Market Analysis Program (MAP)

Industry Sector Markets 1989-1994

Medical

Forecast Update

INPUT®

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

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MEDICAL

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I

Introduction

A

Medical Sector Applications

The changing environment of the medical services industry has expanded the breadth of products and services available from information services vendors.

INPUT divides the health services market into three sectors: hospitals, physicians (including dentists, osteopaths, and health practitioners), and "other" medical (which includes nursing facilities, laboratories, home health care services, and health and allied services).

Hospital sector applications are classified into administrative, financial, clinical, resource management, and decision support operations. Exhibit I-1 shows typical hospital sector applications and their attendant functions.

Applications in other sectors of the medical industry include systems to track managed care, link physicians and outlying clinics with hospitals, and manage home health care services.

B

Key Technological Developments

A trend toward integration of these applications has led developers and users down two paths:

- Integration of applications using a centralized data base system
- Integration of applications using a distributed processing system

The centralized approach assumes that applications for different departments feed into a central data base, typically patient-centered and managed by an information systems (IS) group under corporate control. Centralized systems offer a better fit between applications since the entire system is developed around a central data base. However, vendors are

EXHIBIT I-1

Hospital Sector Applications

Application	Function
Administration	Admission/registration/discharge Patient accounting Medical records Master patient index Census Quality assurance DRG management
Financial management	General ledger Accounts payable Accounts receivable Facilities/utilities management Management reporting Payroll/personnel
Clinical management	Order processing Results reporting Laboratory Radiology Pharmacy Pathology labs Respiratory Dietary
Resource management	Nurse staffing Materials management Inventory control Appointment scheduling
Decision support	Cost accounting Trend analysis Performance monitoring Planning Marketing

finding that users who have sunk considerable sums of money into separate departmental systems are reluctant to replace them all with a centralized system.

The decentralized approach calls for the various departments' applications to be linked, thus allowing data to be shared between them. The decentralized approach allows users to build on the systems already in place, but may show gaps in the bridges among applications.

Regardless of the approach, both centralized and decentralized systems run into obstacles when the question of connectivity arises.

Some attention is being focused on the Health Level 7 (HL-7) standard, a two-year-old communications standard derived from the seven-layer Open Systems Interconnect (OSI) model. HL-7 is intended to describe the content and structure by which heterogeneous systems can communicate. This standard currently addresses admission/discharge/transfer (ADT), order entry, patient billing, laboratory, pharmacy, and radiology. Future specifications, expected to be rolled out in 1990, will include payroll/personnel, general-ledger, and other back-office applications.

With rapid progress already being made on this standard, HL-7 may very well be defining vendors' future development efforts.

II

Issues, Trends, and Events

Health care providers are caught between the rapidly rising costs of delivering health care services and pressures to contain costs from both the public and private sectors. This environment creates opportunities for information services vendors that can clearly demonstrate the quantitative and qualitative benefits of their products and services. Education, training, and continued support are paramount in enabling customers to realize these benefits. The lack of technical sophistication, even in a high-technology discipline such as medicine, can create barriers to full system utilization, as well as barriers to the acceptance of automation.

Economic pressures continue to pose a challenge to health care providers. It has become the mission of medical information services vendors to provide solutions to alleviate those pressures.

A

Issues and Trends

According to the U.S. Department of Commerce, expenditures on health care will rise by 10.7%, from $558.7 billion in 1988 to $618.4 billion in 1989. As shown in Exhibit II-1, hospital care expenditures will rise by 10.4%, physicians services by 13% to $127.6 billion, and nursing home care by 11.4% to $48.8 billion. Leading health care providers are shown in Exhibits II-2 and II-3.

Increased competition, rising health care costs, and federal regulatory and private health care payor efforts to contain costs continue to squeeze health care providers. Health care costs continue to rise at a higher rate than inflation, due to increases in the use of high-priced medical technology, increased longevity of the population, and high human resource costs. Federal efforts to contain costs include the 1983 introduction of Medicare's prospective payment system, which specified set reimbursement rates based on diagnosis-related groups (DRGs). The shift in reimbursement plans from cost-based to fixed-cost accounting resulted in

EXHIBIT II-1

Health and Medical Services Industry Size

Item	Expenditures ($ Billions)		Percent Growth
	1988[1]	1989[2]	1988-1989
Total	558.7	618.4	10.7
Health services and supplies	535.7	594.0	10.9
Personal health care	494.8	550.0	11.1
- Hospital care	216.2	238.7	10.4
- Physicians' services	112.9	127.6	13.0
- Dentists' services	37.0	41.2	11.3
- Other professional services	24.1	28.0	16.2
- Consumer nondurables[3]	39.0	42.0	7.6
- Consumer durables	10.5	11.7	11.4
- Nursing home care	43.8	48.8	11.4
- Other health services	11.3	12.5	10.7
Program administration and net cost of insurance	25.0	26.4	5.6
Government public health activities	15.9	17.6	10.7
Research and construction of medical facilities	23.0	24.4	6.5
Research[4]	14.6	15.8	8.2
Construction	8.4	8.7	3.6

1 Estimated
2 Forecast
3 Includes only expenditures for prescription drugs, over-the-counter drugs, and medical sundries dispensed through retail channels. Spending for drugs dispensed in hospitals and by physicians is reported within those cost categories.
4 Research now includes commercial research activites of drug companies

Note: Totals may differ from sum of constituent figures because of rounding

Source: Bureau of Data Management and Strategy, Office of National Cost Estimates, Office of the Actuary. Health Care Financing Administration and the U.S. Department of Commerce and International Trade Administration (ITA). Estimates and forecasts by ITA

EXHIBIT II-2

Leading Hospital Management Chains—1988

Company	Revenues ($ Millions)	Profits ($ Millions)	Number of Beds	Revenues per Bed $	Number of Units
Hospital Corporation of America	411.2	258.8	42,584	10	1
Humana Inc.	3,435.4	227.1	16,666	206	3
Daughters of Charity National Health System	2,637.0	—	13,787	191	7
Healthtrust	1,667.0	(97.4)	13,218	126	2
American Medical International	3,100.0	115.3	11,622	267	5
Adventist Health System	2,329.1	(7.9)	10,413	224	4
New York City Health & Hospital Corporation	2,283.7	—	7,294	313	28
National Medical Enterprises	3,208.7	174.5	7,152	449	9
Kaiser Foundation Hospitals	5,565.0	109.0	7,058	788	14
Mercy Health Services	1,010.9	1.0	6,835	148	13
Hospital Management Professionals	—	—	6,589	—	6
Sisters of Charity Health Care Systems	918.0	—	5,689	161	15

Ranked by number of beds

Source: *Modern Healthcare*

EXHIBIT II-3

Leading Investor-Owned Nursing Home Systems

System	Number of Beds		Number of Units	
	1987	1988	1987	1988
1. Beverly Enterprises	115,589	109,951	1,053	1,000
2. ARA Living Centers	27,933	27,578	251	251
3. National Heritage	25,500	25,000	231	223
4. Manor Care	18,361	20,760	139	160
5. Health Care & Retirement Corporation	15,588	16,439	126	130
6. UniCare Health Facilities	15,195	15,277	136	134
7. National HealthCorp	8,133	8,515	68	70
8. Diversified Health Services	5,946	7,810	21	31
9. Angeli Group	6,450	6,908	51	55
10. Horizon Health Corp.	5,375	6,343	49	57
11. Meritcare	2,987	5,687	25	57
12. Meridian Healthcare	4,650	4,990	31	34
13. Britthave	4,538	4,560	47	47
14. Geriatrics & Medical Centers	4,350	4,494	21	22
15. American Medical Services	4,202	4,392	27	28

Ranked by number of beds

Source: *Modern Healthcare*

increased cost-consciousness among third-party payors. Exhibit II-4 lists federal legislation that impacted the health care industry.

EXHIBIT II-4

Federal Legislation Impacting Medical Industry

- Medicare and Medicaid programs. These federal programs provide medical coverage for 54 million beneficiaries supported by $112 billion tax dollars in 1986.
- Promotion of Medicare and Medicaid enrollment into HMOs at a fixed cost to the government
- Prospective payment systems based on diagnosis-related groups, which shifted reimbursement plans from cost-based to fixed-cost accounting
- Freezing of reimbursements and physician fees
- Paying fixed rates to ambulatory surgical centers for selected procedures in direct competition with hospitals

These factors have led to consolidation in the industry and increased growth in the delivery of alternative health care services. Mergers, acquisitions, and joint ventures among hospitals continue, though at a decreasing rate, as pressures force hospitals to achieve economies of scale. The number of physician group practices continues to increase as solo practitioners join multispecialty groups to facilitate the referral of patients and reduce overhead costs. Local delivery systems—umbrella organizations that coordinate the services of hospitals, physicians, and other health care providers—have emerged in certain geographic sectors.

Such combinations have allowed health care providers to exercise greater buying power, but shrink the pool of potential customers for information services vendors.

Health maintenance organizations (HMOs) and preferred provider organizations (PPOs) continue to enjoy increasing popularity. Although the majority of HMOs reported losses for 1988, HMOs and other managed care organizations are assured of a growing clientele as federal and private sector payors provide incentives to consumers to enroll in less

costly alternative delivery systems. HMOs and PPOs currently service more than 23% of the U.S. population. HMO enrollment is expected to reach 35 million by the end of 1989, up from 15 million five years ago. The rapid growth of HMOs and other managed care organizations has come at the expense of the hospital sector and has played a role in the decline of hospital inpatient admissions and revenue.

Leading health care maintenance organizations are shown in Exhibit II-5. Growth trends in the health maintenance organization sector are shown in Exhibit II-6.

EXHIBIT II-5

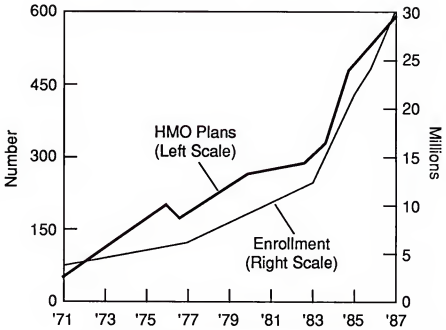
Ten Largest Medicare HMOs

Plan Name, City	Medicare Enrollment
1. Humana Medical Plan, Inc., Miami	143,532
2. FHP of California, Long Beaach	106,685
3. PacifiCare of California, Los Angeles	83,411
4. Kaiser Foundation-Southern California, Pasadena	76,913
5. Share Health Plan of Minnesota, Minneapolis	41,335
6. Physicians Health Plan of Minnesota, Minnetonka	40,588
7. Group Health Cooperative of Puget Sound, Seattle	39,451
8. Kaiser Foundation-Northwest, Portland, Oregon	30,819
9. Share of Illinois, Itasca	26,611
10. Health Insurance Plan of Greater New York	25,359

Source: HCFA

The nursing shortage continues to plague the industry, exacerbated by the increase in demand for nursing services due to the AIDS epidemic and growth in the nation's elderly population. The labor intensiveness of hospital functions, combined with staffing shortages that have reached critical levels, is driving health care providers to automate operations.

EXHIBIT II-6



Source: Office of Health Maintenance Organizations and International Trade Administration.

Increased competition has forced health care providers to ramp up their advertising and marketing efforts to recruit new patients, thus creating a need for marketing systems developed for the health care environment.

Quality, as in all other sectors of the economy, has become a buzzword in health care providers' efforts to differentiate themselves from competitors. A recent study done by the Joint Commission on Accreditation of Health Care Organizations, which sets quality requirements for health care facilities, found that more than half of the hospitals surveyed did not have adequate procedures to review the quality of care. Information systems can play a significant role in monitoring patient treatment and physician performance, thus allowing health care providers to compile data to evaluate procedures and flag inconsistencies in treatment and results.

Liability issues will also force health care providers to implement systems that will provide quality checks on medical practices.

Rapidly rising insurance premiums will force more corporations to restructure their health care benefits programs and to shift a greater part of the burden to employees.

Shifting demographics, such as an aging population drawing on Medicare funds fed by a dwindling contributor base, will place greater strain on the Medicare program.

The growing inaccessibility of quality health care will remain a significant political issue. Despite the repeal of the Medicare Catastrophic Coverage Act, mounting concerns over access and benefits will bring pressure to bear on legislators. Further reforms in Medicare can be anticipated in the future.

Exhibit II-7 summarizes the primary driving forces in the health care industry.

EXHIBIT II-7

Health Care Industry Driving Forces

- Rapid inflation of health care costs
- Public/private sector cost containment measures
- Industry consolidation
- Human resource scarcity
- Shift to alternative delivery systems

B

Hospital Sector Trends

Economic pressures have led to changes in the composition of health care expenditures. Hospital expenditures have decreased as a percentage of total health care expenditures: hospital expenditures represented 38.6% of total outlays in 1988 as compared with a peak of 44% in 1982.

Inpatient revenues increased by only 7.8% in 1988, as compared with 8.2% in 1987, while outpatient revenues increased by 17.9% in 1988. The number of procedures carried out in physicians' offices has also increased as patients, discouraged by high medical costs, resorted to hospitals for only the most critical of procedures. Exhibit II-8 shows growth trends in hospital utilization.

EXHIBIT II-8

Hospital Utilization Statistics

System	Percent Change from Year-Earlier Period			
	1985	1986	1987	1988
Staffed beds	-1.8	-1.2	-0.9	-1.3
Admissions	-4.6	-2.1	-0.6	-0.7
Inpatient days	-6.2	-1.4	+0.2	-0.8
Average length of stay	-1.6	+0.7	+0.8	-0.1
Outpatient visits	+4.8	+8.3	+5.8	5.9
Surgical operations	+0.7	+2.2	+2.9	0.7
Births	+2.7	+0.1	+2.8	5.2
Occupancy rates* (Percent)	63.6	63.4	64.2	64.5
65 and over				
- Admissions	-5.0	-1.0	+0.4	1.7
- Inpatient days	-7.0	-0.6	+1.4	1.0
- Length of stay	-2.0	+0.4	+1.0	-0.7
Under 65				
- Admissions	-4.4	-2.5	-1.0	-1.9
- Inpatient days	-5.6	-2.0	-0.6	-2.2
- Length of stay	-1.2	+0.5	+0.4	-0.3

* Actual occupancy rate, not percent change.

Source: American Hospital Association

Hospitals have restructured to enhance profitability: hospitals are developing group health insurance businesses to channel clients into the hospitals (Humana is one example) or expanding operations in DRG-exempt psychiatric and specialty hospitals (such as National Medical Enterprises).

Increases in the number of hospital and physician alliances are expected as hospitals push to fill beds and as physicians seek access to hospital services to improve productivity.

Wages can account for 60% or more of a hospital's costs. Hospitals are turning to greater use of automation in labor-intensive operations such as point-of-care information systems.

C

Physician Sector Trends

The number of office visits per physician has been declining since the late 1970s when physicians saw about 100 patients per week. Today, a physician sees on average about 75 patients a week. This is due to a combination of more intensive work with each patient as office procedures displace hospital procedures, and a medical school system that graduates more doctors than necessary. Dropping office visits have not impacted the number of newly graduated physicians. This number has been increasing, with an oversupply of as many as 80,000 expected by 1990.

The number of hospital and physician alliances is expected to increase as hospitals expand and strengthen relationships with patient referral sources to recruit more patients. According to the Health Care Advisory Board, physicians control over 70% of hospital admissions. The increasing need for communication between physicians and hospitals provides opportunities for information services vendors with networking capabilities and expertise in micro-to-mainframe communications.

Although DRGs have managed to limit increases in hospital inpatient costs, physician and outpatient costs continue to rise. Future federal cost-containment measures will begin to focus on placing limits on physician and outpatient costs.

For this reason, the proposed resource-based relative value scale (RBRVS) has become a major concern for physicians. Medicare payments are usually based on what physicians have charged in the past. The RBRVS will reimburse physicians based on the amount of work or resources they expend in treating the beneficiary. The new system will redistribute the way in which physicians would be reimbursed from the Medicare program, and this redistribution in turn will change the economics of physicians and specialists whose income derives primarily from the Medicare program.

D

"Other" Medical Sector Trends

Home health care represents one of the fastest growing sectors of the health care industry. Expenditures for home health care services amounted to $9 billion in 1988, and have been increasing at an annual rate of 20% for the past few years. Growth in the market is driven by the increasing longevity of the population, the lower average cost of home

health care compared with institutional costs, and promotion of home health care as an alternative to institutionalization by Medicare and private insurers.

The nursing home care sector also stands to gain a greater portion of the market as hospitals, pressed to move patients quickly through the process in order to contain costs, discharge patients sooner. Moreover, the increasing longevity of the population will contribute to nursing home sector growth.

The laboratory services market continues to consolidate, as do other sectors of the medical industry. DRGs have also taken their toll on laboratories, thus shrinking margins and forcing laboratories to seek nationwide economies of scale.

E

Key Events

The Medicare Catastrophic Coverage Act, signed into law in 1988, was largely repealed one year later, leaving Medicare risk contractors in confusion. The law was to have expanded the Medicare program to provide Medicare beneficiaries with financial protection against catastrophic illness. Changes in the reimbursement plan had provided opportunities for clinical and financial information systems providers.

Hospital Corporation of America (HCA), the nation's leading hospital management chain, sold 55% of its hospitals to an employee stock ownership plan (ESOP) in 1987 and relinquished the remainder of the business through a $3.6 billion leveraged buy-out finalized in early 1989. Management will most likely finance the LBO through sales of additional units. The company recently agreed to sell its psychiatric hospitals for $1.2 billion.

Maxicare Health Plans, a leading managed health care organization, went bankrupt. Bankruptcy reorganization plans call for creditors to assume part ownership of the company.

American Medical International, a leading hospital management chain, sold 36 of its hospitals to EPIC Healthcare Group for more than $730 million. EPIC is a private hospital company that is principally owned by AMI's employee stock ownership plan.

F

Issues for Vendors

Hospital closures and consolidations will result in a limited market for individual information systems and an expanded market for networked systems. Vendors can expect increased competition, acquisitions by larger vendors, and joint ventures as vendors seek to maintain or expand their shares of a smaller market.

In general, hospitals are dissatisfied with their currently installed systems. Inflexibility, limited functions, and the inability to share data are reasons hospitals are actively seeking improvements and expansions to their systems.

Due to inadequate system implementation and utilization, the looked-for improvements in productivity and profitability have never materialized for some hospitals. Sophisticated technology matched with archaic (read "manual") data entry systems has served to compound the labor-intensiveness of DP functions. Moreover, the general reluctance of health care professionals to adopt new technology has limited the effectiveness of information systems.

Hospitals are looking for more-complete, integrated solutions for their information needs. Vendors must be prepared to offer a wide variety of services—most importantly training and support—to provide customers with a single solution.

III

Market Forecasts

A

Introduction

INPUT divides the health services market into three sectors: hospitals, physicians (which includes dentists, osteopaths, and health practitioners), and "other" medical (which includes nursing facilities, laboratories, home health care services, and health and allied services). The health services demographics are summarized in Exhibit III-1.

Demand for industry-specific medical information services will grow 13% annually through 1994, increasing from $3.8 billion in 1989 to $6.8 billion in 1994, as shown in Exhibit III-2.

B

Medical Segments

1. Hospital Segment

The hospital segment is by far the largest of the three segments, with $2.9 billion in expenditures in 1989, as shown in Exhibit III-3. Hospital information services spending will increase 12% annually through 1994, with 1994 expenditures totaling $5.2 billion.

The number of hospital closures totaled a record 81 in 1988. Approximately 16% of the nation's hospital bed capacity is expected to disappear by 1990, according to some estimates. The driving issue is how information systems can improve hospital profitability through cost control.

Expenditures on hospital information services will continue to increase—primarily because information systems are perceived to be the most effective means of controlling costs. However, vendors are faced with increasingly stringent purchasing criteria as users become more dissatisfied with the limitations of previous systems.

EXHIBIT III-1

Medical Industry Sector—Demographic Data

Standard Industrial Classification	Industry Name	Type of Statistic	Data
All	Medical	Number of establishments Number of employees	388,324 6,333,867
801	Physicians	Number of establishments Number of employees	180,078 924,445
802	Dentists	Number of establishments Number of employees	98,412 445,472
803	Osteopaths	Number of establishments Number of employees	6,867 30,739
804	Health practitioners (N.E.C.)*	Number of establishments Number of employees	45,527 150,629
805	Nursing homes	Number of establishments Number of employees	15,951 1,206,200
806	Hospitals	Number of establishments Number of employees	5,825 2,943,749
807	Medical and dental laboratories	Number of establishments Number of employees	13,231 112,254
808	Outpatient care facilities	Number of establishments Number of employees	12,489 257,337
809	Health and allied services (N.E.C.)*	Number of establishments Number of employees	9,928 263,042

*Not elsewhere classified. Note: All data as of 1985.

EXHIBIT III-2

Medical Sector Information Services Markets by Delivery Mode, 1989-1994

Sector	User Expenditures ($ Millions) 1989	User Expenditures ($ Millions) 1994	CAGR 1989-1994 (Percent)
Processing services	1,060	1,560	8
Network services	490	1,170	19
Applications software products	790	1,535	14
Turnkey systems	855	1,375	10
Systems integration	210	610	24
Professional services	345	555	10
Total	3,750	6,805	13

INPUT Forecast Revised: 2/90

Driving the market are the following trends:

- In the past, hospital information systems were acquired piecemeal by individual departments within the hospital. The need to consolidate data from these separate departments to expedite treatment, coordinate resources with the patient load, and monitor performance/quality for organizational fine-tuning will drive hospitals to integrate their systems by networking and/or replacing their current systems.

- The demand for labor-saving automation, including the use of automated data entry systems (bar coding, point-of-care terminals), will continue as a result of critical staffing shortages and rocketing labor costs.

- The shift in hospital care delivery from inpatient to outpatient services will create new information requirements.

EXHIBIT III-3

Hospital Information Services Market by Delivery Mode, 1989-1994

Sector	User Expenditures ($ Millions) 1989	1994	CAGR 1989-1994 (Percent)
Processing services	835	1,175	7
Network services	395	940	19
Applications software products	620	1,205	14
Turnkey systems	650	1,005	9
Systems integration	165	480	24
Professional services	275	440	10
Total	2,940	5,245	12

- The increase in alliances between hospitals and physicians, driven by marketing considerations, has created a need to link these health care providers in order to facilitate the exchange of clinical and financial information. Networking technology and microcomputer-based systems allow physicians at remote locations to link into a hospital's information systems.

- Intense competition has caused hospitals to turn to decision support systems to control costs and pursue aggressive marketing strategies. Hospitals need tools to track service performance and quality, to find patterns in medical treatment, and to analyze their customer base.

- Changes in government regulation and increasingly complex requirements for services billing have created a need for faster and more accurate claims processing. The elimination of the periodic interim payment (PIP) program by HCFA can result in cash-flow problems for hospitals that submit erroneous claims.

- Smaller hospitals are forming regional alliances, thus enhancing their buying power. As the price of computer systems drop, these multifacility providers are finding in-house systems more affordable.
- In response to the changing competitive environment and dissatisfaction with older, installed systems, hospitals are increasingly upgrading or replacing their information systems.
- The increased use of prepaid health plans like HMOs has resulted in hospitals redesigning their systems to accommodate these prospective functions.

2. Physician Segment

The physician segment will grow at an annual rate of 14%, from $665 million in 1989 to $1.3 billion in 1994, as shown in Exhibit III-4.

EXHIBIT III-4

Physician Information Services Market by Delivery Mode, 1989-1994

Sector	User Expenditures ($ Millions) 1989	User Expenditures ($ Millions) 1994	CAGR 1989-1994 (Percent)
Processing services	190	320	11
Network services	85	190	17
Applications software products	145	275	14
Turnkey systems	150	265	12
Systems integration	35	110	24
Professional services	60	95	10
Total	665	1,255	14

The health care industry's emphasis on cost control has made automation an immediate priority. However, studies have shown that physicians have been slower than other health care providers to computerize.

Physicians have been slow to accept computer technology, perhaps because medical schools have not incorporated computers into their curricula, because physicians cannot invest the time to evaluate or learn computers, and because physicians perceive that current systems are too difficult to use.

The growing number of group practices has been fueling physician segment growth rates. Group practices have the patient volume to justify significant automation and the purchasing power to acquire larger and more sophisticated information systems, particularly those based on microcomputer platforms.

The overall trend for the physician segment is toward systems linked with hospital information systems. Hospitals with their extensive resources and computer expertise are selecting computers for physicians or participating medical groups. One result of the physician-hospital relationship is that physicians can automate the financial side of their businesses and gather clinical information on patients while the physician is away from the hospital.

3. "Other" Medical Segment

The "other" medical segment will grow at an annual rate of 17%, from $140 million in 1989 to $305 million in 1994, as shown in Exhibit III-5.

The "other" medical market segment is driven by the dramatic growth of alternative health care facilities, primarily in home health care, and by increasing automation in the as-yet-unpenetrated laboratory services market.

Increased patient volume and the expansion of home health care agencies into "other" medical services is expected to fuel the need for medical information systems.

Minicomputers, microcomputers, and turnkey systems are preferred growth areas in the home health care market because of their lower cost and perceived flexibility in place of processing services.

EXHIBIT III-5

Other Medical Information Services Market by Delivery Mode, 1989-1994

Sector	User Expenditures ($ Millions) 1989	1994	CAGR 1989-1994 (Percent)
Processing services	35	65	14
Network services	10	40	32
Applications software products	25	55	18
Turnkey systems	55	105	13
Systems integration	5	20	32
Professional services	10	20	15
Total	140	305	17

C
Information Services Forecasts

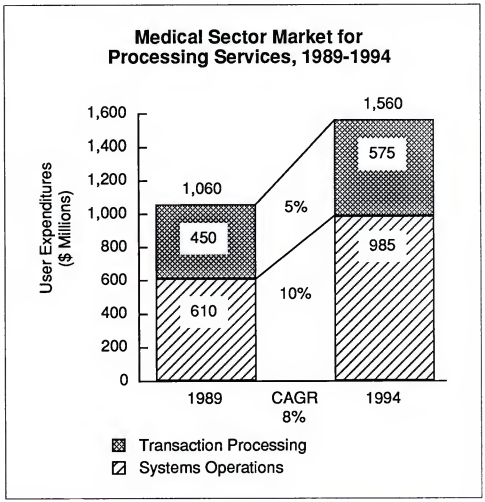
1. Processing Services

Processing services will grow at an annual rate of 8%—from $1.1 billion in 1989 to $1.6 billion in 1994, as shown in Exhibit III-6. The growth rate in the processing services market has been adjusted downward from previous forecasts.

The majority of hospitals that turn to processing services are small operations that do not have the capital or human resources to automate. Rural hospitals particularly, comprising approximately half of the 6,000 hospitals in operation in the U.S., are primary users of processing services. However, closures of rural hospitals have increased in recent years as cost/revenue pressures take their toll.

Midsize hospitals continue to use processing services, but at a declining rate. Large hospitals will continue to install and expand in-house systems and represent a declining portion of the processing services market.

EXHIBIT III-6



It is estimated that 25% of mid-sized hospitals and 8% of large hospitals use processing services.

The decline in the growth of the processing services market can be attributed to the following reasons:

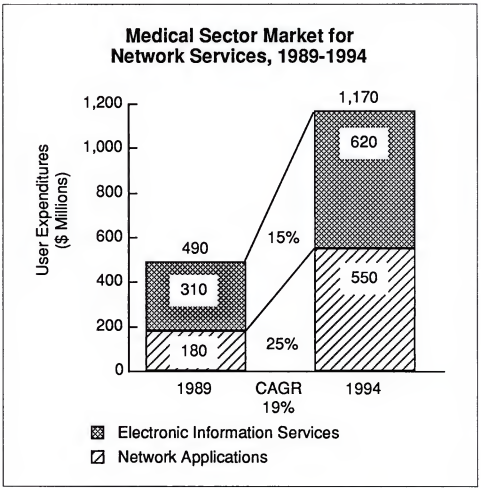
- Consolidation in the medical industry has limited the pool of potential customers.
- Smaller hospitals, by forming multifacility organizations, have achieved the purchasing power to acquire in-house systems.
- The falling prices of computer systems and the increasing processing power of smaller platforms have accelerated this trend.

In fact, major suppliers of processing services, such as Shared Medical Systems and American Express Health Systems Group, have seen their revenues from processing services actually decline or stay the same in recent years.

2. Network Services

Network services will grow at an annual rate of 19%, from $490 million in 1989 to $1.2 billion in 1994, as shown in Exhibit III-7.

EXHIBIT III-7



INPUT defines network services as network applications and electronic information services (EIS). INPUT defines network applications as value-added networks (VANs), electronic mail, electronic data interchange (EDI), and other services such as network management services. EIS is defined as on-line data base access to specific information via terminal-based inquiries—such as stock prices and airline schedules;

on-line news services that offer current information (either general or for a specific category); and videotex services.

EDI is gaining recognition as a cost-effective method of purchasing medical and surgical supplies and is contributing to healthy growth in the network applications area. One of the first EDI implementations in this area is Baxter's ASAP (Analytical Systems Automated Purchasing), a private EDI system that allows customers to use terminals, touch-tone phones, portable terminals, bar code scanners, and processors of all sizes to enter orders with Baxter-Travenol's medical suppliers. Vendors of such captive systems (the medical/surgical suppliers themselves) are opening those systems up to other suppliers.

EDI will gain increasing acceptance as suppliers and hospitals find electronic purchasing an efficient means of ensuring medical/surgical supply flow.

With the restructuring of the health care industry, alliances between health care providers are growing in number. Hospitals must form bonds with physicians, physicians with hospitals, managed care organizations with hospitals, and so on—thus creating a need for communications links to expedite the flow of clinical and financial information.

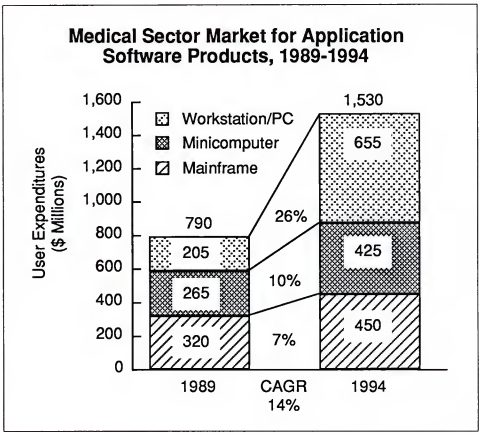
3. Application Software Products

The applications software products market will grow at an annual rate of 14%, from $790 million in 1989 to $1.5 billion in 1994, as shown in Exhibit III-8.

Technological improvements that packed more processing power into smaller platforms—at lower costs—made computer systems more accessible to health care providers. Powerful and relatively inexpensive microcomputers and workstations have brought physicians into the fold as new users. In-house automation by hospitals, physicians, and other health care providers will generate purchases of software.

The bulk of applications currently installed in hospitals are financial systems that perform patient accounting and track patient records. This saturated portion of the market, with approximately 99% and 93% of hospitals using accounting and medical record systems respectively, is experiencing sluggish growth. The market for clinical systems, a relatively unpenetrated niche, is seeing healthy growth.

EXHIBIT III-8



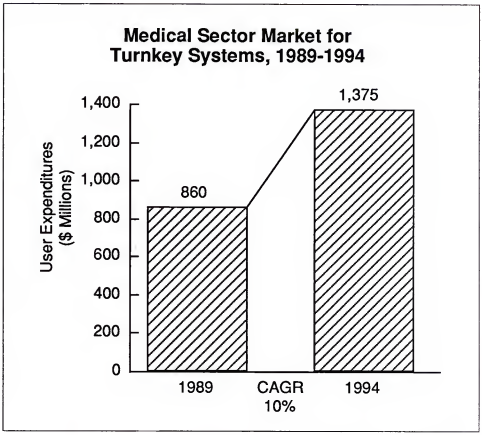
4. Turnkey Systems

Turnkey systems will grow at an annual rate of 10%, from $860 million in 1989 to $1.4 billion in 1994, as shown in Exhibit III-9.

System replacement and first-time purchases contribute to turnkey systems growth. The trend for first-time purchases is related to patient care in the following applications: patient care order entry, pharmacy, laboratory, radiology, and nurse staffing. Demand for turnkey systems in the hospital sector is slowing as hospitals seek delivery systems with broader applications.

Also contributing to turnkey systems market growth is the rapid expansion of the home health care sector, which reached the $9 billion mark in 1988, with its attendant information systems requirements. The most desired applications mentioned by home health care agencies are minicomputer and microcomputer-based turnkey systems offering clinical, durable equipment, financial, and scheduling applications.

EXHIBIT III-9



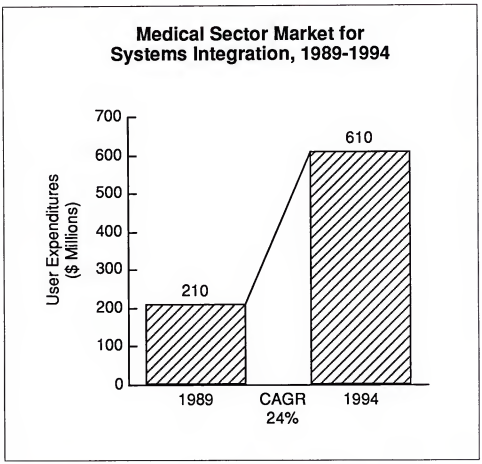
5. Systems Integration

Acquisitions and consolidations, as well as user requirements, continue to drive healthy growth in the systems integration market. Systems integration is expected to grow 24%, from $210 million in 1989 to $610 million in 1994, as shown in Exhibit III-10.

Requirements to reduce labor costs and ensure data integrity have driven hospitals to bypass human interfaces by integrating departmental systems.

Further consolidation, including the formation of investor-owned and multiple-facility providers, will result in a need for integrated information systems for centralized reporting and accounting. Increasingly, hospital and hospital management companies are moving into alternative health care delivery markets. With continuing acquisitions, providers will need to integrate their new ventures with their corporate structure.

EXHIBIT III-10



6. Professional Services

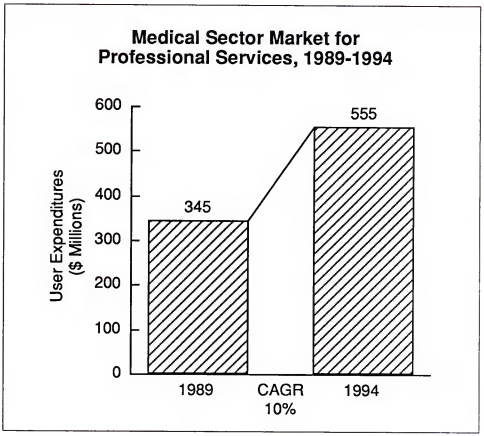
Professional services will grow at an annual rate of 10%—from $345 million in 1989 to $555 million in 1994, as shown in Exhibit III-11.

The following factors are driving growth in the professional services market:

- The majority of health care professionals—such as physicians, nurses, and lab technicians—are not well-versed in computer use. Education and training for these first-time users will sustain growth in professional services.

- Many hospitals do not have the expertise to develop in-house software and thus rely on contract software development. Moreover, hospitals that acquire software incrementally for different applications require consulting services to interface newly acquired software with existing systems. This trend will continue as the installed base grows and requirements to replace outdated systems bump up against budgetary concerns, forcing hospitals to update only incrementally.

EXHIBIT III-11



- The increased demand for automation will sustain market growth in professional services as both users and vendors learn that successful implementations of information systems require greater emphasis on system evaluation and planning.

IV

Competitive Developments

A

Introduction

This chapter presents detailed information on information services vendors serving the medical sector. The chapter is divided into:

- Leading medical information services vendors
- Mergers, acquisitions, joint ventures, and alliances
- Vendor profiles

B

Leading Information Services Vendors

The medical information services market is characterized by the presence of large, well-established vendors: Shared Medical Systems Corporation, IBM, HBO & Company, and Baxter Health Care. Recent entrants include GTE Health Systems, which purchased Intermountain Health Care (IHC) Affiliated Services; and 3M Health Information Systems, which acquired assets from Control Data Corporation in 1987 to make its entree into the market. The most significant competitive change has been the emergence of American Express as a major vendor through its acquisitions of McDonnell Douglas' Health Systems unit and Systems Associates.

Health care providers are increasingly seeking a fully integrated single-source information system. As a result of changing market conditions, leading vendors of information services for the medical markets are positioning themselves as full-line suppliers, selling a broad range of services across multiple delivery modes to all key markets. The key applications and technologies are summarized in Exhibit IV-1. Leading information services vendors are listed in Exhibits IV-2, IV-3, and IV-4.

The revenues of medical claims processing companies (U.S. Administration, Computer Sciences Corporation, and EDS) are accounted for in INPUT's insurance sector report.

EXHIBIT IV-1

Key Applications and Technologies for Vendors

- Local-area networks
- Relational data base management systems
- Bedside terminals and workstations
- Knowlege-based systems
- Clinical information systems

The distribution of delivery mode revenues for Shared Medical Systems has been adjusted from the previous year's estimate based on new information.

Processing services revenue for McDonnell Douglas Health Systems remained flat in 1988 at approximately $75 million. McDonnell Douglas' revenues for 1988 have been incorporated with those of American Express.

C

Acquisitions, Alliances, and Reorganizations

Merger and acquisitions activity is marked by the entry and exit of significant vendors.

McDonnell Douglas sold its Health Systems unit to Systems Associates Inc., a subsidiary of American Express Data Base Services, which was itself purchased in 1986. These two entities now form the Health Systems Groups of American Express Information Services Company. The new company, staffed by more than 1,100 employees, will be serving more than 1,000 clients in the United States and Puerto Rico. The Health Systems sale completes McDonnell Douglas Information Systems' divestiture of its health-related companies.

IBM and Baxter Healthcare announced plans to form a 50-50 partnership for a health care information services company that will include software products, services and employees of the Systems and Annson Systems divisions of Baxter, and IBM health care software products and development activities. This partnership raised some eyebrows among Baxter's competitors that do business with IBM, but severe concerns won't surface in the industry until the new organization proves itself.

EXHIBIT IV-2

Leading Vendor Shares of Medical Sector Industry-Specific Information Services, 1988

Vendor Name	$ Millions					Market Share (Percent)
	Processing Services	Application Software	Turnkey Systems	Professional Services	Total	
Shared Medical Systems*	245	20	70	15	350	11
American Express*	105		145		250	8
HBO & Company	12	26	100	48	186	6
Baxter Healthcare*	20	59	11	68	158	5
IBM*		60	65		125	4
Cycare	55	1	15	5	76	2
IDX			50		50	2
TDS Healthcare Systems		54			54	2
Unisys Health Systems*		15	20	10	45	1
Cerner Corporation		4	36		40	1
3M Health Systems*			35		35	1
Meditech		30			30	1
Leading vendors subtotal	437	269	547	146	1,399	46
All other vendors	623	521	308	199	1,651	54
Industry total	1,060	790	855	345	3,050	100

* INPUT estimate

EXHIBIT IV-3

Leading Vendor Shares of Hospital Sector Industry-Specific Information Services, 1988

Vendor	Total Revenues ($ Millions)	Market Share (Percent)
Shared Medical Systems	315	12
American Express*	225	9
HBO & Company	172	7
Baxter Healthcare	158	6
IBM	110	4
TDS Healthcare Systems	54	2
Cerner Corporation	40	2
Unisys Health Systems	36	1
3M Health Systems	34	1
Meditech	28	1
Leading vendors subtotal	1,172	45
All other vendors	1,408	55
Industry total	2,580	100

* Includes McDonnell Douglas Health Systems

Arthur Andersen, Andersen Consulting, GTE Health Systems, and Sears Business Center have joined forces to form United Medicorp, which will be providing services directed toward the hospital and physician sectors. In addition to providing claims processing services, the new organization will be introducing patient invoicing and collection services.

GTE entered the medical information services market through its purchase of IHC Affiliated Services (Salt Lake City, UT), the information systems arm of Intermountain Health Care, a not-for-profit health care provider.

EXHIBIT IV-4

Leading Vendor Shares of Physician Sector Industry-Specific Information Services, 1988

Vendor	Total Revenues ($ Millions)	Market Share (Percent)
Cycare	71	12
Shared Medical Systems	35	6
American Express	25	4
IBM	15	3
HBO & Company	14	2
IDX	10	2
Leading vendors subtotal	170	30
All other vendors	405	70
Industry total	575	100

Unisys spun off its medical information services group as a separate unit. Unisys Health Care Systems, based in Charlotte (NC) and staffed by 350 employees, provides turnkey, applications software, and professional services to approximately 200 clients nationwide.

D
Vendor Profiles

AMERICAN EXPRESS INFORMATION SERVICES COMPANY
HEALTH SYSTEMS GROUP
412 East Boulevard
Charlotte, NC 28203
(704) 333-1276

Larry Ferguson, President
Unit of American Express Company
Total employees: 1,100
Total revenue, Fiscal Year End 12/31/88:
$250,000,000 *

* INPUT estimate

The Company

American Express Health Systems Group is a division of American Express Information Services. A diversified information services vendor, the newly-formed American Express Information Services unit entered the medical informations services market through its acquisition of Systems Associates, Inc. (NC), a provider of turnkey systems for hospitals and custom programming and consulting services, in 1986 for approximately $33.8 million. At the time, Systems Associates had revenue of $32.9 million and approximately 350 employees.

In addition, American Express acquired Specialty Services Group, a provider of physician billing and reimbursement maximization management services, and Professional On-line Computers, Inc. (POLCI), which provided on-line management of patients' files, account billing and rebilling, practice analysis reports, appointment scheduling, accounting scheduling, accounting payroll insurance, and claims processing.

More recently, the company strengthened its position in the market with the purchase of McDonnell Douglas' Health Systems unit in 1989 for an undisclosed consideration. Both American Express' health systems units and McDonnell Douglas Health Systems were significant vendors of processing services and turnkey systems to the health care industry.

The new organization, now called American Express Health Systems Group, is based in Charlotte (NC). McDonnell Douglas Health Systems experienced sluggish growth in 1988. Revenue remained flat in 1988 in its processing services business. INPUT estimates that the American Express Health Systems Group, combining revenues from both Systems Associates and MDHS, reached $250 million in 1988.

Key Products and Services

The company has three main product lines. The two host-based systems were inherited from the former McDonnell Douglas Health Systems unit. They are:

- The Patient Care System (PCS) is a Tandem-based turnkey system that manages all patient information activites, including patient admissions and registrations, test and procedure ordering, result reporting, historical recordkeeping, and nursing treatments. There are currently over 30 PCS installations.

- The Hospital Financial Control (HFC) system, introduced in 1970, is the Health Systems Company's distributed processing service currently used by 467 hospital clients nationwide.

  - Applications supported include the following:

    - Financial Management: Executive Operating Summary, Advanced Management Reporting System, and General Ledger.

    - Patient Management: Registration Control, Medical Records, Third Party Billing, and Accounts Receivable.

    - Human Resource Management: Payroll, Personnel, Benefit Accurals, and Labor Management.

    - Statistical Management: Case Mix Management, Cost Accounting, and Financial/Statistical History.

    - Asset Management: Fixed Assets, Preventative Maintenance, Enhanced Payables, and Materiel Management.

  - Data is transmitted via on-line terminals or microcomputers from the hospital to Health Systems Company's data center in St. Louis.

  - The Hospital Data Communication (HDC+) system provides admitting and order entry functions for HFC customers via a DEC VAX front end processor.

The third product line is an in-house system previously marketed by American Express' affiliate, Systems Associates:

- SAINT is a comprehensive in-house hospital information system, comprised of 38 integrated software modules, that offer both clinical and financial applications.

- The SAINT Talk module provides an emulator application allowing IBM and IBM-compatible microcomputers to function as SAINT terminals.

- In addition, the system offers a bedside terminal application called SAI/MedTake System.

Additional in-house offerings include: Collector Account System for Hospitals; Cost Management System; Food Management System; Hospital Physician Network; Laboratory Management System; Materiel Management System; Medical Records Management System; Nurse Staffing and Scheduling System; Operating Room Scheduling and Management System; and Pharmacy Management System

Industry Markets

Nearly all of the company's medical information services revenue were derived from the hospital sector.

Geographic Markets

Nearly 100% of the company's revenue were derived from sales in the U.S.

CERNER CORPORATION
2800 Rockcreek Parkway
Kansas City, MO 64117
(816) 221-1024

Neal L. Patterson, CEO
Public Corporation, OTC
Total Employees: 275
Total Revenue, Fiscal Year 12/31/88: 40,925,000

The Company

Cerner Corporation develops, markets, and supports turnkey systems to the health care industry for use in clinical departments.

Although 1988 showed rapid growth in sales, increasing by 22% from $33.5 million in 1987 to $40.9 million in 1988, net earnings decreased by 15%. Contributing to the companies difficulties were delays in the release of PathNet 300, an upgrade of the company's flagship PathNet Laboratory Information System, and disproportionate costs incurred while converting clients' systems to the new PathNet product.

A three-year financial summary follows:

CERNER CORPORATION
THREE-YEAR FINANCIAL SUMMARY
($ thousands)

	FISCAL YEAR		
	1988	1987	1986
Revenue	$40,925	$33,595	$17,356
• Percent increase (decrease from previous year	22%	94%	68%

Key Products and Services

The company's flagship product is PathNet, developed for the clinical laboratory. PathNet addresses the information needs of five clinical departments: general laboratory, microbiology, blood bank transfusion services, blood bank donor services, and anatomical pathology.

As of December 1988, PathNet installations numbered 147 throughout the U.S. and Canada. Installations were in hospitals ranging in size from approximately 70 to 1,650 beds. The PathNet

300 enhancements were made commercially available during the second quarter of 1988.

The MedNet Information Systems (MedNet) product line, introduced in 1987, addresses the information processing needs of the medical-related service areas. The MedNet respiratory care and pulmonary physiolgoy systems are currently available. As of December 1988, five institutions throughout the U.S. and Canada have installed this system.

Products under development are:

- The RadNet Radiology Information System, an integrated system that addresses the therapeutic and diagnostic information processing needs of the radiology department.
- The PharmNet Pharmacy Information System, offering similar functions.

Presently, Cerner systems can interface with more than 120 medical instruments and 63 different types of hospital and administrative billing systems.

Industry Markets

The market for PathNet consists primarily of hospital-based laboratories associated with HMOs and other providers, independent laboratories, and blood banks.

Geographic Markets

Approximately 97% of Cerner's revenue was derived from sales in the U.S., with the remaining 3% coming from Canada.

CYCARE SYSTEMS, INC.
4343 East Camelback Road
Suite 320
Phoenix, AZ 85018
(602) 952-5300

Jim H. Houtz, Chairman and CEO
James D. Dyer, President and COO
Public Corporation, NYSE
Total Employees: 1,445
Total Revenue, Fiscal Year End
12/31/88: $83,734,000

The Company

CyCare Systems, Inc., incorporated in 1969, provides processing services, turnkey systems, facilities management (systems operations), and professional services to over 5,500 clients in the health care industry, including physicians, dentists, medical group practices, medical schools, hospitals, and managed care organizations.

CyCare's strategic plan includes a goal to stress recurring revenues through acquisitions and in its pricing and product strategies. Since 1985, service revenues have exceeded systems sales. In keeping with that acquisition strategy, the company acquired practice management operations, offered primarily to hospital-based physicians, in 1984 and 1986, and acquired Databill, Inc. in 1988, all of which have products and services which are recurring in nature.

During 1988, CyCare expanded its business with the following acquisitions:

- In February 1988, CyCare made its largest acquisition to date: The company acquired Databill, Inc., a wholly-owned subsidiary of American Physicians Services Group, Inc., for approximately $12.6 million in cash and notes, an additional contingent payment of $1.2 million, and a warrant exercisable in July 1989 for up to 200,000 shares of CyCare stock at $6.81 per share.

  - Databill provides batch and on-line services and systems in the one-to-five physician marketplace.

  - The operations of Databill have been merged into CyCare's Practice Management business unit.

- In July 1988, CyCare acquired Articulate Publications, Inc. of Los Angeles for $1 million plus additional contingent payments

of up to $1.9 million based on future performance. The acquisition was accounted for as a purchase.

- Articulate Publications is a publisher/distributor of microcomputer software in the 1-to-5 physician and dental marketplace.

- Articulate Publications contributed $860,000 to CyCare's 1988 revenue (for the period July 15, 1988 through December 31, 1988).

- Articulate Publications now operates as CyCare's Software Publishing business unit.

CyCare's 1988 revenue reached $83.7 million, a 24% increase over 1987 revenue of $67.7 million. Net income was $486,000, compared to net income of $3.8 million for 1987. A five-year financial summary follows:

CYCARE SYSTEMS, INC.
FIVE-YEAR FINANCIAL SUMMARY
($ thousands, except per share data)

	FISCAL YEAR				
ITEM	1988	1987	1986	1985	1984
Revenue	$83,734	$67,718	$57,186	$48,585	$40,074
• Percent increase from previous year	24%	18%	18%	21%	37%
Income before taxes	$949	$3,842	$5,116	$5,430	$4,314
• Percent increase (decrease) from previous year	(75%)	(25%)	(6%)	26%	39%
Net income	$486	$3,762 (a)	$2,866	$3,116	$2,600
• Percent increase (decrease) from previous year	(87%)	31%	(8%)	20%	37%
Earnings per share	$0.09	$0.70	$0.55	$0.67	$0.59
• Percent increase (decrease) from previous year	(87%)	27%	(18%)	14%	20%

(a) Includes a positive cumulative effect from a change in accounting for income taxes of approximately $1.5 million or $0.27 per share.

CyCare management attributes revenue increases during 1988 primarily to the acquisition of Databill in February 1988, which was partially offset by slowing systems sales.

- Services revenue increased 39% during 1988. Sales attributed to companies acquired during 1988 accounted for over 65% of the increase in services revenue, while the addition of new service customers and increased charges to other customers made up the remainder of the increase.

- System sales declined nearly 17% during 1988. The decline, particularly in the third and fourth quarters, is traced to the emphasis of cost containment within the health care industry over the past several years.

Total costs and expenses were $82.8 million in 1988, compared to $63.9 million in 1987. The increase resulted principally from higher personnel and operating costs incident to delays in integrating the Databill acquisition, increased research and development costs, higher interest costs from acquisition-related debt, a fourth-quarter writeoff of accounts receivable related to several large accounts in the Managed Care Division, and a $415,000 severance accrual related to product and office consolidations.

- Research and development expenses were $3.2 million during 1988, a 22% increase over $2.7 million for 1987. The increase is related primarily to the development of the C2000 system which integrates the company's C900 clinic and C1000 hospital systems.

During the third quarter of 1988, CyCare management reorganized the company and restructured certain operations in order to improve its responsiveness to clients and the quality of its products and services.

- The restructuring involved the consolidation of three data centers and 12 product lines, as well as the sale of a forms business and a portion of a commercial business acquired with Databill.

CyCare's current organization structure is summarized as follows:

- The four Strategic Support Units consolidate corporate support services and include: Finance and Administration; Marketing; Technology, which provides software and hardware technical support to CyCare's other units; and the Corporate Information

Center, which consolidates CyCare's data processing operations.

- CyCare's seven Strategic Business Units include the following:

  - The Group Practice unit, headquartered in Phoenix, provides processing services, turnkey systems, and systems operations (facilities management) services to the 15-plus physician group practice and faculty practice market. Regional offices are located in Atlanta, Arlington Heights (IL), and San Diego (CA).

  - The Practice Management unit, headquartered in Mt. Clemens (MI), provides processing, consulting, and collection management services to hospital-affiliated practice plans, faculty practice plans, and hospital-based physicians. Regional offices are located in East Meadow (NY) and Houston (TX).

  - The Physician & Dental Services unit, headquartered in Phoenix, provides processing services and turnkey systems to medical practices with one to 15 physicians and dentists. Branch offices are located in San Antonio (TX) and Woodland Hills (CA).

  - The Managed Care unit, headquartered in Phoenix, provides processing services, turnkey systems, and systems operation services to health maintenance organizations (HMOs), individual practice associations, and preferred provider organizations.

  - The Hospitals unit, headquartered in Birmingham (AL), provides turnkey systems and systems operations services to hospitals.

  - The Software Publishing unit, headquartered in Los Angeles (CA), was formed with the acquisition of Articulate Publications, Inc. This unit provides application software products for one-to-five physician and dental groups.

  - The Data Clearing unit, headquartered in Dubuque (IA), provides various processing and mailing services.

A two-year summary of source of revenue by Strategic Business Unit follows:

CYCARE SYSTEMS, INC.
TWO-YEAR SOURCE OF REVENUE SUMMARY
($ millions)

	FISCAL YEAR			
	1988		1987	
BUSINESS UNIT	REVENUE $	PERCENT OF TOTAL	REVENUE $	PERCENT OF TOTAL
Group Practice	$30.3	36%	$33.0	49%
Practice Management	22.7	27%	15.1	22%
Physician & Dental Services	16.9	20%	13.3	20%
Data Clearing Services	7.0	8%	2.1	3%
Managed Care	3.0	4%	2.2	3%
Hospitals	1.4	2%	--	--
Software Publishing	0.9	1%	--	--
Other	1.5	2%	2.0	3%
TOTAL	**$83.7**	**100%**	**$67.7**	**100%**

Key Products and Services

Approximately 80% of CyCare's 1988 revenue was derived from services, which include: batch, remote batch, on-line, and distributed processing services; and systems operations and other professional services. Nineteen percent of 1988 revenue was derived from hardware/software for distributed processing and turnkey systems, and microcomputer software products. The remaining 1% of revenue was derived from interest and other income. A three-year summary of source of revenue follows:

CYCARE SYSTEMS, INC.
THREE-YEAR SOURCE OF REVENUE SUMMARY
($ millions)

	FISCAL YEAR					
	1988		1987		1986	
ITEM	REVENUE $	PERCENT OF TOTAL	REVENUE $	PERCENT OF TOTAL	REVENUE $	PERCENT OF TOTAL
Services	$66.8	80%	$47.9	71%	$34.6	61%
Systems	16.0	19%	19.2	28%	21.7	38%
Interest and other	0.9	1%	0.6	1%	0.9	1%
TOTAL	**$83.7**	**100%**	**$67.7**	**100%**	**$57.2**	**100%**

The following discussion will focus on CyCare's products and services by Strategic Business Unit.

Group Practice:

CyCare's business was founded in the group practice marketplace. This business unit, with over 230 clients, provides batch, remote batch, shared (on-line), and distributed processing services; turnkey systems; and systems operations services to the 15-plus physician group practice and faculty practice market.

- Applications supported include medical billing and insurance, patient information and registration, patient appointment scheduling, and financial and administrative products.

- New applications added during 1988 include Alternate Pricing, Clinic Prepaid II, Referral Authorization, and Third Party Management.

- The most common delivery system within this client base is distributed processing. Clients perform processing on their own computers using CyCare software, while bills and insurance statements are processed and distributed by mail or electronically through CyCare's Corporate Information Center. Distributed systems available include the following:

  - C250, based on Honeywell DPS 6 minicomputers, is designed for intermediate-sized group practices.

  - C350 incorporates claims clearing.

  - C450, based on Honeywell DPS 6 minicomputers, is designed for faculty practice plans of medical schools.

- Turnkey systems include the following:

  - C300, based on the Honeywell DPS 6 minicomputer, is designed for intermediate-sized group practices.

  - C400, based on Honeywell DPS 6 minicomputers, is designed for faculty practice plans of medical schools.

  - C900, based on IBM mainframes, is targeted to very large health care providers. An MVS version supports over 2,000 terminals, while a VSE version supports up to 350 terminals.

Practice Management:

This business unit, with over 350 clients, accepts responsibility for the business office functions of hospital- and medical school-based physicians.

- The client base consists primarily of radiologists, anesthesiologists, pathologists, and emergency department physicians.

- Services include consulting, batch processing for billing and management reporting, systems operations, collection management, and patient inquiry and follow-up. Fees are generally derived as a percentage of collections.

- Through 1988, much of management's effort was directed toward integrating the Houston operation of Databill into the Practice Management organization. During 1989, CyCare plans to expand into the radiology market in Texas through this office.

Physician & Dental Services:

This unit provides batch, remote batch, on-line and distributed processing services and microcomputer-based turnkey systems to medical practices of one-to-15 physicians and dentists.

- This unit has grown primarily as the result of acquisitions. The current client base (numbering over 1,900 clients) is concentrated in five major geographic areas--the Northwest, Southern California, Texas-Southwest, Midwest, and South Florida.

- The software applications offered to this market are the same as those offered in the Group Practice market.

- The C100 is a Wang 2200-based turnkey system designed for smaller group practices.

- The C150 Distributed Medical Computer System is based on IBM microcomputers or Honeywell XPS-100 Series minicomputers.

  - C150 is designed to handle daily record processing in-house, while statement and insurance processing is generated at CyCare's Corporate Information Center.

- During 1988, CyCare introduced a C150 rental program, eliminating the large capital expenditure required.

Managed Care:

This unit, with 21 clients, provides on-line and distributed processing services, turnkey systems, and systems operation services to health maintenance organizations (HMOs), Individual Practice Associations (IPAs), and Preferred Provider Organizations (PPAs).

- Software applications marketed to these organizations include those offered to Group Practice and Physician Services clients plus specialized products such as membership and enrollment, premium billing, claims processing, and utilization reporting.

- C500 is a Honeywell-based turnkey system for HMOs.

- C870, introduced during 1988, is a shared (on-line) service providing clients with access to a CyCare IBM mainframe located at the Corporate Information Center.

Hospitals:

CyCare currently provides turnkey systems and systems operation services to four hospitals. CyCare entered this market to maintain its current clinic and group practice client base and, at the same time, to capitalize on the opportunities in the hospital information marketplace.

- Software applications encompass the major functional areas within a hospital, including: admission, transfer, and discharge; patient accounting; patient care; and medical records.

- C1000 is an IBM mainframe-based turnkey hospital information systems.

- During 1988, CyCare began development of the C2000, which integrates its C900 and C1000 systems to provide data sharing between hospitals and outlying clinics. To date, two contracts have been signed for the installation of this product.

Software Publishing:

Software Publishing currently markets the Medicalis and Dentalis microcomputer software products to the 1-to-5 physician and dental marketplaces, respectively.

- There are currently over 2,200 installations of the software, which is distributed through a network of over 250 dealers in over 40 states.

CyCare plans to offer a rental program through its dealer network that includes Medicalis or Dentalis software, hardware, support contracts, and distributed processing options.

Data Clearing:

Data Clearing Services, with 1988 revenue of $7 million and over 1,000 clients, offers the following services to certain target markets:

- Distribution Services, which include laser printing, microfiche, and mailing services, are provided primarily to credit unions.
- Commercial processing (a business acquired with Databill) is provided to specific non-medical groups.
- Claims processing includes an insurance claims clearinghouse and a national COBS (coordination of benefits service) data base.
- Revenue for 1988 also includes $1.9 million from a forms business acquired with Databill.

The forms business, as well as a portion of the commercial processing business, will be sold during 1989.

Other:

The CyCare Health Care Network System (C700) permits large health care organizations (such as group practices, hospitals, and managed care organizations) to communicate with independent physicians.

- The large health care organization installs a C300 or C500 turnkey system at its main office. A C100 system is installed at the participating physician's office.

Industry Markets

Over 95% of CyCare's 1988 revenue was derived from the health care industry. The remainder of revenue was derived from Data Clearing services provided to credit unions and other commercial businesses.

Geographic Markets

Virtually all of CyCare's 1988 revenue was derived from the U.S. Less than 1% of total revenue was derived from Canada.

CyCare's approximately 5,500 clients are located in 48 states and five Canadian provinces.

HBO & COMPANY
301 Perimeter Center North
Atlanta, GA 30346
(404) 393-6000

Walter S. Huff, Jr., Chairman, President, and CEO
Public Corporation, OTC
Total Employees: 1,810
Total Revenue, Fiscal Year End 12/31/88: $187,409,000

The Company

HBO & Company was formed in 1974 to provide turnkey systems and associated support services to the health care industry. As a result of the February 1985 acquisitions of Mediflex Systems Corporation and Amherst Associates Inc., HBO now also provides application software products, processing services, and systems operations (facilities management) and custom programming professional services. The company's target market is short-term acute care hospitals.

HBO re-examined its business and refocused its business strategies when the company's revenue and operating income growth rates declined in 1985. In 1986, HBO positioned itself for future growth by reorganizing with a profit orientation toward the delivery of both products and services, unbundling the pricing of its products, selling its non-information services consulting business, reducing staff, and streamlining operations.

HBO's current business consists of four principal units, as follows:

- The Minicomputer Group provides minicomputer-based turnkey systems to hospitals for patient care, nursing, physician, laboratory, pharmacy, radiology, and financial applications. This group is HBO's largest business with over 600 employees and 1988 revenue of $88 million.

- The Mainframe Group provides mainframe-based application software products, systems engineering, systems operations, and consulting services to large, complex metropolitan health care institutions. In 1988, this group's revenue was over $42 million.

- The Decision Support Group provides processing services, turnkey systems, and software products to assist hospital management in planning and analysis of their operations. This group's 1988 revenue was $28 million.

- Medical Systems Support, Inc. (MSSI) is a wholly owned subsidary, that provides computer hardware and other equipment maintenance services to HBO clients and certain other customers. MSSI's 1988 revenue was approximately $28 million in 1988.

HBO's 1988 revenue reached $187.4 million, a 7% increase over 1987 revenue of $175.2 million. Net income was $12.5 million in 1988, compared to net income of $13.3 million in 1987. A five-year financial summary follows:

HBO & COMPANY
FIVE-YEAR FINANCIAL SUMMARY
($ thousands, except per share data)

	FISCAL YEAR				
ITEM	1988	1987	1986	1985	1984
Revenue	$187,409	$175,230	$154,822	$188,835	$145,371
• Percent increase (decrease) from previous year	7%	13%	(18%)	30%	54%
Income (loss) before taxes	$19,020	$21,030 (a)	$(8,454) (b)	$35,194	$30,071
• Percent increase (decrease) from previous year	(10%)	349%	(124%)	17%	55%
Net income (loss)	$12,519	$13,321	$(3,612)	$20,842	$18,278
• Percent increase (decrease) from previous year	(6%)	469%	(117%)	14%	53%
Earnings (loss) per share	$0.80	$0.62	$(0.16)	$0.90	$0.80
• Percent increase (decrease) from previous year	29%	488%	(118%)	13%	48%

(a) Includes a net pretax gain on disposition and write-down of investments of $5.9 million, which reflects a $9.8 million gain on the sale of land acquired in 1982 for a corporate campus less several write-downs of investments totaling $3.9 million.

(b) Includes a one-time charge against earnings of $9.4 million to cover work force reductions and other steps to increase operating efficiency.

HBO management attributes 1988 results to the following:

- Revenue in 1988 increased 7% over 1987 due primarily to increased software license fees, hardware sales, hardware maintenance fees, and customer service fees.

- In February 1988, HBO completed the sale of its Computer Resources, Inc. (CRI) subsidiary. If the revenue from CRI were excluded from 1988 and 1987 financials, HBO's 1988 revene would show a 9% increase over the prior year.

- Included in the operating results for 1987 were a number of nonrecurring items related to proxy fight expenses and net gain of the sale of real estate. If the these one-time items are excluded (for comparative purposes), HBO's 1988 net income of $12.5 million would represent a 14% increase over 1987 results.

- Earnings per share were dramatically affected by the sizable stock purchase program completed by HBO during the first quarter of 1988. The company bought 8.6 million shares of its common stock, or approximately 37% of the shares outstanding at the time. As a result of the reduction in shares outstanding, improved profitability, and a lower effective income tax rate, earnings increased 29% over 1987 levels.

In February 1988, HBO sold CRI to Infomed (Princeton, NJ). Terms of the sale were not disclosed.

- HBO originally acquired an 83% equity interest in CRI during 1984 and 1985.

- Headquartered in Pompano Beach (FL), CRI provides minicomputer- and microcomputer-based turnkey systems to home health care agencies.

- Computer Resources contributed approximately $193,000 to HBO's 1988 revenue and $3.2 million to 1987 revenue.

Revenue for the nine months ending September 30, 1989 reached $143.6 million, a 6% increase over $135.8 million for the same period in 1988. Net income rose 20%, from $7.6 million to over $9.1 million.

As of December 31, 1988, HBO had 1,810 employees. The company currently has approximately 1,800 employees.

HBO's primary competitor is Shared Medical Systems.

Key Products and Services

Approximately 53% of HBO's 1988 revenue was derived from minicomputer-based turnkey systems and maintenance services, 26% from professional services systems operations and customer support services, 15% from software product licenses (6% from MediPac and CliniPac mainframe products and 9% from decision support products), and 6% from decision support processing services. A three-year summary of source of revenue follows:

HBO & COMPANY
THREE-YEAR SOURCE OF REVENUE SUMMARY
($ millions)

	FISCAL YEAR					
	1988		1987		1986	
ITEM	REVENUE $	PERCENT OF TOTAL	REVENUE $	PERCENT OF TOTAL	REVENUE $	PERCENT OF TOTAL
Turnkey systems						
• Monthly service fees	$31.9	17%	$32.8	19%	$34.9	23%
• Hardware sales	25.2	13%	22.4	13%	5.0	3%
• Software licenses	15.0	8%	7.4	4%	8.0	5%
• Maintenance	28.1	15%	24.1	14%	16.2	10%
• CRI	0.2	--	3.2	2%	4.5	3%
• Discounted service agreements	--	--	--	--	8.5	6%
	$100.4	53%	$90.1	52%	$77.1	50%
Professional services						
• Systems operations	$16.4	9%	$17.1	10%	$18.5	12%
• Customer support services	31.8	17%	26.6	15%	16.2	10%
	$48.2	26%	$43.7	25%	$34.7	22%
Software products						
• Mainframe	$10.5	6%	$8.7	5%	$5.5	4%
• Decision support	16.6	9%	16.0	9%	(a)	(a)
	$26.1	15%	$24.7	14%	$5.5	4%
Processing services					(b)	(b)
• Decision support	$11.7	6%	$16.9	10%	$34.4	22%
Other (c)	--	--	--	--	$3.1	2%
Total	$187.4	100%	$175.2	100%	$154.8	100%

(a) Included with decision support processing revenue.

(b) Includes decision support software product revenue.

(c) Includes Amherst consulting revenue (sold in 1986).

HBO provides a range of products and services to hospitals for patient, clinical, and financial information management and decision support applications.

- The company's primary target market is the 3,000 short-term acute care hospitals in the U.S. of more than 100 beds.
- As of December 31, 1988, there were 243 users of HBO's patient information systems, 178 users of HBO's departmental (clinical) information systems, 277 users of HBO's financial systems, and over 850 decision support systems sold.
- HBO currently has over 950 hospital clients nationwide.

The two-year summary that follows lists unit sales for certain of HBO's primarily product offerings as of December 31, 1988.

HBO & COMPANY
SYSTEM INSTALLATIONS

	UNITS SOLD	
SYSTEM	1988	1987
Minicomputer Systems		
• CLINSTAR		
- Patient Care	14	13
- Laboratory	11	10
- Radiology	14	6
- Pharmacy	14	14
• Star Financial System	3	1
	56	**44**
Mainframe Systems		
• MediPac - Financial System	9	9
• CliniPac - Patient Care	8	3
	17	**12**
Decision Support Systems		
• Processing	11	49
• TRENDSTAR	65	65
• Micro products	102	118
	178	**232**

Turnkey systems are currently marketed primarily under equipment purchase agreements and software license agreements.

- Under equipment purchase and software license agreements, a customer pays a one-time fee for the purchase of the hardware and a renewable multi-year license to use the software.

- HBO has curtailed its service agreement pricing for turnkey systems. Under service agreements, a customer paid a monthly fee for the use of the software and related hardware over the life of the agreement. Monthly service fees are derived primarily from seven-year contracts with hospital clients.

Turnkey systems marketed by HBO include the following:

- MEDPRO[R] is a Four-Phase-based patient information system. HBO actively marketed MEDPRO from 1974 to 1985.

- CLINSTAR™ - Patient Care (formerly MEDSTAR) is a patient information system that incorporates all the capabilities of MEDPRO plus functions to support concurrent DRG analysis and reporting. The system is based on Data General Eclipse minicomputers and can serve hospitals up to and in excess of 1,000 beds.

- CLINSTAR systems for departmental applications are based on Data General Eclipse minicomputers. The systems are available as standalone products or can be integrated with each other and/or MEDSTAR. Systems include:

  - CLINSTAR-Lab interconnects all areas of the hospital laboratory.

  - CLINSTAR-Radiology allows for the scheduling of patients, procedures, and radiology resources.

  - CLINSTAR-Pharmacy provides for the administrative and clinical needs of the hospital pharmacy.

- The STAR Financial system, introduced in 1988, incorporates the same data base technology as the MEDSTAR and CLINSTAR systems and completes the Data General minicomputer-based STAR family of products.

  - HBO also plans to make STAR products available for DEC and Hewlett-Packard minicomputers.

- IFAS[R] is an HP-3000-based financial information system that supports patient billing and accounting, payroll/personnel, inventory, accounts payable, general ledger, and financial reporting. As of December 31, 1988 there were 105 IFAS users.

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- GALAXY™ is a Four Phase-based system designed for hospitals with fewer than 150 beds. Applications include patient administration, order communications, DRG/case Mix analysis, patient accounting/accounts receivable, general ledger, payroll/personnel, accounts payable, inventory, and fixed assets. As of December 31, 19898 there were 19 Galaxy users.

Mainframe software products provided by HBO include the following:

- MediPac® is an IBM 4300-based patient registration and accounting system. As of December 31, 1988 there were 150 MediPac users.

- CliniPac™ is an IBM-based patient information system that may be integrated with MediPac.

- Both mainframe products can interface with HBO's CLINSTAR departmental systems.

HBO's decision support processing services and products are targeted to the needs of the managers and the executives of the hospital.

- Revenue from decision support processing is on the decline and is being replace by increased one-time sales of decision support software.

- HBO markets the TREND family of products for decision support applications.

  - TRENDSERVE is HBO's on-line processing service.

  - TRENDSTAR is a DEC MicroVAX-based turnkey system. The DS II Series, introduced in 1988, is HBO's latest generation of TRENDSTAR applications for DEC MicroVAX systems.

  - TRENDPAC I is IBM mainframe software available for in-house use.

  - HBO's TREND decision support systems use client general accounting, cost accounting, and medical records and statistical data to assist in preparing DRG analysis, annual business plans and budgets, management and control reporting, financial modeling, strategic and financial

planning, reimbursement enhancement, and regulatory reporting.

- TRENDSTAR/DS II applications include the following:

  - The Hospital System Library is a budgeting and forecasting tool. It is also available as a processing service.

  - The Case Mix Library allows hospital administrators to analyze their patient load, the types of services most often used, how efficiently physicians are performing, and information about the hospital's market and business characteristics. It is also available as a processing service.

  - The Marketing Systems Library, introduced in late 1987, is a management tool that analyzes data on hospital customers and competitors.

- The company also markets several PC-based decision support products, which do not contribute significantly to revenue.

Professional services provided by HBO include the following:

- HBO provides facilities management services to about 20 client hospitals, generally under one- to three-year contracts. HBO typically supplies its MediPac and CliniPac systems for the customers' IBM mainframe and personnel for management, software installation, customization, and support services.

- HBO also provides customer support services to all of its clients, including installation of systems, custom programming, and software maintenance.

Medical Systems Support, Inc. (MMSI), HBO's wholly owned subsidiary, provides maintenance services for equipment installed at HBO client sites. Currently MMSI maintains Four Phase-Motorola, DEC, Hewlett Packard, and Data General computers.

- During 1986 the company added maintenance services for diagnostic imaging and other clinical equipment and has since begun supporting data communications and telecommunications equipment. MSSI's goal is to be able to provide hospitals with a single source for all their equipment maintenance needs.

- The principal market for MSSI is the 2,100 hospitals in the U.S. with more than 200 beds. The company also markets to a few government agencies and other selected customers.

Industry Markets

Virtually all of HBO's revenue is derived from hospitals. A small percentage is derived from maintenance services provided by MMSI to government and other clients.

Geographic Markets

One hundred percent of HBO's revenue is derived from the U.S.

HBO has sales and services offices in Atlanta, Rolling Meadows (IL), Dallas and Houston (TX), Amherst and Lexington (MA), Los Angeles and Foster City (CA), Mt. Laurel (NJ), and Pittsburgh and Wayne (PA), Southfield (MI), Elmsford (NY), Louisville (KY), St. Louis (MO), and Tampa (FL).

MMSI is headquartered in Lewisville (TX).

COMPANY PROFILE

IDX Corporation
1400 Shelburne Road
South Burlington, VT 05403
(802) 862-1022

Richard E. Tarrant, President
Private Corporation
Total Employees: 350
Total Revenue, Fiscal Year 12/31/88:
$50,000,000 *

* INPUT estimate

The Company

IDX, formerly known as Interpretive Data Systems, was founded in 1969. The company markets integrated DEC-based turnkey systems to the medical industry.

Key Products and Services

All of IDX's 1988 revenues were derived from turnkey systems.

IDX specializes in providing integrated systems with a centralized database. Available applications include patient accounting, general accounting, patient care, managed care, and applications for ancillary departments:

APPLICATION AREA	PRODUCT NAME
Patient Accounting	Admission, Discharge, Transfer Hospital Patient Accounting Physician Billing/AR Paperless Collection System
General Accounting	General Ledger Accounts Payable PC Exchange Human Resource Management Fixed Assets Materials Management
Patient Care	Medical Records Order Communication Management Patient Scheduling
Ancillary Departments	LABPlus IDX/DECrad (patient registration/tracking)
Managed Care	Premium Billing Membership and Enrollment Referall Authorization Claims Adjudication and Vendor Contract Management

In addition, IDX provides the following:

- IDX Express, which allows the user to send inter-office mail electronically.
- Security Plus, a front-end security system that allows user-defined security classifications and prohibits unauthorized access to applications.
- Applications Enhancement System, a combination of MUMPS and development tools.

Industry Markets

One hundred percent of the company's revenue is derived from the medical industry.

Approximately 15% of the company's business is derived from the hospital sector, 20% from the physician sector, and 65% from the "other" medical sector.

Geographic Markets

All of the company's revenue was derived from sales in the U.S.

COMPANY PROFILE

KEANE, INC.
Ten City Square
Boston, MA 02129
(617) 241-9200

John F. Keane, President
Public Corporation, OTC
Total Employees: 808
Total Revenue, Fiscal Year End
12/31/87: $43,505,000

The Company

Keane, Inc., founded in 1965, provides professional services to Fortune 1000 manufacturers, major banks, financial services firms, and insurance companies, and application software products and facilities management services to hospitals.

The KeaMed Hospital Systems Division provides application software products and facilities management services to small and medium hospitals.

- KeaMed Hospital Division revenue was $9.5 million, a 5% decrease from $10.2 million for 1986.
  - KeaMed's business continued to be adversely impacted by economic pressures facing hospitals.
  - While Wang-based software product business was profitable, IBM System 36 and System 38 business continued to experience losses. As a result, Keane management has phased out the System 36 and System 38 product lines and is now concentrating on the Wang VS-based applications.

Key Products and Services

Through the KeaMed Hospital Systems Division, Keane markets Worry-Free Software™ software products to small- to medium-sized hospitals (50 to 400 beds).

- Worry-Free Software is a modular and integrated hospital information system that includes financial, patient care, and clinical systems.
  - Financial Systems.
    - Inpatient billing.
    - Outpatient billing.
    - Payroll/personnel.
    - Materials management.

  - Accounts payable.
  - General ledger and budgeting.

- Patient Care Systems.

  - ADT (Admission, Discharge, and Transfer).
  - Outpatient registration.
  - Medical records abstracting/DRG.
  - Chart deficiency.
  - Central index.
  - Order entry.
  - Results reporting.

- Clinical Systems.

  - Radiology.
  - Pharmacy.
  - Laboratory.

- Keane is currently marketing the software for Wang VS minicomputers under Wang's Idependent Sales Organization Agreement. Modules range in price from $10,000 to $150,000.

- As previously discussed, Keane no longer actively marketing software products for IBM System 36 or System 38 computers.

- Keane provides customization and implementation for each system, including user training and documentation. A Software Protection Plan, available to users, incorporates changes by the hardware vendor, third-party insurers, and the government into the system and furnishes new releases and documentation. The annual fee for the plan is 12% of the system purchase price.

Through KeaMed Hospital Systems, the company also provides Extended Operations Support (EOS) facilities management services to hospitals. EOS includes the design, development, implementation, and management of client computer systems.

- Keane offers a line of both on-line and batch systems designed for interaction with each other, although each system can be purchased separately. Both the batch and on-line systems accommodate special client requirements such as microfiche, labels, or tape-to-tape output production and backup.

- Applications available to facilities management clients include:

  - Order Communications/Results Reporting.
  - Patient Admissions and Registration.

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- Patient Billing and Receivables.
- General Ledger and Budgeting.
- Accounts Payable.
- Medical Records.
- Payroll/Personnel.
- Radiology Management System.
- Pharmacy Management System.

- Facilities management contracts are usually for three to five years and are billed based on a monthly schedule. KeaMed currently provides facilities management services to 16 hospitals.

Industry Markets

Approximately 22% of Keane's 1987 revenue was derived from the health care industry (acute care hospitals). The remaining revenue was derived from companies in the manufacturing, banking, financial services, insurance, and utilities industries and government.

Geographic Markets

One hundred percent of Keane's 1987 revenue was derived from the U.S.

The company is marketing its Worry-Free Software across the U.S.

KeaMed has offices in Melville (NY) and Lexington (MA).

MEDICAL INFORMATION TECHNOLOGY, INC.
MEDITECH Circle
Westwood, MA 02090
(617) 329-5300

A. Neil Pappalardo, President
Private Corporation
Total Employees: 390
Total Revenue Fiscal Year End
12/31/88: $40,000,000

The Company

Medical Information Technology, Inc. (MEDITECH), founded in 1969, provides systems and application software products to the health care industry. The company licenses its financial, clinical, administrative, and patient care applications to hospitals, clinics, and independent labs. In 1976, MEDITECH moved away from shared systems toward in-house systems and has virtually discontinued its remote computing activities except for a very small percentage of clients.

Total 1988 revenue reached $40 million, a 25% increase over 1987 revenue of $32 million. A five-year revenue summary follows:

MEDITECH
FIVE-YEAR REVENUE SUMMARY
($ thousands)

	FISCAL YEAR				
ITEM	1988	1987	1986	1985	1984
Revenue	$40,000	$32,000	$28,000	$25,400	$19,900
• Percent increase from previous year	25%	14%	10%	28%	16%

MEDITECH estimates 1989 revenue will increase by approximately 20%.

As of December 31, 1988, MEDITECH estimates it had approximately 390 employees.

MEDITECH's major competitors include hospital information systems firms and laboratory information systems firms, as follows:

- Hospital information systems competitors: Shared Medical Systems (SMS), HBO & Company, and McDonnell Douglas.
- Laboratory information systems competitors: Cerner Corporation and Sunquest Information Systems.

Key Products and Services

One hundred percent of MEDITECH's 1988 revenue was derived from software products and associated support services (approximately 60% derived from application and systems software licenses and 40% from software maintenance agreements, education, and training).

Approximately 300 institutions use MEDITECH's products. Of these, 95% are hospitals, 2.5% are clinics, and 2.5% are prepaid health plans.

MEDITECH's products run on DEC and Data General minicomputers, including the new Data General RISC machines. Applications operate under MEDITECH's proprietary operating system MIIS/MAGIC. All software was developed by MEDITECH and operates in an on-line, interactive mode.

MEDITECH's applications modules for hospital patient care, clinical, administrative, and financial management requirements can be used independently or as part of an integrated system and may interface with applications from other vendors.

- Patient care modules include the following:
  - Admissions/Discharges/Transfers collects reservation and admission data for inpatients, outpatients, emergency room, and surgical day care patients; allows retrieval of patients demographic data from previous visits; transfers demographic and insurance data to inpatient status when required; and produces on-demand management reports on hospital patient and census information. A total of 133 systems are installed.
  - Medical Records is an indexing system that works in conjunction with the Admissions/Discharges/Transfers module. Medical Records retrieves medical record numbers of previously admitted patients and assigns unit numbers to new patients; handles up to 1 million on-line record numbers; offers multiple name search methods; and

generates reports for reviewing a hospital's medical record activities. A total of 124 systems are installed.

- Case Mix Management is an optional feature sold with Admission/Discharges/Transfers and Medical Records modules that collects and reports patient information required by prospective payment and PSRO regulations; assigns DRGs (Diagnostic Related Groups) based on assigned ICD-9 codes; and generates reports for monitoring costs as reimbursement limits are approaching, ensuring patient abstract completion, and analyzing statistical case mix and resource consumption. A total of 75 systems are installed.

- Nurse Station Communications stores patient's demographic, dietary, and routine medical information for on-line review and updating; shows orders, messages and ordered procedure results entered for a patient; acts as a message center for ordering medical procedures and housekeeping tasks; captures charges as orders are entered; and generates nursing management reports and statistics for analyzing patient data. A total of 76 systems are installed.

- Nursing Acuity/Workload Management is an optional feature of the Nurse Station Communications module that uses patient care nursing information to automate the determination of patient care requirements such as required care hours and staffing mix needed at each unit; allows monitoring of quality of care and the analysis of trends in staffing needs. A total of 36 systems are installed.

- Resource/Appointment Scheduling maintains a master schedule for organizing each "provider," either person, department, or equipment; provides for on-line appointment scheduling, cancelling, searching, or reviewing; and generates management reports on available providers, appointment schedules, and cancelled or no show appointment lists. A total of 51 systems are currently installed.

- Mail/Registry is an information network for locating personnel, sending messages, and distributing mail within the health care institution. A total of 46 systems are currently installed.

- MEDITECH's line of clinical application software includes the following modules:

  - Pharmacy maintains patient profiles that can be checked for drug and allergy interactions and tracks drug usage; processes orders, schedules refills, updates inventory levels, and calculates dosages to be dispensed, IV drip rates, and patient charges; and generates management reports for complying with government regulations. A total of 102 systems are currently installed.

  - Laboratory is a system for processing patient laboratory work that generates collection lists, labels, and worksheets; captures test results for comparison against normal ranges and displays result trends; records patient charges; and provides for on-line inquiries, reports, and summaries. A total of 224 systems are currently installed.

    - The Laboratory Client Option stores client (physician, medical group, or other hospitals) specimens in separate data bases to ensure the confidentiality of each client's patient information; verifies specimen receipt in central laboratory; prints a report of results by client, route, or telecommunications site; and offers a variety of billing features and reports. A total of 32 systems are currently installed.

  - Radiology stores patient registration information, demographic data, and exam history for on-line retrieval; tracks exam status from order entry through report signing and records charges; provides for on-line report dictation of test results; and generates management reports including exam statuses, work accomplished per day per shift, and a variety of statistical reports. A film locator option is available for tracking radiology films within the hospital or borrowed from or on loan to outside institutions. A total of 65 systems are currently installed.

  - Microbiology is a system for processing specimens and procedure orders in various laboratories such as mycobacteriololgy, bacteriology, mycology, paristology, virology, and serology. The system provides for the detection of organisms isolated for infection control, monitors quality control, provides for on-demand inquiries on test results, and includes workload statistics for analyzing staff requirements for specimen processing; and produces daily billing statements, revenue summaries, and reports for management. A total of 204 systems are currently installed.

- Anatomical Pathology is an on-line text-handling system for recording, storing, searching, and reporting of pathology findings of surgical pathology, cytology, and autopsy departments. Daily billing transaction and revenue reports, workload reports, and other internal lab reports can be generated. A total of 108 systems are currently installed.

- Blood Bank provides for on-line inquiry and storage of data on donor recruitment and donor history, cross-match results, antibody profiles, and transfusion data; flags abnormal test results; captures charges; prints mail merge documents and telephone lists; and issues patient charges and compiles statistical reports. A total of 89 systems are currently installed.

- Global Report Writer Option provides a data base searching tool for performing statistical analyses and creating data base reports. Features include English prompts, on-line report definitions, and error checking. Users can create and modify structured reports that include any patient-related information stored in their MEDITECH data base. A total of 81 systems are currently installed.

• Financial application modules available include the following:

- Materials Management provides for the management of equipment and supplies purchasing and receiving, inventory control, supplies usage, equipment maintenance, and vendor performance. It also prints purchase orders, reports, and receiving slips. A total of 83 systems are currently installed.

- General Ledger supports budgeting and cost allocation functions and contains six component parts: chart of accounts and organizational hierarchy, bookkeeping, inquiry, general reporting, budgeting, and cost allocation. It also includes a report feature capable of monthly or quarterly account comparisons and a budgeting option. A total of 108 systems are currently installed.

- Billing/Accounts Receivable (B/AR) records patient charges, allows on-line account inquiry, prints bills and claim forms, and provides follow-up and management reports on demand. A total of 117 systems are currently installed.

- Physicians' Billing/Accounts Receivable Option is an optional feature of the B/AR module for providing individual billing systems to a hospital's medical staff that pulls charges from hospital records and posts professional fees to the appropriate physician's billing systems.

- Accounts Payable maintains vendor and invoice information for on-line inquiry and controls check writing and bookkeeping functions; and allows direct user control of posting, reporting, and checking functions. A total of 96 systems are currently installed.

- Fixed Asset Accounting allocates depreciation expenses of fixed assets such as land, buildings, and movable assets among hospital departments and forwards depreciation expenses to the General Ledger module. A total of 67 systems are currently installed.

- Payroll/Personnel calculates and issues paychecks from employee time-card information, maintains employee payroll and personnel data on-line, controls position openings, and generates payroll and personnel summary reports. A total of 85 systems are currently installed.

- Cost Accounting enables hospitals to compare the cost of providing services to the revenue received for each DRG by extracting patient and service unit information from the B/AR module, using the information to identify services that are most profitable or unprofitable, and incorporating the past and present volume and cost data from General Ledger for departmental budget preparation and decision making. A total of 27 systems are currently installed.

- MAGIC™ Office combines word processing with mail list features, spreadsheet, electronic mail, personal data base management, remote processing, and staff registry features into an integrated information management package. A total of 36 systems are currently installed.

- MEDITECH has developed the General Data Search (GDS) Option for use with the application modules for accessing and selecting data base information to compile files for statistical studies without altering data base elements.

Software is usually sold in conjunction with hardware supplied by hardware manufacturers. MEDITECH is an Independent Software Vendor (ISV) for DEC and Data General and has a close working relationship with these vendors. Other hardware products recommended by MEDITECH include Wyse terminals and Espirit hardware. In effect, most end users receive a turnkey system.

Pricing for perpetual licenses for in-house software is dependent on the size and type of installation required. Current prices are available upon request from MEDITECH.

MEDITECH's operating system, MIIS/MAGIC, is a software environment for the development and operation of application programs.

- The system includes an operating system, a programming language, a language interpreter, a data base management system, and a set of utility programs. It was developed as an enhancement of the MUMPS Operating System/Language, originally designed by MEDITECH's founder, Mr. Pappalardo. MIIS/MAGIC is the enhanced version of the MIIS Standard that also supported microcomputers.

- MIIS/MAGIC has approximately 300 installations, with more than 2,500 end users. It is licensed directly by MEDITECH, as well as by many OEMs and distributors, who use it to develop medical and nonmedical applications. License fees, like product pricing, is dependent on the size and type of installation.

MEDITECH has approximately 300 hospital customers worldwide.

Previously, MEDITECH undertook custom applications software development projects for commercial and governmental institutions.

Industry Markets

Approximately 97% of MEDITECH's 1988 revenue was derived from the medical/hospital industry, and the remaining 3% from OEMs and computer systems distributors.

A three-year summary of source revenue by industry follows:

MEDITECH
THREE-YEAR SOURCE OF REVENUE SUMMARY

	FISCAL YEAR		
INDUSTRY	1988	1987	1986
Medical/hospital	97%	93%	87%
OEMs and computer systems distributors	3%	7%	13%
TOTAL	**100%**	**100%**	**100%**

Geographic Markets

Approximately 73% of MEDITECH's 1988 revenue was derived from the U.S., 23% from Canada, 2% from Europe, and 2% from South America, Near East, and Far East.

SHARED MEDICAL SYSTEMS CORPORATION
51 Valley Stream Parkway
Malvern, PA 19355
(215) 296-6300

R. James Macaleer, Chairman and CEO
Graham King, President
Public Corporation, OTC
Total Employees: 3,860
Total Revenue, Fiscal Year End
12/31/88: $378,738,000

The Company

Shared Medical Systems Corporation (SMS) was formed in 1969 to provide information services to the hospital industry. In June 1976, SMS became a publicly held corporation.

SMS is currently the nation's leading provider of information services to the health care industry.

- The company's products and services are provided to hospitals, clinics, and physician groups for financial, administrative, and clinical management applications.

- SMS currently provides remote computing, network, and distributed processing services; application software products; turnkey systems; and various professional services, including proprietary network design, custom programming, systems installation, education, and facilities management.

Revenue for 1988 was $378.7 million, a 3% decrease from 1987 revenue of $390.7 million. Net income declined 35%, from $45.3 million in 1987 to $29.4 million in 1988. A five-year financial summary follows:

SHARED MEDICAL SYSTEMS CORPORATION
FIVE-YEAR FINANCIAL SUMMARY
($ thousands, except per share data)

	FISCAL YEAR				
ITEM	1988	1987	1986	1985	1984
Revenue	$378,738	$390,730	$374,880	$312,207	$256,753
• Percent increase (decrease) from previous year	(3%)	4%	20%	22%	22%
Income before taxes	$44,952	$75,529	$55,300	$74,332	$62,637
• Percent increase (decrease) from previous year	(40%)	37%	(26%)	19%	22%
Net income	$29,398	$45,318	$31,968	$41,748	$33,756
• Percent increase (decrease) from previous year	(35%)	42%	(23%)	24%	24%
Earnings per share	$1.25	$1.80	$1.26	$1.66	$1.37
• Percent increase (decrease) from previous year	(31%)	43%	(24%)	21%	23%

SMS management attributes the company's slowed growth and net income declines to the following:

- 1988 revenue declines were attributed primarily to weaker sales and renewal activity during 1987 and a portion of 1988. In addition, a higher percentage of new contracts were fixed-price contracts (producing revenues on a monthly basis over several years), rather than perpetual license agreements (which generate large one-time license fees during the approximately twelve-month period following a sale).

- Expenses were approximately $333.8 million (88% of revenue) in 1988, compared to $315.2 million (81% of revenue) in 1987. The increase in expenses was attributed primarily to increased personnel costs and equipment-related costs to service the business. General and administrative expenses for 1988 include a charge of $2.5 million in anticipation of payment for the settlement of a class action suit filed against SMS and certain officers.

- The small revenue growth (4%) in 1987 was attributed to selling-related problems.

- In 1986, income before taxes and net income were adversely affected by the equity in losses and write-down of the company's investment in SMS International N.V. (SMSI) and the related shutdown expenses of SMSI's Japanese subsidiary.

  - SMSI, which operated as a 45%-owned affiliate of SMS during 1985, was established by SMS in 1981 to provide services--directly and through subsidiaries, joint ventures, and license arrangements--to health care organizations outside North America. Effective June 30, 1986, SMS acquired 100% ownership of SMSI.

  - The activities described above resulted in additional expenses during 1986 of approximately $30.2 million, reducing overall earnings by approximately $20 million.

Research and development expenditures were approximately $37.5 million (10% of revenue) in 1988, $37.9 million (10% of revenue) in 1987, and $34.4 million (9% of revenue) in 1986. During 1988, 1987, and 1986 the company also capitalized approximately $13.5 million, $8.7 million, and $3.1 million, respectively, for certain software development costs.

SMS is currently organized into seven divisions and two subsidiaries as follows:

- The Hospital Systems Division, SMS' largest business unit, provides network and distributed processing services, application software, and associated hardware to domestic, nonfederal hospitals.

- The Decision Support Division, formed in 1988, markets a family of integrated DEC-based decision support products and provides consulting services.

- The Laboratory Products Division, formed in early 1988, is dedicated specifically to the development, marketing, delivery, and support of hospital clinical laboratory information systems.

- The Radiology Systems Division, formed in 1988, provides DEC-based systems to the hospital radiology information systems market.

- The Turnkey Systems Division, formed in late 1987, is dedicated exclusively to the development, marketing, installation, and support of DEC-based turnkey hospital information systems. The division's current product line consists of the ALLEGRA™ system.

- The Physicians' Services Division provides processing, facilities management, turnkey systems, and practice management and consulting services to physician group clients.

- The Federal Systems Division, formed in 1988, markets SMS' products and services to hospitals operated by the federal government.

- SMS International N.V. markets SMS products and services outside North America.

- SMS Canada provides SMS products and services in Canada.

Major competitors of SMS include the following:

- Processing competitors include Systems Associates, Inc. (First Data Resources/American Express) and various regional firms.

- Competition from vendors providing in-house systems comes from IBM, HBO & Company, and Baxter Healthcare Corporation.

- Physicians' services competitors include Cycare and IDX.

Key Products and Services

INPUT estimates approximately 70% of SMS' 1988 revenue was derived from remote and facilities management processing services, 25% from software and hardware leases from in-house/distributed processing and turnkey systems, and the remaining 5% from professional services.

SMS' products and services are provided to hospitals, clinics, and physician groups.

- The company's primary market is acute-care hospitals, generally with 100 or more beds, and physician groups.

- SMS currently serves more than 1,200 hospitals and physician group practices.

- There are over 1,000 mainframes and minicomputers running SMS software installed at SMS client locations.

SMS provides over 100 applications to its hospital, clinic, and physician group clients for financial, administrative, and clinical management. A summary of applications provided by SMS is shown in the exhibit.

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EXHIBIT

SMS APPLICATIONS

APPLICATION AREA	APPLICATION AREA
Financial Management • Inpatient Billing • Advanced Outpatient • Physicians Billing • General Ledger and Statistics • Risk Management • Planning • Marketing Support • Payroll • Time and Attendance • Personnel • Human Resources • On-line Account Management • On-line Cost Accounting Management • On-line Materials Management • Inventory Control • Accounts Payable • Accounts Receivable • Property Accounting Management • Ambulatory Information System • Financial Patient Index • Master Patient Index **Administration** • Administration, Planning, and Statistics • Census • Comparative Statistics • Discharge Planning • Infection Control • Medical Records • Professional Services • Quality Assurance • Risk Management • Tumor Registry • Utilization Review • DRG Management • Drug Utilization Review • Marketing • Mortality Rate Analysis **Decision Support** • Trend Monitor • Cost Accounting Manager • Performance Manager • Flexible Budget Monitor • INFOSTATION	**Clinical Management** • Admissions • Care Planning • Chart Location and Delinquency • Clinic Scheduling • Inpatient Registration • Laboratory: Blood Bank, Chemistry, Anatomic Pathology, Microbiology • Order Processing • Results Reporting • Outpatient Registration • Nurse Staffing • Patient Care Plans • Patient Identification • Resource Scheduling • Pharmacy • Radiology • Reregistration • Dietary • Remote Physician Access **Physicians' Systems** • Architecture • Decision Control • Patient Management • Guarantor/Patient Billing • Insurance Processing • Accounts Receivable • Physician Production Analysis • Advanced Collection Workstation • Medical Records Chart Tracking • Clinical Patient Profiles • Ad Hoc Reporting • Appointment Scheduling **Other** • HARMONY • Development Office System • Computer-Aided Instruction • Professional Staff Credentialing

New/enhanced applications introduced during 1988 include the following:

- The Decision Support Division released SMS' Decision Support System (DSS), a family of integrated DEC-based software applications, data bases, and consulting services for health care executives and managers.

  - DSS integrates clinical and financial information drawn from SMS applications, other hospital systems, and external data bases.

  - DSS applications address revenue management, costs, utilization, quality of care, and operational activities--such as HMO/PPO contracting, productivity analysis, and monitoring physician treatment profiles. DSS products include capabilities for forecasting and simulation, pricing analysis, and product line management and planning.

- A new version of SMS' Nursing application automates and integrates care plan and patient classification activities.

- During 1988, SMS began hospital-based tests of various bedside technologies, including stationary and handheld devices, in order to evaluate their effectiveness as part of nursing applications.

- The latest version of SMS' Radiology Management System, when integrated with a SMS hospital information system, supports patient scheduling, registration, tracking, results reporting, film tracking, and equipment maintenance scheduling. The system uses barcode technology to access films and reports. An electronic voice synthesizer facilitates remote inquiry into the results reporting system. Imaging capabilities are under development.

- SMS' Laboratory System now provides applications dedicated to chemistry, microbiology, anatomic pathology, and blood bank activities. SMS is pursuing a new segment of the clinical marketplace--multi-entity labs. During 1988, SMS' new Laboratory System was installed at a central lab that serves five affiliated hospitals.

- A new version of the SMS Pharmacy System provides inpatient and outpatient support of hospital pharmacy functions, including full medication and IV support of outpatients, expanded inventory control capabilities, and an enhanced clinical inquiry capability.

SMS currently provides remote computing, distributed processing, and in-house systems to its hospital clients.

- The Information Systems Center processes data for more than 800 hospital and physician group clients using IBM 3090 computers. There are currently more than 30,000 terminals attached to the network that connect clients with the Information Systems Center.

- INDEPENDENCE ™, an IBM-based financial and clinical management system targeted to large hospitals, is available as a remote computing service and as an in-house system for IBM 43XX and 30XX computers.

  - INDEPENDENCE Inhouse Computing Option (ICO) is targeted to large hospitals that require an in-house system.

  - SMS' INDEPENDENCE Remote Computing Option (RCO) allows hospitals to run their financial and clinical applications at SMS' Information Systems Center on dedicated computers.

  - Over 100 clients have INDEPENDENCE installed as an in-house system, and approximately 45 hospitals are using the Remote Computing Option.

- ALLEGRA® is an integrated DEC VAX-based health care information system targeted primarily to community hospitals with 100 to 400 beds. The system supports clinical, financial, administrative, and decision support applications. There are currently 50 ALLEGRA clients.

- EXACT® is a distributed system with clinical applications processed on in-hospital DEC or IBM computers, and financial applications processed remotely at the SMS Information Systems Center.

- SMS' current DEC VAX-based Laboratory System, marketed and supported by the Laboratory Products Division, includes Anatomic Pathology and Blood Bank applications, and a MicroVAX-based on-line instrument interface capability. The system can serve any single hospital or multi-entity environment and can be delivered as part of an integrated hospital system or on a standalone basis.

- Professional services provided to hospitals include client site facilities management, education, custom programming, proprietary network design, system installation, and consulting.

- During 1988, the Decision Support Division provided programming and analysis projects for clients, and research assignments for third parties, including government agencies.

- SMS has announced the following agreements:

  - In April 1988 SMS announced a research and development agreement with CliniCom and Scripps Memorial Hospitals, Inc. of La Jolla (CA). The agreement will link the CliniCom handheld terminal to the SMS Patient Management and Pharmacy Systems to quantify the clinician's needs for information at the bedside.

  - In March 1988 SMS and Atwork Corporation of Chapel Hill (NC) announced they are jointly marketing three microcomputer-based nurse management information systems developed by Atwork and designed for integration into SMS' health care information systems.

    - The three systems include the Automated Nurse Staffing Office System, the Operating Room Scheduling Office System, and the Recruitment Manager.

SMS services over 400 medical practices representing over 10,000 physicians nationwide. The company provides the following products and services to physician groups:

- SIGNATURE[R] consists of interrelated physician applications and subsystems designed to provide financial, clinical, and administrative information processing support for medical groups of all sizes.

  - SIGNATURE is an on-line, interactive system. Basic application modules include Architecture, Decision Control, Patient Management, Guarantor/Patient Billing, Insurance Processing, Accounts Receivable Management, and Physician Production Analysis.

  - Optional applications available include Advanced Collection Workstation, Medical Records Chart Tracking, Clinical Patient Profiles, AD HOC Reporting, and Appointment Scheduling.

  - SIGNATURE is available as an in-house or as a remote computing option. All configurations operate using IBM and compatible computers under MVS.

  - There are currently over 100 SIGNATURE clients.

- The Physicians Office System (POS) is an in-house microcomputer-based office management system targeted to small physician practices of up to five physicians.
  - POS includes all functions related to patient registration, charge and payment entry, patient and insurance billing, receivables management and reporting, and patient charting. Other modules are available to access and interact with data in the system's data base.
  - POS can be used to access SMS mainframe hospital systems to preadmit patients, order tests, view admission/discharge/transfer (ADT) data, and obtain lab results.
- SMS continues to support, but no longer actively markets, the MED-GROUP, PBS, and PBS2000 products.

SMS' local-area network product, HARMONY, facilitates communications within medical complexes and among affiliated institutions in the same geographic area.

Industry Markets

Virtually 100% of SMS' 1988 revenue was derived from the medical industry. Acute-care hospitals accounted for the majority, with the remainder from physician group practices and clinics.

SMS currently has one federal-funded hospital client, the Philadelphia Veterans' Hospital.

Geographic Markets

The majority of SMS' 1988 revenue was derived from the U.S. INPUT estimates less than 5% was derived from international locations.

SMS currently has contracts with hospitals in 47 states, the District of Columbia, and Puerto Rico. The company also has hospital contracts in Canada, the U.K., Ireland, The Netherlands, West Germany, and Spain.

U.S. branch offices are located in Ann Arbor (MI); Atlanta (GA); Boston (MA); Charlotte (NC); Chicago (IL); Cleveland and Columbus (OH); Dallas (TX); Denver (CO); Indianapolis (IN); Kansas City (KS); Los Angeles, Oakland, San Francisco, and Santa Barbara (CA); Miami (FL); Milwaukee (WI); Nashville (TN); New Orleans (LA); New York (NY); Philadelphia and

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Pittsburgh (PA); Phoenix (AZ); Seattle (WA); Somerset (NJ); St. Louis (MO); Washington, D.C.; and Wilmington (DE). The company also has an office in San Juan (PR).

International offices are located in Canada (2), Germany, Ireland, Spain, The Netherlands, and the U.K.

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3M HEALTH INFORMATION SYSTEMS
575 W. Murray Blvd.
Salt Lake City, UT 84157-0900
(800) 367-2447

President
Unit of 3M Health Care Group
Total Employees: 350
Total Revenue, Fiscal Year End 12/31/89:
$35,000,000 *

* INPUT estimate

The Company

3M Health Information Systems is a unit of 3M Health Care Group, a provider of pharmaceuticals, medical equipment, medical supplies, and diagnostic systems. The company develops, markets, and supports turnkey systems primarily to hospitals.

3M Health Information Systems was formed through 3M's acquisition of two medical information services companies:

Key Products and Services

3M Health Information Systems offers three main product lines. The departmental systems are:

- Medlab Laboratory Systems are a collection oflaboratory computer systems, capable of interfacing with laboratory instruments and hospital information systems, that provide patient reports, management reports, and long term storage and retrieval.

  - Available Medlab Laboratory Systems modules can perform the following functions: admit, discharge, and transfer; test order entry; speciment; reception; worklist; results entry; patient results reporting; management-related reporting; inquiry; instrument interfaces.

  - Available software modules include: chemistry; hematology; urinalysis; serology; microbiology; radioimmunoassay; coagulation; enzymology; endocrinology; electrophoresis; toxicology; isoenzymology.

- Code 3 Systems are knowledge-based systems that facilitates the coding process and allows health care providers to monitor and analyze health care utilization.

- Available hospital software modules include: outpatient management; risk management; discharge planning; infection control; utilization management; chart management; medical records; quality assurance.

- The following applications are included: ICD-9-CM coding; HCPCS/CPT coding; DRG management; prospective payment optimization; abstracting and reporting; chart deficiency monitoring; chart location; third-party payor tracking; pre-admission review; quality assurance screening.

- The Code 3 System was first introduced in 1982 and is currently installed in 1500 hospitals.

The third product line is a comprehensive group of applications crossing all product lines. the HELP Patient Care systems uses expert systems technology for all departmental applications. Its components include: ADT, patient index and registration, pre-admission review, order entry, results reporting, infection control, blood gas interpretation, special care units, discharge planning, nursing assessment, laboratory, pharmacy, radiology, utilization review, and medical records.

Industry Markets

Approximately 96% of 3M Health Information Systems sales were in the hospital sector. The remainder was derived from sales to the "other" medical sector.

Geographic Markets

All of 3M Health Information Systems 1988 revenue were derived from sales in the U.S.

10. Other Vendors

a. Datacare, Inc.

Located in Roanoke (VA), Datacare is a provider of hospital information systems software. Products offered are comprehensive clinical and financial packages that include general-ledger, personnel/payroll, and decision support functions. Annual sales in 1988 reached $20 million.

b. Global Health Systems, Inc.

Located in Rockville (MD), Global Health Systems develops, installs, and maintains integrated patient-record-based turnkey systems for ambulatory care facilities and hospitals. Annual sales in 1988 reached $2.5 million.

c. Global Software, Inc.

Located in Raleigh (NC), Global Software, Inc. develops, markets, and supports IBM-based accounting application software products for clients across industries, as well as vertical software products for the health care industry. Annual sales reached $25 million in 1988.

d. GTE Health Systems

A subsidiary of GTE, GTE Health Systems entered the market through the acquisition of IHC Affiliated Services, the information services unit of health care provider Intermountain Health Care (UT), in late 1988. GTE also acquired GEIS' EMC*Express, an EDI application specific to the health care industry. The company intends to address current health care industry trends by capitalizing on its communications networking expertise.

e. Health Data Sciences Corporation

Located in San Bernardino (CA), Health Data Sciences provides an integrated, patient-centered turnkey system that addresses patient care, laboratory, pharmacy, and DRG case mix applications. Health Data systems are based on a Data General platform. INPUT estimates that Health Data brought in $10-15 million in sales in 1988.

f. Management Science America, Inc.

Management Science America (MSA), founded in 1963, develops, markets, and supports a range of application software packages for use on medium- to large-scale mainframes. MSA provides an integrated line of patient accounting and information systems for hospitals with 300+ beds.

g. National Data Corporation

National Data Corporation (NDC) was incorporated in 1967 to provide specialized data processing and facilities management processing services. The company currently provides various processing services, professional services, turnkey systems, and systems operations in the health care industry.

NDC's Health Care Data Services Division provides turnkey systems for pharmacy management to hospitals, HMOs, and independent and chain store pharmacies. Turnkey systems sales to the medical industry reached $15 million in 1988. The company is located in Atlanta (GA).

h. Triad Systems Corporation

Triad Systems Corporation, founded in 1972, develops, manufactures, markets, and supports turnkey systems in three vertical markets: the automotive parts aftermarket, retail hardgoods dealers, and dentists.

Through the Dental Division, Triad markets practice management turnkey systems to dental practices. The systems are based on minicomputers and range in price from $7,500 to $35,000, with an average system price of $15,000. There are currently over 800 dental systems installed.

V

New Opportunities

The opportunities for information services vendors are summarized in Exhibit V-I.

EXHIBIT V-1

Opportunities for IS Vendors

- Integrated and clinical systems
- Physician-outpatient, facilities-hospital networking
- Outpatient facility information systems

A

Hospital Segment

Most hospitals are expected to install integrated systems to replace their fragmented existing applications. Before the introduction of the prospective payment system, hospital's information systems monitored the financial and administrative tasks of billing and collections. Separate systems were then established for departmental management functions. The prospective payment system is forcing hospitals to change how they manage information. Whereas previous systems were separate, systems must now be integrated. Hospitals must be able to account for what it costs to deliver medical services rather than what they paid for the medical services. Medical information systems which exist today are not designed to capture cost data.

Hospitals cannot function well with separate systems for financial operations, patient care, and nursing management, etc. A single integrated system increases efficiency and quality of care by redirecting the handling of data from information processing to information management. The changing medical environment requires an integrated information system, on a single computer system or a network of computer systems, and a single data base.

Integrated systems and clinical systems will be integrated into the hospital's medical information system. Point-of-care information systems will use bedside terminals and workstations to update the patient data base and allow rapid access by physicians and nurses. The computerization of clinical operations is expected to follow. However, clinical labs are considered as a decentralized function of a hospital's information system. The challenge confronting hospitals is the integration of clinical information systems with its financial/patient system.

The nationwide increase in the number of HMOs and rapid growth rate forecast throughout the 1990s represent a lucrative segment of the health care industry. Because of fixed reimbursement payments to hospitals by HMOs, participating hospitals require a comprehensive interconnected information system. Hospitals will be seeking information systems providing immediate feedback on the profitability of participating in an HMO plan.

B

Physicians Segment

The rapid development of networking capabilities is offering many alternatives for linking physicians and other health professionals to the hospital's information system. The ability of physicians to tie into the hospital's information system from any location will enable a physician to monitor a patient's progress and reduce the time spent traveling and communicating between the physician's private practice and the hospital.

Hospitals are installing personal computers in physicians' offices. Hospitals are responding to physicians' interest in performance evaluation and obtaining quality of care and productivity measurements. Physicians are using this information to evaluate how their patients compare with other physician's patients in terms of length of stay, severity of illness, and hospital charges. The collaboration between a hospital and its physicians can be seen as a way to build patient volume and increase its referral base. Information systems that tie physicians to the hospital strengthen loyalties and increase the chances that physicians will practice primarily at the hospital.

C

"Other" Medical Segment

New health information services will emerge to conform with the changing sites of health care delivery. New types of delivery systems are emerging such as ambulatory care centers and home health care. These new alternative delivery systems or outpatient facilities will provide new markets and opportunities for information system vendors.

Increasingly, hospitals are diversifying their product lines enabling the hospital to offer a continuum of care. In a multiple facility environment, a patient may move between inpatient and outpatient status. Future systems will require the integration of inpatient and outpatient systems. Information on a patient must be current and accessible regardless of where the patient receives services.

The information system must be designed to support the multiple-entity medical environment and should be integrated, allowing the sharing of information among a variety of health care professionals and in a variety of locations.

VI

Conclusions and Recommendations

The challenge for information service vendors is to provide a fully integrated system that meets all aspects of a hospital's operations. Hospitals do not want a wide variety of different systems; they want systems that tie together all their needs and allow them to cope with the informational requirements for regulatory agencies and an intensively competitive environment.

Increasingly hospitals are moving into alternative health care delivery and joint ventures with physicians. Vendors need to move outside the hospital environment by providing systems to a variety of provider functions in remote locations. Vendors who can offer networked systems among hospitals, outpatient facilities, and physicians are likely to outperform their competitors.

As the health care industry expands its services, the number of users (physicians, nurses, pharmacists, technicians, etc.) and locations will increase, along with their information needs. The health care systems of the future will become increasingly complex and support various needs. In a diversified environment, standalone systems will be replaced by comprehensive information management tools.

ME-A

Appendix: Definitions

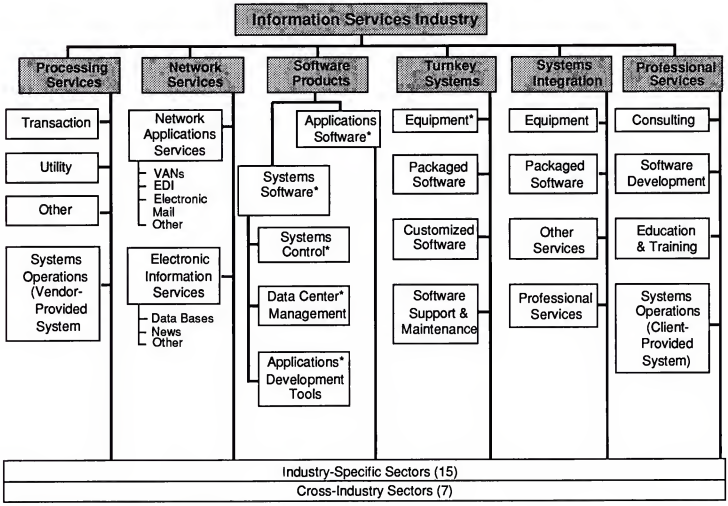
Definitions of medical terms used are as follows:

- *HMOs (Health Maintenance Organizations)* - A patient pays a predetermined monthly fee for a range of health care services rather than paying for individual services rendered.
- *PPOs (Preferred Provider Organizations)* - These provide discount rate health care to plan members in exchange for prompt payment and a guaranteed patient base.
- *DRGs (Diagnosis Related Groups)* - System that catalogs illnesses requiring hospitalization and determines the length of stay and treatment guidelines for hospitals and physicians. The medical provider receives the same payment for every patient in a given DRG, no matter what the actual of length of stay and regardless of what real expenses are incurred.

Exhibit A-1 outlines the structure of the information services industry and the various delivery modes discussed in Chapter III (Market Forecasts). For detailed definitions and descriptions of these delivery modes, see the separate MAP Program report titled "Appendix A: Definitions."

EXHIBIT A-1

Information Services Industry Structure



*Broken out by Workstation/PC, Minicomputer, and Mainframe segments

Source: INPUT

ME-B

Appendix: Forecast Data Base

This appendix contains detailed forecasts by delivery mode for the entire medical sector. In addition, summary forecasts by delivery mode are provided for three segments: hospitals, physicians, and "other."

These forecasts were revised in February 1990, and are lower than the preliminary forecast reported in the overall MAP Forecast Data Base published in December 1989. The reasons for these changes are outlined in Appendix C of this report.

EXHIBIT B-1

Medical Sector User Expenditure Forecast by Delivery Mode, 1988-1994
($ Millions)

Sector by Delivery Mode	1988	Growth 88-89 (%)	1989	1990	1991	1992	1993	1994	CAGR 89-94 (%)
Total Medical Sector	3,275	15	3,755	4,195	4,715	5,310	5,995	6,805	13
Processing Services	975	9	1,060	1,145	1,235	1,334	1,441	1,558	8
- Transaction Processing Services	425	6	450	473	497	522	548	575	5
- Systems Operations	550	11	610	672	739	813	894	983	10
Network/Electronic Information Services	395	24	489	580	690	822	980	1,172	19
- Electronic Information Services	250	23	308	354	407	468	538	618	15
- Network Applications	145	25	181	227	283	354	443	553	25
Application Software Products	670	18	793	896	1,017	1,160	1,331	1,535	14
- Mainframe	290	11	322	344	369	394	422	451	7
- Minicomputer	230	15	264	291	320	352	387	426	10
- Workstation/PC	150	38	207	261	329	414	522	657	26
Turnkey Systems	775	11	860	945	1,035	1,135	1,250	1,375	10
Systems Integration	160	26	210	260	320	400	490	610	24
Professional Services	300	15	345	379	417	459	505	556	10

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EXHIBIT B-2

Hospital Information Services Market by Delivery Mode, 1988-1994
($ Millions)

Segment by Delivery Mode	1988	Growth 88-89 (%)	1989	1990	1991	1992	1993	1994	CAGR 89-94 (%)
Total Hospital Segment	2,580	14	2,940	3,295	3,690	4,130	4,650	5,245	12
- Processing Services	775	8	835	895	960	1,025	1,095	1,175	7
- Network Services	315	25	395	470	560	665	790	940	19
- Application Software	530	18	620	715	815	925	1,055	1,205	14
- Turnkey Systems	590	10	650	710	770	840	920	1,005	9
- Systems Integration	130	25	165	200	250	310	385	480	24
- Professional Services	240	15	275	305	335	365	405	440	10

EXHIBIT B-3

Physician Information Services Market by Delivery Mode, 1988-1994
($ Millions)

Segment by Delivery Mode	1988	Growth 88-89 (%)	1989	1990	1991	1992	1993	1994	CAGR 89-94 (%)
Total Physician Segment	575	15	665	750	855	965	1,095	1,255	14
- Processing Services	170	11	190	210	230	260	285	320	11
- Network Services	70	23	85	100	120	140	160	190	17
- Application Software	120	18	145	160	185	210	240	275	14
- Turnkey Systems	135	11	150	170	190	210	235	265	12
- Systems Integration	30	25	35	45	60	70	90	110	24
- Professional Services	50	16	60	65	70	75	85	95	10

EXHIBIT B-4

"Other" Information Services Market by Delivery Mode, 1988-1994
($ Millions)

Segment by Delivery Mode	1988	Growth 88-89 (%)	1989	1990	1991	1992	1993	1994	CAGR 89-94 (%)
Total Other Segment	125	12	140	165	195	220	255	305	17
- Processing Services	30	13	35	40	45	50	55	65	14
- Network Services	10	27	10	15	20	25	30	40	26
- Application Software	20	18	25	30	35	40	45	55	18
- Turnkey Systems	50	12	55	60	70	80	90	105	13
- Systems Integration	5	25	5	10	10	10	15	20	24
- Professional Services	10	15	10	10	15	15	20	20	15

ME-C

Appendix: Forecast Reconciliation

The are several differences between the 1988 medical sector forecast presented in last year's report and the 1988 actual data shown in Exhibit C-1.

The processing services growth from 1987 to 1988 was 8%, compared to the forecast growth of 15%. The lower actual growth was due to the conversion of users from third-party processing services to in-house systems, including turnkey systems. This conversion has proceeded at a more rapid pace than was previously anticipated. Significant vendors in this area showed modest or negative growth rates for 1988.

Significant vendors in the area of turnkey systems were missed in previous forecasts. For this reason, the turnkey systems base for 1988 was adjusted upward.

The five-year forecast for all delivery modes, with the exception of systems integration and network services, has been decreased due to prevailing economic conditions within the medical services industry. Intense cost pressures brought on by rapidly rising health care delivery costs and inadequate federal/private payor reimbursements, as well as continuing consolidation and restructuring within the industry, contribute to a general slowing of expenditures.

EXHIBIT C-1

Medical Sector Data Base Reconciliation

Industry Sector	1988 Market			1993 Market			88-93 CAGR per data 88 Rpt. (%)	88-93 CAGR per data 89 Rpt. (%)
	1988 Report (Forecast) ($M)	1989 Report (Actual) ($M)	Variance as % of 1988 Report	1988 Report (Forecast) ($M)	1989 Report (Forecast) ($M)	Variance as % of 1988 Report		
Total Medical Sector	3,218	3,275	+2	7,031	5,995	-15	17	13
- Processing Services	1,026	975	-5	1,848	1,441	-22	13	8
- Network Services	392	395	+1	1,337	980	-27	28	20
- Application Software Products	672	670	0	1,522	1,331	-13	18	15
- Turnkey Systems	665	775	+17	1,144	1,250	9	11	10
- Systems Integration	164	160	-2	498	490	-2	25	25
- Professional Services	299	300	0	682	505	-26	18	11

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