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Market Analysis and Planning Services (MAPS)

U.S. Information Services Industry-Specific Markets 1987-1992

Telecommunications Sector

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DECEMBER 1987

U.S. INFORMATION SERVICES INDUSTRY-SPECIFIC MARKETS, 1987-1992

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I

Issues, Trends, and Events

I

Issues, Trends, and Events

A Introduction

What the Bell Operating Companies can and cannot do in light of U.S. District Judge Harold Greene's three-year review of the Modified Final Judgement is one of the the key questions affecting this segment. The answer will determine many IS needs of telephone companies.

- With the exception of electronic white pages, the RBOCs will not be permitted to provide information services content. They will be permitted to provide the "gateway" functions of transmission, protocol conversion, billing management, address translation, and introductory information content.
- These terms remain to be further defined.
- Commentors on the proposals have suggested adding character generation, rate information, and other aspects relevant to information services.

The Judge's rulings may be overturned, and there are proposals for the FCC to oversee divestiture. The matter will probably be resolved in higher courts. Meanwhile, planning in an uncertain environment continues.

Beyond the question of preparing for the BOC's eventual roles in information services are continuing and new IS needs. Several companies (such as US Sprint) are upgrading installed software for billing and network management systems, preparing for increased competition in providing operator services to interexchange carriers, developing systems for newly competitive 800-number services, and planning for the support of new data services.

B

Definitions

This analysis and forecast focuses on the needs of AT&T, the Bell Operating Companies (BOCs), independent local exchange carriers (LXCs), long-distance interexchange carriers (IXCs), long-distance resellers, and cellular telephone operators.

Excluded from the analysis are value-added networks, the broadcasting and cable television industries, fiber optic and satellite networks, and international record carriers.

The analysis focuses on industry-specific products and services used by the included entities, rather than similar offerings used to manage large corporation networks.

II

Market Size and Growth

II

Market Size and Growth

Sales of industry-specific services to the telecommunications industry will total $866 million in 1987 and will grow to $2.04 billion by 1992, as shown in Exhibit II-1. This increase represents an average annual growth rate (AAGR) of 19% and is largely driven by industry needs to plan, implement, and manage new services.

A

Processing Services

Processing services of all forms represent a $510 million market in 1987. The market will grow at an AAGR of 18% to a $1.15 billion market by 1992, as shown in Exhibit II-1.

In the telecommunications sector, two forms of processing services predominate: billing and management.

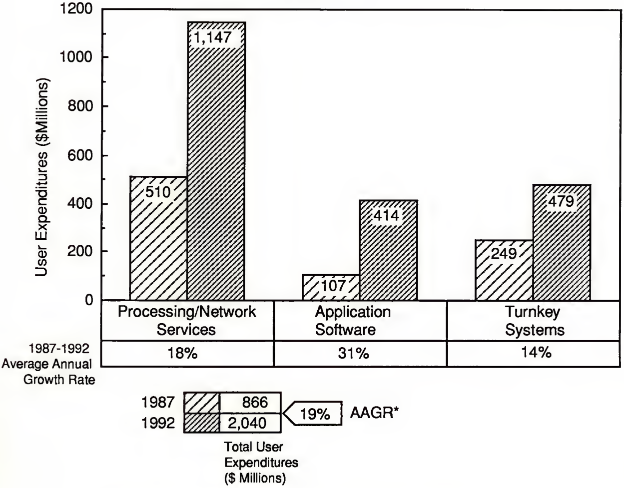
1. Billing

As US Sprint can attest, accurate and timely billing systems can be critical to cash flow and good customer relations.

- The company is planning to contract for both Bell and independent telcos to bill Sprint's customers who make over $50 in calls per month. U.S. West Service Link will provide credit card billing validation services using software developed by its Applied Communications unit.
- MCI has agreements with several RBOCs for its long-distance billing.
  - However, in at least one case (Bell Atlantic), the RBOC does not calculate MCI charges.
  - Under the experimental program, MCI prices each call, applies discounts and taxes, and sends billing data to Bell Atlantic in an invoice-ready format.

EXHIBIT II-1

TELECOMMUNICATIONS SECTOR INDUSTRY-SPECIFIC INFORMATION SERVICES USER EXPENDITURE FORECAST BY DELIVERY MODE, 1987-1992



* Does not include Professional Services Expenditures

- Bell Atlantic combines the MCI total with local charges, prints the combined charges, and mails the bill.

- MCI pays a fixed fee for the service, which, among other benefits, improves collections. The service also gives MCI greater flexibility and control in that it can implement pricing changes or promotions on its own system without concern about delays in implementing changes by the BOCs if the BOCs were providing the billing calculations themselves.

Problems with billing due to the lack of answer supervision on some central office connections for interexchange carriers caused some anxious months for IXCs serving California. The state Public Utilities Commission proposed stopping the IXCs from billing for calls of under one minute due to consumer complaints about bills for unanswered calls. Such complaints have led to software-based answer supervision solutions to obviate the problem.

Interstate billing and collections were detarriffed by the FCC on January 1, 1987.

The largest portion of telecommunications billing, that required by AT&T (with 75% of the long-distance market), is not generally available to independent vendors.

- Although AT&T announced an intention to take over most of its own billing and collections (B&C), it has negotiated with most independent telcos for such services. In the past it paid close to $2 billion per year for B&C.

- Most of the independent telephone companies negotiated through an agent and an industry association. Cellular long-distance, and low-usage customers will continue to be billed by the initial service provider.

AT&T's billing needs do represent a sizable professional services opportunity, with EDS providing facilities management and other professional services for an extended period.

Contributing to the growth in bill processing is cellular radio (over 1 million subscribers by the end of 1987), increasing long-distance usage, enhanced business and consumer services, and increasing data communications.

Also contributing to growth in future bill processing will be the BOCs' billing services (often contracted out) for information service access provided by independent companies using telco facilities, and billing systems for Local-Access Data Transport (LADT) packet-switched data networks, which most BOCs are installing.

Several billing-related services have emerged in the post-divestiture period.

- Indiana Bell is offering long-distance carriers access to a data base of customer credit information. The Communications Revenue Protection System hosts data provided by subscribing carriers on customer credit histories, stolen credit cards, and unauthorized access codes.
- The National Exchange Carriers Association has formed a subsidiary to manage detariffed billing and collection services provided by its members to AT&T under a 6-year contract for competitive billing and collection services.
  - The service will also coordinate rate calculation changes due to new services and calling plans.
  - Further, the NECA represents small telcos in resolving the differences in billing formats used in the meet-point billing process, which compares and verifies local-exchange carriers' access billing for interexchange carriers.
- US Intelco Networks has negotiated billing and collection contracts with AT&T on behalf of its telephone company owners as well as additional independent telcos.

2. Management

Services in this category include inventory tracking, repair and maintenance controls, personnel scheduling, order processing, marketing management, traffic analysis, and project management.

As new projects and services are initiated, requirements for these management processing services increase, particularly for short-term planning and project management applications that cannot be economically developed internally.

3. Other Processing Services

Directory publishing and information systems use data processing, data base management, sales, and publication services.

Specialized directories have emerged from entities other than the telcos and although some have not been successful, the telephone companies have responded with new formats such as the so-called "Smart Yellow Pages," which uses maps and graphics (requiring advanced data base and publishing systems) to increase utility and differentiate the product.

With Judge Greene's recent approval for electronic white pages, new data base management and delivery systems will be required. Eventually, a need for a universal directory assistance service may emerge, requiring

centralized storage by a third-party, or gateways to subscriber data bases maintained by the telcos themselves.

Computer Output Microform (COM) processing services remain strong among the smaller-to-midrange companies in this segment. These services reduce massive paper data bases to manageable formats and size. However, turnkey COM systems have become more affordable and are impacting third-party services throughout the size range.

B

Turnkey Systems

Turnkey systems represent a $249 million 1987 market, growing at an AAGR of 14%, and are projected to represent a $479 million market by 1992, as shown on Exhibit II-1.

Systems capable of handling network management, maintenance, multiple ranges of customer services (such as alternative operator services, toll services, and directory assistance), and of handling responsibilities formerly held by AT&T are driving turnkey systems growth.

Other turnkey systems include inventory, provisioning service/repair bureau systems, and systems supporting enhanced emergency (E911) services that are usually sold to municipal agencies.

C

Software

Application software products, as in most industries, are the fastest growing delivery mode, totalling $107 million in 1986 and growing to $414 million in 1992, for a healthy 31% average annual growth rate, as shown in Exhibit II-1.

Continuing strong performance of packaged applications software is expected because of new services being developed by market participants associated with ISDN, the need for gateway and billing software to support independent information service providers (data and voice), and software to replace aging systems.

D

Professional Services

Where no software packages for a specific need exist, professional services firms assist by custom coding for the project. Therefore many of the same drivers in software apply to the delivery of professional services.

Expenditures for professional services in the telecommunications industry will grow from their 1987 value of $594 million to a 1992 market of $1.46 billion (20% AAGR).

The continuing effects of divestiture and deregulation and the requirements of regulatory and oversight agencies on both the federal and state levels have placed new burdens on telecommunications companies. Requirements for separate subsidiaries with separate bookkeeping systems, and lately, the need to merge units previously separated, are leading to needs for flexible accounting systems able to handle the rapidly changing demands of the new environment.

Educational professional services within telecommunications are also significant, with several vendors running formal technical and strategic seminars, creating video presentations, and publishing training documentation. The industry's need for qualified technical professionals remains high, and existing employees need to be retrained in new technologies and new businesses.

III

Competitive Developments

III

Competitive Developments

A

Introduction

A "new reality" is being recognized in the telecommunications segment. According to FCC statistics, AT&T's market share of the long-distance market has declined from 80% in late 1984 to 75% based on switched-access minutes. This decline, although coupled to increased long-distance usage, is perhaps less than the alternative long-distance carriers had hoped for, but does underscore the importance of optimizing systems to maximize profit margins.

Also, continuing merger activity, both real and speculative, is taking place as the market adjusts to the new reality.

B

Mergers, Acquisitions, and Partnering

Industry consolidations, now slowing, have inhibited the market somewhat since fewer companies will exist as customers, and because sellers have joined to strengthen their stance in the marketplace. Former customers and vendors are often becoming one and the same.

There have been some failures in the partnering approach. Advanced Cellular Technologies, Inc. (ACTI), headquartered in Creve Coeur (MO), was formed as a cellular radio clearinghouse to authorize and process billing for cellular roamers.The company was a joint venture of Auxton Computers; Cincinnati Bell Information Systems; Cellular Business Systems, Inc. (recently purchased by CBIS); and McDonnell Douglas Information Systems Group. The venture was closed due to competition in this segment.

Speculation continues about a possible merger between US Sprint and MCI. Observers say that an alternative interchange carrier must hold at least 10% of the market to remain competitive. Each party has something other than market share to bring to such a merger: Sprint has its fiber optic network and MCI its billing system. The changing management at MCI may be a sign that such a merger between rivals is not unthinkable.

C

An Increasingly Global View

Many of the telcos have formed international units to pursue offshore sales and development projects. Similarly, overseas telephone companies and their subsidiaries are targeting the U.S. market. Examples of the latter include ComputAsia, a subsidiary of the Hong Kong Telephone Company, and Norway's EB Telecom.

The export of U.S. technological "know-how" is showing signs of success, but the willingness of U.S. telecom companies to install products "not invented here" remains to be proven.

Among the activities of RBOC international subsidiaries are:

1. Bell Atlantic International

This company is providing professional services and software to PTTs for telephone company order processing, and maintenance/installation control.

2. Bell South International (BSI)

BSI is active in Europe, India, Central America, and the Far East. For Guatel in Guatemala, BSI is developing digital network services. In India, it will provide training and technical support on data communications in support of establishing a nationwide data network.

3. NYNEX International Co. (NIC)

NIC has opened offices in Europe and the Far East and has agreed with Japan's NTT and France's DGT for personnel and information exchanges leading to new products and services. With the French PTT, NYNEX will jointly market services via seminars to customers with communications needs in France and within NYNEX's territory.

NYNEX is also a participant in a joint venture for fiber optic services between the U.S. and Europe.

The company's motivation for pursuing international activities is the presence of Multinational Corporations (MNCs) in the New York and Boston areas. MNCs in this customer base are likely to be now using or needing foreign-operated services, giving the RBOC an entrée to the market.

4. Pacific Telesis International (PTI)

PTI has developed relationships with the PTTs of Spain (research and development facilities), Kuwait (cellular radio), and Thailand (for digital paging services).

- In Japan, the company plans a 10% investment in International Digital Communications, a transpacific carrier, pending approval from federal regulators.

- In its pursuit of international business, Pacific Telesis is representing itself as a source of California high technology

5. Southwestern Bell

The St. Louis-based company is working with PTTs in Europe on software development, primarily applications for managing telephone company operations. It is also providing support for automated directory services (Israel) and directory advertising sales (Australia).

D

Vendor Profiles

This section profiles vendors providing processing services, professional services, software, and turnkey systems to the telecommunications industry. It focuses on major market participants and innovative firms, with particular attention paid to recent developments.

Additional information about these and other companies can be found in the *Vertical Market Telecommunications Analysis* published by INPUT in October, 1986. Many companies are discussed in INPUT's Company Analysis and Marketing Service (CAMS) reports.

1. AGS Computers, Inc.

AGS (Mountainside, NJ) provides custom software development, professional services, and applications software for the telecommunications, banking/finance, and computer manufacturing industries.

Approximately 25% of AGS' 1986 computer services revenue of $159.7 million was derived from telecommunications, the majority from AT&T. AGS has approximately 3,000 employees.

AGS Information Services (formerly AGS Systems Development) has provided services to AT&T since 1970 and was engaged in more than 100 AT&T and affiliate projects at the end of 1986. As a result of this association, the unit has a large UNIX consulting staff. Since divestiture, AGS has also supplied UNIX services to other computer companies and large end-user organizations.

2. American Management Systems, Inc.

AMS (Arlington, VA) is working to replace all computer applications at PacTel Personal Communications (a Pacific Telesis subsidiary) for cellular telephone lead tracking, order entry, call processing, and billing and financial management systems. Installation will be in multiple data centers.

For U.S. Sprint, the company is performing a feasibility study to install the AMS Message Processing System at Sprint.

AMS' computer-assisted collection system has been sold to AllTel Corporation, MCI, and Sprint, for on-line scheduling, assignment, and distribution of collections work.

Earlier, the company acquired the rights to a software package developed by Pacific Telecom, Inc. for its telephone operating companies and also used by telcos in the AllTel group.

- The package, called Carrier Access Billing System Plus, has been enhanced with updated tariff information.
- The package is targeted to local telcos and will help them generate reports and handle billing for interexchange carriers accessing local telco networks.

Other applications under development as part of the Customer Account Management System support customer billing, message processing, and customer order entry – all operating on IBM mainframes. The company plans other joint ventures to develop software for the telecom industry.

AMS has a long and continuing relationship for providing systems development and support services for all units of MCI in order processing, billing, accounts receivable, and collections.

The company provides services and software to this segment as well as to financial services institutions, government agencies, and utilities.

AMS reported 1986 revenues of $135.5 million, with 3% or $4.4 million from the telecommunications industry, an increase of 42% from 1985. AMS expects to receive approximately $7 million in revenues for services to the industry in 1987, an increase of 82% from this segment, on total anticipated revenues of approximately $170 million, or a 27% overall increase.

One part of AMS' strategy is to work contractually and jointly with clients in software development projects.

3. Bank of Illinois

The Bank of Illinois (Champaign, IL) operates a data center that provides processing services to telecommunications organizations and other entities.

Regional independent telephone companies and cellular operators currently use the data center's billing and other services, although the center is believed to have lost a major cellular account in 1987.

The data center sees its major competitive strength as its stability. Backed by a financial institution, it's able to expand without needing external resources.

4. Bell Atlantic Software Services

This BOC group offers approximately 50 software products in three categories: telco-specific, telco-specific but easily modifiable for other industries, and general-use applications.

Additionally, the Bell Atlantic Service Bureau offers timeshared applications on an occasional basis.

Target markets are other BOCs, independent telcos, and interexchange carriers.

5. Bell Communications Research (Bellcore)

Bellcore was formed from AT&T's Central Services Organization (CSO) after divestiture to provide technical and other support to the Bell Operating Companies and their regional affiliates. Bellcore also participates in international standards forums and administers the North American Numbering Plan.

Among the professional services provided are applied research in evolving technologies and ISDN. Other new services are planning, software, documentation, training, and field support.

Bellcore is a leading provider of telecommunications software to the BOCs. Bellcore supports over a hundred individual systems, from large mainframe programs to microcomputer applications.

6. Bell South Advanced Systems

This Birmingham (AL) unit is developing ISDN-compatible software with Digital Equipment Corporation and Northern Telecom to integrate applications and communications between computers and PBXs. On-line directories and other features are under development.

7. Cincinnati Bell Information Systems, Inc. (CBIS)

CBIS (Cincinnati, OH) is an unregulated, fully separated subsidiary of Cincinnati Bell, Inc. It provides telecommunications software and services to BOCs, independents, and offshore telecom companies for billing and outside plant management, and has ventured into processing services with a cellular radio offering. Its products are also sold to corporate telecommunications users.

Among its software products and services are systems for customer billing, order entry, message processing, cable records, customer service, construction force management, and cellular account management.

CBIS has acquired several entities to bolster its service and software offerings. For example:

- Auxton Computer Enterprises was purchased in 1987 for approximately $86 million after several joint ventures. Auxton now operates as a CBIS subsidiary.
  - Auxton provides processing services for long-distance carriers, resellers, cellular operators, and paging services.
  - Auxton software available for customer IBM processors includes packages for service orders, customer records, cable records, central office inventory, and engineering work orders.
- Cellular Business Systems, Inc. (CBSI – Park Ridge, IL), was acquired in 1986 as a division of CBIS.
- Creative Management Systems, Inc. (McLean, VA), a designer of telephone call accounting software systems, was acquired in 1985.

The company maintains offices in London and Hong Kong, and has done work developing a call record system for British Telecom's 800 service. Additionally, it developed a billing system for Telecom Australia.

The company has grown from 200 employees in 1983 to over 1200 presently.

8. Computer Consoles, Inc. (CCI)

CCI (Waltham, MA), a major provider of turnkey systems, experienced declining revenues in 1985. The decline was attributed to various factors, including overly optimistic sales projections, inadequate marketing resources to support diversification efforts, and organizational and internal communications problems.

In 1986, the company reported a net loss of $3 million on revenues of nearly $130 million.

- This loss represents an improvement over the previous year. The improvement was due to sales of Direct Access Intercept System II and to an $18 million order for directory assistance equipment to British Telecom.
- Further, the company's diversification beyond telecommunications markets is starting to bear fruit, with a sales program through resellers now in place.
- Quarterly results for the period ending September 30, 1987 showed revenues of $37.8 million, the fifth consecutive profitable quarter.

New products introduced in 1987 include the Automated Listing Services system for telcos to expand electronic white page directory services.

- The system is a fault-tolerant configuration of CCI's own supermin-computer and its software. It provides customer name and address services and direct customer access via microcomputer.

Other products in the family are Electronic Yellow Pages and Internal Directory Services
for corporate users. INPUT feels this product will benefit from recent rulings allowing the
BOCs to offer electronic white pages services.

CCI has cut its work force and closed its Computer Products division because of continuing losses and is abandoning its low-end systems development effort.

The company is continuing expansion from its focus on the telephone industry to integrated office systems sold along with other large customized turnkey systems to telcos, the federal government, and special vertical markets such as law firms.

In late 1986, CCI announced a development agreement for an interface between CCI's directory assistance/enhanced listing services data base and Northern Telecom's digital central office switches supporting the Traffic Operator Position System (TOPS).

- The agreement, said to be the first between a directory assistance data base supplier and a digital switch maker, is expected to result in development of a system enabling telcos to handle both information and toll/ operator assistance calls simultaneously.

- In addition to information and toll calls, Northern Telecom's "universal service position," which is competitive with a U.S. West product, enables an operator to handle access to electronic yellow pages, automated list services, nonpublished call back, and message delivery services.

- In July 1987, a similar agreement was announced with Rockwell International Corporation to connect Rockwell's operator call management switch with CCI's directory service and audio response system. The system can use either CCI's terminal or one developed by Rockwell jointly with US West Knowledge Engineering. First installations will be in the second half of 1988. Both companies will market the system.

9. Computer Horizons Corp. (CHC)

This New York-based firm is primarily involved in providing custom software analysis, design, and programming services to the communications as well as other industries.

Fiscal 1987 (year ending February 28, 1987) results show that an estimated 33% of the company's operating revenue of $58.5 million was derived from the communications industry, a decline of nearly 13% from 1986 due to leveling off of business from AT&T. Overall, the company grew 15%.

CHC is diversifying into other areas due to slowed growth in the communications segment, but maintains its long-term relationships with AT&T and the divested BOCs. For Bell Atlantic Network Services, CHC is marketing Strategic Architecture Methodology and a DB-2 data dictionary to financial institutions and others.

Earlier projects included design and development services for various aspects of new telephone billing systems created by AT&T's reorganization, as well as other administrative and financial information systems.

10. Computer Task Group

CTG (Buffalo, NY) was founded in 1966, and is one of the largest professional service firms in the commercial market.

CTG's 1986 revenues were $143.4 million, a 24% increase over 1985.

Telecommunications clients include 11 RBOCs and BOCs. Project examples are:

- CTG analyzed a BOC's operating systems and data bases to recommend improvements and provide technical support during implementation.
- The company provided installation, enhancement, and production support for financial software packages at another BOC.
- For a RBOC, CTG reviewed an Information Center design and recommended improvements from operational and human factor perspectives.
- For another BOC, the company modified the order entry and customer billing services.
- For an interexchange carrier, CTG is maintaining and providing special project support for a marketing information system.

11. Comshare, Inc.

Comshare (Ann Arbor, MI), founded in 1966, is one of the earliest companies to offer commercial timesharing services.

While processing services are still a major business, the company is focusing on promoting decision support systems (DSS).

The company's telecommunications industry applications are called 4.1.1. and include an integrated system for telcos to control administrative activities such as telephone number assignments and voice traffic load balancing.

- The principal 4.1.1. product is MIDAS (Mechanized Dial Assignment), which changes office records when a service order is written, and recalculates load balance when equipment or circuits are changed.
- Incorporated in MIDAS are several modules for equipment balancing, and modules to support analog-to-digital central office switch conversions and translations, to manage the main distribution frame, and to manage outside plants.
- All applications are available through remote computing and can be licensed for IBM MVS environments.

The company sells to AT&T, Pacific Telecom, British Telecom, Alltel, Ameritech, MCI International, Telecom Canada, as well as other telephone groups and overseas companies.

12. Data Architects, Inc. (DAI)

DAI (Waltham, MA) ended its 1986 fiscal year with $27 million in revenues, a 29% increase from the previous year. Approximately 10% of its revenue is from work in the telecommunications sector.

In 1987, DAI signed a contract valued at over $3 million with Southern New England Telecommunications Corporation for procurement of the development of SONAR (Service Order Negotiation and Retrival), a product originally developed for U.S. West, and marketed by DAI. SONAR automates the service order process for ordering phone and line equipment with interfaces to all associated computer system applications such as inventory, billing, customer records, and scheduling.

In January, 1983, DAI developed and installed the Call History Information Processing System for U.S. Sprint. The system processes and relays records for toll calls to national centers.

In 1985, for the British Columbia Telephone Company, it built the NICS (Network Information and Communications System) network management support system, which takes data from different types of voice network switches, and monitors and manages traffic patterns. As with

SONAR, DAI maintains exclusive marketing rights to the system, and receives revenues from installation, training, and customization professional services.

13. Digital Equipment Corporation

DEC, through its Computer Integrated Telephony program, is working with several equipment manufacturers and BOC units on applications supporting Centrex and other services.

14. Electronic Data Systems

EDS (Dallas, TX) is involved in professional services for the telecommunications industry, with long-term contracts with AT&T, and more recently with Contel Service Corporation and American Information Technologies Corporation (Ameritech), for systems development and facilities management of billing operations.

- EDS operates the AT&T WATS/800 billing Conversion System, and is enhancing the AT&T Federal Billing System.

- EDS was awarded a contract to digitize engineering plant records at Indiana Bell.

- EDS is custom designing a system to maintain outside plant records and automated a formerly paper-based mapping system of facilities for the five Ameritech telephone companies. The project is expected to take three to five years, and may be further enhanced with artificial intelligence so that the system automatically performs plant engineering and design.

15. General Electric Information Services (GEIS)

GEIS (Rockville, MD) offers the Mechanized Assignment and Record Keeping (MARK) service through its remote computing service.

The MARK service supports a wide range of telephone service assignment tasks, and validates addresses, assigns telephone numbers, and identifies equipment available for new service.

The modular system interfaces through IBM PCs and compatibles to telephone company applications supporting service orders, trouble analysis, repairs, line testing, inventory, outside plant cable management, engineering graphics, network management planning, customer billing records, street address guides, and central office switching management. Thus, MARK integrates with existing customer support systems, and provides usage, line saturation, and other relevant reports. It also validates subscribers' long-distance service equal-access selection.

MARK was developed in association with General Telephone of Florida at an estimated cost of $25 million. The service is provided on a fixed monthly fee basis.

16. GeoVision Corporation

The Ottawa (Ontario) company was founded in 1974 to provide software and professional services for geoprocessing and mapping applications. While its products are primarily used by survey and mapping firms, the company plans to target utilities (particularly telephone companies) in the future.

- In 1987, GeoVision sold to Southwestern Bell Telephone a system that enables engineers to view any portion of a job area, to identify plant facilities and their specifications, and to prepare and process work orders.
- Beta testing is scheduled for March, 1988, using Unisys computer equipment.

17. GTE Data Services (GTEDS).

This Tampa (FL) data processing subsidiary of GTE performs most of its processing and facilities management work for GTE domestic and overseas telephone companies (i.e., captive processing) through its proprietary SNA network connecting approximately ten data centers.

GTEDS also handles long-distance landline and cellular bill processing for AT&T Communications traffic within GTE's territory.

In 1987, the company bought a national roaming clearinghouse for cellular telephone service, the Positive Roamer Validation system and Cell-U-Rator message processing system, from Bell Atlantic. Positive Roamer minimizes unauthorized usage and Cell-U-Rator performs toll and airtime rating and billing. The acquisition was said to give GTEDS a leading position in information management for cellular operators. Cellular services are offered through the company's Cellular Account Management System.

The company is working to market software and services to other telephone companies, and to leverage its experience in data center facilities management for commercial markets beyond telecommunications. GTEDS has approximately 200 employees.

18. IBM

Working with several equipment manufacturers (Siemens, Ericsson) and telephone companies (Bell Atlantic, United Telecommunications), IBM is studying the development of software interfaces based on Bellcore's Intelligent Network architectures for new international services. These

new services include 800 service, alternate billing, credit card validation, and virtual private networks.

19. McDonnell Douglas Communications Industry Systems Company (MDCISC)

McDonnell Douglas acquired Computer Sharing Services (a division of Rio Grande Industries) of Denver in January, 1984, and Tymshare in April, 1984. These companies' services are combined with some of McDonnell Douglas' mainframe products and services to form the newest entity, a part of McDonnell Douglas Information Services Group (ISG) that consolidates overlapping products and sales forces.

The company offers processing services directed to telephone companies. These services include adaptations of general services as well as those especially designed for the industry.

- The Outward Telephone Information System (OTIS) tracks telephone set inventory, movement, and performance.

- The Pricing and Loading system (PAL) assists in managing the repair and maintenance of switching equipment.

- Several facilities administration applications are included in the Management Scheduling and Control System (MSCS), which is adapted for telephone applications. MSCS is an integrated system for analog-to-digital switch conversion, and it is used for other large-scale project management tasks.

MDCISC is a large processor for the industry outside the former Bell system, with all 22 BOCs, the RBOCs, AT&T, and the major independents claimed as customers.

In 1987, the company arranged with Audre, Inc. to market that company's line of automated digitizing and recognition systems to the North American communications industry.

20. National Data Corporation

National Data Corporation (Atlanta, GA) is offering alternative operator services to US Sprint, and to American Telecommunications Corporation (Dallas, TX), a long-distance provider to the hotel industry. The service supports person-to-person calls, collect calls, and credit card calls.

For NYNEX, the company was developing and testing an automated yellow pages system in Albany, NY. Expansion of the testing phase was truncated since is inconsistent with the Modified Final Judgement as an information service. Under the service, callers could locate specific businesses (such as ethnic restaurants) by location.

The company is also in the third year of agreements with AT&T and BellSouth to sell a telephone credit card processor as part of a system allowing callers to use major credit cards.

Earlier, NDC handled AT&T's long-distance "equal access" selection promotional campaign.

21. Northern Telecom

This (Richardson, TX) manufacturer of telecommunications equipment is developing a central-office-based decision support product called Planet to analyze data traffic from multiple central offices and to assist network traffic planners in optimizing network configurations. Planet is scheduled to be available in early 1988.

22. Rockwell International

Rockwell's Common Carrier Systems, Switching Systems Division (Downers Grove, IL) markets a digital Service Node with enhanced 911 software. This system routes emergency calls from several central office areas to public safety answering points, regardless of serving area, municipal, or service agency boundaries. The system also forwards automatic number identification data and this allows rapid identification of the calling party and location.

23. Science Dynamics Corporation

This company has formed a joint venture with Northwestern Bell to develop and sell central office products using automatic number identification (ANI) systems. The initial product will be an enhanced version of a system for automated ordering of pay-per-view events by cable television viewers. Five other telcos are currently using the system, and other products using ANI are planned.

24. Telesciences Inc.

Telesciences Inc. (Morristown, NJ) has agreements with several BOC subsidiaries to sell its Subscriber Electronic Billing Complex (SEBX) Automatic Message Accounting/Billing Data Collection System, consisting of a portable data unit and host. The unit captures call record data at the central office and is polled by the host for preparing bills.

25. TelcoSolutions, Inc. (TSI)

TSI (Ramsey, NJ) was formed in 1976 as a software and systems company. It designs Tandem systems for telcos and others. Among its products are InfoQuote, an operator services systems with automatic charge quotations, ratings, telemarketing, and other features. Other products are targeted to corporations and include internal directory and Electronic mail systems.

The company has agreements with US West Knowledge Engineering Inc. for joint product development and marketing.

26. TDS Computer Services

TDS, based in Madison, WI, is a wholly owned subsidiary of Telephone and Data Systems (TDS), a telephone operating group.

The company primarily services TDS companies, including 70 telcos, 16 CATV firms, and paging and mobile telephone companies throughout the Midwest and eastern states.

TDS Computer Services claims 1985 revenues of approximately $7 million.

TDS says it is developing distributed systems; however, in the case of long-distance billing, it sees economies of scale in maintaining centralized processing.

27. U.S. Intelco Networks

This Olympia (WA) company is owned by 160 independent telephone companies. The company provides processing services through its Allied Data subsidiary, and has several software packages called Telco:Allied. These services are for billing, general ledger, payroll, customer service, and other related functions.

In 1987, the company introduced the menu-driven PC-based Carrier Billing System Version 3 for independent telephone companies to manage and produce interexchange carrier access bills and reports.

Also, the company negotiated a contract with AT&T to handle long-distance billing and collections for over 300 independent telcos.

The company claims over 525 independent telco clients for all its services.

28. U.S. West

This Denver-based RBOC sells telecommunications software for PCs through the Information Systems Division.

U.S. West subsidiary Knowledge Engineering Inc. (KEI) sells an IBM XT-based Multiple-Purpose Operator Workstation (MPOW), which is designed to Bellcore specifications and compatible with several digital toll switches.

- Agreements are in place with Rockwell International and DSC Communications Corporation (Plano, TX) for sales to IXCs and the alternative operator services market.

- KEI also has an agreement with TelcoSolutions, Inc. (Ramsey, NJ), a software and systems company, to market existing products and develop new ones. The first new product will be an enhanced directory assistance retrieval system for small and medium-sized telcos using TSI's software, KEIS MPOW workstations, and a Tandem computer. TSI's other products are described above.
  - MPOW features enhanced graphics and handles toll, directory assistance, and supervisor functions, with access to LAN-based data bases for rate and route information.
  - Because it is a DOS-based system, it will also operate telco-developed applications.
  - The company cites the system's adaptability to changing switches, information, and software as a key benefit over competitive products based on minicomputer-hosted dumb terminals. Another benefit is faster response time.

Landmark, U.S. West's publishing company, has purchased several other telephone directory publishers to expand its directory operations. The company and its subsidiaries publish some 800 telephone and city directories in 42 states.

29. Volt Information Sciences

This New York City company designs, markets, and maintains customized turnkey systems. The company also provides professional services, custom software development, and consulting for the telecommunications industry.

Fiscal 1986 revenues were $427.6 million, with a net loss of $4 million due to write-downs.

Volt's turnkey systems, based on DEC VAX and PDP equipment, are used for printed and electronic telephone directories and directory assistance systems.

In association with United Telecom, Volt is offering The Information Line in the Kansas City area, and in association with United Telecommunications is offering a similar service in Atlanta. These are information retrieval systems enabling an operator to provide callers with information on local business advertisers.

In 1986, the company acquired two subsidiaries of The Grantz Group, Datacomp Corporation and DataServ. These subsidiaries produce and compile white and yellow page directories, and offer data base management and typesetting services to telcos. Volt also acquired half the stock of DataNational Corporation, which publishes speciality and local telephone directories.

In 1987, the company, through a subsidiary, formed a joint venture with Pacific Bell Directory to automate directory publishing.

30. Others

Smaller firms selling to the telecommunications market are:

- Appex-Lunayach Systems Corporation (Waltham, MA) custom develops software on DEC equipment for most business and engineering aspects of telecommunications companies. Its cellular roaming technology, called Appex Positive Roamer Verification System, was endorsed by an industry association as a national system and was in use by Bell Atlantic (until a sale to GTEDS) and by NYNEX.

- Commercial Software, Inc. (New York, NY) provides several software packages for cost allocation, telecommunications equipment management, on-line inquiries and credit card authorization, trouble reporting, network management, and network optimization and design, primarily for DEC VAX processors.

- Computer Generation (Atlanta, GA) is selling the Regional Bell Operating Companies a DEC-based system to support measured local services.

- Data Products Inc., an affiliate of Sugar Land Telephone (Texas) is marketing carrier access billing system for IBM System 36 and S/38 computers, and a variety of integrated telephone company management applications called Telco Friendly 36 for the S/36. The company is an IBM Value-Added Reseller, and provides a variety of professional services.

- Emery DataGraphic, a division of Harris-McBurney (Englewood, Colorado) provides professional services consulting and conversion to telcos and other utilities to automate mapping and facilities management record-keeping systems.

- Geographic Systems, Inc. (Andover, MA) provides marketing software for the geographical analysis and forecasting used by New England Telephone for planning wire centers and telephone exchange capacities. The company also performs professional services.

- Mid-America Computer Corporation (MACC) (Blair, NE) provides billing services and sells a turnkey system. MACC is the national data administrator/billing center for the Air-Ground Radio Automated System (AGRAS), which provides dial-up telephone service to general-aviation pilots.

- National Telephone Services (Atlanta) provides alternative operator services.

- North Central Data Cooperative (Mandan, ND) is a data processing cooperative servicing member telcos and other independents, as well as electric and other rural utility companies. The cooperative sells turnkey systems based on Burroughs processors. Software maintenance and consulting services are also available.

IV

Information Systems Department Outlook

IV

Information Systems Department Outlook

A Overview

In some cases, IS departments at telecommunications entities have been overloaded due to the continuing demands and fallout of divestiture, a more competitive environment, and regulatory agency requirements for accurately reported data. It is therefore not surprising that deregulation and divestiture remain as the key drivers of change within the industry.

In addition to keeping up with routine demands, IS is taking a more active role in marketing, tracking customer information, identifying prospects for new services, and even participating in the sales process of technically advanced solutions.

In addition to reducing staffing needs, new technologies are being investigated to permit telecommunications companies to provide not just better, but more rapid service to customers. The threat of more flexible competitors is changing attitudes in the formerly monopolistic environment.

B Budget Analysis

This analysis is based on information collected from telephone company IS managements. It does not cover the entire spectrum of the telecommunications industry, as described in Chapter I, Section B, and does not include expenditures in departments other than IS.

It is important to note that the data gathered from IS managers often represented budget requests and that actual expenditures will vary from the received budget.

Exhibit IV-1 shows the 1986 budget distribution and the projected budget growth for 1987 in this segment.

EXHIBIT IV-1

1986 BUDGET DISTRIBUTION AND 1986-1987 CHANGES IN THE TELECOMMUNICATIONS SECTOR

BUDGET CATEGORY	1986 I.S. BUDGET (Percent)	1986 -1987 EXPECTED BUDGET GROWTH (Percent)
Personnel Salaries and Fringes	32.1	3.7
Mainframe Processors	5.4	15.7
Minicomputers	5.2	17.2
Microcomputers	2.8	11.5
Mass Storage Devices	1.5	4.6
Other Hardware	12.0	22.3
Total Hardware	26.9	25.2
Data Communications	3.4	-12.0
Voice Communications	1.9	-11.0
Processing Services	12.2	24.6
External Applications & Systems SW	7.2	19.0
Professional Services	5.6	14.1
Turnkey Systems	5.9	14.0
Software Maintenance	1.6	0.6
Hardware Maintenance	1.3	16.1
Other	1.9	3.3
Total	100.0	12.0

The largest budget growth areas are in hardware, processing services, software, professional services, and turnkey systems.

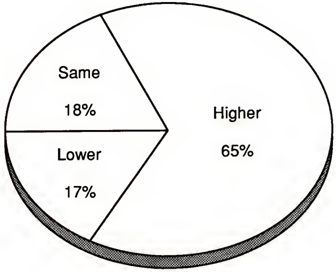
- Overall, hardware budgets, now accounting for approximately 27% of the IS budget, are expected to increase 25%.
- Processing services, now accounting for approximately 12% of the IS budget, are expected to increase nearly 25%.
- Externally purchased applications and systems software, representing slightly over 7% of the budget, are expected to increase 19%.

The categories expected to decline are data communications, voice communications, and other services expenditures.

Exhibit IV-2 shows that approximately 83% of the respondents expect their IS budgets will increase or remain the same for 1987, while 17% expect lower budgets.

EXHIBIT IV-2

TELECOMMUNICATIONS BUDGET CHANGES, 1986 -1987
(Percent)



Factors contributing to the increases in 1987 IS budgets were:

- Increased purchasing in support of planned data communications services and for more-effective corporate information management systems.
- Increased use of specialized applications and services available from third-party processing vendors.
- Expected increases in needs to maintain newly purchased hardware, in some cases due to reduced staffing.

Factors contributing to decreasing or modest increases in IS budgets were:

- Increased use of corporate facilities for data communications.
- Lower costs and more-effective management of voice communications services.
- Increased reliance on internal capabilities for software maintenance.

Overall, IS departments expect a 12% budget increase for 1987.

V

New Opportunities

V

New Opportunities

Technological change is creating new opportunities in the telecommunications segment. Many of the BOCs are installing local packet-switching networks and are positioning themselves to offer a wide variety of new services as the regulatory climate permits. These new network services will provide opportunities for vendors, as well as continuing needs for systems and services to replace those antiquated in the new environment, and needs for internal management improvements.

A

Electronic Data Interchange

Electronic Data Interchange (EDI) services for provision, procurement, and use of telecommunications equipment, products, and services, using the Telecommunications Industry Forum (TCIF) subset of the ANSI X12 EDI standard, are being addressed. Approximately 100 companies are participating in developing data segments addressing the industry's unique needs, as well as discussing bar coding and standardized product coding.

- EDI billing systems for large telecommunications users are apparently not currently being examined, and remain an opportunity area.
- EDI billing systems would provide machine-readable, detailed records directly to customers' accounting systems for internal processing, cost allocations, and payment, ideally through electronic funds transfer.
- Utility companies are examining similar systems for their large electricity customers.

Several BOCs are evaluating their options as EDI services, and Southern New England Telephone has made known its intention to resell another company's service through its ConnNet Local-Access Data Transport network.

B

New Billing Systems

One interexchange carrier (IXC) has stated that the Carrier Access Billing System used by most of the local-exchange carriers (LXC) needs to be replaced, and has proposed alternative ways of billing for access.

- Suggested alternatives are quarterly statistical sampling, end-office traffic averaging, or trunk group measurements.

- Such changes would have a widespread impact in the industry, and would basically require "starting from scratch" since CABS apparently cannot be modified to provide billing as accurately as desired by the IXCs.

C

Gateways and Billing Systems for Information Service Providers

Software for anticipated access to a variety of information service providers, and for billing consumers for usage, will be needed once the BOCs get clarification on the specifics of what they will be permitted to offer.

D

Traffic Management for Large Users

End users have shown interest in measuring network traffic, not only through the serving central office, but to their entire networks. With virtual private networks becoming increasingly used, this feature will be required.

E

Security Systems

Software and systems supporting security functions within data and voice services are needed. Software is being developed to spot "hackers" attempting to test access codes against long-distance exchanges. After detection, the next attempt is permitted, the line trapped, and the call traced to the violator.

F

ISDN Applications

The Integrated Services Digital Network (ISDN) is currently being tested. When implemented, ISDN-related applications will be needed. Examples include: messaging, teleconferencing, data base information services, transactions, and telemetry applications for alarms, equipment monitoring, and utility management. ISDN thus represents opportunities for software development, professional services, information providers, and third-party services.

G

Artificial-Intelligence-Based Controls

Network planning, testing, management, and configuration systems drawing upon individual and group knowledge through artificial intelligence are just beginning to appear. These controls will be needed in the telecommunications industry and by large users facing staff and expertise shortages and rapidly changing needs.

H

Mobile Data and Cellular Opportunities

Other emerging areas in telecommunications are mobile data applications (using cellular, paging, or other radio common-carrier frequencies) for field personnel and other requirements, digital radio-based rural telephone systems, proposed mobile satellite communications services, and radio positioning/messaging systems.

Proposed rural telephone systems may offer niche opportunities. An estimated 1 million homes are currently beyond telephone network services. Cellular-like systems are being considered as new and replacement installations.

Longer-term, once-amortized, currently analog cellular telephone networks will eventually be replaced by digital technologies. This replacement will require project management, new supporting systems, and other applications.

VI

Recommendations and Conclusions

VI

Recommendations and Conclusions

For vendors considering product or service development in this market, INPUT recommends:

- Vendors should be aware of the fact that needed systems are often massively complex and interrelated, a fact that can heavily influence service or software design, and require long-term contracts and relationships.

- Vendors should examine ways of adapting software, systems, and services to large telecommunications users who are operating and managing their own facilities, and for international (particularly developing) markets where telecommunications infrastructures are still being developed.

TE-A

Appendix: Forecast Data Base

EXHIBIT A-1

TELECOMMUNICATIONS INDUSTRY SECTOR INDUSTRY-SPECIFIC USER EXPENDITURES FORECAST

1986-1992

Segmentation by Delivery Mode	($ M) 1986	86-87 Growth (Percent)	($ M) 1987	($ M) 1988	($ M) 1989	($ M) 1990	($ M) 1991	($ M) 1992	AAGR 87-92 (Percent)
Processing/Network Services									
Remote Comp/Batch	400	22	487	584	695	821	960	1,098	18
Facility Management	20	15	23	27	31	36	42	49	16
Total Processing Services	420	21	510	611	726	857	1,002	1,147	18
Applications Software									
Mainframe/Mini	61	48	90	125	165	208	252	297	27
Micro	12	42	17	25	36	53	78	117	47
Total Application Software	73	47	107	150	201	261	330	414	31
Turnkey Systems	218	14	249	283	323	368	420	479	14
Sector Total	711	22	866	1,044	1,250	1,486	1,752	2,040	19

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