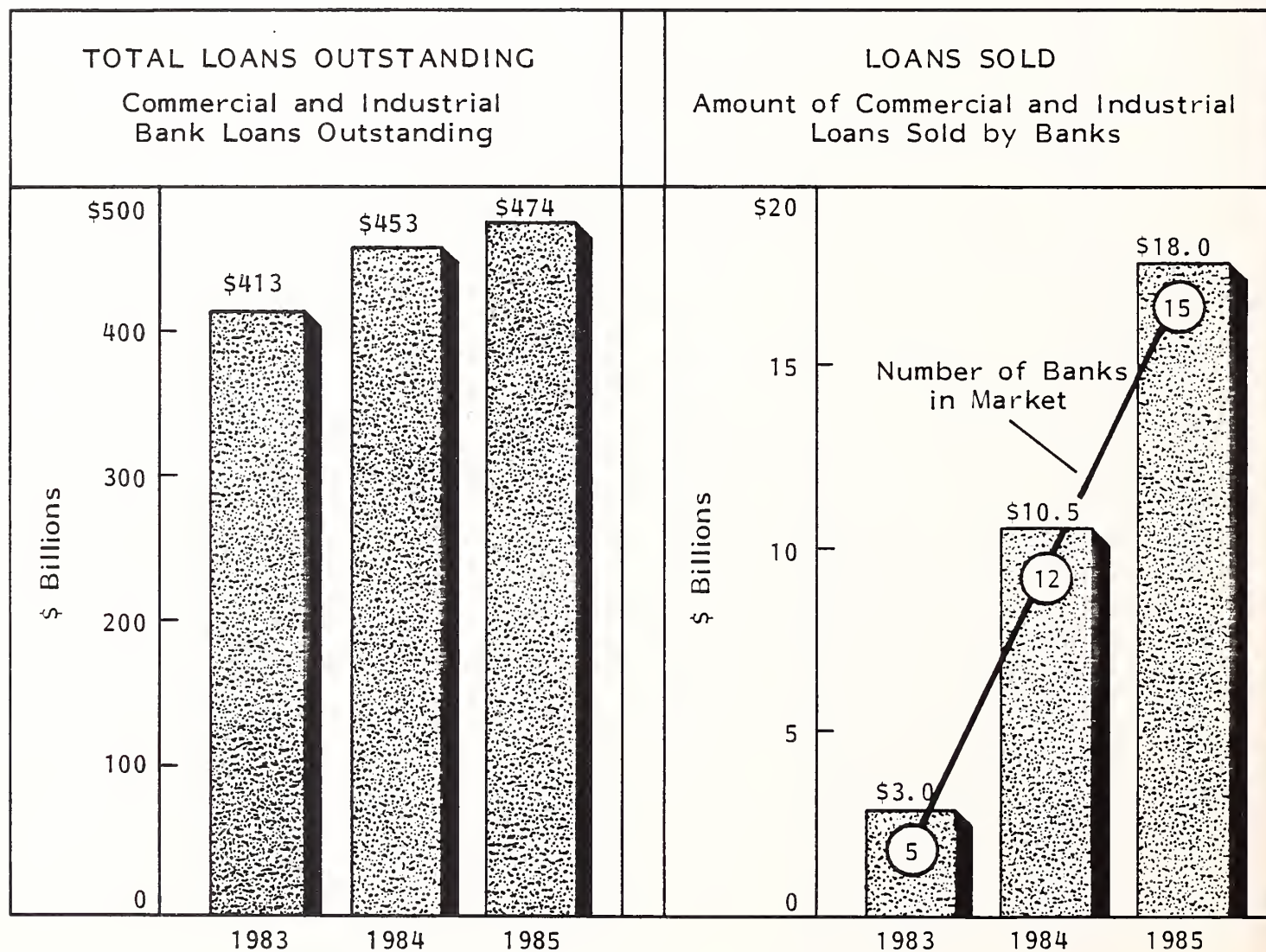
Sources: Federal Reserve Board;
Strategic Planning
Associates, Inc.

EXHIBIT III-15

GROWTH OF FOREIGN HOLDINGS OF U.S. TREASURY DEBT, 1975-1985

Total Privately-Held Marketable Treasury Debt ($ Billions)

June 30, 1985:
$1,310.7 Billion
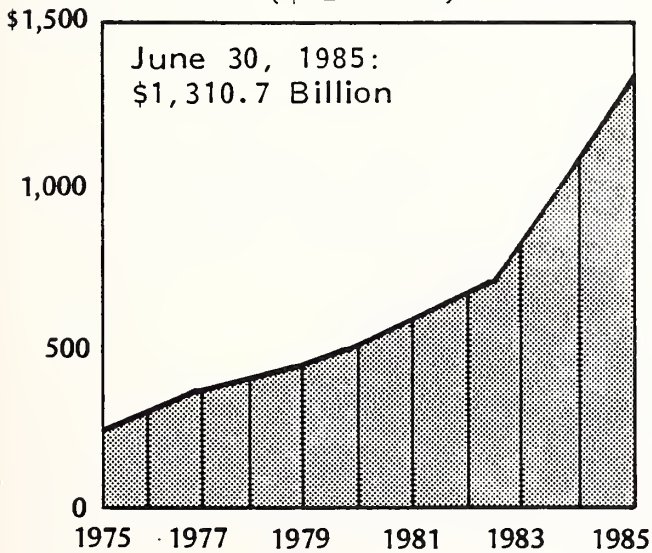
Total Foreign Holdings of Marketable U.S. Treasury Securities ($ Billions)

June 30, 1985:
$201.3 Billion
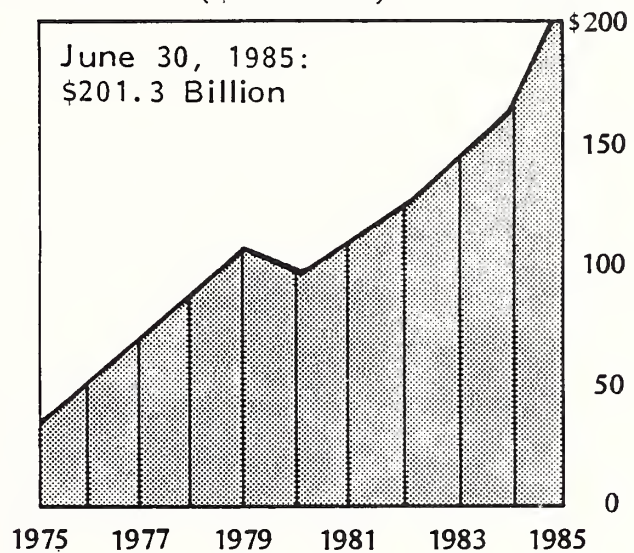
Foreign Holdings of Marketable U.S. Notes and Bonds ($ Billions)

June 30, 1985:
$49.7 Billion

June 30, 1985:
$26.7 Billion

June 30, 1985:
$124.9 Billion

All Europe   Japan   Other*
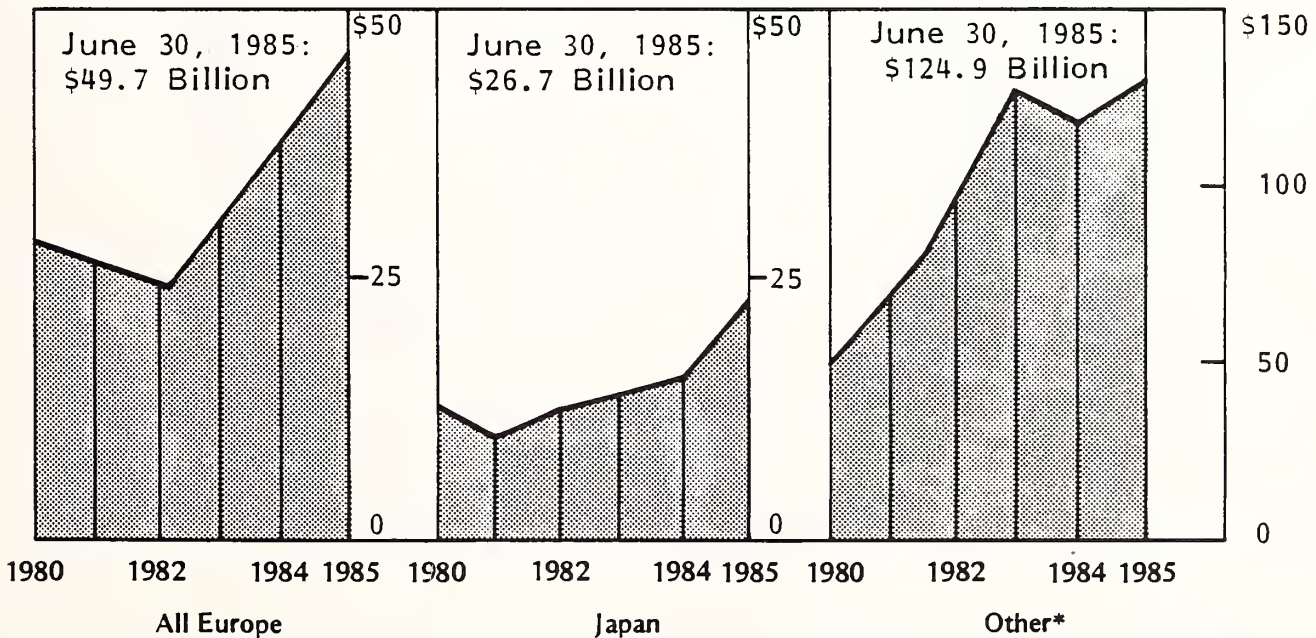
* Mostly OPEC or oil-producing countries.   Source: Goldman Sachs; U.S. Treasury Department.

INPUT
WBAN

- Industry consolidation will shift from the regionals to a number (less than 100) of very large banks with national presence.

  The structure that emerges will not be truly centralized. Independent banks, primarily in unit banking states, are seen to retain a presence to serve their local constituency, proprietorships, and small businesses as well as friendly consumers who are willing to trade interest rate differentials for customized service and seeming security.

- The larger of the independent banks will remain viable through the formation of multi-bank holding companies or cooperative associations providing both local and national electronic information services to their members.

- The net result is seen to be a market structure containing between 5,000 and at most 7,000 distinct entities to which hardware and computer services vendors can offer financial information products and services.

b. Profitability

- Survival of commercial banks in this timeframe will be heavily dependent on banks being low-cost providers of financial information services to clients (corporate and consumer).

  - For the retail market, this implies low-cost distribution to the consumer, proprietor, and small businessperson.

  - As shown in Exhibit III-16, over 65% of non-interest expense in retail banking is related to operating and directly supporting branch operations. The data suggests that brick and mortar operations from the days of high interest-rate spread will have to be replaced by electronic

- 62 -

INP

EXHIBIT III-16

DISTRIBUTION OF RETAIL BANKING NON-INTEREST EXPENSE
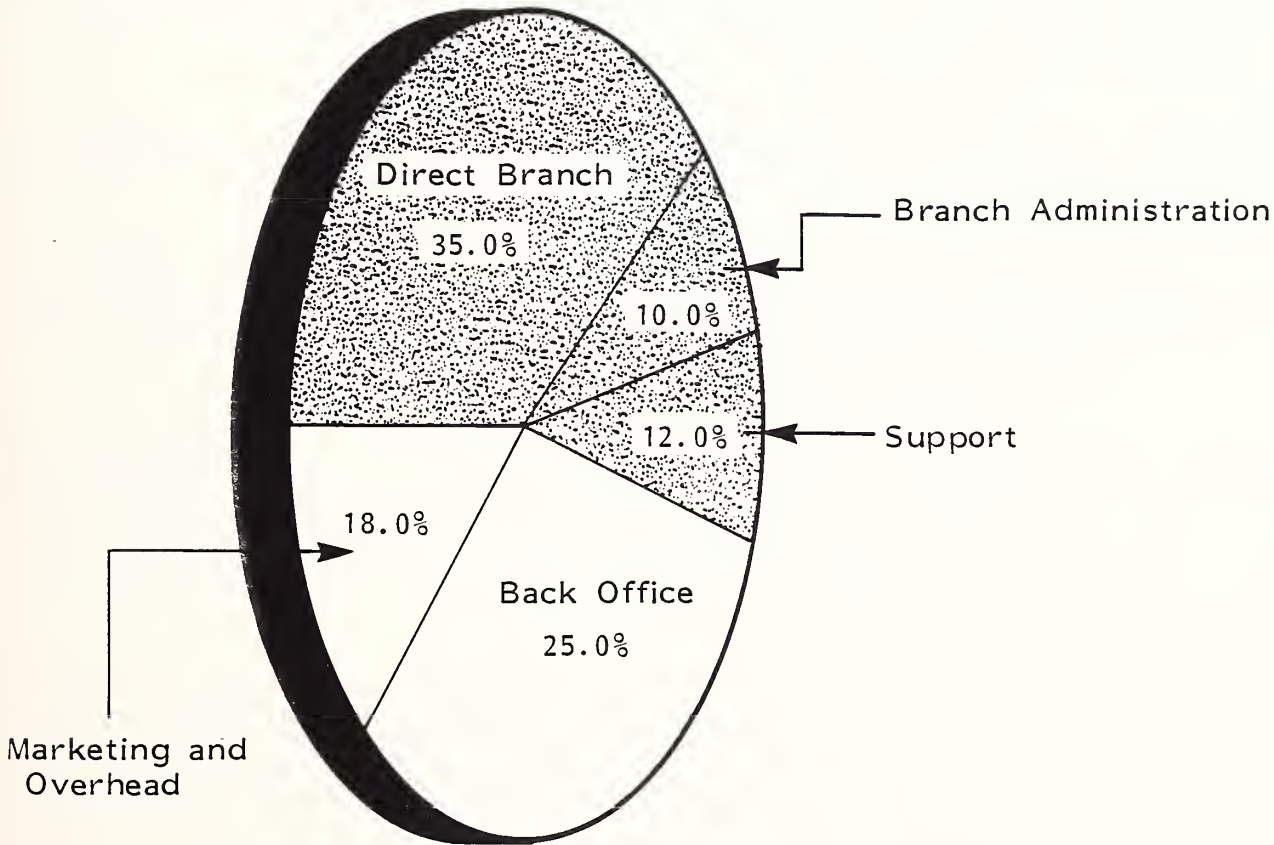
INPUT
WBAN

technology moving out to the consumer in the retail and home environment.

- Replacement of traditional bank branch brick and mortar operations is seen to offer myriad opportunities (particularly in transaction-oriented, secure network services) to hardware and computer services vendors offering financial information products and services.

c. Centralization/Decentralization

- Commercial banking operations are seen as becoming on the one hand decentralized with respect to information system operation and on the other more centralized as to operational control, particularly with respect to customer and corporate data.

- The factors playing against centralization/decentralization are shown in Exhibit III-17.

  - All four elements are highly important for successful banking operations at the national and regional levels.

  - Control of the telecommunications network is critical in establishing centralized control while allowing for decentralized operations of banking financial information services.

- Profit center responsibility for a line-of-business strategy (retail, money markets, corporate relationship, etc.) together with the information system resource responsibility are seen as key factors in money center bank corporate organization.

- Profit center responsibility is seen to create new sales point opportunities for hardware and computer services vendors offering industry-specific financial information products and services.

INI

EXHIBIT III-17

FACTORS INFLUENCING CENTRALIZATION/DECENTRALIZATION OF THE BANKING AND FINANCE INDUSTRY

INFRASTRUCTURE ELEMENTS	CENTRALIZATION PRESSURE	DECENTRALIZATION PRESSURE
Processing	Potential scale benefits of an integrated data utility	Increased price/performance relationship of small computers
People	Scarcity of skilled people	Need to respond to business unit needs
Telecommunications	Complexity of deregulation and convergence of voice and data	Increased use of telecommunications in banking products
Planning	Need for an overall view of technology	Need to match line-of-business strategies

Source: First Manhattan Consulting Group.

INPUT
WBAN

d. Relationship Banking

- Full relationship-based banking is the goal of offering a total portfolio of financial information services to a bank's clients. The elements of the relationship are as shown in Exhibit III-18.

  - The customer relationship data base, under IBM's centralized data base management system architecture, is the critical element in establishing full client relationship-based banking.

  - Somewhere along the line, dropping the artificial barriers (the "Chinese Wall") imposed by the Glass Steagall and Bank Holding Company Acts is a necessary ingredient to give recognition to the reality of market forces.

  - The necessity of implementing full relationship-based banking on a national basis will offer a significant opportunity to both hardware and computer services vendors offering cost-effective financial information products and services.

e. Specialization

- A broadening of the types of financial services that can be offered is seen for virtually all financial intermediaries, including nonbank corporations whose financial subsidiaries are expected to eventually fall under regulatory authorities through Congressional, judicial, and regulatory action.

- Competition, availability of national electronic financial networks, and economies of scale will foster specialization in offering financial services to both the corporate and consumer marketplace.

INP

EXHIBIT III-18

RELATIONSHIP-BASED BANKING INFORMATION SYSTEMS ARCHITECTURE
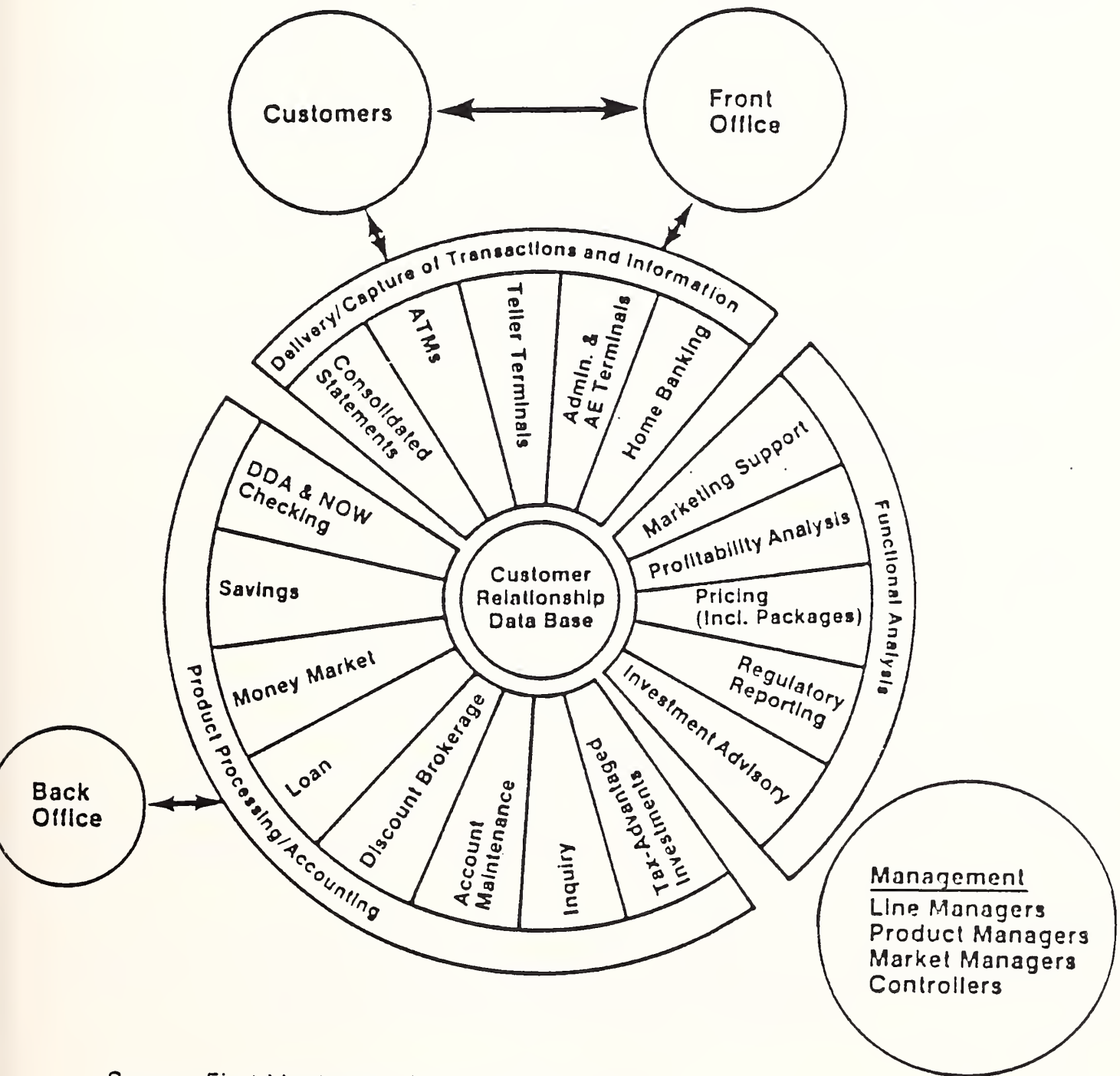
Source: First Manhattan Consulting Group.

- American Express and Prudential Insurance Company of America are becoming the most diversified of all financial services offerers.

- Citicorp is turning into the nation's largest consumer finance company.

- Merrill Lynch and Company leads the market with the most IRA, Keogh, and other individual retirement accounts.

- Aetna Life and Casualty has the most assets under discretionary management.

- Sears Roebuck and Co. has more financial outlets than Citicorp and American Express combined.

- Prudential, with over $7 billion in lease assets, leads in this financial service.

- Prudential is also the leading financier of company receivables.

- Specialization in financial markets is seen as offering industry-specific opportunities for both hardware and computer services vendors' products and services offerings.

5. STRUCTURAL CHANGES IN OTHER FINANCIAL INSTITUTIONS, 1985-1995

   a. Savings and Loan Industry

- The industry is seen as continuing the trend of conversion from a mutual to a stock organizational structure.

   - The top 200 public companies control well over half of the capital of the industry and nearly 60% of its assets.

- 68 -

IN

- Another 700 privately-held stock S&Ls constitute a second market segment, of which the larger ones are taking the route of sale to commercial industry, supporting specialized financing operations for the industrial parent.

- The remaining mutual plus the weak privately-held stock companies form a disaster group, the portfolios of which, if liquidated, would bankrupt the FSLIC insurance fund.

- The major industry problem in the next five years is considered to be the overhang of problem real estate assets, held primarily through default, the current value of which are far below the valuation held on the books of the affected S&Ls.

- A trend is seen toward specialization (i.e., mortgage servicing, secondary mortgage market packaging, home equity lending, etc.).

- A shift of management attention to the cost side of S&L operations is seen as another driving force toward consolidation.

- S&L service bureau operations (i.e., NCR, Dataline, Genesco, etc.) are seen as lacking capital to upgrade operations to support electronic delivery. Many are owned by association groups and are candidates for sale/merger/acquisition.

- The Savings and Loan (S&L) industry is being sustained and kept from bankruptcy by a combination of stopgap measures fostered by regulatory authority (Federal Home Loan Bank) and lobbying interest efforts by special interest groups (i.e., national and state S&L leagues).

  - Until the fourth quarter of 1985, net book value (as opposed to true market value) of S&L portfolios (assets) net of deposits resulted in a negative net worth for the industry in the aggregate.

INPUT

- The distribution of savings and loan industry assets is as shown in Exhibit III-19. The major portion of other S&L assets are illiquid (primarily real estate), resulting in S&Ls being highly vulnerable to rapidly rising interest rates when holding 20-year, fixed-rate mortgages.

- Moreover, many S&Ls have attempted diversification with efforts in consumer lending and EFT, but none have had much success.

- As long as interest rates were held artificially low (5% savings accounts), the interest return on mortgages held, as shown in Exhibit III-20, left plenty of room for interest rate spread between price of funds (primarily deposits) and mortgage yields. With the elimination of Regulation Q coupled with rapidly rising inflation, the situation rapidly changed, accounting for the rapid depletion of the FSLIC Insurance Fund and the enforced merger of over 500 S&Ls in the 1983-1985 timeframe.

- The S&L industry remains in deep financial trouble. Stopgap measures such as the transfer of fixed rate mortgages into mortgage pools insured by federal mortgage agencies and special capital notes issued by the Federal Home Loan Bank continue to prop up the industry in search of better times.

  - There are over 500 S&Ls currently waiting for the right time to "sell out" to other healthy financial institutions.

  - Considerably less than 1,200 separate entities are expected to survive in recognizable form by the end of the decade.

  - The rapid consolidation of the S&L industry is seen as an opportunity for acquisition of S&L processing services and for providing data base services by computer services vendors for financial evaluation and merger and acquisition evaluation.

EXHIBIT III-19

DISTRIBUTION OF SAVINGS AND LOAN
INDUSTRY TOTAL ASSETS, 1970-1984

Source: Federal Home Loan Bank Board

- 71 -

INPUT
WBAN
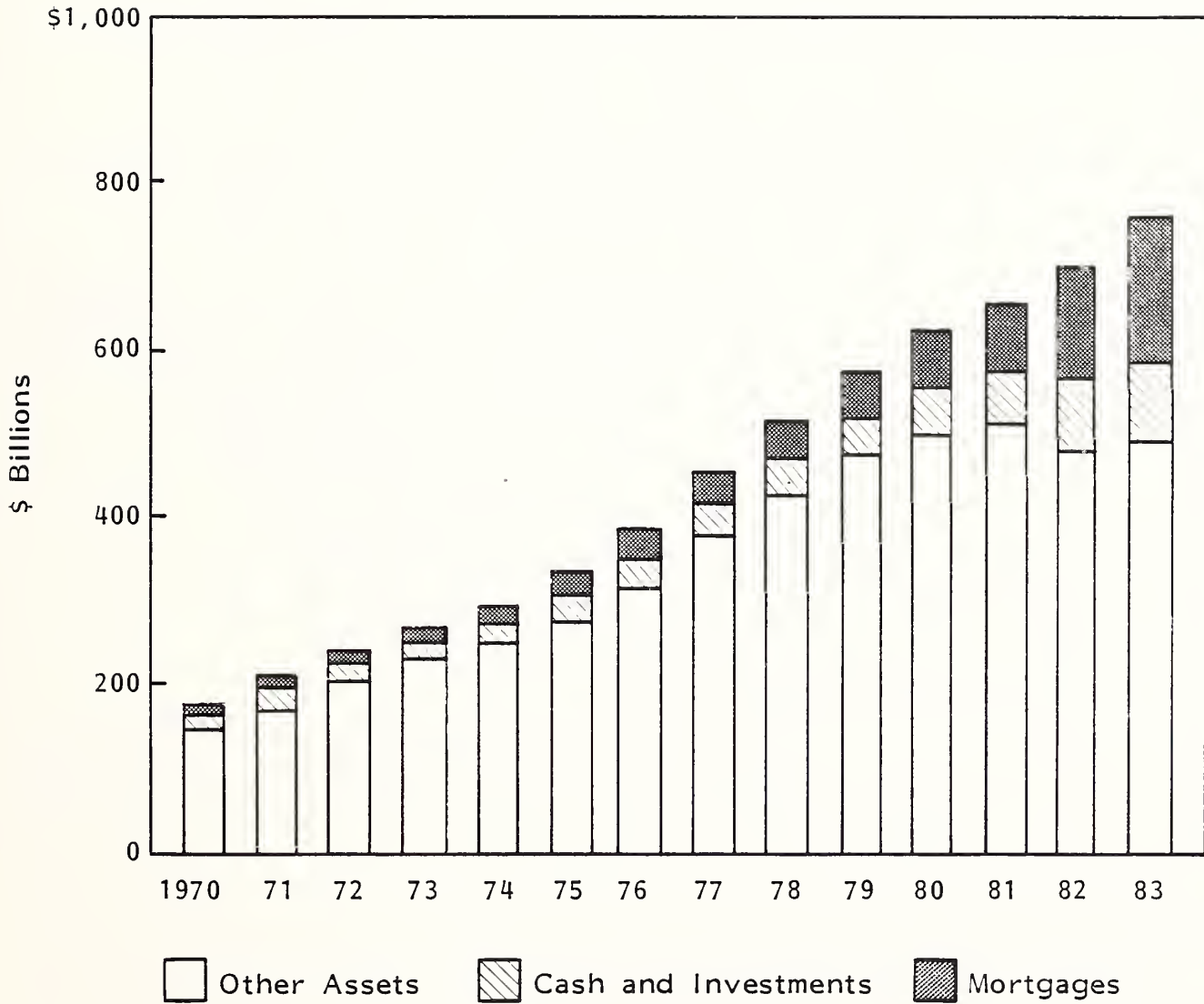
EXHIBIT III-20

DISTRIBUTION OF SAVINGS AND LOAN (S&L)
AVERAGE COST OF MONEY VERSUS AVERAGE MORTGAGE YIELDS, 1969–1983

Savings & Loans - Yields and Costs (Percent)

Interest Return on Mortgages Held

Average Cost Savings

Average Cost Savings and Borrowings

Source: Federal Home Loan Bank Board.

- 72 -
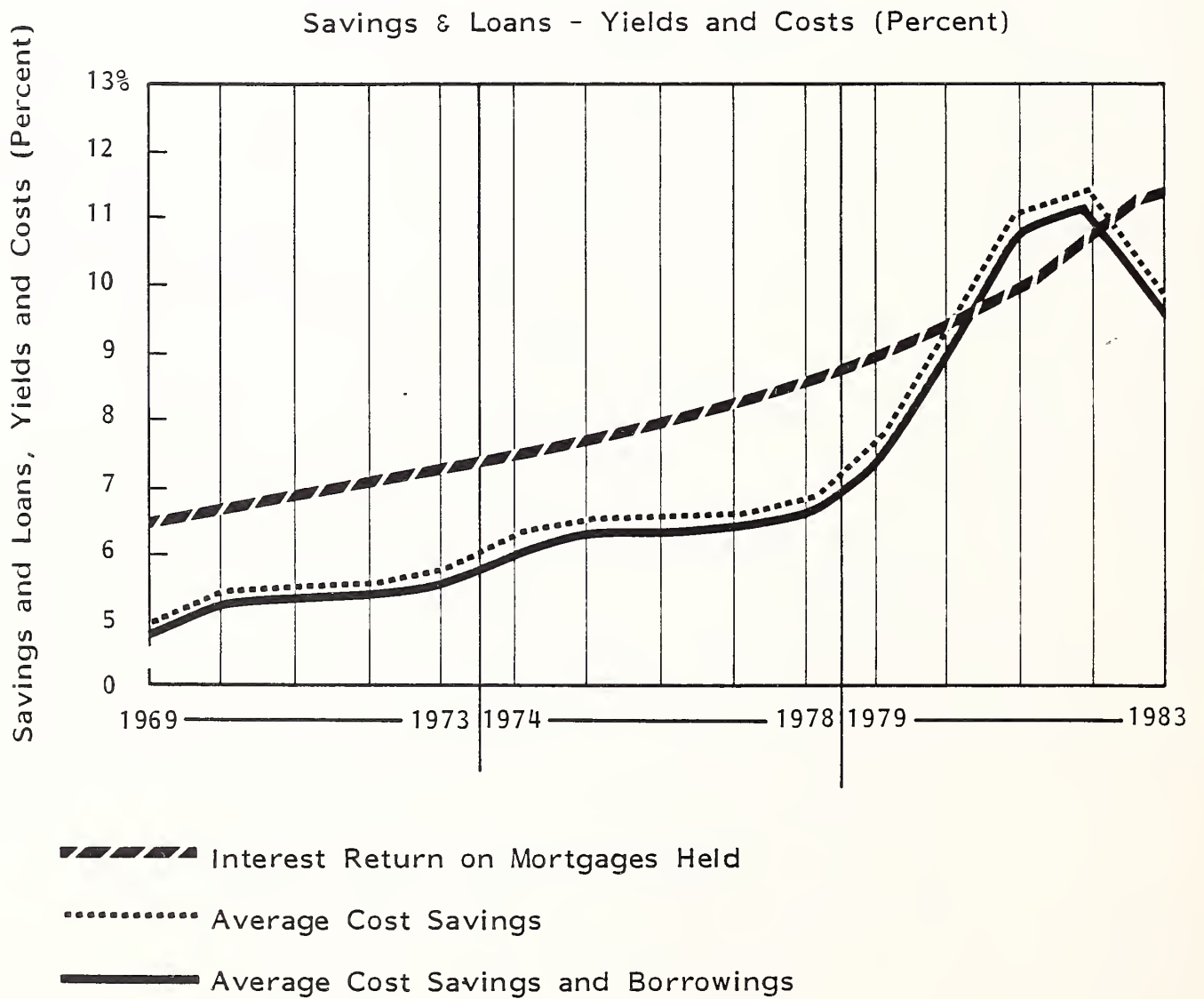
b.   Regulatory Agencies

● Not much change in the status quo is seen with respect to merging one or more of the several federal (state) agencies involved in regulating the banking and finance industry.

- There is little political incentive to disturb the status quo. Congress is seen to have more important issues with respect to the stability of and response to de facto changes in the existing industry structure.

- Some administrative streamlining appears in order between the Federal Reserve, the Comptroller of the Currency, and the FDIC.

- Premiums based on risk assignment are seen a natural progression, but one which is torturously difficult to define and accomplish. Such an accomplishment is seen as key to merging the FDIC and the FSLIC (S&L industry).

- An even dimmer view is seen of the transfer of state regulatory functions to the federal bureaucracy.

B.   PAYMENT SYSTEMS, 1985-1995

● Development and control of electronic financial information networks is key to delivering financial services to both the wholesale and retail marketplaces in the coming decade. Indeed, the control and cost-effectiveness of electronic delivery is a necessary condition for financial institution survival, much less expansion.

INPUT

- At the highest financial institution corporate levels, the strategy is clear that "He who controls the electronic payment systems, controls the banking and financial services marketplace."

- The vital importance of financial transaction networks is highlighted in Exhibit III-21.

  - Accelerated growth is expected over the next five years. The volume of electronic transactions will more than double for an 18% annual growth rate over the forecast period.

  - With national networks in place, electronic payments transactions will steadily increase to 65 billion annually, an 8% AAGR over the forecast period.

  - Transaction growth will be greatest for automatic teller machine-initiated (debit card) transactions, 15% over the next decade.

  - . Electronic transactions (credit/debit card) volume at point of sale terminals will more than triple for an annual growth rate of 13% over the ten-year period.

- Clearly, offering products and services related to the electronic payment system(s) is a target of opportunity for both hardware and computer services vendors offering financial information services.

I. ELECTRONIC FUNDS TRANSFER SYSTEMS (EFTS)

- Faced with private sector competition, the FED will still retain primary control over the payments clearance system. The FED will continue to utilize the payments clearance system (both check and electronic funds) as a means of administering a central bank control over U.S. money markets.

IN

EXHIBIT III-21

FORECAST OF U.S. ELECTRONIC PAYMENTS, 1983-2000
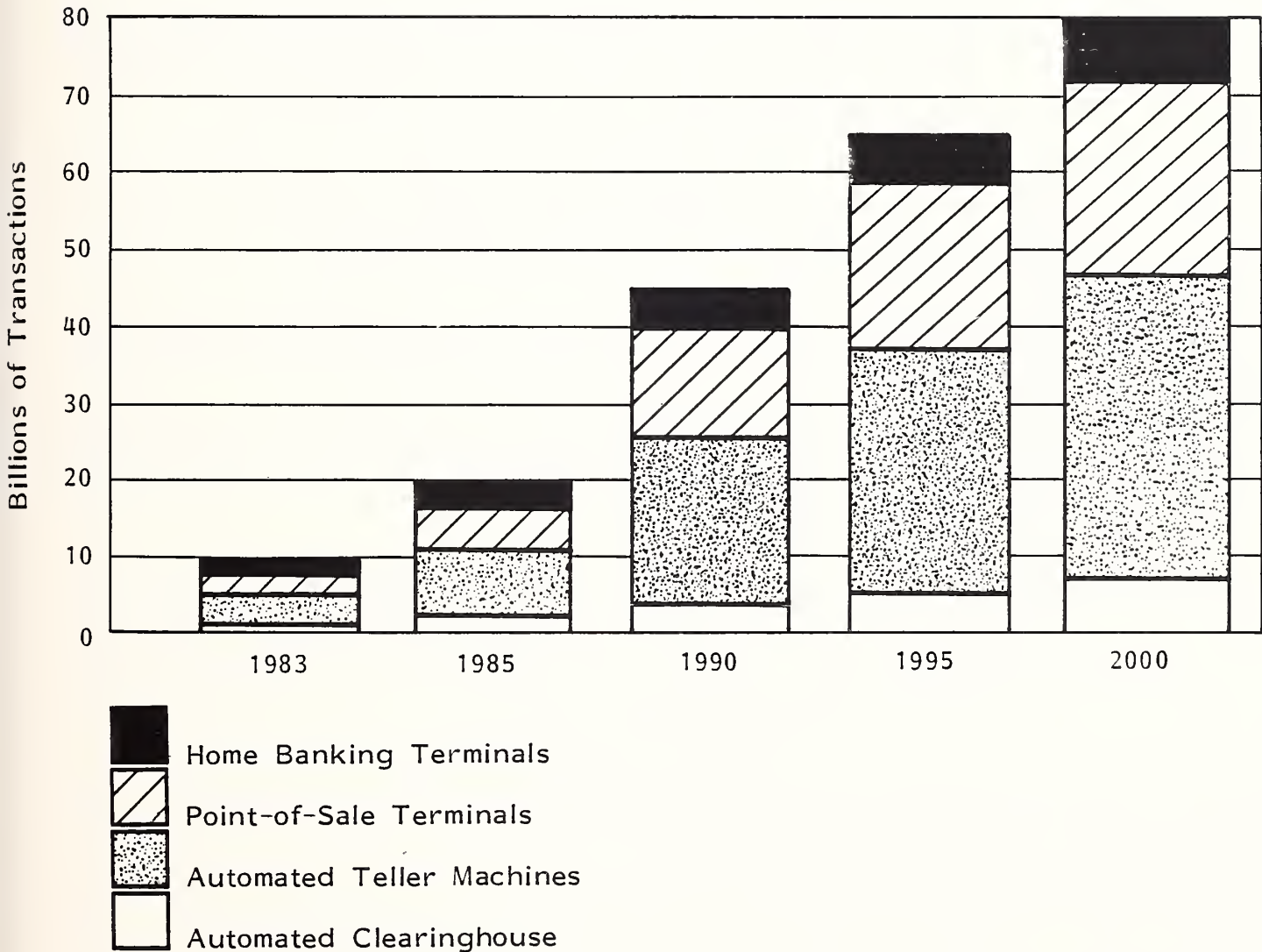
Source: Federal Reserve Board (FRB), American Bankers Association (ABA).

INPUT
WBAN

- The FED is expected to continue to process the major volume of interstate and remote location transaction volume.

- Bank association sponsored, and frequently facility managed, clearinghouses will shift to increasing electronic technology for clearance of at least high-value check transactions between clearing banks in greater metropolitan areas.

- Check truncation (see Chapter IV, Technology Assessment, Check Truncation) should greatly alter check payment systems operations within the next five years.

- Government and to an increasing extent business payments are seen as becoming increasingly electronic over the forecast period.

  - The payments will be routed through automated clearinghouses (ACH).

  - The ACH flow of operations, seen in Exhibit III-22, will with private sector participation be accomplished over electronic networks, replacing magnetic tape.

  - The 17 ACHs, primarily run for association members by the FED, will shift at least in part to management by computer services vendors (GEISCO, ADP, Tymshare etc.).

  - Growth is, as shown in Exhibit III-23, forecast to be greatest in private sector debits and credits.

  - Accelerated growth in private sector ACH transactions is seen as dependent on resolution of an electronic data interchange standard which can be accepted by ACH financial transaction systems (see Section 2, Consumer Financial Transactions Networks, below).

INP

EXHIBIT III-22

AUTOMATED CLEARINGHOUSE FLOW OF OPERATIONS

Authorizes payroll deposits or bill payment and supplies identification of his bank and account number

```
┌──────────┐                                              ┌──────────┐
│ Customer │ ──────────────────────────────────────────> │ Business │
└──────────┘                                              └──────────┘
```

Submits paper record of transaction made, or, in the case of some types of bills, about to be made.

Submits magnetic tape containing

For Payroll Deposit —
Employee name, bank and account number and amount.

For Bill Paying —
Customer name, bank and account number and amount.

```
┌─────────────────┐
│ Originating Bank │
└─────────────────┘
```

Strips off payroll or bill data that apply to individuals whose accounts are with it and completes these transactions

Forwards all other data to automated clearing house (ACH) on magnetic tape.

Notifies business when transactions are completed by self or through ACH

```
┌──────────────────┐
│ Other Originating │
│      Banks        │
└──────────────────┘

┌──────────┐        ┌────────────────────────┐
│ Other ACHs │ ──> │ Automated Clearing House │
└──────────┘        └────────────────────────┘

┌──────────┐
│ Other ACHs │
└──────────┘
```

Sorts and consolidates all data, sorting by receiving bank in own area or by ACH servicing the specified banks in other areas

Sends individual magnetic tapes to all receiving banks.

Sorts by customer and completes transactions.
Prepares descriptive entries on all transactions for inclusion in customer notification (if used) and monthly statements.

```
┌──────────────────┐        ┌──────────────────────────────┐
│ Other Banks for  │        │       Receiving Banks         │
│ Which Receiving  │ <────> │ (which can be the same as     │
│ Bank Provides    │        │     Originating Banks)         │
│ Preauthorization │        └──────────────────────────────┘
│    Services      │
└──────────────────┘
```

Customer Notification/Statement

- 77 -

INPUT
WBAN

EXHIBIT III-23

ACH SYSTEMS TRANSACTION GROWTH

Private Sector Debits & Credits

Treasury and Non-Treasury Government Payments

SOURCE: National Automated Clearing House Association

- 78 -

INPU
WBAN

- Integration of corporate treasury, lock box, funds transfer, and secure corporate financial data base services into PC-based cash management system(s) is a primary factor in implementing full-relationship banking with corporate customers (see Section A-4, Structural Changes in Commercial Banking, 1991-1995, above).

- Wholesale electronics funds transfer systems (EFTS) are discussed in detail in Chapter V, Security, Section B, Electronic Funds Transfer Systems (EFT).

- Participation of the private sector in wholesale electronic funds transfer systems is seen as a major opportunity for hardware, computer services, and telecommunication vendors offering financial information products and services.

2. CONSUMER FINANCIAL TRANSACTION NETWORKS

- The three components of shared financial transaction networks are shown in Exhibit III-24.

    - For proprietary bank ATM networks, the bank component contains the ATM and, as necessary, the switch.

    - In shared ATM networks the ATM may be in either the retail or the bank environment. The switch may be located either in the bank environment or with a third-party vendor.

    - Because of their location in the retail environment, POS terminals are primarily attached to shared financial transaction networks.

    - The switch components are primarily part of third party network vendors (i.e., VISA, MasterCard, Sears, Tymshare, etc.).

INPUT

EXHIBIT III-24

SHARED FINANCIAL TRANSACTION NETWORK COMPONENTS
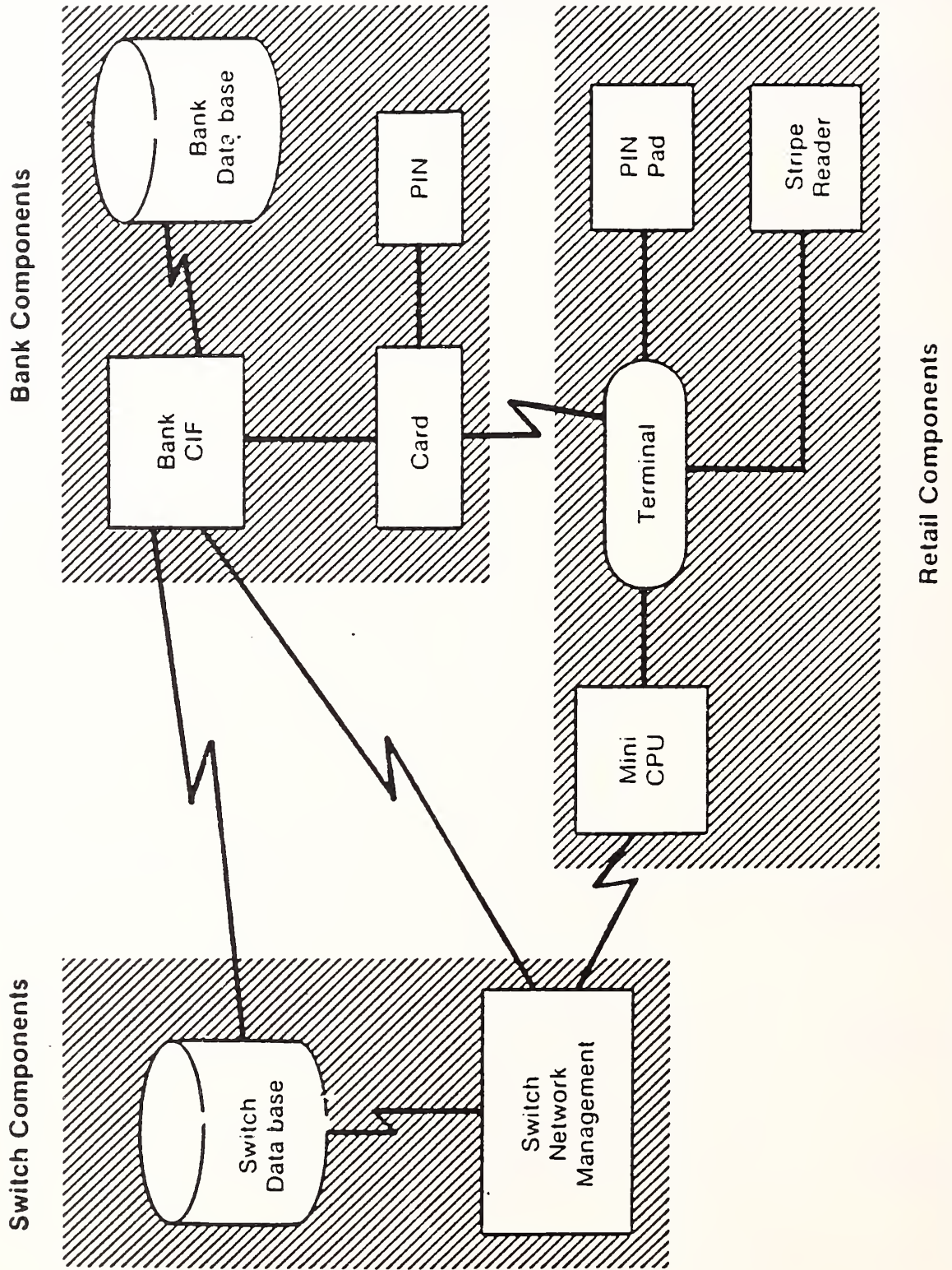
CIF Central information file.
PIN Personal identification number

- 80 -

INP
WBAN

- POS networks were extensively analyzed in a recent INPUT report on check guarantee/authorization services (see Appendix C, Related INPUT Reports).

    - The trend is toward electronic verification of all POS transactions in the retail environment.

    - The market potential is truly huge. Currently over 25 billion credit card/check authorization transactions are processed annually with market penetration well under 20%.

    - The market is in the process of interfacing existing networks with electronic interchange handling a wide variety of terminals, protocols, and message formats for both debit and credit transactions.

- There are approximately 100 proprietary and shared ATM networks operating in local and regional areas with less than a dozen having national presence.

    - The trend is heavily toward shared networks which has been proven necessary to support the economic viability of expensive terminal (ATM) capital expenditures.

    - The eight leading national shared networks are shown in Exhibit III-25. The installed base of 23,110 ATMs represents just under half of the total installed base in the U.S.

    - The national networks support a card base of approximately 103 million, or well over 90% of total bank cards in issue in 1984 (see Exhibit III-26).

- Point of sale consumer networks are seen as a three dimensional activity:

    - The ability of financial institutions to appropriately handle the transactions.

INPUT

EXHIBIT III-25

LEADING NATIONAL SHARED AUTOMATED TELLER MACHINE
NETWORKS INSTALLED BASE, 1984

Network	Number of ATMs
Cirrus	6,471
Plus	4,675
Express Cash	3,200
Citishare	2,400
Visa	2,240
The Exchange	1,690
Nationet	1,434
Master Teller	1,000

Total: 23,110

Number of ATMs

- 82 -

INF
WBAI
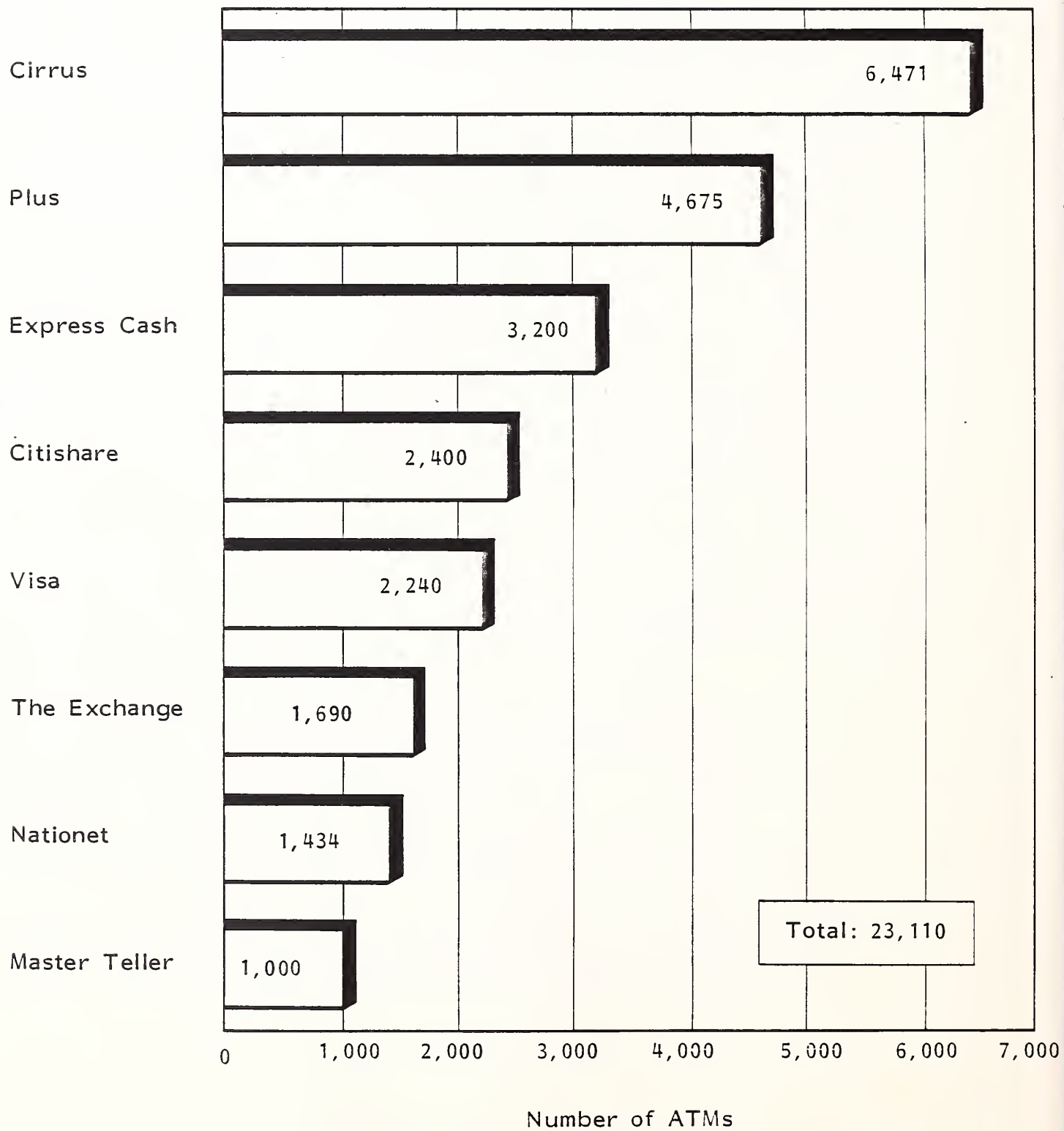
EXHIBIT III-26

LEADING NATIONAL SHARED AUTOMATED TELLER MACHINE
NETWORKS CARD BASE, 1984

Card Base (Millions)

- 83 -
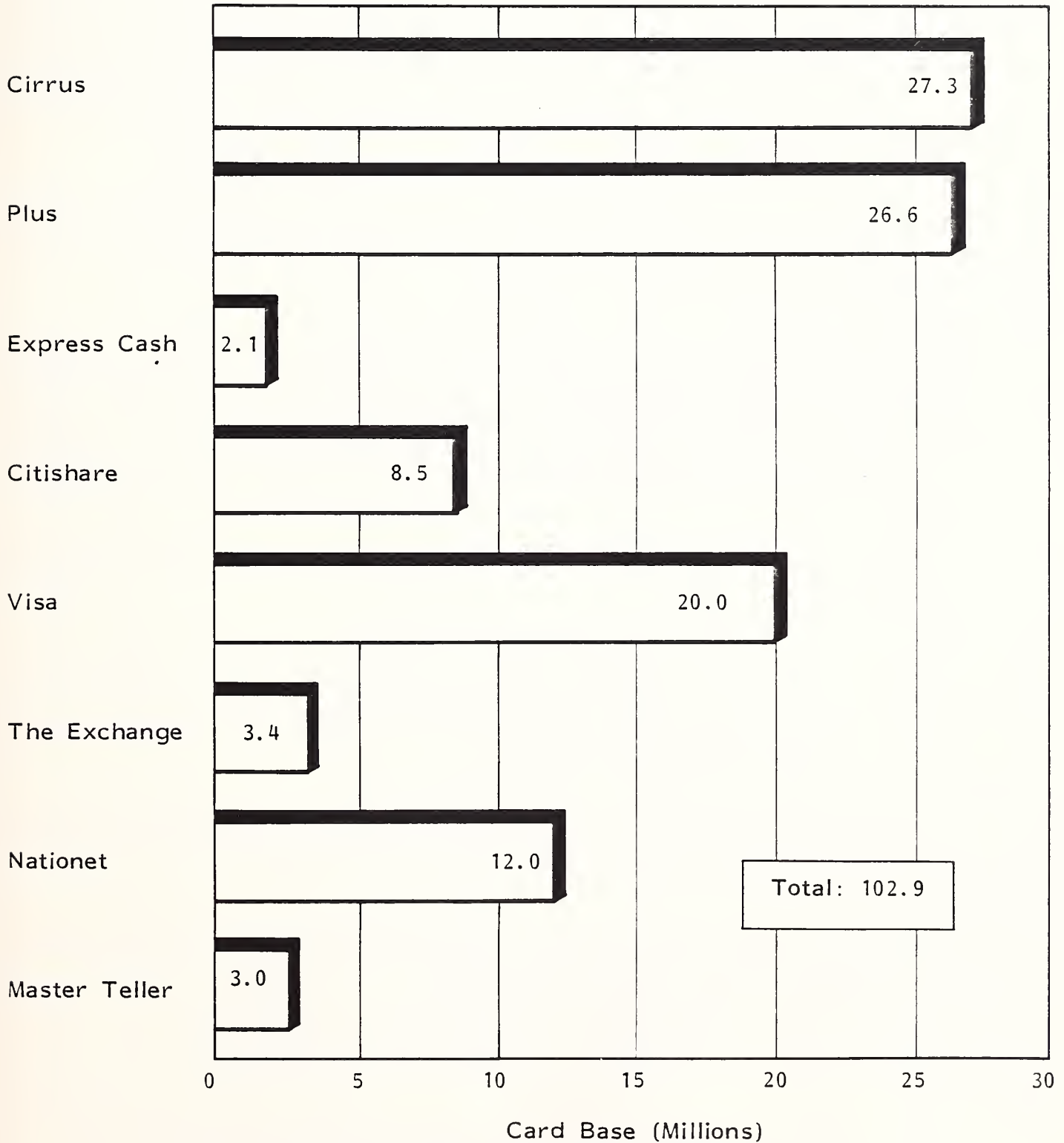
- The participation of the retailer.

- Cost-effective shared switched data communication networks.

- Ownership of POS networks is seen as an interplay between banks and retailers where each wants control over the transaction network at least to the point of interchange. It is the tension that this situation creates that offers computer services and telecommunications vendors market opportunities to provide network solutions which satisfy both interested parties.

- The ability of financial institutions to influence the development and pricing of retail POS systems is seen as of critical importance to bank survival in the consumer marketplace.

- The bank card business has, except in periods of high inflation, been one of the most lucrative businesses in which commercial banks can engage. The interest rate spread for handling credit card accounts receivable is currently the widest of any forms of credit granting in the banking and finance industry.

- Economies of scale, as shown in Exhibit III-27, favor very large issuers and processors.

  - The industry is seen in a state of consolidation where the market share of the ten largest issuers is growing at more than twice the industry dollar volume growth rate.

  - It appears only a matter of time until interest rates charged consumers will vary based on the individual's consumer credit.

- The debit card is seen as the key mechanism for both direct payment and an ever-growing range of financial services.

INP

EXHIBIT III-27

COMPARISON OF BANK CARD PROCESSING COSTS
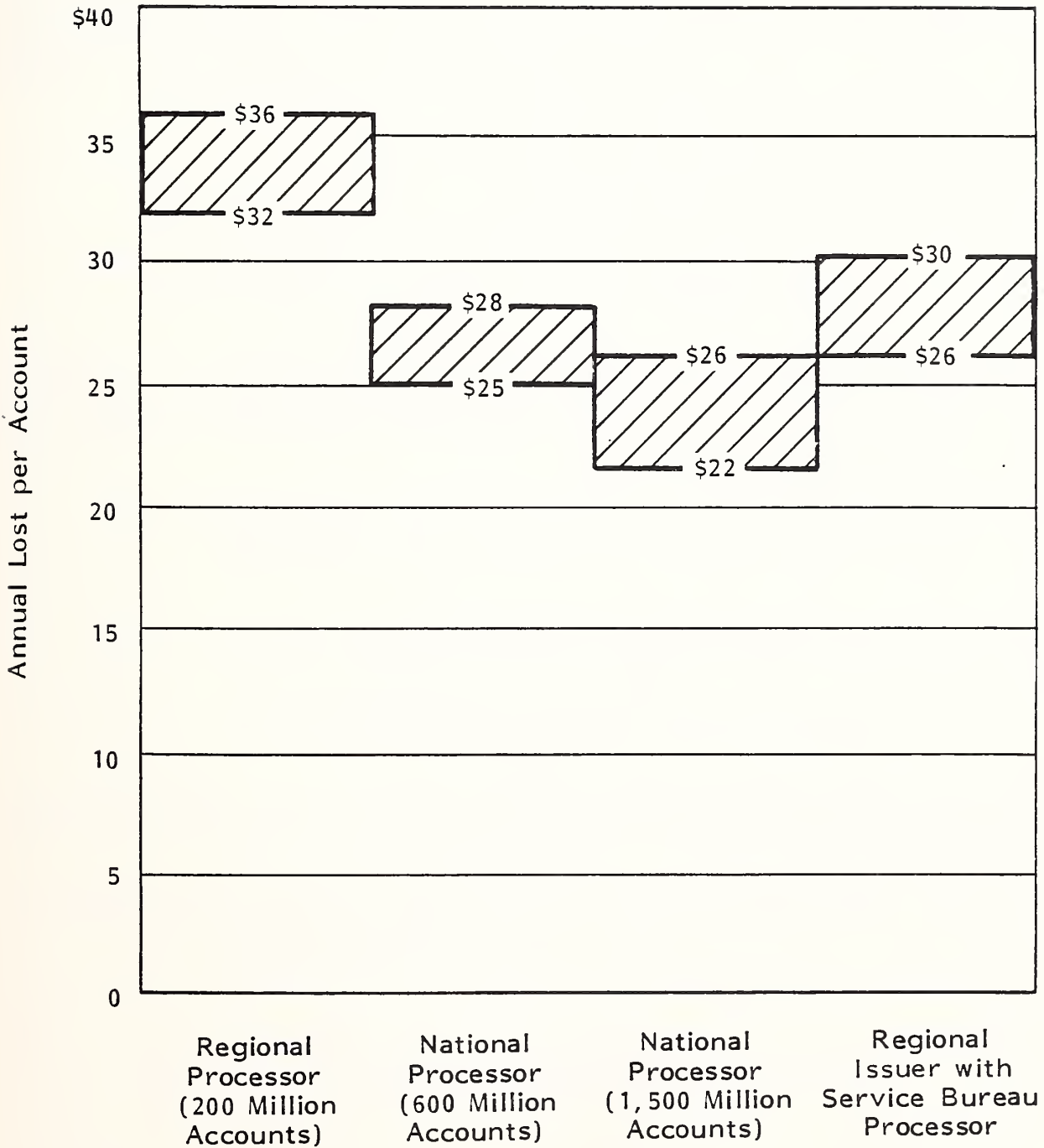
Source: First Manhattan Consulting Group.

- The question of "float" will be resolved as users are appropriately charged for the true value of convenience credit.

- Key to the widespread use of bank debit cards will be the question of security (i.e., user verification and message authentication). The issue of security is discussed in detail in Chapter V, Security.

- Developing an array of electronic services, financial and otherwise, through shared debit card networks is seen as a major market opportunity for computer services and telecommunications vendors offering financial information products and services.

3. OTHER FINANCIAL NETWORKS

    a. <u>Mortgage Networks</u>

- National Electronic Mortgage market networks are seen as a new financial information service which can rapidly match consumer and loan broker needs with mortgage funds availability.

- Market entrants currently marketing services regionally are:

    - ShelterNet (First Boston Capital Group).

    - Loan Express (Planning Research Corporation).

    - Realtors National Mortgage Access (National Association of Realtors).

    - International Mortgage Exchange (Union Planters National Bank).

    - Loan Link (TRW).

    - RKI Data Banks (Realty Knowledge, Inc.).

INF

- The market is seen to expand on a national basis within the forecast period.

  - Interest rate differentials between the east and west coast will be moderated.

  - Packaging and sale of mortgages into the secondary market will be greatly facilitated.

  b. Electronic Data Exchange Networks

- In its most recent study on Electronic Data Exchange (see Appendix C, Related INPUT Reports), INPUT analyzed the market for electronically transferring standard business documents such as purchase orders and invoices between cognizant parties.

  - EDI is seen as providing new opportunities for computer services and telecommunications vendors.

  - Exponential growth is forecast with the market exceeding $1 billion by 1990.

  - Transfer between EDI networks and the payment system (primarily automated clearinghouses) is expected to occur as a data interchange standard is evolved.

  - Accelerated growth in ACH transactions will likely occur in the latter half of the forecast period.

  c. Securities Trading Networks

- The use of financial information networks to conduct securities trading should become effective within the forecast period.

INPUT

- Discount brokerage houses are interconnecting to private investors with PC-based securities analysis, portfolio management, and, lately, securitites buying and selling order placement and execution.

- Such systems are finding widespread use both with private traders and self-administered Keogh and other retirement plans.

- NASD has recently linked the American and the London Stock Exchange, offering the ability to trade nearly 600 British and American issues within a 13-hour daily window.

- Institutional Network recently installed its INSTINET trading system in the offices of a London brokerage house, allowing the firm to trade in over 8,000 publicly-traded U.S. stocks.

- The trend is toward global trading around the clock well within the forecast period.

C.   MARKET FORECAST

- The market forecast presented below for industry-specific financial informa-tion services expenditures for the 1985-1990 forecast period was initially developed in a recent INPUT report updating INPUT's forecast for banking and finance information services (see Appendix C, Related INPUT Reports).

- The industry-specific forecast was updated based on INPUT's most recent forecast of the Computer Services Industry (see Appendix C, Related INPUT Reports).

1. BANKING AND FINANCE INDUSTRY, 1985-1990

   a.   Industry-Specific Forecast

● Commercial banks represent—and will continue to represent—more than 60% of information systems expenditures in the banking and finance industry, as shown in Exhibit III-28.

● Commercial bank information services market opportunities include:

   - Wholesale, retail, and trust transaction processing, facility management, software products, professional services, and, increasingly, turnkey systems.

   - Micro software products, turnkey systems, and network services for personal investment and self-managed IRAs and Keoghs.

   - Real estatement management, loan appraisal, origination in tracking.

   - On-line data base services for S&L and independent bank acquisition and mergers.

   - Insurance, consumer cash management accounts (CMA), and equity home lending.

   - Credit analysis services, turnkey systems, and software products.

   - Fee and profitability analysis software and turnkey systems.

● Commercial banks are not the only market opportunity.

   - Acquisition of S&L processing accounts and processing service companies is active.

INPUT

EXHIBIT III-28

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL INFORMATION SERVICES
EXPENDITURES FOR THE BANKING AND FINANCE INDUSTRY
BY MARKET SUBSECTOR, 1985-1990

MARKET SUBSECTOR	USER EXPENDITURES ($ Millions)			AAGR (Percent) 1985-1990
	1985	1986	1990	
Commercial Banks	$3,914	$4,798	$10,432	22%
Savings and Loans	767	916	1,902	20
Security and Commodity Firms	768	934	1,971	21
Other Financial Institutions	687	822	1,617	18
Total	$3,136	$7,470	$15,922	21%

INP
WBAN

- On-line data base services to and data use from security and commodity firms is a very lucrative market opportunity.

- With definitions blurring, many products and services are applicable across banking and finance industry subsectors.

- With industry growth exceeding 21% annually over the forecast period, the banking and finance industry market sector represents a $16 billion market opportunity for offering industry-specific products and services.

  - The services are increasingly being delivered on-line.

  - Services will be increasingly targeted to the top 300 banks and perhaps 1,000 regional and local holding companies.

- Sizable industry-specific information service opportunities exist, as shown in Exhibit III-29, for virtually all modes of delivery.

- As financial and electronic networks spread over the consumer marketplace, on-line interactive products and services will become even more important.

  - Interactive DBMS-oriented processing will be used for all mainline applications in wholesale, retail, trust, and financial information services.

  - Processing services is and will remain the largest information services delivery mode but will fall below half of total expenditures by 1990.

- Applications software products driven by the microprocessor market (PCs and intelligent work stations) will become a $3.5 billion market by 1990.

INPUT

EXHIBIT III-29

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES
FOR THE BANKING AND FINANCE INDUSTRY BY DELIVERY MODE, 1985-1990

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)			AAGR (Percent) 1985-1990
	1985	1986	1990	
PROCESSING SERVICES				
Remote Computing/Batch	$2,411	$2,865	$5,583	18%
Facilities Management	898	1,056	1,900	16
Total Processing Services	$3,309	$3,921	$7,483	18%
APPLICATIONS SOFTWARE				
Mainframe/Mini	845	1,140	2,989	29
Micro	94	128	477	38
Total Applications Software	$ 939	$1,268	$3,466	30%
PROFESSIONAL SERVICES	1,254	1,529	3,500	23
TURNKEY SYSTEMS	644	753	1,473	18
Total	$6,146	$7,471	$15,922	21%

INI
WBA

- Professional services, particularly the implementation services in relation to establishing consumer and corporate DBMS, offer many opportunities for strategic partnering.

    b.   Value-Added Network (VAN) Services Forecast

- As financial electronic networks spread into the consumer marketplace, on-line and interactive products and services will, as shown in Exhibit III-30, create a VAN delivery market approaching half a billion dollars by 1990.

    - Shared ATM/POS network services are where the action is at.

    - Electronic interchange (protocol and data) through microprocessor-driven switches is a necessary step as a prelude to network integration and consolidation.

    - Data and transmission security will become a major problem and hence a major opportunity during the latter part of the forecast period.

    - VAN networks will be used to implement an ever-widening array of applications including securities trading, mortgage markets, and corporate relationship banking.

2.   COMMERCIAL BANKS, 1985-1990

- Information services to the commercial banking industry in 1985 represents, as shown in Exhibit III-31, a nearly $4 billion marketplace.

    - Although the top 300 banks represent less than 3% of the total number, they represent well over 50% of the total market for computer services vendors' industry-specific products and services.

- 93 -

INPUT

EXHIBIT III-30

- 94 -

FORECAST OF USER EXPENDITURES FOR VALUE-ADDED NETWORK
SERVICES FOR THE BANKING AND FINANCE INDUSTRY, 1985-1990

MARKET SECTOR	USER EXPENDITURES ($ Millions)			AAGR 1985-1990 (Percent)
	1985	1986	1990	
Commercial Banks	$30	$100	$300	30%
Other Financial Institututions	50	55	150	25
Total	$80	$155	$450	28%

EXHIBIT III-31

USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES FOR
COMMERCIAL BANKS BY INSTITUTION SIZE IN 1985

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)				
	INSTITUTION SIZE (Deposits)				1985 TOTAL
	Small < $100	Medium $100-500	Large $500-1,000	Very Large >$1,000	
PROCESSING SERVICES					
Remote Computing/Batch	$382	$304	$135	$601	$1,422
Facilities Management	63	136	155	275	629
Total Processing Services	$445	$440	$290	$876	$2,051
APPLICATIONS SOFTWARE					
Mainframe/Mini	90	160	70	280	600
Micro	6	7	12	25	50
Total Applications Software	$ 96	$167	$ 82	$305	$650
PROFESSIONAL SERVICES	189	196	119	349	853
TURNKEY SYSTEMS	135	71	55	100	361
Total	$865	$874	$546	$1,630	$3,915

INPUT
WBAN

- Facility management arrangements are particularly attractive for medium to large commercial banks. Medium to very large multi-bank holding companies are also excellent FM targets.

- Applications software products sell best to very large banks, which represent nearly half of the total applications software market.

- Just over one-quarter of the total 1985 expenditures are for small institutions. Remote and batch processing are heavily used for retail applications and for customer services on a private-label basis.

- Lacking expertise, small banks are particularly attracted to total solutions offered by turnkey systems.

- Information services expenditures will, as shown in Exhibit III-32, grow nearly threefold by 1990 as commercial banks, already a mature industry in terms of automation, continue becoming increasingly electronic.

    - Above-industry-average growth (22% annually over five years) is seen to be concentrated in the areas of applications software and professional services, which as a group will increase from just under 40% to nearly half of total industry-specific expenditures by 1990.

    - Rapid market growth is fostered by strategic partnering between hardware and software vendors and between software and professional services vendors.

3. AGGREGATE ECONOMIC FORECAST—COMMERCIAL BANKS, 1990-1995

- Exhibit III-33 shows that commercial banks are expected to spend in the aggregate between $28-$38 billion annually by 1995 for industry-specific financial information services.

INP

EXHIBIT III-32

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES
FOR COMMERCIAL BANKS BY DELIVERY MODE

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)			AAGR (Percent) 1985-1990
	1985	1986	1990	
PROCESSING SERVICES				
Remote Computing/Batch	$1,422	$1,622	$3,126	17%
Facilities Management	629	746	1,309	17
Total Processing Services	$2,051	$2,368	$4,435	17%
APPLICATIONS SOFTWARE				
Mainframe/Mini	600	823	2,230	30
Micro	50	70	281	41
Total Applications Software	$650	$893	$2,51.1	31%
PROFESSIONAL SERVICES	853	1,052	2,454	24
TURNKEY SYSTEMS	361	446	966	22
Total	$3,915	$4,759	$10,366	22%

INPUT
WBAN

EXHIBIT III-33

AGGREGATE ECONOMIC FORECAST OF FINANCIAL INFORMATION SERVICES
FOR THE COMMERCIAL BANKING SECTOR, 1986-1991
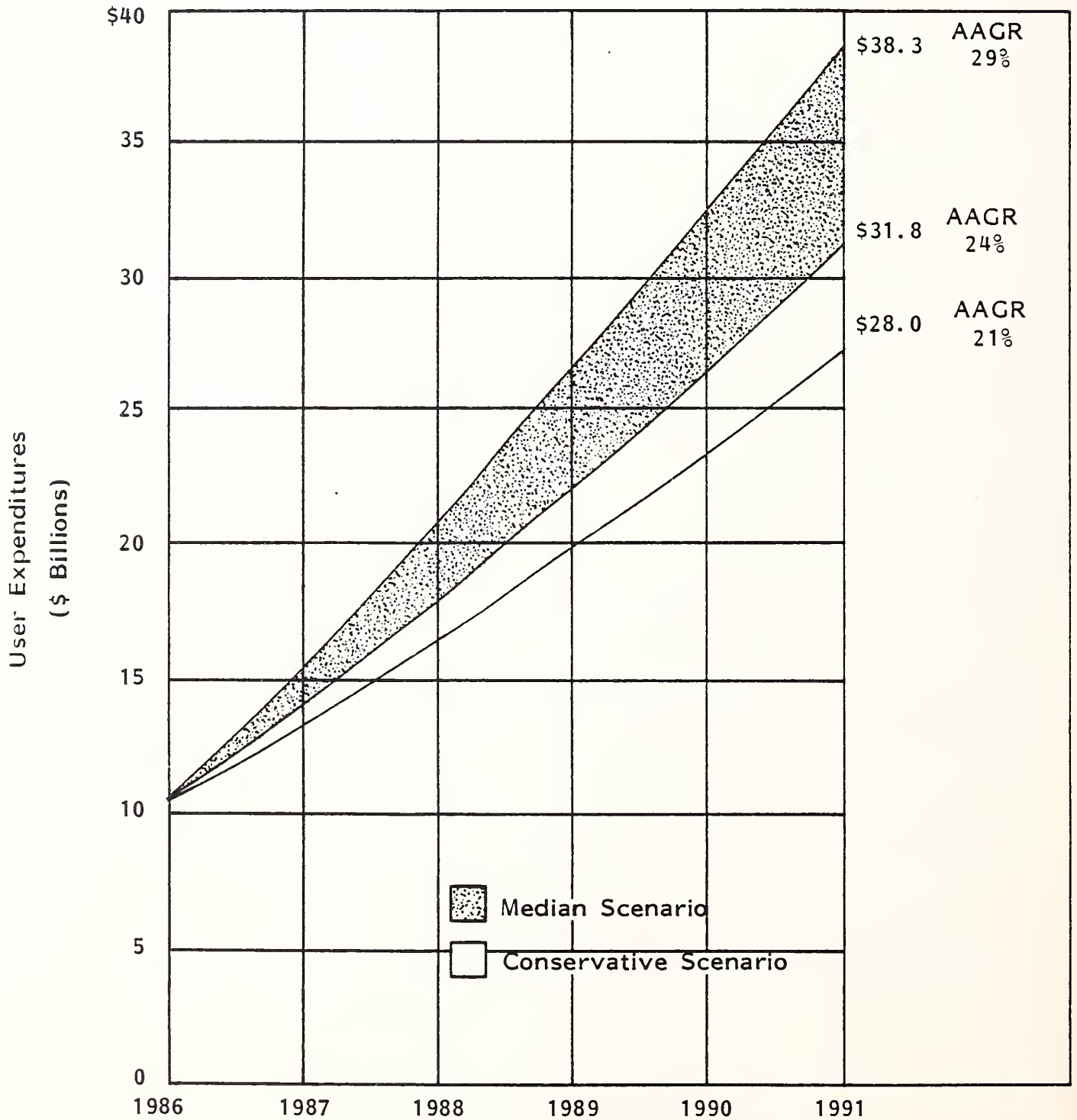
- This represents an aggregate annual growth rate between 20% (recession) and 30% (economic expansion) during the five-year forecast period.

- Services are increasingly targeted toward larger institutions and multi-bank holding companies.

- Product and services offerings are increasingly national in nature.

- Total solutions are seen to be the order of the day, while networks play an increasingly important role.

- Computer services industry consolidation/partnering will occur to provide total solutions in targeted market niches.

- The role of the system integrator will become increasingly important as the distinction between information processing and telecommunications technology becomes blurred.

D.   INFORMATION SERVICES PROVIDERS

I.   COMMERCIAL BANKS

- Commercial banks have traditionally been providers of information services to their correspondents, to their corporate clients, and on an increasing basis through their correspondents to the correspondents' corporate clients.

- In a recent study on correspondent bank processing (see Appendix C, Related INPUT Reports), INPUT determined that commercial banks provided well over one-third of the computer services to predominantly smaller banks:

INPUT

- Services include demand deposit accounting, check clearance, check processing, savings, loans, administration/CIS, and electronic transactions including ACH and ATM/POS bank card services.

- The bank information services market segment is seen to be in the process of consolidation. Many banks are involved in selling data processing services to other financial institutions and computer services vendors. However, a number of regional banks, as shown in Exhibit III-34, have elected to expand their positions in the financial information services marketplace.

- MCorp, a Texas multi-bank holding company, is converting MTech into the largest data processor for financial institutions in the U.S. It currently is providing information services to 825 financial institutions and is operating in 11 states outside of Texas. 1985 revenues are projected at $150 million.

- First Interstate Bank Corporation is standardizing the delivery of its technology-based retail banking products throughout its 13-state bank holding company banks and affiliates. First Interstate was a leader and founding partner of the Cirrus network. Its Teller Item Processing System (TIPS) allows customers to have account access in its 13-state network. Its Administrative Branch Communications System (ABCS) is used to market a wide variety of product services in the retail marketplace. NOVA, Interstate's POS system, provides credit card and check authorization services to well over 5,000 terminals in 13 states. First Interstate is marketing its electronic services on a franchised basis to banks as far away as Minnesota, Hawaii, and Florida.

- Security Pacific Corporation has formed an automation company as a subsidiary to offer total electronic banking to its 400 correspondents and affiliates. Services that the automation company offers are:

  - Interactive computing.

  - Capital market services.

IN

EXHIBIT III-34

LEADING COMMERCIAL BANK VENDORS OF ELECTRONIC INFORMATION SERVICES

	Melton National	Bank of Boston Corp.	Mercantile Texas	Irving Bank Corp.	Wachovia Corp.	First Interstate	Banc One	NBD Bancorp
Percentage of Local ACH Processed	90%	15%	—	—	41% credits 62% debits	28%	42%	60% orig traffic 15% rec'd traffic
Data Processing for Correspondent Banks (Number of Institutions)	250	460	480	500	—	65	200	10
Provides Switching Facilities	/	/	/	—	—	/	/	/
Central Information File by Name or Number	/	/	x	/	/	/	/	/
Automated Back Office for Telecommunication Messages and Wire Transfers	x	/	—	/	—	/	—	/
On-Line Cash Management Systems	/	/	/	/	/	/	/	/
Real Time/Microprocessor Cash Management System	x	x	x	x	x	x	x	/
ATM Networks								
● Regional	CASHSTREAM	MONEC	MPACT	—	RELAY	—	/	Network One
● National	CIRRUS	PLUS	CIRRUS	—	CIRRUS	CIRRUS	/	CIRRUS
Average Number of Transactions Per Machine, Per Month, and Number of Card Holders	7,000/ 950,000	8,000/ 400,000	7,000/ 1,500,000	7,000/ 1,500,000	8,000/ 450,000	7,500/ 4,700,000		7,400/ 26,000
Experimental Services	Home Banking, Pilot ATMs in Giant Eagle Supermarkets	ATMs in Supermarkets	ATMs in Supermarkets	—	Video-financial Services	Home Banking, NOVA	Video-financial Services; ATMS in POS Program	Proprietary Home Banking Pilot and POS Large Retailers

/ Service provided   x Service not provided   Source: Salomon Brothers Inc.

INPUT
WBAN

- Electronic banking.

- Funds transfer, clearance, and back office notification services.

• The establishment of data processing as one of its four main lines of business, which include wholesale banking, retail banking, and other financial services, is seen as giving recognition to the strategy of controlling Security Pacific's destiny by being a major player like Citicorp in the delivery of national and eventually international financial information services through electronic networks.

• National Bank of Detroit (NBD) Corporation is both consolidating the back room activities of its 18 affiliates and becoming one of the largest ATM/POS bank card transaction processors in the Midwest.

- NBD processes more than 1.5 million bank card transactions monthly, interconnecting 600 ATMs at over 100 regional financial institutions.

- NBD also serves as the electronic switch that connects its Network One with the Cirrus national ATM network.

- NBD recently purchased Computer Communications of America, a credit card authorization and processing association which operates one of the largest point-of-sale networks in the Midwest.

• Citicorp is seen as the leading high technology financial intermediary in the commercial banking sector.

- Citibank's customers have access to 11,000 automated terminals in 45 states and internationally in Hong Kong and Europe.

- Transaction Technology, Inc. (TTI), a subsidiary charged with developing electronic consumer banking, is due to release its Consumer

- 102 -

Banking System (CBS). CBS is customer rather than account based. It will fully automate back office processing through on-line applications to a common data base. CBS will interconnect to Citibank's completely automated branch facilities.

- Citicorp's investment in communications technology on a global basis has been over $3 billion over the last five years, an amount exceeding the equity capital of virtually all of the nation's largest banks.

- Citicorp, under its new chairman John Reed, has reorganized its corporate structure to be better positioned in capital markets. Its global wholesale communications network, which has direct telecommunications ability for 24 hours a day, 7 days a week in 140 cities spanning 85 countries, operates five major nodes under the standard X.25 linkage.

- The Global Communication Network enables Citicorp to become a low-cost provider of international as well as national wholesale financial services.

- Citibank's electronic banking network serves nearly 12,000 U.S. clients with more than 100 corporate financial information service products.

- Citicorp now operates consumer banking facilities in 41 states and has banking relationships with nearly 12 million consumers nationwide.

- Active in S&L acquisitions, Citicorp obtained a 60-branch S&L network in Illinois and 34-branch S&L institution in Florida to add to its 92-branch Citicorp Savings of California.

- Citicorp is decentralizing its processing operations, having moved check processing to its Delaware-based operation facility and its credit card servicing activities to South Dakota, and is building a Nevada-based processing center for handling its mortgage operations.

INPUT

- Citicorp's latest entry into home banking is its full feature FOCUS system, a PC-based money management account which combines checking, overdraft lines, automatic daily sweep into mutual funds, VISA debit, installment loans, and discount brokerage.

2. STRATEGIC PARTNERING

- In a recent INPUT report on professional services opportunities (see Appendix C, Related INPUT Reports) INPUT emphasized the importance of strategic partnering in providing system integration and software implementation services and of participating in the evolution of new distribution channels for the delivery of hardware, software, and information systems services through the corporate information centers and information systems departments of corporate end users.

  - The trend is toward providing total solutions to end users.

  - The proliferation in personal computers and intelligent terminals is resulting in end users with a greater understanding of computer-based solution possibilities, a primary marketing focus.

  - The competitive edge has shifted from hardware power and product functionality to expertise in vertical markets and marketing and distribution.

  - Hardware vendors—even IBM—are moving out into the marketplace to seek needed market resources to deliver their products and services.

- Automatic Data Processing (ADP) has acquired the brokerage quotation businesses of both GTE and Bunker Ramo which ADP will integrate into its well established brokerage back office operations in order to provide total solutions to the securities industry.

INP

- Convergent Technologies Corporation and 3 Com Corporation are in the process of merging to offer complete solutions including intelligent work-stations, networking software, and telecommunications (LAN) to end users.

- Systematics, Inc., long a facility manager and processor for medium-sized banks, is in the process of integrating and upgrading its "Family Financial Systems Software" to provide on-line—near real time—operation for large and very large retail banking operations. The integrated software appears likely to offer a total retail solution to all but perhaps the very largest money center banks.

- Strategic partnering with fail-safe IBM plug-compatible hardware vendors could easily result in a "turnkey solution" to what would otherwise become a nightmare situation with the rising tide of the electronic transactions initiated through bank debit cards.

INPUT

IV TECHNOLOGY ASSESSMENT

IV   TECHNOLOGY ASSESSMENT

A.   THE FUNDAMENTAL ISSUE

- The fundamental technical issue is that computer/communications technology
  (with the help of vendors) is driving our entire society toward the "information
  age" before there is any clear understanding of the following:

  - What distinguishes data from information from knowledge?

  - What is the value of data, information, and information from
    knowledge?

  - Can computer/communications systems to support the information age
    be built?

  - If such systems are built, what will their impact be on the economy and
    the general commonweal?

- Over 20 years ago, at the first IBM Programming Symposium, Jerome Wiesner,
  President of MIT, cautioned the attendees about the unknown social impacts
  of computer technology. However, at the end of his speech, he stated that it
  was impossible to slow the advance of the new technology. He used the
  analogy of a jet plane rushing down the runway and, having reached the point
  of no return, could either accelerate and take off, or slow down and crash.

- 107 -

INPUT

- Wiesner's jet plane is now airborne toward a largely unknown destination which may or may not have landing facilities, and Wiesner's car is careening along without knowing what lies in front of it. The fundamental fact and issue is that we don't know what the impact of computer/communications technology is going to be. The issue requires serious thought and consideration.

B. THE MAJOR TECHNICAL ISSUES AND CHALLENGES DEFINED

- While it appears necessary to give careful thought to the fundamental issue described above, technology continues to advance and be applied as rapidly as systems can be implemented. A primary issue concerning the implementation of advanced computer/communications networks is how processing and data/information/knowledge will be distributed over such networks.

- Another key technological issue is productivity in the systems development process and the current emphasis upon immediate "results" at the expense of quality. INPUT has referred to the current environment as being one of distributed systems development (DSD). There is considerable evidence that by applying increasing amounts of technology the quality of data/information/knowledge is degenerating.

- Associated with the above issues is the increasingly dominant role of IBM in leading and/or controlling the advance of computer/communications technology and the increasing acceptance on the part of both users and vendors of IBM's role. Since computer/communications technology will determine the course, and even success, of future banking and financial services, the degree of reliance (and even dependence) upon IBM for leadership in technical matters cannot be ignored.

INF

- All of these issues—the uncertainty associated with data/information/knowledge based systems and the major technical issues concerning the networking of such systems, the potential quality problems which are anticipated, and the dominance of IBM—are exceptionally complex and have been analyzed by INPUT in some detail in other reports (see Appendix C, Related INPUT Reports).

C. DATA/INFORMATION/KNOWLEDGE

- While information processing terminology has progressed from data processing systems to management information systems to decision support systems to knowledge-based systems and now to expert systems, there is currently very little information content in the terminology or even knowledge of what the terminology succinctly means. Since we have passed the point of no return on the computer/communications propelled journey into the "information age," it is helpful to have some understanding of the general characteristics of data, information, and knowledge (see Exhibit IV-1).

- The distinctions between (and among) data, information, and knowledge are still the subject of academic study, but the following simple definitions should suffice from a systems point of view:

  - Data are facts (or presumed facts), and considerable progress has been made in encoding and storing data on electronic media for processing and access by computers.

  - Information is the result of analysis (by either humans or analytical tools) and may be based on facts and/or opinions. Information may be presented in many formats to facilitate understanding, but it is normally stored on paper—in file cabinets or libraries.

INPUT

EXHIBIT IV-1

GENERAL CHARACTERISTICS OF DATA/INFORMATION/KNOWLEDGE

	DATA	INFORMATION	KNOWLEDGE
Systems Types	Computing, Data Processing	Management, Information, Decision Support	Knowledge Based, Expert
Current Media	Electronics	Paper	Human
Process Supported	Arithmetics Logical	Communications	Principal Decision Making
Network Level	I	II, III	IV, V

- 110 -

IN
WB

- Knowledge is the result of human analysis of both data and information. The process of human knowledge acquisition (learning) and storage (memory) are not very well understood despite cross disciplinary research under the general label of "artificial intelligence." Confronted with a vast array of data, information, and uncertainty, humans have the ability to solve problems (make decisions) with varying degrees of success. When the problem solving process can be described it is called knowledge, when it can't be described it is labeled intuitive. Most knowledge is stored in the human brain, and most discoveries and decisions of significance have a substantial intuitive component.

- In order to improve productivity (lower costs), computer/communications must replace paper-based storage and conventional communications systems and assist human beings in performing arithmetic and logical operations on data, communicating information, and applying knowledge in problem solving and decision making. To the degree that conversion to electronic media and lower personnel costs can be used as a measure of productivity improvement, the following conclusions can be reached:

  - Computer systems, and our best efforts at office automation, have succeeded only in producing ever-increasing amounts of paper. In fact, the primary measure of productivity improvement in the office is the quantity of paper documents (reports, correspondence, and spreadsheets) that can be produced in a given period of time.

  - While each human being is currently capable of performing arithmetic and logical operations on personal computers at a rate greater than the entire accounting departments of yesteryear, the number of white collar workers continues to increase as more technology is applied.

  - The volume of paper documents being circulated has grown exponentially during the last 20 years, but communications volume should not be

INPUT

mistaken for information. Information content is related to what is new and not to what is redundant. The second copy of the same document not only contains no information, it lowers the relative information content of both documents.

- There is little indication that the increased volume of data and information have improved the quality of decision making (especially in planning as opposed to operations). In fact, since it seems possible to generate "information" supporting practically any decision, one of the primary uses of computer/communications technology has been to provide a convenient excuse for avoiding responsibility in decision making.

- As crude knowledge-based systems begin to emerge in the form of expert systems, there is little hope that past problems of systems development can be avoided. The story is all too familiar. A highly skilled "knowledge engineer" sits down with the expert and attempts to determine how he does what he does and the data and information he needs to do what he does. It is the same laborious process which has plagued "data base systems" and "management information systems" since they were first conceived, and there is little indication that there will ever be any substitute for thorough systems analysis and sound systems architecture in the development of high-quality systems.

- In addition, the mathematics to support forecasting and decision making has not progressed a great deal since John von Neumann predicted that a breakthrough comparable to the development of the calculus would be required to make a significant progress in the social sciences. The progress which is being made (for example, in fuzzy arithmetic and catastrophe theory) has yet to be proven in practical applications such as simple supply and demand curves, much less in the general economy.

INF

D. DATA/INFORMATION/KNOWLEDGE DISTRIBUTION

- Over ten years ago, INPUT defined a "proper" hierarchical network consisting of large mainframes, minicomputers, intelligent terminals, and dumb terminals according to their price and functions (see Exhibit IV-2). The primary distribution of data/information/knowledge over this network falls quite conveniently into the proper hierarchy.

- Most data reside and are processed on mainframes.

    - Minicomputers (departmental processors) are the engines of office automation where most information is generated, stored, and handled.

    - The intelligent workstation (personal computer) is where data and information interface with knowledge (the human user).

    - Dumb terminals remain dumb in the sense that they perform specific functions (as opposed to being user-programmable), but may be more expensive than their intelligent relatives at Level III. (An ATM is a good example.)

    - Mobile terminals (Level V, not shown) are becoming increasingly practical because of rapid microprocessor and storage developments combined with improved communications networks such as cellular radio.

- Communications alternatives, both technical and in services, have proliferated more rapidly than has technology on the computer side.

    - Competition between carriers of all kinds may be confusing, but it is certainly providing alternatives. Bypass microwave networks and satellite "teleports" are coming into being with the result that cost-

INPUT

EXHIBIT IV-2

HIERARCHICAL NETWORK

Primary
Functions

Level I
Purchase Price $4,000,000

Large-Scale
System(s)

1. Heavy Computation
2. Transaction Processing against Large Data Bases
3. RJE Replacement of Standalone Batch Systems

Level II
Purchase Price
<$200,000

Minicomputers

1. Network Control
2. Scientific Timesharing
3. Program Development and Maintenance
4. Simple Transaction Processing

Level III
Purchase Price
<$20,000

Intelligent
Terminals

1. Collection, Editing and Display of Data
2. Control of Level IV Terminals

Level IV
Price Varies
Significantly

Terminals

1. Data Entry and Display
2. Sensing and Control Devices

INP
WBA

effective alternatives for both international and local distribution are becoming available.

- Integrated digital systems networks (ISDNs) are being planned for the immediate future, antennas are becoming cheap enough for even the smallest company to afford, and technology is now being developed which will turn a conventional TV antenna into a two way station for interactive access to the spectrum between over-the-air TV channels.

- Geography is becoming less important in terms of space, time, and cost. The major issue involved for computer/communications networks is how the two technologies will merge. Standards are key to this determination. Traditionally, computer systems and communications personnel do not communicate very well—each considers the other to be an extension of itself.

- At the time the distributed network was first described by INPUT, it was also recommended that all processing (data) first be centralized and then distributed in an "orderly" basis. (That is why replacement of standalone systems was and remains an important function of large mainframes.) Unfortunately, productivity problems associated with the systems development process combined with the rapid development of microprocessor technology in the form of personal computers has resulted in the distribution of computer power to the users being far from orderly.

- In fact, the distribution of data, information, and knowledge over the computer/communications network has been chaotic and the result has been the potential for every employee to have a standalone system waiting to be tied into the network. Data/information/knowledge have been, and continue to be, distributed with little regard for how control can be exercised. It is difficult to exaggerate the potential danger of this situation to the general corporate well being.

- 115 -

INPUT

- Concurrent with this dangerous situation, all computer/communications technology continues to advance more rapidly than it can be comprehended, much less be put to intelligent use. When the original network was described by INPUT, it was stated that emphasis on processors was misplaced since it would soon be possible for every employee to have more than enough processing power at the desk top. Not only has this occurred, but it is now safe to say that with the development of optical memories it will soon be possible for each employee to have a significant portion of the entire corporate data/information base not only at the desk top but in the briefcase. And, when knowledge-based systems are developed they can also be easily distributed and transported.

- INPUT believes that there has been entirely too much attention given to new hardware technology (combined with a pathological compulsion to apply it) and entirely too little attention given to the intelligent application of this technology.

E.   DISTRIBUTED SYSTEMS DEVELOPMENT

- Distributed systems development (DSD) is manifested in the following current trends:

    - The use of personal computers to compliment and/or supplement services (or lack thereof) from the Information Services (IS) department.

    - The strong and natural desire to connect these personal computers to mainframe data bases so that end users can have access to corporate data.

- 116 -

INP

- The promotion of information centers to improve the responsiveness of the IS department in developing new systems or modifying old ones.

- The use of productivity tools, such as fourth generation languages, to prototype applications and show immediate results.

- While recognizing that the intelligent application of any of these approaches may achieve significant improvements in productivity, it is necessary to recognize that there are inevitable conflicts in the DSD environment. To mention a few:

  - Top-down systems design does not necessarily interface smoothly with bottom-up applications development. In fact, prototyping is being referred to as "premature and external systems development" by some IS department executives.

  - Access to corporate data creates security problems, and security requirements can restrict access—this is a problem both ways.

  - As systems development tools become more integrated from micro-to-mainframe, there is increased functional capability (and complexity). This is not necessarily compatible with the very user friendliness which encouraged the use of personal computers to begin with—quite the contrary.

  - The problems of data base integrity and synchronization increase exponentially as data bases are distributed to information centers and intelligent workstations. These problems do not have a ready solution.

  - While the purchase of personal computers (and the implementation of distributed processing) has frequently been justified on the basis of offloading mainframes and providing a more cost-effective information systems solution, there is no indication of the predicted decrease in

INPUT

demand for mainframe processing power. In fact, micros linked to mainframes seem to create processing demands which are overburdening host mainframes.

- Add to all of this the problem of conflicting reports generated from competing systems (or those in different stages of evolution) and it becomes apparent that volume of information does not correlate very well with quality (true information content), driving both internal and external auditors crazy.

- It becomes apparent that the very productivity tools which drive the distributed systems development (DSD) environment may be counterproductive when they are evaluated against anything other than the ability to "get results." The recent, highly-publicized case of using a fourth generation language to develop an unworkable system for motor vehicle registration in New Jersey is a good example. It isn't productive to get a system "up and running" if it is of such poor quality that it must be done over.

- In the current DSD environment, it is especially important to measure productivity improvement based on performance at the following levels:

  - Hardware/software performance has been deemed as being relatively unimportant because hardware costs are coming down and people costs are going up. While this is an understandable argument from both hardware vendors and users justifying the latest technology, it is also true that substantial investments have been made in new technology which has not provided promised benefits in terms of either decreased costs or improved business planning. The number of applications systems which require additional, unanticipated hardware to achieve minimally acceptable performance is legend but seldom measured.

  - Human/computer dyad performance refers to the relative effectiveness of an individual using computer/communications technology, and while

INP

such performance is relatively easy to measure, the validity of many measurements is highly questionable. For example, getting out bigger documents faster does not address the value of the information being generated, and the measurements are frequently flawed in terms of ignoring hidden costs such as professionals' time spent performing clerical functions at the expense of their professional duties.

- Work unit networks represent various organizational entities such as departments or project teams and their relative effectiveness before and after automation. Work unit networks are characterized by being communications oriented, and the measurement problems associated with paper volume versus information content become even more complicated. Unnecessary communications between, or among, network nodes can adversely impact work unit performance while appearing to enhance the performance of all human/computer dyads. There is a significant difference between being busy and being productive in the office. Little attention has been given to anything other than word processing and routine calculations (such as spreadsheets) in measuring white collar productivity.

- Institutional performance is by far the most important and the most difficult to analyze in terms of the contribution of computer/communications systems. Despite all of the talk about decision support, it is doubtful that anything other than routine accounting reports contributes very much to the decision making process. Then the correlation between decision making and institutional performance must be established, and this is seldom done objectively. Management is all too ready to accept credit for outstanding institutional performance and blame "bad" data and information for the failures. This often turns out to be the case. Given the same data/information, some executives will succeed and others will fail. Executives have some right to take credit for success. However, even the best executive can be misled by faulty or conflicting information.

INPUT

- The DSD environment can best be summarized by reverting to Wiesner's jet plane analogy—the IS department with some help from the manufacturer got the plane off the runway and it is heading off to parts unknown. The passengers all have different desired destinations and would like a turn at the controls, but no one has had any experience taking off, landing, or navigating a jet plane much less handling the anticipated turbulence ahead. The automatic pilot installed by the manufacturer is pretty good at executing lazy eights in a holding pattern, but the destination doesn't get much closer that way and everybody is getting restless as the travel agent's promise of a wonderful flight for everyone seems to be going largely unfulfilled.

F.   THE ROLE OF IBM

- While the advance of computer/communications technology cannot be stopped, IBM has established a position of dominance which does permit it to control the release and/or acceptance of new technology. To the degree that it dominates and exercizes this control, IBM lends an element of stability to the advance of technology which is not recognized in the marketplace or by its competitors because of the constant state of confusion surrounding specific product announcments. To illustrate the point, take the case of IBM's bread and butter—large mainframes and magnetic disk storage.

  - In 1976, INPUT published a 1983 forecast of magnetic disk costs (see Exhibit IV-3). While IBM announced certain products a little early due to competitive pressure from plug-compatible vendors, the 1985 announcement of the 3380 extended capability disk drives finds all models falling within the range projected 11 years earlier.

  - In the same 1976 report, INPUT projected that within ten years, large-scale mainframes would have ten times the price-performance of the

- 120 -

INI

EXHIBIT IV-3

MAGNETIC DISK COST FORECAST CONFIRMED

* 1973 Forecast

INPUT
UCR1WBAN
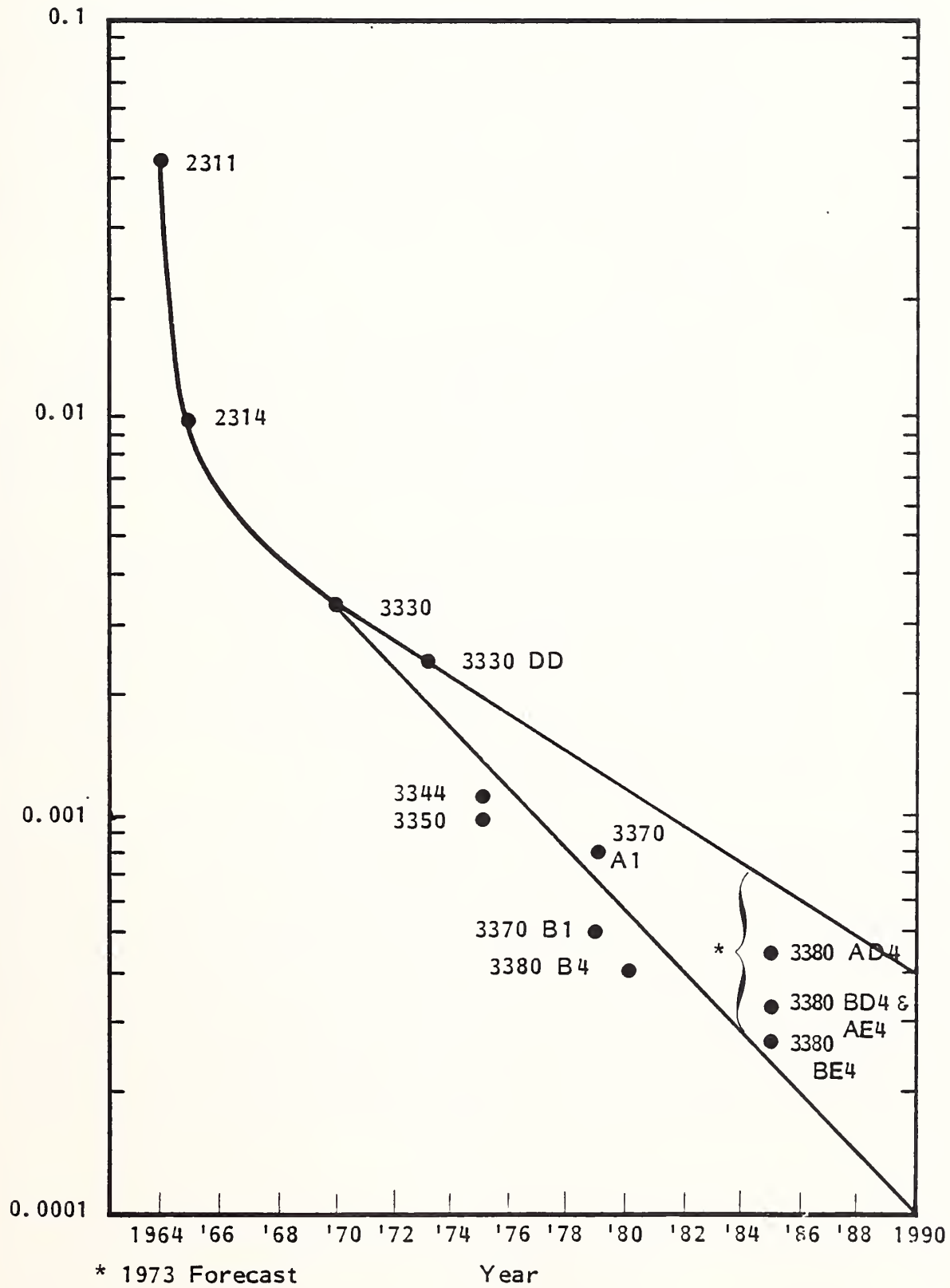
IBM 370/168 (while another respected industry analyst was projecting 100 times). Exhibit IV-4 plots processing power per dollar for IBM mainframes from 1954 through the 1985 announcement of the IBM 3090.

- The progress is remarkably smooth, and most deviations on the high side can be related to specific competitive events which were considered a threat to IBM's dominance. (The IBM 7074 was in specific response to the RCA 601, and the IBM 3033 was in response to the Amdahl software-compatible mainframe threat.)

- The 1976 INPUT forecast was pretty much on track--the IBM 3090 has up to 9.7 times the 370/168 (for scientific work), and the National Advanced Systems response to IBM was a system with 9.5 times the overall price-performance of the 370/168.

  - The point is that IBM will be quite orderly and predictable in its release of technology as long as it can meet its business objectives which are also orderly and predictable. However, IBM has demonstrated a remarkable ability to respond to perceived competitive threats, especially since it was forced to shorten product cycles in response to rapidly changing microprocessor technology.

- The instrument of IBM control is systems software and its Systems Network Architecture (SNA). Regardless of how much they have been maligned, IBM operating systems (from OS to VS to MVS to MVS/XA and now to VM) have sold more iron (directly and indirectly) than any other technological development. Over the last ten years, the primary purpose of this awesome systems software strategy has been to keep minicomputers from assuming their proper place in the hierarchical network shown earlier by INPUT in Exhibit IV-2.

- 122 -

INI

EXHIBIT IV-4

PROCESSING POWER PER DOLLAR, 1954-1985
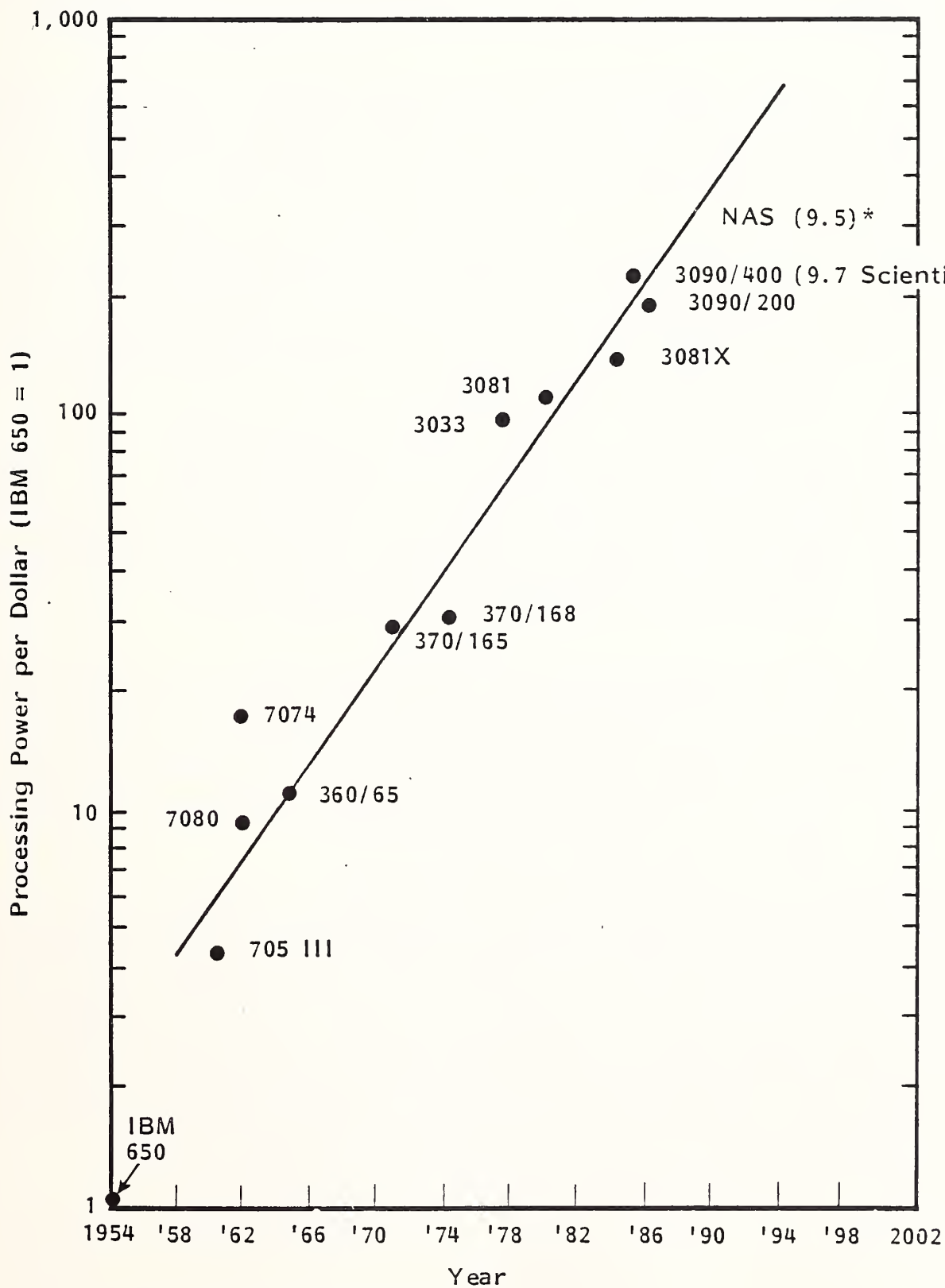
* Price-Performance 370/168 = 1

INPUT
UCR1WBAN

- Since IBM's software strategy is so pivotal to its business strategy, it is key not only to issues and challenges, but to opportunities as well. INPUT examined IBM's systems software strategy (see Appendix C, Related INPUT Reports). The study broke IBM's software strategy down into four strategic periods.

    - The SNA/DDP strategic period (1985-1990) during which time IBM will continue to pursue a highly centralized strategy with emphasis on large host mainframes.

    - The electronic office strategic period (1990 to 1995) during which IBM will integrate data processing systems with office systems (including paper based systems) and effectively render obsolete and replace most current office automation products.

    - The expert systems strategic period (1995 to 2000) which will be characterized by differentiation into specialized systems emphasizing common data/information/knowledge services to various segments (industries and professions) and to individuals.

    - The custom products strategic period (beyond the year 2000) which will see the mechanization (automation) of information services down to the individual. (In other words, by providing individualized services at the end user level, IBM will effectively shift account control to that level.)

- It is obvious that IBM is already somewhat involved in all of the above areas. For example, SCANMASTER facilitates electronic handling of documents and Prolog has been announced along with an "Expert System Environment" under VM. However, the strategic periods isolate the systems developments most important to IBM in achieving its revenue objectives during the specified timeframe.

INI

- Assuming INPUT's analysis of IBM's long-range strategy is reasonably accurate, it is possible to draw certain conclusions about IBM's endorsement (by rejection) of certain technologies. The most convenient way to comment on IBM's position is to proceed down the hierarchical network shown earlier in Exhibit IV-2.

- There is no question that IBM will continue to depend upon mainframes and magnetic disk storage for the bulk of its revenue and growth during the late 1980s. This continued emphasis on Level I of the processing hierarchy represents a continuing battle against the proper role of minicomputers which extends back to the time when SNA was announced. Some of the confirmations and conclusions which can be reached about the SNA/DDP strategic period are:

    - It has been obvious for sometime that IBM has opted for a multi-operating system (VM and MVS/XA) and data base system (IMS and DB2) environment at Level I. This all adds up to continued centralization of data base control on large host processors with enormous storage capacity.

    - The entire Sierra announcement with its emphasis upon scientific processing and the announcement of UNIX (under VM) running on mainframes were designed to absorb interactive timesharing which has been so successfully implemented on minicomputers.

    - Essentially, IBM's preferred processing hierarchy excludes minicomputers from performing any significant amount of processing (see Exhibit IV-5).

    - IBM series are used as terminal controllers under IBM's version of UNIX. For those who like to regard the System 36 as a minicomputer (it would be more properly described as a small business system with terminals), it is not designed or supported to perform the functions assigned at Level II.

INPUT

EXHIBIT IV-5

IBM'S PROCESSING HIERARCHY

Primary
Functions

Level I
Large Mainframes   308X

1. Heavy Computation
2. Transaction Processing against Large Data Bases
3. Data Base Management for Network

Level II
Mid-range
Mainframes

43XX

1. Local Data Base Management (for LAN)
2. Growth Path to Level I (4381 MUS/XA)
3. Direct Replacement of Minicomputers —
   Including Scientific and Engineering Processing
   (4361)

Level III
Intelligent Workstations
(Connected to Either
Level I or II)

XT370

1. Professional Workstation
2. Program Development and Maintenance
3. Transaction Processing against Personal Data Bases
4. Level I and II Compatible Processing
5. PC Standalone

3270PC

1. Intelligent Workstations
2. Collection, Editing, and Display of Data
3. Processing against Multiple Local and Remote DBs
4. PC Standalone

81XX

1. Cluster Controller
2. Document Interchange
3. OA Interface

PC AT

1. All of Level III Functions

Various Input, Output, and Sensing Devices

Level IV
Terminals

- 126 -

- IBM has made a lot of money from large-scale mainframes for a long time. That will be the emphasis during the SNA/DDP strategic period. The software strategy assures a high demand for MIPS at the host. In fact, it is INPUT's opinion that demand for processing power will exceed the capacity of the technology even including the follow-on Summit series projected for announcement before 1990.

- While the demand for MIPS is assured, the real growth area is in magnetic disk storage, and IBM will be extremely sensitive to any technological threat to that growth--especially optical disks (more on optical disks later).

• IBM's continuing battle with minicomputers at Level II has been complicated by the emergence of LANs and specifically ETHERNET.

• An initial IBM reaction was that their controller-based systems for point of sale and financial systems and their general purpose 3790/8100 clusters were LANs. That attitude has evolved into one bordering on condescension as they point out the many complexities associated with LANs:

- It is emphasized that LANs address the cabling problem and not the problem of attaching terminals.

- Independence in attaching terminals must consider the requirements of noncoded information (voice to full-motion color images), coded data (thousands of bits per screen), and coded information (images with hundreds of thousands of bits per screen), and if users only want to cable once they had better go slow.

- The answer from IBM's point of view is obviously SNA.

- IBM has been quite explicit in its preferences and ultimate direction:

INPUT

- IBM prefers Ring topology and Token protocols (although they will continue to implement others).

- Very large networks will be supported with expanded addressing capability (MVS/XA will be obsoleted in the late 1980s) and will permit network interconnection.

- Non-SNA device attachment is anticipated (and will theoretically be facilitated).

- There will be new data network attachments and enhanced network management capabilities.

- New communications products from IBM will emphasize new functions, ease of use, and interconnection.

- Software distribution will be incorporated under SNA.

- All of the above sounds effective and INPUT believes this will be IBM's emphasis during the SNA/DDP strategic period. The issue and challenge remains as to timing and the potential cost of either going forward or waiting for IBM to establish standards.

- When we view Levels II, III, and IV (to say nothing of V) with the rich variety of products arriving on practically a daily basis, it is little wonder that both the present and the future of office automation is in a state of disarray. This suits IBM's business objectives during the SNA/DDP strategic period. However, IBM has been preparing for the electronic office period for some time.

- Since IBM has established the standard(s) for intelligent workstations, it can also be assumed that the linkage to mainframes will await IBM's leadership.

INP

The most popular candidate for a micro-to-mainframe link is currently LU6.2 which provides a direct application-to-application link from Level I to both Levels II and III. Referred to as "peer-to-peer," it can only be pointed out that during the SNA/DDP strategic period, it is probable that some peers will be more equal than others, and it doesn't take much imagination to figure out which are which.

- As pointed out earlier, the primary emphasis during the electronic office strategic period will be upon integration. IBM has been forging its set of software tools for office systems integration for over five years. Unfortunately, the tools themselves were developed to solve IBM's hardware problems. The primary vehicle which has been put forth is DISOSS (Distributed Office Support System) which was announced in 1978. It has been extended to include two sets of protocols:

  - Document Content Architecture (DCA) defines the structure under which all IBM documents will be stored.

  - Document Interchange Architecture (DIA) defines the rules to be used by all IBM office systems when sending documents between office systems.

  - While DISOSS is far from a standard for office systems today, competitive vendors are beginning to recognize DISOSS by announcing compatible products.

- Considering the problems of the DSD environment, it is possible to make a good argument that IBM's strategy not only makes sense, but is the only one which can be adopted.

  - Certainly, strong central control is necessary if the requests of data base integrity and synchronization, privacy, and security are to be provided.

- 129 -

INPUT

- Standards are necessary for the industry to prevent the obvious problems.

- The networking environment is complicated at all levels. It would be unwise to proceed more rapidly than IBM is proceeding.

- Users are incapable of developing applications systems fast enough to keep up with technological developments anyhow.

● There are several reasons to be concerned about IBM's dominance:

- Performance at the hardware/software level may not only be unacceptable from a cost point of view, but may actually prove unworkable. IBM systems software and SNA have evolved into increasingly compiex environments. IBM's technical achievement in making the whole thing work should not be minimized. However, the obvious direction toward multiple operating and data base systems with layer upon layer of overhead cannot go on forever. Eventually the big engines will be unable to get many systems off the ground.

- The limitation in hardware/software performance will limit productivity improvement at other performance levels. Some of this impact can already be seen:

  . Delays in micro-mainframe links result from the complexity of the mainframe software. Once the link is made, it is found (or will be found) that performance of the mainframe will be the limiting factor on productivity at the human/machine dyad level either because of response time in file transfer or because the cost is prohibitive.

- 130 -

INP

- The continuing battle to keep high performance minicomputers from assuming their proper functions at Level II in the processing hierarchy (in favor of mainframe hardware/software architectures) has the same impact on productivity at the work unit network (LAN) performance level.

- The dissatisfaction associated with unrealized benefits from new technology at the corporate performance level is already apparent. Miscalculations of problems in performance at the hardware/software level can result in disastrous or even catastrophic impacts on corporate performance.

- Given IBM's leadership role (especially with IS management), there is also the potential for IBM to control the acceptance of valuable new technology in the marketplace. The case with minicomputers in the office environment has been emphasized and that battle continues. INPUT anticipates a similar battle against emerging optical memories which will soon threaten IBM's magnetic disk revenues.

G.   OPTICAL MEMORIES

- Cheap low-cost storage is the key to implementing the electronic office. INPUT believes that optical memories will revolutionize not only computer storage at all levels in the procesing hierarchy but information and knowledge storage and communications as well. In other words, optical memories have the potential for replacing paper documents and books.

- INPUT made an analysis of optical memories in 1983 (see Appendix C, Related INPUT Reports). Events since that time tend to confirm the conclusions, some of which are summarized below.

INPUT

- The cost of optical memories was projected to fall within a range of $1 \times 10 - 5$ to $1 \times 10 - 6\%$ per bit (not byte) by the 1987-1990 timeframe. To understand the significance of this, refer to Exhibit IV-3 and realize that the cost of magnetic storage is only projected to fall to 1×10^{-4} cents per bit by 1990. The IBM 3850 Mass Storage System only falls slightly below the 1×10^{-4} level. This represents more than an order of magnitude in cost reduction, and at that point an optical disk system would cost less than paper media.

- The capacity of the optical disk also has some "gee whiz" attributes such as a single (double sided) platter capable of holding as much as a 3380 magnetic disk drive or the contents of the Encyclopedia Britannica; an optical disk "juke box" could contain the equivalent of two million reels of magnetic tape or the paper content of the National Archives in 225 square feet of floor space.

- With those attributes, it doesn't take much imagination to think of applications, but due to certain attributes such as erasability (current technology is "write once") and availability, the application of the technology tends to be confused in the marketplace. In its report, INPUT defined several general applications systems which can be identified at various levels of the processing hierarchy.

  - Starting at Level III, it is possible to have a standalone video disk system driven off a PC for the storage and retrieval of images, graphics, and documents on disks which have been preprocessed (published). Such systems are already beginning to appear.

  - Also at Level III could be a standalone optical disk system which would provide a document input through a camera/scanner to take advantage of the "write once" capability of current optical disks. Such systems would serve as bank check archival storage and electronic filing systems and compete primarily against current micrographics systems. Such standalone optical disk systems are within the capabilities of current technology and are beginning to appear.

- The next step is to hang this rudimentary electronic filing and retrieval system on a LAN at Level II. This is also within the capability of current technology and several systems integrators are developing such systems. The confusion concerning LANs isn't going to help acceptance, and while IBM recognizes the need for image transmission on LANs, the very confusion which has been created is a good example of slowing the acceptance of current technology.

- The next system is a giant step forward at Level II to an integrated image processing system which has the ability to store images and also update an encoded data base by extacting data using pattern recognition as the documents are entered (see Exhibit IV-6). Such a system is possible using current technology ("write once" is satisfactory), and a pilot project using video tape for image storage was installed at the Central Bank of Belgium over five years ago. An expanded system would incorporate available media.

- The applications at Level I for mainframe optical storage are apparent even with "write once" technology where it is currently feasible to both compliment and supplement DASD with optical storage. The lack of trust in the new technology (which is certainly not discouraged by IBM) wasn't helped when Storage Technology Corporation (STC) ran into its difficulties.

- Once erasable optical media is available, distributed information systems which will effectively integrate data/information/knowledge bases will be possible. In other words, encoded data bases, images, and libraries will all be stored on specialized processors attached to the host computer directly or over a communications link.

- Embedded in the network at Levels I, II, and III will be network store-and-forward reservoirs for both temporary and permanent storage of network traffic (data, images, and voice).

INPUT

EXHIBIT IV-6

INTEGRATED IMAGE PROCESSING SYSTEM

Minicomputer/Controller

- Processing Images
- Controlling Storage Hier-
  archy and Information
  Base
- Serving Data Entry and
  Retrieval Requests
- Controlling External
  Communications

Optional

- Communications
  Links
- Micrographics
  Interface
- OCR Reader
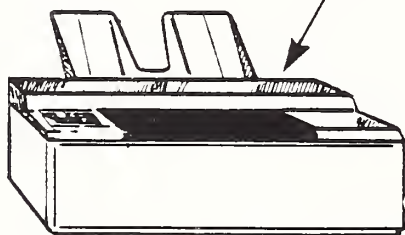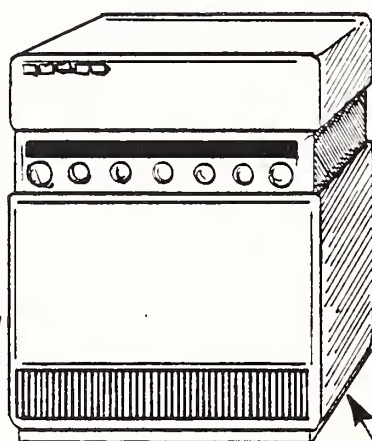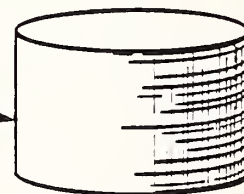
Disk Storage

- Encoded Data Base
- High-Use Images

Camera/Scanner(s)

Work Stations

- Multipurpose Displays
- Demand Printers
  - Conventional
  - Laser
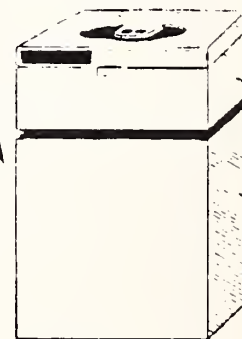
Optical Disk

- Images
- Documents
- Text
- Archival Data

Applications:

- Document Storage
- Data and Information Base Management
- Document Control, Routing, and Processing
- Integrated Word Processing, Data Processing,
  and Electronic Filing

INPU
UVDS W

- When will all of these wonderful things become available? INPUT made certain predictions and those predictions continue to look pretty good except for the fact that IBM has extended its dominance of the industry during the current "slump" (see Exhibit IV-7). There are indications that IBM will permit others to announce the early optical memory products for its hardware (PCs). This is probably in keeping with the theory that any announcement would constitute its "blessing." IBM would prefer to leave its customers with questions about the viability of the technology.

- Products are beginning to appear in the early systems categories. During 1985 Verbatim announced a 3.5-inch erasable optical drive which would be available in quantity in 1987. It had the following attributes:

  - The optical disk drives would sell for $300 and store from 40 to 100 megabytes per disk (which would sell for $30-35).

  - This works out to a cost of 3.75×10^{-5} per bit for an erasable media drive with availability right on the targeted 1988 projection. While the cost is higher than the 1×10^{-5} projected, a larger sized platter would increase capacity over 100 times while increasing the drive cost substantially less than that. The cost per bit, even for erasable optical memories, should fall within the predicted range by 1988.

- On the basis of the technology available, it would appear that the INPUT forecast remains reasonably accurate. However, there is a difference between availability and acceptance in the marketplace. IBM is in an increasingly strong position to hold to, and even extend, the preferred announcement dates in INPUT's forecast.

INPUT

EXHIBIT IV-7

AVAILABILITY OF OPTICAL MEMORY SYSTEMS

| GENERAL SYSTEM CATEGORY | AVAILABILITY | | | | | IBM | |
	CURRENT	1984	1988	1990	PREFERRED	PREDICTED
1. Standalone Videodisk	X	–	–	–	1985	1984
2. Standalone Optical Disk	–	X	–	–	1985	1985
3. Electronic Filing and Retrieval (Local Area Network)	–	X	–	–	1985	1985
4. Integrated Image Processing						
a. Basic System	–	X	–	–	1987	1986
b. Advanced System	–	–	X	–	1988	1988
5. Mainframe Optical Storage						
a. DRAW	–	X	–	–	1987	1986
b. Erasable	–	–	X	–	1990	1989
6. Distributed Information Manager	–	–	X	–	1988	1988
7. Network Store-and-Forward Reservoir	–	–	–	X	1990	1990

- 136 -

INPUT
UVOS WE

H.   PATTERN RECOGNITION

- The importance of optical memories in implementing the electronic office has been emphasized, but during any period of conversion there will obviously be enormous quantities of paper documents passing between work unit networks which are essentially paperless and those which continue to spew out paper documents. A high percentage of all business documents and correspondence are in processable form when they are originated only to go through countless media conversions back to paper for communication. The integrated system depicted in Exhibit IV-6 uses pattern recognition to extract data from the digitized (compressed) image coming from the camera/scanner. These data are used to update an encoded data base and solve the ever present data entry problem.

- As the electronic office period develops, the problems associated with data entry will diminish because data will pass from one work unit (or individual) to another in electronic form over interconnected networks. Those using paper media for data communication will be penalized (either through incentives to use electronic media or actual charges for the processing of paper media). However, original communication at the human/machine dyad level will continue to present a data/information/knowledge input problem to human beings having an increasingly wide range of skills and motivation. The primary means of inputting data/information/knowledge into computer/communications networks is through keyboards, and there is every indication that this will remain true in the foreseeable future.

- There continues to be something of an aversion to the use of keyboards (and computers) among certain occupational categories (executives are the most frequently mentioned, but it goes much deeper than that). There is a continuing search for keyboard replacements. If we eliminate the mouse and touch screens (neither of which would seem to preserve the executive image very much), most of the alternatives for human-to-computer communications

INPUT

can be roughly included under pattern recognition falling into the following categories: codes, character, voice, natural language, and bio-identification.

- Considerable progress has been made in hardware/software systems to read codes such as the Universal Product Code and the heavily stylized fonts associated with magnetic and optical character recognition. Cost-effectiveness is heavily dependent upon the particular system being implemented. From railroad cars to supermarket products, codes are being read automatically, and stylized fonts are being used on turnaround documents of all kinds. Technology will continue to improve code flexibility, reliability, and cost-effectiveness and broaden the application areas.

- Considerable progress has also been made in the general character recognition problem for both multiple fonts and hand printed characters. General pattern recognition has progressed to the point where the primary limiting factor is cost in terms of the number of characters which can be recognized at acceptable speeds. For example, the system installed at the Central Bank of Belgium was limited to the recognition of approximately 20 characters (symbols) based on the processing power of the minicomputer being used. Microprocessor technology has progressed to the point where high volume systems could cost justify a separate processor for each symbol to be recognized. While it is probable some script (and even printed characters) will forever remain unreadable, it is currently possible to develop cost-effective systems such as those depicted in Exhibit IV-6.

- Microprocessor technology has also permitted voice recognition of individualized vocabularies at costs which should encourage its use in specialized environments where it is impractical to use keyboards because both hands are required for other purposes (airplane cockpits, operating rooms, assembly lines, warehouses, etc). Systems for general recognition of limited vocabularies of isolated words (10 to 100) and for a small set of known users are currently available and may be cost-effective for certain applications. However, real time, continuous speech recognition systems accepting

INP

unrestricted vocabularies, unknown speakers, and many discourse topics are not conceivable with today's knowledge and technology and may never be on a cost-effective basis. Between what is available and what may never be available, the area of carefully dictated transcription has received considerable attention and should be put into proper perspective:

- The first general statement is that no cost-effective systems for automatic transcription exist today, and it would probably be ill-advised to assume such systems will be available during the electronic office period. In other words, conventional dictation will remain the most cost-effective solution in the foreseeable future.

- This should not be terribly disturbing in the overall scheme of things since the transcription of dictation represents less than 0.2% of office expense, and it is not at all clear what percentage of this could be saved if a machine-prepared rough draft were available (secretaries correct a lot of dictated mistakes on the fly and going back to dig them out of computer prepared version could be more trouble than it is worth).

- An INPUT study (see Appendix C, Related INPUT Reports) broke down office costs into 38 occupational/functional categories. The portion of total office systems costs related to dictation and transcription ranked 37 and 38. It seems apparent that the electronic office has the potential for more important savings than automatic transcription of dictation.

● The next level of pattern recognition becomes involved with understanding natural language once it is in machine readable form. There is currently great emphasis upon natural (meaning human) languages for human-to-computer communications. The theory seems to be that it would be easier, or more fitting, for humans to "tell" computers what should be done in English (as an example of natural language). Supposedly this would permit anyone to

INPUT

"program" whether they keyed in natural language instructions from a keyboard or talked directly into voice recognition systems. IBM, after extensive research in natural language for programming, came to the following conclusions (IBM Systems Journal, Volume 20, Number 2, 1981: "Natural Language Programming: Styles, Strategies, and Contrasts"):

- "We emerge from this analysis of subjects' solutions (they had college students attempt to define several simple procedures) with a somewhat tentative yet nagging uncertainty concerning the viability of an unconstrained natural language computer interface for programming."

- "While we have no doubts at all concerning the capacity of natural English for specifying highly precise and complete procedures, we are concerned about people's abilities to use the language in this way, particularly for difficult problems."

- "Although we expected numerous difficulties to be detected concerning the potential of actually implementing a system to interpret natural language programs, we were not prepared for the magnitude of what we see as being the three major obstacles: style, semantics, and word knowledge. Concerning the first, there is little way in which the vast differences in styles could be increased--programming-language style is simply alien to natural specification. With respect of semantics, we also were unprepared to find out the extent to which the selection of the appropriate "meaning" (to a word, phrase, or sentence) is dependent upon the immediate and prior context. And as for world knowledge, we suspect that the extent to which shared experiences and knowledge are critical to procedural communication and understanding among people has barely been hinted at by our present data."

- In other words, don't depend upon natural language to ease the burden of systems development in conventional computer or office systems. INPUT suspects the same will be true for using natural language in emerging expert

IN

systems. Difficulties with natural language are apparent in general communications today whether it be in technical articles, correspondence, or face-to-face meetings between human beings. To expect a computer to be better than a human being at interpreting natural language is asking a bit much.

- The final area of pattern recognition is in "bio-identification" systems which permit identification of a specific individual by his voice, retinal pattern, fingerprint, etc. In other words, the executive could pick up his telephone and say "This is Mr. Jones, please send me the personnel files (or transfer $1 million to a Swiss bank)" without the inconvenience of going through normal security procedures. Or someone could enter the computer room or vault by looking into a retinal scanner or pressing a thumb against a pad. Except in the most critical security situations, such solutions are neither cost-effective, practical, nor desirable at the present time. Although some pilot voice identification systems are currently available, cost (or even reliability) does not indicate that they will be practical for such applications as ATMs or credit checking in the foreseeable future, and better alternatives are becoming available for most applications anyway.

- In summary, pattern recognition in all of the above areas has been the subject of extensive research for many years, and while substantial progress has been made, the more esoteric remain distant promises. However, there is sufficient technology and knowledge to implement specific systems in applications resulting in a substantial reduction of paper volume and improvement in the quality of decision making—that is where the immediate and most productive effort can be put.

I.   FIBER OPTICS

- Deregulation of the telephone industry has spawned the Regional Bell Operating Companies (RBOC), many of which have major capital investments

INPUT

in fiber optics networks. Within the next five years and certainly by the end of the decade, fiber optic telecommunications (digital voice, data, and images) with sufficient bandwidth for highly cost-effective operations will be in widespread use.

- Acting as system integrators, the RBOCs are extending fiber optic networks into existing and new "electronic" buildings housing a wide variety of financial institutions. Such networks will greatly assist financial institutions in becoming low-cost providers of electronic information services to both their consumer and corporate clients.

J. CHECK TRUNCATION

- The general consensus of banking executives interviewed is that technology in the form of optical storage and image transmission will become cost-effective in the 1985-1990 timeframe.

- The problem appears to be as much with consumer acceptance of the non-return of the original check as it is with the in-place electronic networks necessary to clear the still-slowly-growing volume of check transactions. As banks are forced to price services based on true cost and the consumer is billed for his desire to have the checks returned versus check images or a descriptive statement (GIRO), then check truncation which will save hundreds of millions in payment systems cost will become widespread.

- Banking executives (i.e., Mellon Bank) report that check truncation has been effective in selected areas, particularly when offered with packaged financial services.

INF

- As shown in Section G above, optical storage is ideal for capturing the check image together with the significant financial numeric data at least at the first major point of check clearance.

- It is believed that optical storage techniques will be in widespread use by 1990.

- Lower-cost distributed systems may well transfer the point of data capture to the point of entry into electronic financial networks before 1995.

K.   AUTOMATED DATA ENTRY

1.   OPTICAL DATA ENTRY

- The price barrier for optical character recognition equipment of upwards of $6,000 for reading printed text material will crumble in the 1985-1990 timeframe.

- Units integrated with PCs will fall well below $3,000, allowing an increase in productivity for word processing approaching a factor of five over keystroke entry.

- This successful technology combines fine grid scanners, microprocessors, and adaptive software.

- INPUT believes this optical data entry technology will find selective use throughout financial institutions in at least the following areas:

    - Letters of credit.

    - Loan documents.

INPUT

- Marketing.

- Personal trust.

- Administration.

- Executive memoranda and report preparation.

- Legal.

- Tax.

- Foreign trade.

2. VOICE DATA INPUT

- Cost-effective systems for selective vocabularies (less than 100 words), adapted to and dependent upon specific (1-3) input personnel are forecast to be available in the 1985-1990 timeframe and be cost-effective before 1995.

- Such PC-driven voice data input systems will be used in financial institutions in at least in the following areas:

    - Telephone order entry (i.e., securities, products).

    - Telemarketing (i.e., products).

    - Accounting data entry.

    - Credit inquiry/verification.

    - Lock box operations.

    - Check reject processing.

- 144 -

INP

L.   CONSUMER INFORMATION SERVICES

- A recent INPUT study (see Appendix C, Related INPUT Reports) concludes that financial services targeted to the consumer in his home (home banking and other financial information services) will not become cost-effective by 1990.

- Home banking will remain in an introductory stage until the 1990-1995 timeframe when the growth stage will be reached for individuals having personal computers with modem capability.

- Successful (profitable) home banking ventures are tied to communication industry delivery of other consumer information services. Other services include brokerage, financial, and entertainment information offered through videotex gateway services.

- Security is, as outlined later in Chapter V, a major issue in implementing and offering consumer financial information services.

M.   POINT OF SALE

1.   SWITCHING AND NETWORKS

- Major proprietary and public networks are in place to support rapid growth in transaction processing for credit card authorization and check guarantee. Loan granting represents an emerging POS transaction payment method being promoted by consumer financial companies.

- Major POS service vendors include Nabisco, McDonnell Douglas Payments Company, National Data, and AMEXCO/FDR.

INPUT

- Value-added network suppliers such as Telenet/Uninet and Compuserve are also developing product offerings becasue POS applications are ideally suited for these networks due to the random occurrence and short duration of each transaction.

- Transactions may be entered via dedicated, low-cost terminals or automatically through electronic cash register systems.

2. TERMINALS

- Terminals are available from numerous sources and require little state-of-the-art technology. Principal features are automatic dialing of authorization centers, optical/magnetic reading of card data, entry of customer's PIN or other security identification, and display for authorization response. A keyboard is the primary method for entry of variable transaction amounts.

- Five years ago, most authorizations were done manually and the POS connection was to operator-staffed centers where CRT displays were used to access files. These voice centers are now largely displaced. As a result, former labor-intensive authorizations which cost in the $0.50 to $0.75 range are now accomplished automatically for under $0.15.

3. TECHNOLOGY LEADS TO NEW POS PRODUCTS

- POS services are being expanded to provide electronic data capture (EDC) of variable transaction information. This will speed the clearing of transactions among retailers, banks, and consumer accounts.

- EDC will also provide for the growth of paper truncation at an earlier point in transaction processing. While this type of truncation is unrelated to checks, experience gained in bank card paper truncation will ultimately be transferred to the check side as well, leading to what can be called the electronic check.

INf

N. ATM NETWORKS

- ATM networks have been extensively discussed in Chapter III, Strategic Analysis.

- The concentration of transactions at the more costly ATM terminals which often function like bank branches generally makes leased lines economical whereas the low cost of POS terminals encourages proliferation, leading to lower volumes that encourage use of value-added networks.

- Networks and switching systems to support a rapid growth in ATM use are already in place, although transaction processing capacities of computer systems will have to grow substantially.

- INPUT believes it will be the primary objective of both proprietary and switched ATM networks to concentrate on volume and drive down operating costs. Thus, by 1990 it will be difficult to justify standalone proprietary networks.

- The strategic emphasis of ATM networks will be on interchange and wide-spread use of bank cards and other financial access instruments. INPUT believes that in several markets such as supermarkets, POS and ATM services may become indistinguishable from each other and will be accomplished via switching technology rather than through separate dedicated terminals as at present.

O. EFT NETWORKS

- EFT networks are generally separate from POS and ATM networks because the EFT networks primarily handle wholesale transfers of funds and related instructions among banks and other financial institutions.

INPUT

- Such networks include FEDWIRE, BANKWIRE, SWIFT, and CHIPS. These and other networks are discussed in Chapter V, Section B.

- An emerging family of other EFT networks is the Federal Reserve-sponsored Automatic Clearinghouse System (ACH), consisting of over 20 independent ACH regions in the U.S. Over the next five to ten years, ACH networks will be established by individual ACH regions or with the assistance of independent third-party vendors such as GEISCO.

- To the extent ACH transactions reduce or eliminate existing wholesale transactions among banks, other EFT network volumes may change.

- Security technology to protect individual transactions will be an increasing opportunity in all EFT networks as total volumes expand.

INF

V SECURITY

V SECURITY

A. THE MAGNITUDE OF THE PROBLEM

- Security is seen by the top banking executives interviewed as an ongoing concern. The concern is global and as yet ill-defined. Bank administrators, industry associations, consultants, and information services vendors are just beginning to focus attention on the potential magnitude of the problem and its implications in relation to the increased use of electronic technology throughout the banking and financial information services marketplace.

- Attention is focused in the following primary areas:

  - Identification and validation of the consumer at the entry points of consumer financial information networks.

  - Protection of information flowing through financial transaction networks, both wholesale and retail.

  - Authentication of at least high-value wholesale funds transfer.

  - Protection of the integrated customer (both wholesale and retail) information data bases.

- 149 -

INPUT

- Protection of financial information systems from unauthorized access from both external telecommunications and internal financial institutions' programming/operations personnel.

- The consensus among the executives interviewed is, "Something needs to be done, and that technology will solve the problem when selectively applied over the next five to seven years."

1. CREDIT CARDS

- A recent INPUT report on credit card services (see Appendix C, Related INPUT Reports) determined credit card industry losses in 1984 as well over $3 billion, or about 1.2% of total charge volume.

- Over 15% of total losses is related to fraud from cardholders, criminals, and merchant employees. The portion related to fraud is rising at a considerably greater rate (over 13% annually) than total losses (approximately 4% annually).

- By 1990, the portion of total losses related to fraud will increase to 18%, exceeding $1.1 billion annually.

2. DEBIT CARDS

- In 1984, debit card industry losses were estimated to have exceeded $1.3 billion, and the portion related to fraud, at a 20% growth rate, approached $300 million.

- Unless the growth in the portion of bank card losses related to fraud are stemmed, the figure will approach $650 million by 1990.

- The recent rapid growth of commercial bank fraud-related losses is clearly shown in Exhibit V-1.

INF

EXHIBIT V-1

GROWTH IN COMMERCIAL BANK FRAUD-RELATED
LOAN LOSSES, 1980-1985
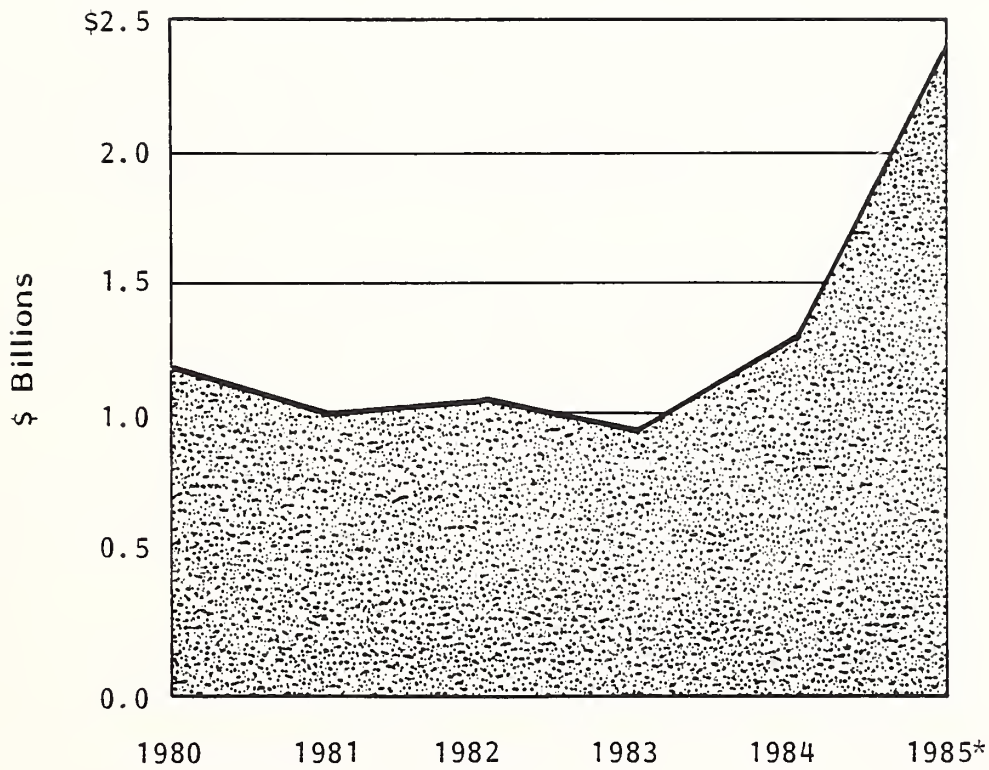
Source: FDIC; Input Research.

Note: For Banks with at Least $300 Million in Assets.

*Estimate

3. AUTOMATIC TELLER MACHINES (ATM)

- A 1983 study by the U.S. Department of Justice indicated that approximately $100 million was lost in 1983 through fraudulent use of automated teller machines and that the loss rate is growing at least as rapidly as the growth of new ATM installations. In well over 70% of the cases studied the personal identification number (PIN) was easily accessible to the fraudulent user. It appears that a methodology of personal identification more "user friendly" than a system-assigned PIN would significantly reduce ATM fraud.

4. FUNDS TRANSFER

- The magnitude and growth of fraud-related funds transfer losses has been difficult to assess. Few of the real occurrences make the newspapers as banks are reluctant to reveal weaknesses in their procedures related to funds transfer.

- Most breaches in the funds transfer mechanism are "people related," almost invariably involving bank personnel.

- As yet barely recognized is the information gained by speculators (fraudulent and otherwise) through surreptitious monitoring of the funds transfer communications networks.

B. ELECTRONIC FUNDS TRANSFER (EFT) NETWORKS

- The dollar volume of funds transfer on an international basis is becoming truly staggering. Daily volumes in excess of $500 billion are becoming more common than not.

- 152 -

- Wire transfer of funds in connection with domestic corporate cash management information services currently exceed $200 billion on a daily basis within the U.S.

- Wholesale EFT systems have been created to deal with large dollar/low volume transactions between financial institutions. All the systems mentioned below are undergoing revisions to incorporate improved security technology and procedures.

    - FEDWIRE: An automated financial information system utilizing a secure switch (Culpepper, VA), FEDWIRE links Federal Reserve Banks, branches, offices, the Treasury, and a few member banks. FEDWIRE provides transfer of reserve account balances, transfer to U.S. government and federal agency securities, and administrative and research information. The system is becoming more on-line between financial institutions and the Federal Reserve.

    - BANKWIRE: "BANKWIRE II" is owned by member U.S. financial institutions for funds transfer between participating members. The current system provides a minimum level of message protection and authentication. The system handles funds transfer, miscellaneous reimbursements between participating financial institutions, and administrative reporting functions.

    - CLEARINGHOUSE INTERBANK PAYMENTS SYSTEM (CHIPS): CHIPS is a clearinghouse for international money transfers between participating banks. It is operated by the New York Clearinghouse and makes settlements through the book of the Federal Reserve Bank of New York. CHIPS provides a minimum level of information transfer security coupled with message authentication.

    - SOCIETY FOR WORLD-WIDE INTERNATIONAL FINANCIAL TELE-COMMUNICATIONS (SWIFT): SWIFT is a privately operated, non-

INPUT

profit corporation (operating under Belgian law) providing secure communications and message-switching capability for multi-currency payment messages between participating financial institutions on a multinational basis. The system does not (like FEDWIRE) have settlement capability. The existing system is in the process of being upgraded to provide increased information transfer security as well as individual message authentication.

- There has been an attempt to standardize a Financial Institution Message Authentication Standard (FIMAS) through the National Bureau of Standards (NBS) and 20 large financial institutions. The pending standard addresses the two categories of potential EFTS threats--illegal reading or copying of data and the unauthorized addition, deletion, or alteration of funds transfer information. The functions the standard addresses are:

  - Using DES technology to process an EFT message and produce a value called a message authentication code (MAC). When transmitted with the message, the MAC assures both the message's integrity and origin.

  - Handling data message quality through error detection and correction codes.

- A preliminary standard has been published by NBS. However, advanced scientific microprocessor technology permits breaking of DES algorithm on a cost-effective basis for funds transfers in excess of $1 million.

  - One solution is larger key size.

  - Another potential but expensive solution is a public key system methodology whereby each message is authenticated between each sender and receiver for each transmission, as is currently done in classified tactical military message switching systems. A major problem is the human factors involved in key management.

- 154 -

C.   FINANCIAL INSTITUTION CONSUMER TRANSACTION NETWORKS

I.   NETWORK SECURITY

- There are two basic factors that affect consumer network security:

    - Technology in the form of encryption and authentication of message traffic.

        Human factors related to operational personnel and end users.

- Technology available for consumer network security includes:

    - Data Encryption. Here both software and microcircuits are currently available, implementing primarily the American Data Encryption Standard (DES) certified by the National Bureau of Standards (NBS). Advanced microprocessors are currently capable of breaking the DES encryption at acceptable cost-effective levels for large dollar volume (less than $1 million) transactions, something not ordinarily found in consumer transaction networks. Increasing key size coupled with block chaining techniques raise the level of security at the expense of probably unacceptable computation time.

    - Public Key Encryption. The use of public-key crypto systems, coupled with authentication schemes, can ensure the integrity and validity of individual message traffic at the cost of carefully controlling the personnel and methodology involved in key generation distribution and installation.

    - Authentication. Carefully implemented personal verification and message authentication techniques ensure the trustworthiness of message traffic through all levels of consumer transaction networks.

INPUT

In addition to high cost, effective authentication is heavily dependent upon key management systems administered by human beings.

- INPUT believes that given cost-effective baseline security technology, consumer transaction network security and consumer privacy future solutions are more cost-effectively handled by control of human factors than by looking for technology to solve the problem. Such factors are:

    - System design.

    - Implementation.

    - Operation.

    - Control.

    - Legislation.

- As increasing numbers of operational personnel and users are given "user friendly" access to consumer transaction networks, problems of fraud and privacy will increase at least proportionately.

    - There are at least 50,000 computers currently interconnected to consumer transaction networks.

    - INPUT estimates that by 1990 fully half of the American labor force will know how to use personal computers at least. Indeed, security must be considered as an integral part of advanced consumer financial transaction network design and implementation.

INP

2. USER VALIDATION

- The personal identification number (PIN) together with on-line data bases for debit/credit card transactions is currently the most widely deployed methodology for user validation when consumers initiate financial transactions. This methodology was carefully analyzed in a recent INPUT report on credit card/check verification services (see Appendix C, Related INPUT reports).

- The failure of the above methodology to deter people determined to commit fraud is clearly evidenced in Section A above, where the magnitude of the problem is currently exceeding $1 billion annually and growing at a larger rate than any of the related statistics.

- The microprocessor-imbedded or "smart card" is currently hailed as a potential solution to the user validation problem within the next five years. Although the smart card offers additional consumer financial network transaction capabilities, INPUT believes that as currently envisioned as operating in an "off-line" mode, the smart card offers little more in the way of user validation at a cost ranging between a factor of four and an order of magnitude more than existing magnetic striped cards.

  - The anticipated transaction growth of consumer electronic financial transaction networks over the next decade warrants consideration of accomplishing user validation in an "off-line" mode (i.e., not connected on-line to verification/authorization data bases).

  - Electronic information systems research indicates that "trusted systems" can only exist through the establishment of some form of "handshaking" methodology between the end user and the system manager. Authentication through personal verification and message authentication is the only known way of ensuring security/privacy.

INPUT

-       When used as a part of an on-line authentication system, the smart card can be both effective and used for offering additional financial information services, which might at some future time result in a cost-effective implementation.

●   The functional design of the smart card is as shown in Exhibit V-2. The design is referred to as "second generation." Implementations are currently being tested by both VISA and MasterCard in the U.S. Preliminary results indicate that:

-       Reliability (excessive wear) is a major problem.

-       Compatibility with existing magnetic stripe technology is a must.

-       Production costs of from $2-10 are prohibitively high as compared to magnetically striped plastic cards ($0.75 or less). Conversion of in excess of 500,000 retailer terminals does not appear to be cost-effective for at least the next five years.

-       Users see little advantage of the "smart card" over existing bank cards.

-       In effect, the "smart card" is a solution in search of a real problem.

●   A technology recently officially endorsed by the Financial Industry Security Counsel (FISC) is provided by Light Signatures, Inc.. A subsidiary of Telecredit, Inc., Light Signatures' counterfeit-proof card results from a crystallization process which gives a "snowflake" or fingerprint making it virtually impossible to duplicate (to be cost-effective, financial transaction amounts would have to exceed $100 million, clearly well beyond the transaction value range for consumer financial transaction networks).

-       The technology has been successfully applied in a cost-effective manner to such commodities as clothing and phonograph records.

INP

EXHIBIT V-2

SMART CARD FUNCTIONAL DESIGN

INPUT
USFR WBAN
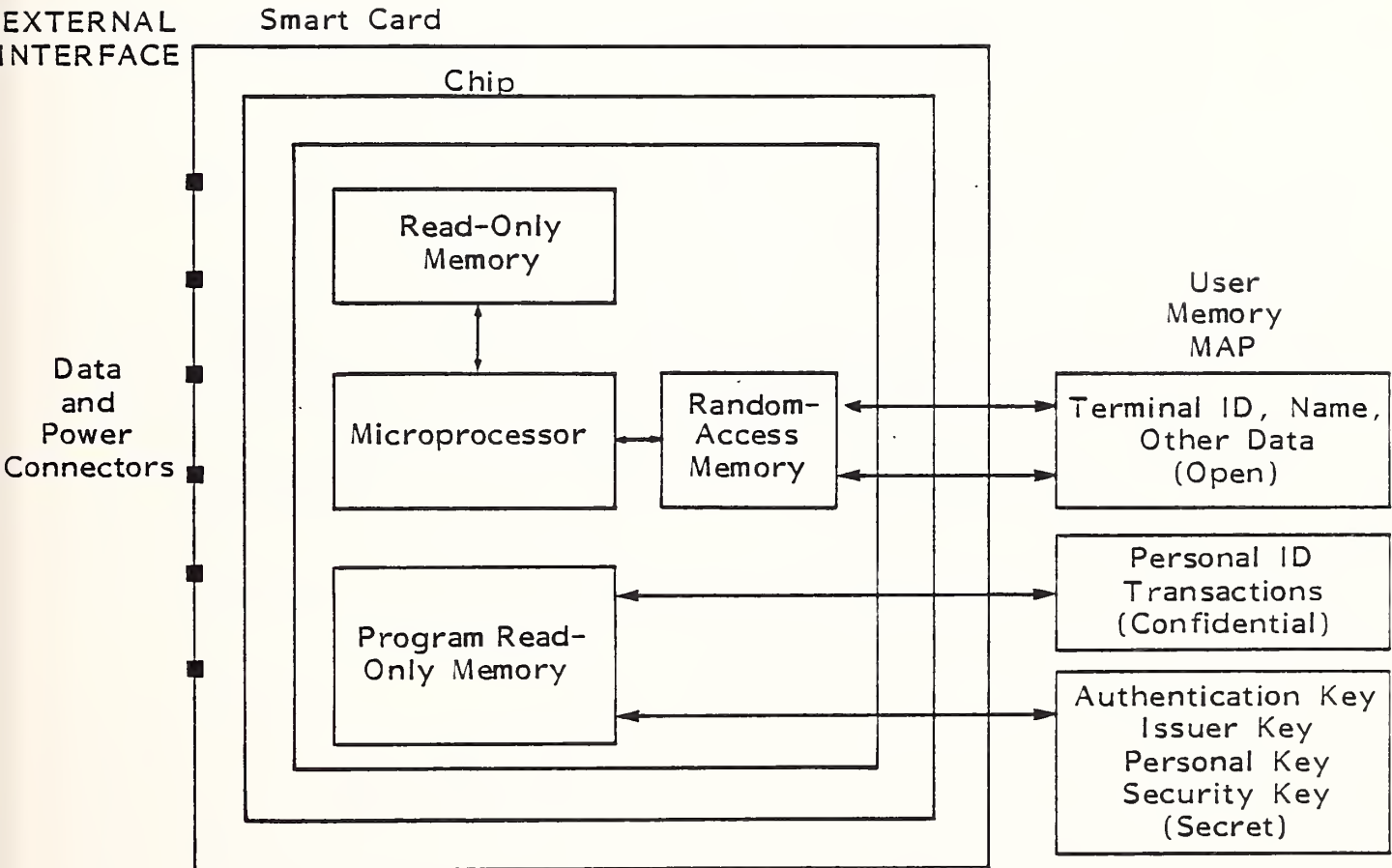
-     Light Signature systems will soon be employed to validate and verify stock certificates for at least New York Stock Exchange listed stocks.

-     Card validation is accomplished "off-line." Again, user verification and message authentication require selective on-line system capability.

3.   HIGH-VOLUME TRANSACTION PROCESSING

●   An important gap exists today in the processing technology available to support the high-volume transactions envisioned for future growth in ATM networks and some POS systems. This initially affects security not so much in terms of fraud loss as in terms of reliability and accuracy. Ultimately, however, a continued break down in reliability and accuracy would invite fraudulent experimentation.

●   Most transaction processing systems available today from IBM and other major computer equipment manufacturers provide for processing levels well under 25 transactions per second. Unique systems, such as those developed for the airlines, do provide for higher transaction rates, but these systems require specialized equipment, software, and communications service modifications. Moreover, related support costs are well above that affordable or typical in financial institutions.

●   Within the last five years, several manufacturers including Tandem and Stratus have built substantial markets outside of the IBM environment, promoting "nonstop" capabilities. In reality these systems, while providing the security of fault-tolerant, nonstop processing back up, are especially impressive for their capacity to handle transactions in the 50 to 100 per second capacity range and beyond.

●   INPUT believes that over the next five years the capacity of transaction processing systems will grow with the market requirements, thus closing the gap.

IN

- In addition, IBM has already agreed to a marketing arrangement with Stratus to expand the range of services to its financial institution customers.

- IBM has also recently enhanced its transaction processing software to provide transaction rates in excess of 25 per second, thus signaling its intention to meet the requirements of its financial institution customers.

D. FINANCIAL INFORMATION COMPUTER SYSTEM SECURITY

- A recent INPUT study (See Appendix C, Related INPUT Reports) covered evolving strategies of protecting information systems and software (developed in-house or acquired) from lost or unauthorized access in the mainframe, distributed, and personal computer environments. The findings as they relate to financial information systems are summarized below.

1. STRATEGIES

- Strategies for providing security to financial information systems software are shown in Exhibit V-3. The strategies form a stable triangle in three dimensions:

  - People really count.

  - Good administration is a necessary component.

  - Technology is the core defense.

INPUT

EXHIBIT V-3

STRATEGIES TO PROTECT
FINANCIAL INFORMATION SYSTEMS AND SOFTWARE

PEOPLE COUNT

- Top Management Responsible
- Security Director
- Background Investigation
- Hiring and Termination Procedures
- Corporate Security Policy
- Education
- Personal Security Evaluations
- Code of Conduct
- Separation of Duties

ADMINISTRATION NECESSARY

- Documentation Control
- Fire Protection
- Disaster Recovery
- Legal
- Insurance

Secure Financial Information Systems and Software

TECHNOLOGY, THE CORE DEFENSE

- Passwords and Terminal IDs
- Security Monitors
- Telephone Access Controllers
- Smart Cards
- Encryption
- Fiber Optics
- Secure Microprocessors
- Secure Microdisk Storage
- Security Operating System Kernels
- Formal Design Methodologies
- Structured Programming
- Change Control

INP
USPR V

- Strategies relating to users at all levels include:

  - Corporate security policy.

  - Selection of a trained security director, well placed in the organization and backed by top corporate management.

  - Heightened user awareness through briefings, seminars, etc.

  - Human resources including careful selection, hiring and termination procedures, security evaluations, and separation of critical duties.

- Administrative strategies include:

  - Disaster protection and recovery.

  - Documentation control.

  - Legal protection through copyright and trade-secret registration.

  - Insurance against fraud and disaster.

- Strategies for utilizing technology are the basis of security, including:

  - Intelligent terminals including secure microprocessors, terminal IDs, personal verification, and eventually "smart cards" (see Section C, Financial Institution Debit/Credit Card Networks, above).

  - User networks including public key encryption, message authentication, fiber optic communication lines, and microprocessor-driven active telephone access controllers.

INPUT

2. PROCESSOR STRATEGIES

● Strategies to achieve levels of post-processor security together with the corresponding advantages/disadvantages are shown in Exhibit V-4. Both individually and in selective combination, the strategies are best considered when first designing a secure financial information system. The essential steps are:

- Utilization of a formal design methodology.

- Development (procurement) of a secure operating system kernel.

- Development (procurement) of an effective security monitor (operating system).

- Implementation of structured programming.

- Establishment of and rigorous adherence to formal change control procedures.

● Another dimension in viewing secure financial information systems is shown in Exhibit V-5. Here the system is viewed at five levels (domains) with operator/user access most rigorously controlled at the hardware level and least, but carefully, controlled at the specific financial application program level.

● Hardware vendors are beginning to design microprocessors which facilitate development of secure systems according to the criteria established by the Department of Defense (DoD) Computer Security Center and contained in the specification "Department of Defense Trusted Computer System Evaluation Criteria."

INP

EXHIBIT V-4

LEVELS OF SECURITY

LEVEL	OPTION	ADVANTAGES	DISADVANTAGES
1	Passwords	Low Cost	Most Vulnerable
2	Terminal IDs	Low Cost	Inflexible
3	Security Monitors	Good Security Audit Trail	High Cost Needs Administration Susceptible to Systems Programmers
4	Encryption	High Security	Major Cost Degrade System Performance Needs Administration
5	Telephone Access Controllers	Good Internal Security High External Security Good Audit Trails Analog System	Internal Security Susceptible to Systems Programmers
6	Smart Cards	Very High Security Authentification of Both User and Host Flexible	Currently High Cost Needs Administration

- 165 -

INPUT
USPR WBAN

EXHIBIT V-5

SECURE FINANCIAL INFORMATION SYSTEMS EXECUTION DOMAINS
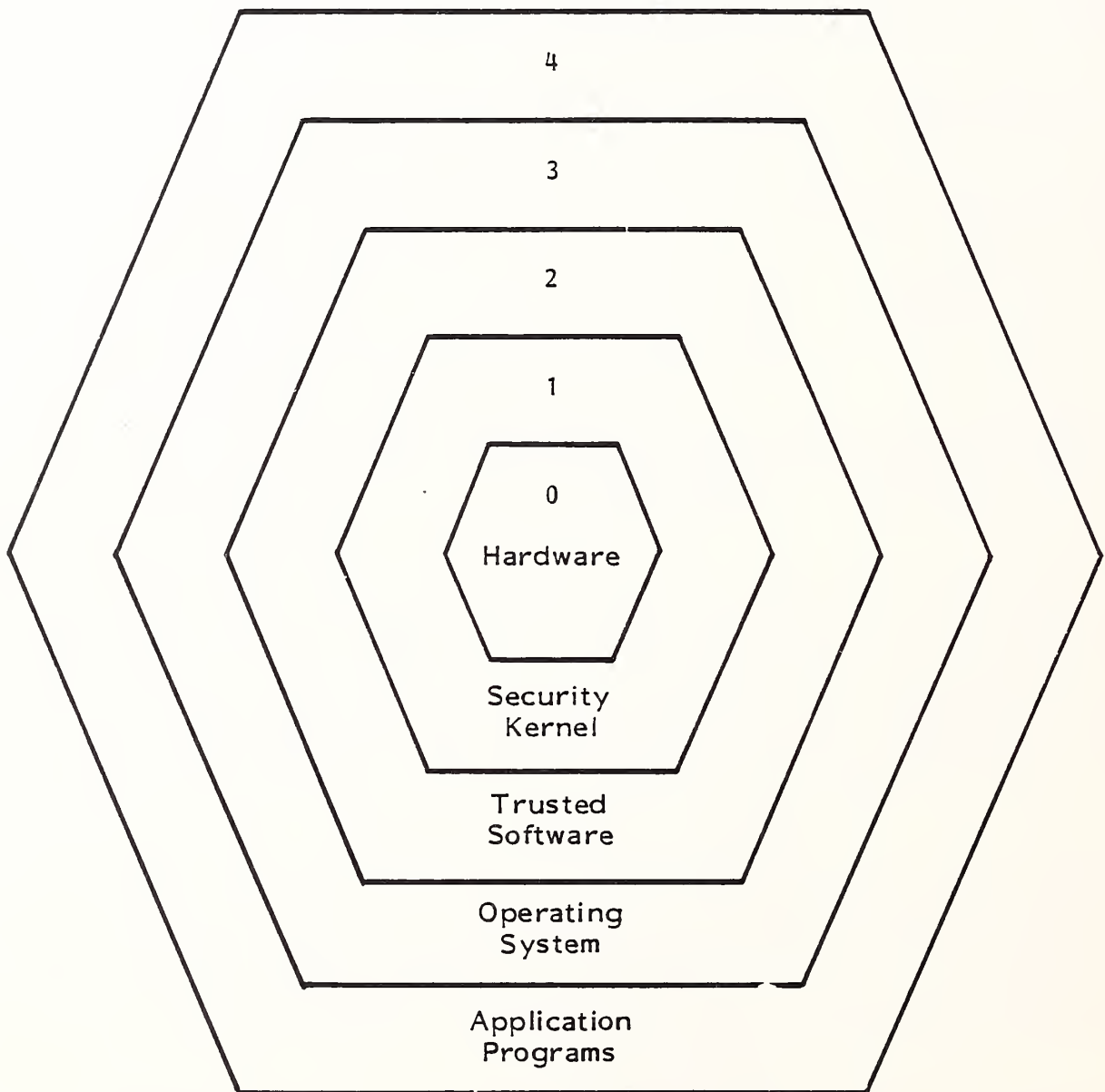
- Architectural functions necessary to support protected systems based on the concept of a security kernel are:

  - Support of multiple processors.

  - Control over a large, segmented virtual memory.

  - Four execution domains, the most privileged being level zero.

  - Control of access to input/output devices.

- Intel Corporation has developed the iAPX 286 miroprocessor to support secure operating systems. Analysis indicates that the microprocessor architecture could reduce by an order of magnitude the overhead in implementing a secure information system.

- INPUT expects that a secure UNIX operating system utilizing trusted system architecture will find widespread acceptance in the financial information systems marketplace within the next five years.

- The execution domains restrict the access of programs in less privileged domains to a few well-defined interfaces with more privileged domains (where zero level is the most privileged).

  - The next most privileged domain is the security kernel. It implements the basic security mechanism.

  - Software (such as user identification, authentication, and security auditing) closely related to the security kernel is carefully verified and if possible proven correct (trusted). The security software runs either in its own demain or in a four-domain system in the operating system domain.

INPUT

- Properly constructed application programs can take advantage of all of the security features of a secure hardware/firmware/software host system, thereby protecting the privacy of consumer data and strategic financial information in the retail, wholesale, trust, and other areas of financial institution information system product offerings.

3. SECURITY, A REAL MARKET OPPORTUNITY

- It is clear from the analysis presented above that security is a real issue. Much must be done to accommodate for the rapidly increasing volume of electronic financial transactions in the consumer, corporate, and multi-national financial marketplace.

- INPUT believes that the opportunities for providing secure systems in a cost-effective manner are legion. It is probable that IBM in a future product announcement will, as outlined in Chapter IV, set the stage for providing baseline security for financial transaction information systems.

INF

APPENDIX A: DEFINITIONS

APPENDIX A: DEFINITIONS

A.   REVENUE

- All revenue and user expenditures reported are available (i.e., noncaptive) revenue, as defined below.

    - NONCAPTIVE INFORMATION SERVICES REVENUE - Revenue received for information services provided within the U.S. from users who are not part of the same parent corporation as the vendor.

    - CAPTIVE INFORMATION SERVICES REVENUE - Revenue received from users who are part of the same parent corporation as the vendor.

- OTHER REVENUE - Revenue derived from lines of business other than those defined above.

B.   SERVICE MODES

- PROCESSING SERVICES - Remote computing services, batch services, and processing facilities management.

- 169 -

INPUT

REMOTE COMPUTING SERVICES (RCS) - Provision of data processing to a user by means of terminals at the user's site(s) connected by a data communications network to the vendor's central computer.

- INTERACTIVE (timesharing) - Characterized by the interaction of the user with the system, primarily for problem solving timesharing but also for data entry and transaction processing; the user is on-line to the program/files.

- REMOTE BATCH - Where the user hands over control of a job to the vendor's computer, which schedules job execution according to priorities and resource requirements.

- BATCH SERVICES - This includes data processing performed at vendors' sites of user programs and/or data that are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and computer output microfilm processing, are also included. Batch services include those expenditures by users who take their data to a vendor site that has a terminal connected to a remote computer for the actual processing.

- PROCESSING FACILITIES MANAGEMENT (PFM) (Also referred to as "resource management" or "systems management") - The management of all or a major part of a user's data processing functions under a long-term contract (more than one year). This would include both remote computing and batch services. To qualify as PFM, the contractor must directly plan, control, operate, and own the facility provided to the user, either on-site, through communications lines, or in a mixed mode.

IN

- Processing services are further differentiated as follows:

  - <u>Function-specific</u> services are the processing of applications that are targeted to specific user departments (e.g, finance, personnel, sales) but cut across industry lines. Most general ledger, accounts receivable, payroll, and personnel applications fall into this category. Function-specific data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are included in this category. General-purpose tools such as financial planning systems, linear regression packages, and other statistical routines are also included. However, when the application, tool, or data base is designed for specific industry use, then the service is industry specific.

  - <u>Industry-Specific</u> services provide processing for particular functions or problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an applications "tool" that the user employs to produce a unique solution. Specialty applications can be either business or scientific in orientation. Industry-specific data base services, where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of industry-specific applications are seismic data processing, numerically controlled machine tool software development, and demand deposit accounting.

  - <u>Utility</u> services are those where the vendor provides access to a computer and/or communications network with basic software that enables users to develop their own problem solutions or processing systems. These basic tools include terminal-handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

INPUT

- TURNKEY SYSTEMS - An integration of systems and applications software with hardware, packaged as a single entity. The value added by the vendor is in both the software and integration. Most CAD/CAM systems and many small business systems are turnkey systems. This does not include specialized hardware systems such as word processors, cash registers, and process control systems.

- Turnkey systems revenue is divided into two categories:

  - INDUSTRY-SPECIFIC, i.e, systems that serve a specific function for a given industry sector such as seismic processing systems, automobile dealer parts inventory, CAD/CAM systems, and discrete manufacturing control systems.

  - CROSS-INDUSTRY systems, i.e, systems that provide a specific function that is applicable to a wide range of industry sectors such as financial planning systems, payroll systems, and personnel management systems.

- Revenue includes hardware, software, and support functions.

C. BANKING AND FINANCE INDUSTRY TERMS

- AUDIO-RESPONSE UNIT - An audio response unit receives digital data from a processor. Part of the data activates pre-selected vocabulary. Other data (primarily numeric) is converted from digital to voice. The entire message is then transmitted on a voice line.

- AUTHENTICATE - To determine the accuracy of a user's identity or a message's certification of its time or place of origin.

- 172 -

INF

- <u>AUTOMATED CLEARINGHOUSE (ACH)</u> - An automated clearinghouse exchanges payments between members via computer media such as magnetic tape. The ACH is formed by an association of private depository institutions. Most of the current ACHs are located on the premises of Federal Reserve Banks. The ACHs in Chicago and New York are privately operated.

- <u>AUTOMATIC TELLER MACHINES (ATM)</u> - Allows consumers to initiate deposits to, cash withdrawals from, and other transactions for their bank or S&L accounts.

- <u>BANK CUSTOMER PROFITABILITY ANALYSIS</u> - A statement of the activity cost in an account and the adequacy of the compensation to the bank.

- <u>CASH MANAGEMENT SYSTEM</u> - A group of applications that includes:

    - Information for a bank customer on balances, transactions, pending transactions, and operational products. It is gathered within the bank and from other banks.

    - General information on services and interest rates.

    - The capability of initiating transactions, particularly funds transfer.

- <u>CHECK GUARANTEE</u> - Check guarantee is that process by which the services vendor guarantees that uncollectable checks will be purchased at predetermined discounted value from the retailer without recourse. The vendor takes whatever action is necessary, if any, to recover funds from the consumer.

- <u>CHECK TRUNCATION</u> - The process whereby the movement of a paper check is stopped at the depository institution first receiving the check. Pertinent information is converted to an electronic image and processed by the payments clearance system; the customer receives a descriptive account

INPUT

statement. Facsimile check copies are made available as necessary in response to inquiries.

- CHECK VERIFICATION - Check verification is a process by which the vendor advises the retailer of the likelihood that the check is good or that the check is bad based on negative data held in the vendor's data base. The retailer retains liability for uncollectable checks.

- CLEARANCE - Clearance is the process whereby retailer check deposits move from the depositing bank through a clearance bank (often the Federal Reserve) to the bank on which the check was drawn.

- CLEARING HOUSE INTER BANK PAYMENT SYSTEMS (CHIPS) - An automated clearing facility operated by the New York Clearing House Association which processes international funds transfers among its members.

- CREDIT CARD AUTHORIZATION - Credit card authorization is the process whereby the services vendor either declines authorization, approves the credit transaction within pre-prescribed limits, or obtains, as necessary, approval from the financial institution holding the credit card account. Credit card losses are borne by the participating financial institution. Provision for credit card losses are bundled in the discount rate on credit card charge amounts the merchant pays for credit card services.

- CRYPTOGRAPHY - A form of access control applicable to sensitive resources that are beyond the scope of program access control and physical access control.

- DEBIT CARD - A card that identifies the holder of a deposit account. It is generally used in conjunction with ATM or point of sale (POS) terminals and aids in the withdrawal of funds. When used with a POS terminal, the funds are then deposited from the buyer's account into the seller's account.

- 174 -

IN

- ELECTRONIC CASH REGISTER (ECR) - An electronic cash register operates as a point of sale (POS) terminal with respect to credit card authorization/check guarantee. ECRs also handle sales, data capture, balancing, and inventory control.

- ELECTRONIC FUNDS TRANSFER SYSTEMS (EFTS) - Use terminals, telecommunications, and computers to accomplish funds transfers between parties, which may be consumers, corporations, or financial service institutions.

- ENCRYPTION - A process for protecting program and data that must be stored on or transmitted over media that cannot be otherwise protected against unauthorized monitoring.

- EXHAUSTION - An attack carried out by entering all possible values (for example, of a password) and trying to supply a secret quantity unknown to the hacker.

- FINANCIAL INQUIRY SERVICES (FIS) - Provide on-line access to a wide range of security, commodity, bond, money instrument, interest rate, foreign exchange, and option price data bases directly related to activity on national exchanges. The services include the data base, remote computers, the communications network, communication controllers, and the inquiry terminals.

- GIRO - A payment system in which a bank depositor instructs his bank to transfer funds from his account directly to creditor accounts and to advise the creditors of the transfers. The depositor can specify the amount to be paid, in contrast to a preauthorized debit, which withdraws the same amount or the full amount of the bill each month.

- HACKER - An individual, usually outside a corporate organization, who attempts to gain unauthorized access to the corporate information system through random or systematic attacks.

INPUT

- **IMPLEMENTATION SERVICES** - Implementation services are professional services delivered by professional service and software product vendors related to implementing systems and applications software products. The services are primarily for software development but may include professional consulting services.

  - Implementation services cover software product installation, support, and utilization for application development and extension.

  - Implementation services are offered directly by software product vendors and by professional services vendors in support of software product sales.

- **INDIVIDUAL-BASED AUTHORIZATION** - Permitting or denying access to users according to previously recorded individual authorization, with that interaction accompanying a request for access (individual rather than resource based).

- **INTERCHANGE NETWORK** - VISA and MasterCard operate electronic switching networks that route credit card authorization messages as necessary between processing participants and financial institutions of record.

- **INVESTMENT PERFORMANCE ANALYSIS** - The evaluation of investment practices relating to market performance of security holdings.

- **KERNEL** - A security kernel is a hardware/software mechanism that contains all security-relevent operating system functions. Implementations may contain one component, called the kernel, which enforces a specified set of security rules. Other components are called trusted processes.

- **LOCK BOX (WHOLESALE/RETAIL)** - A special post office box used by a bank to receive customer payments and accelerate the collection of funds by

reducing mail and check-clearing float. Lock boxes are usually classified as retail (high-volume, low-dollar amounts) or wholesale (low-volume, high-dollar amounts).

• MARKETING ASSISTANCE PROGRAM (MAP) - A MAP is an organization selected by the local branch office of a hardware vendor to assist in the sales and/or installation of the vendor hardware and software.

• MONEY MARKET SWEEP - A review of the balances in a group of customer accounts after the close of daily business that will automatically invest all funds above a set amount in money market funds.

• MONEY MARKET TRADING - Provides a brokerage service for use by corporations and individuals wishing to invest their excess cash in short-term money market instruments.

• NEGOTIABLE ORDER OF WITHDRAWAL (NOW) ACCOUNT - A special account that pays a rate of interest and provides check capabilities. The consumer writes a NOW draft (similar to a check) which, when countersigned by the depository institution, allows for third-party payment.

• ON-LINE - A computer system in which source data are collected through input devices that directly feed and are controlled by the computer itself, which may belong to or be located at another institution. Examples of this are the Chemlink balance reporting system and most data processing or switching facilities.

• PASSWORD - Data a user provides for purposes of authentication.

• PENETRATION - An unauthorized access that gives the hacker control of the system—a type of attack.

INPUT

- <u>POINT OF SALE (POS) TERMINAL</u> - A terminal located at a retail outlet, such as an electronic cash register or a keypad-activated credit authorization or check guarantee terminal, for handling both authorization and transaction information.

- <u>PROOF AND TRANSIT</u> - Process by which MICR check amounts are encoded, batches balanced (proofed) and separated between "on us" and all others, all others sorted into demand categories, cash letters prepared for those in transit, and clearance affected through a primary bank, clearance association, or the Federal Reserve Bank (FED).

- <u>QUERY</u> - A request for information from a data base, specifically one for data collected from a number of records and presented as a sum, average, etc.

- <u>REAL TIME</u> - A word applied to systems in which data are processed as soon as they are generated. This is an ambiguous term, however, since banks use it to describe many different systems, including those that actually use batch processing. In this report, it is used in its original meaning; namely, a balance reporting system that updates the account almost as soon as a credit or debit has been processed.

- <u>REFERENCE MONITOR</u> - A computer system component that checks each reference from subject (users or program) to object (file, device, user, or program) to determine if the access is valid.

- <u>RESOURCE-BASED</u> - Permitting or denying access to users according to their ability to provide authenticating data and association with a resource request.

- <u>SAME DAY TRANSACTION REPORTING</u> - Provision to send details on debit and credit activity to a customer terminal periodically during the day.

- <u>SECURITIES TRANSACTION REPORTING</u> - The use of on-line timesharing facilities to obtain current and pending security transaction information.

- 178 -

INP

- SECURITY CUSTODY ACCOUNTS - A service rendered by banks and depository institutions, usually located in metropolitan areas, whereby securities are received for safekeeping in the vault of a bank for a service fee. This service can include buying and selling of securities, collection of dividends and interest payments, transfer of ownership, and automatic credit and debit entries to the depositor's account.

- SETTLEMENT - Settlement is the process whereby credit card transactions once balanced at the retail level are entered at the depositing bank or services vendor, sorted by the institution servicing the retailer, and transmitted and net funds due each participant determined (settled).

- SHARE DRAFT ACCOUNTS - Special share accounts at credit unions. The credit union member writes a share draft which, when countersigned by the credit manager, allows for third-party payment.

- SOFTWARE EDUCATION AND TRAINING - Software education and training are professional services delivered by software product vendors and professional services vendors, including specialized education vendors.

  - The services relate directly to mainframe, mini, and micro systems and applications software products offered by software and hardware vendors.

  - Services offered are to both IS personnel and end users.

- SWITCHING FACILITY - A facility that links ATM and POS terminals to depository and credit-granting institutions to accomplish instantaneous authorizations and fund transfers. It also links and sorts the credits and debits of institutions in an ATM or POS network.

INPUT

- <u>SYSTEM INTEGRATION</u> - System integration professional services, as delivered by professional services vendors and software product vendors, are related to integrating software products, integrating software products with hardware, and at times integrating software products with communications products.

  - System integration services are tied to commercial software products.

  - System integration services are primarily software development professional services but may include professional consulting services.

- <u>TROJAN HORSE</u> - A routine that does not contribute to the documented function of the program that contains it, but instead is something the program's developer would prevent if possible (a routine that takes advanatge of the program's security level to effect unauthorized access).

- <u>TRUSTED</u> - A component that can be relied on to enforce the relevant security policy.

- <u>VALUE-ADDED DEALER (VAD)</u> - A VAD is a local organization that stocks, sells, and supports a hardware vendor's products, adding value by including other vendor software packages and services.

- <u>VALUE-ADDED INTEGRATOR (VAI)</u> - A VAI is an organization that integrates one vendor's hardware and software with other vendors' hardware and software, adding value through its own products and services and delivering, supporting, and sometimes managing the information system for the customer.

- <u>VALUE-ADDED REMARKETER VAR)</u> - A VAR is a company that has national presence and that is authorized to sell a hardware vendor's hardware and software products in selective markets, adding value through software products and services.

- <u>WIRE TRANSFERS</u> - The electronic transfer of funds from one institution to another through the Federal Reserve Wire, BANKWIRE, or SWIFT systems.

INP

APPENDIX B: DATA BASE

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL INFORMATION SERVICES
EXPENDITURES FOR THE BANKING AND FINANCE INDUSTRY BY
MARKET SUBSECTOR, 1985-1990

	USER EXPENDITURES ($ Millions)			AAGR (Percent) 1985-1990
	1985	1986	1990	
Commercial Banks	$3,914	$4,798	$10,432	22%
Savings and Loans	767	916	1,902	20
Security and Commodity Firms	768	934	1.971	21
Other Financial Institutions	687	822	1,617	18
Total	$6,146	$7,470	$15,922	21%

INPUT
WBAN

MEDIAN FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES FOR THE BANKING AND
FINANCE INDUSTRY BY MARKET SUBSECTOR, 1991-1995

	USER EXPENDITURES ($ Millions)			AAGR 1990-1995
	1990	1991	1995	
Commercial Banks	$10,432	$12,935	$30,720	24%
Savinags and Loans	1,902	2,170	3,115	19
Security and Commodity Brokerage	1,871	2,560	7,215	30
Other Financial Institution	1,617	1,910	3,615	18
Totals	$15,822	$19,475	$47,665	23%

INPU
WBAN

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES
FOR THE BANKING AND FINANCE INDUSTRY BY DELIVERY MODE, 1985-1990

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)			AAGR (Percent) 1985-1990
	1985	1986	1990	
PROCESSING SERVICES				
Remote Computing/Batch	$2,411	$2,865	$5,583	18%
Facilities Management	898	1,056	1,900	16
Total Processing Services	$3,309	$3,921	$7,483	18%
APPLICATIONS SOFTWARE				
Mainframe/Mini	845	1,140	2,989	29
Micro	94	128	477	38
Total Applications Software	$939	$1,268	$3,466	30%
PROFESSIONAL SERVICES	1,254	1,529	3,500	23
TURNKEY SYSTEMS	644	753	1,473	18
Total	$6,146	$7,471	$15,922	21%

INPUT
WBAN

USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES FOR
COMMERCIAL BANKS BY INSTITUTION SIZE IN 1985

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)				
	INSTITUTION SIZE (Deposits)				1985 TOTAL
	Small < $100	Medium $100-500	Large $500-1,000	Very Large > $1,000	
PROCESSING SERVICES					
Remote Computing/Batch	$382	$304	$135	$601	$1,422
Facilities Management	63	136	155	275	629
Total Processing Services	$445	$440	$290	$876	$2,051
APPLICATIONS SOFTWARE					
Mainframe/Mini	90	160	70	280	600
Micro	6	7	12	25	50
Total Applications Software	$ 96	$167	$ 82	$305	$650
PROFESSIONAL SERVICES	189	196	119	349	853
TURNKEY SYSTEMS	135	71	55	100	361
Total	$865	$874	$546	$1,630	$3,915

INPU
WBAN

FORECAST OF USER INDUSTRY-SPECIFIC FINANCIAL
INFORMATION SERVICES EXPENDITURES
FOR COMMERCIAL BANKS BY DELIVERY MODE, 1985-1990

INFORMATION SERVICES	USER EXPENDITURES ($ Millions)			AAGR (Percent) 1985-1990
	1985	1986	1990	
PROCESSING SERVICES				
Remote Computing/Batch	$1,422	$1,622	$3,126	17%
Facilities Management	629	746	1,309	17
Total Processing Services	$2,051	$2,368	$4,435	17%
APPLICATIONS SOFTWARE				
Mainframe/Mini	600	823	2,230	30
Micro	50	70	281	41
Total Applications Software	$650	$893	$2,511	31%
PROFESSIONAL SERVICES	853	1,052	2,454	24
TURNKEY SYSTEMS	361	446	966	22
Total	$3,915	$4,759	$10,366	22%

INPUT
WBAN

FORECAST OF USER EXPENDITURES FOR
VALUE-ADDED NETWORK SERVICES
FOR THE BANKING AND FINANCE INDUSTRY, 1985-1990

MARKET SECTOR	USER EXPENDITURES ($ Millions)			AAGR 1985-1990 (Percent)
	1985	1986	1990	
Commercial Banks	$ 30	$100	$300	30%
Other Financial Institutions	50	55	150	25
Total	$80	$155	$450	20%

INPU
WBAN

APPENDIX C: RELATED INPUT REPORTS

APPENDIX C: RELATED INPUT REPORTS

- The Economics of Computer/Communications Networks and Their Future Impacts, 1976.

- Impacts of Upcoming Optical Memory Systems, 1983.

- Market Impacts of IBM's Software Strategy, 1984.

- New Professional Services Opportunities, 1985.

- Protecting the Corporate Systems and Software Investment, 1984.

- Market Update: Banking and Finance Information Services, 1984-1989, 1984.

- Check Guarantee and Credit Card Authorization Services, 1985.

- Electronic Data Exchange, 1985.

- Correspondent Bank Processing Services Markets, 1985-1990, 1985.

- U.S. Information Services Markets, 1985-1990, Volume 1 - Industry-Specific Markets, 1985.

INPUT

APPENDIX D: QUESTIONNAIRE

1. What is your position on changes in the structure of the banking and finance industry?

☐ Between 1985-1990

☐ Commercial Banks   ☐ Merger/Acquisitions   ☐ Regionals

☐ Money Center Banks   ☐ Independents   ☐ National Banks

☐ S/Ls   ☐ Credit Unions   ☐ Finance Companies

☐ Sears, AMEX, Penneys, Merrill Lynch, Prudential   ☐ Commercial Credit

Comments: _____

_____

_____

_____

_____

_____

_____

_____

☐ After 1991, to 1995

Comments: _____

_____

_____

_____

_____

_____

_____

- 189 -

INPUT

2.   What is your position on the changes in payments system?

☐ Between 1985-1990

☐ Fed Clearance   ☐ Check Truncation   ☐ Descriptive Statements

☐ ACH   ☐ Shared POS   ☐ Banking Networks

☐ (Swift, Fed Wire, ATM Nets, etc.)

☐ Debit Cards   ☐ Security

Comments: _____

_____

_____

_____

_____

_____

_____

_____

☐ After 1991, to 1995

Comments: _____

_____

_____

_____

_____

_____

_____

_____

INPU

3. What is your position on regualtion/deregulation of the banking and finance industry:

☐ Between 1985-1990

    ☐ Federal Reserve   ☐ FDIC   ☐ FSLIC

    ☐ Comptroller Currency   ☐ Unit Banking States

Comments: _____

_____

_____

_____

_____

_____

_____

☐ After 1991, to 1995

Comments: _____

_____

_____

_____

_____

_____

_____

INPUT

4. What is your position with respect to transaction and information security of the banking and finance delivery network?

☐ SWIFT ☐ FED WIRE ☐ VAN (i.e. Tymnet) ☐ Shared EFTS Networks ☐ Other _____

☐ 1985-1990

Comments: _____

_____

_____

_____

_____

_____

_____

_____

☐ 1991-1995

Comments: _____

_____

_____

_____

_____

_____

_____

_____

INP

5. What is your position with respect to decentralization of banking and
    finance industry operations?

    ☐ Distributed Processing   ☐ Distributed Data Bases

    ☐ Intelligent Workstations (PCs)   ☐ Other _____

    ☐ 1985-1990

    Comments: _____

    _____

    _____

    _____

    _____

    _____

    _____

    _____

    ☐ 1991-1995

    Comments: _____

    _____

    _____

    _____

    _____

    _____

    _____

    _____

INPUT

6. What is your position with respect to the growing importance of international corporate banking?

☐ Multinational   ☐ Foreign Banks   ☐ Foreign Capital
(Eurobonds, Treasury Bonds,
Loans)

☐ Merchant Banking   ☐ Export/Trading Companies

☐ 1985-1990

Comments: _____

_____

_____

_____

_____

_____

_____

☐ 1991-1995

Comments: _____

_____

_____

_____

_____

_____

_____

_____

    INP

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.

Offices

NORTH AMERICA

Headquarters
1943 Landings Drive
Mountain View, CA 94043
(415) 960-3990
Telex 171407

New York
Parsippany Place Corp. Center
Suite 201
959 Route 46 East
Parsippany, NJ 07054
(201) 299-6999
Telex 134630

Washington, D.C.
11820 Parklawn Drive
Suite 201
Rockville, MD 20852
(301) 231-7350

EUROPE

United Kingdom
INPUT
41 Dover Street
London W1X 3RB
England
01-493-9335
Telex 27113

Italy
Nomos Sistema SRL
20127 Milano
Via Soperga 36
Italy
Milan 284-2850
Telex 321137

Sweden
Athena Konsult AB
Box 22232
S-104 22 Stockholm
Sweden
08-542025
Telex 17041

ASIA

Japan
ODS Corporation
Dai-ni Kuyo Bldg.
5-10-2, Minami-Aoyama
Minato-ku,
Tokyo 107
Japan
(03) 400-7090
Telex 26487

INPUT®
Planning Services For Management