COMPUTER SERVICES MARKETS
IN HOSPITALS

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IN

HOSPITALS

INDUSTRY REPORT #15

OCTOBER 1978

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COMPUTER SERVICES MARKETS IN HOSPITALS

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COMPUTER SERVICES MARKETS IN HOSPITALS

LIST OF EXHIBITS .

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I INTRODUCTION

I   INTRODUCTION

- This report is produced by INPUT as part of the Market Analysis Service, and covers the hospital industry sector.

- Research for this report was concentrated on non-Federal Government short-term general hospitals since they have the highest potential for the use of EDP products and services within the hospital community.

- Before the research started, INPUT clients were asked to suggest specific issues and areas of interest to be incorporated into this study. As a result, part of our interview program was directed toward small hospitals, under 100 beds.

- Research carried out for this report includes a series of vendor and user interviews, as specified in the Appendix in Exhibit A-1.

- Interviews were conducted in August and September, 1978.

- Separate questionnaires were used for the vendors and users for both on-site and telephone interviews. Sample copies of these questionnaires are included in the Appendix.

- Inquiries and comments on the information presented are invited from our clients.

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II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. MAJOR FINDINGS

I. MARKET STRUCTURE

- Total U.S. health care costs in 1978 will be over $180 billion and will be 9% of the GNP.

- The 6,000 short-term general hospitals (non-Federal government) which were the focus of this study will have estimated annual expenses of about $52 billion in 1978. The expenses are very labor intensive, with about 60% of these dollars being spent on salaries and benefits of hospital staff.

- Despite government pressures to hold down the high cost of health care, these costs will continue to increase at least at a 10-12% rate per year.

- Total EDP expenditures for this group of hospitals will account for 1-1.5% of their total expenditures.

- It is expected that these costs, particularly for outside services, will increase by an AAGR of 15% because of the planned expansion of EDP within these hospitals.

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2.   USE OF EDP IN HOSPITALS

- While the past use of EDP in hospitals has been concentrated on traditional business management applications, there is a clear indication of an expanded use of EDP within the total hospital environment.

    - Ninety-three percent of the hospitals interviewed were using EDP for business management applications.

    - Seventy-seven percent had patient management applications.

    - Thirteen percent had clinical applications.

- Major planned expansions are expected by hospitals in both patient management and clinical applications. Over half of the hospitals interviewed were planning to implement admitting-discharge-transfer and medical records applications to improve the quality of patient management.

- Business management applications will also change from their historical accounting functions to management tools for the planning and control of hospital expenditures.

- The significance of these findings is that hospitals are recognizing the importance of the management of information resources and are establishing frameworks that will permit the establishment of total information systems within hospitals over the next decade.

- This is further substantiated by the plans of hospitals to move applications from a batch or remote batch mode of delivery to on-line.

    - All hospitals are planning to move more business management applications on-line, with planned expansions up to 35% over current levels.

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- Similar expansions are planned for patient management applications, although current patient management applications show a higher percentage (16 to 70%) of on-line applications than business management applications (5 to 30%).

- Another strong indicator is the planned lease/purchase of display terminals by hospitals over the next five years.

  - All hospitals interviewed were planning on at least doubling the number of display terminals installed over the next five years.

  - Larger hospitals in the 300 and over bed size were planning on having up to 200 display terminals per hospital on-line by 1983.

- Distributed data processing (DDP) is becoming an important aspect of the hospital EDP environment.

  - Thirty-four percent of the 100 bed hospitals interviewed have on-site minicomputers tied into a local or remote mainframe.

- These DDP systems are being provided by in-house developed systems, RCS vendors and medical services companies.

3.   COMPUTER SERVICES FORECASTS

- Computer services for hospitals, as defined in this study, represent the major portion of the total medical industry market for computer services.

- Total computer services revenues for hospitals will be $270 million in 1978 and will continue to grow to a level of $551 million in 1983. Details are presented in Exhibit II-1.

- The forecast of computer services expenditures for hospitals distributed by mode of service is presented in Exhibit II-2.

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EXHIBIT II-I

COMPUTER SERVICES EXPENDITURES FOR HOSPITALS
BY MODE OF SERVICE (1978/1983)

1978

BATCH
$66M (24%)

REMOTE COMPUTING
$67M (25%)

SOFTWARE PRODUCTS
$19M (7%)

PROFESSIONAL
SERVICES
$30M (11%)

FACILITIES MANAGEMENT
$88M (33%)

TOTAL $270M

1983

BATCH
$61M (11%)

REMOTE
COMPUTING
$200M (36%)

SOFTWARE
PRODUCTS
$50M (9%)

PROFESSIONAL
SERVICES
$59M (10%)

FACILITIES
MANAGEMENT
$181M (34%)

TOTAL $551M

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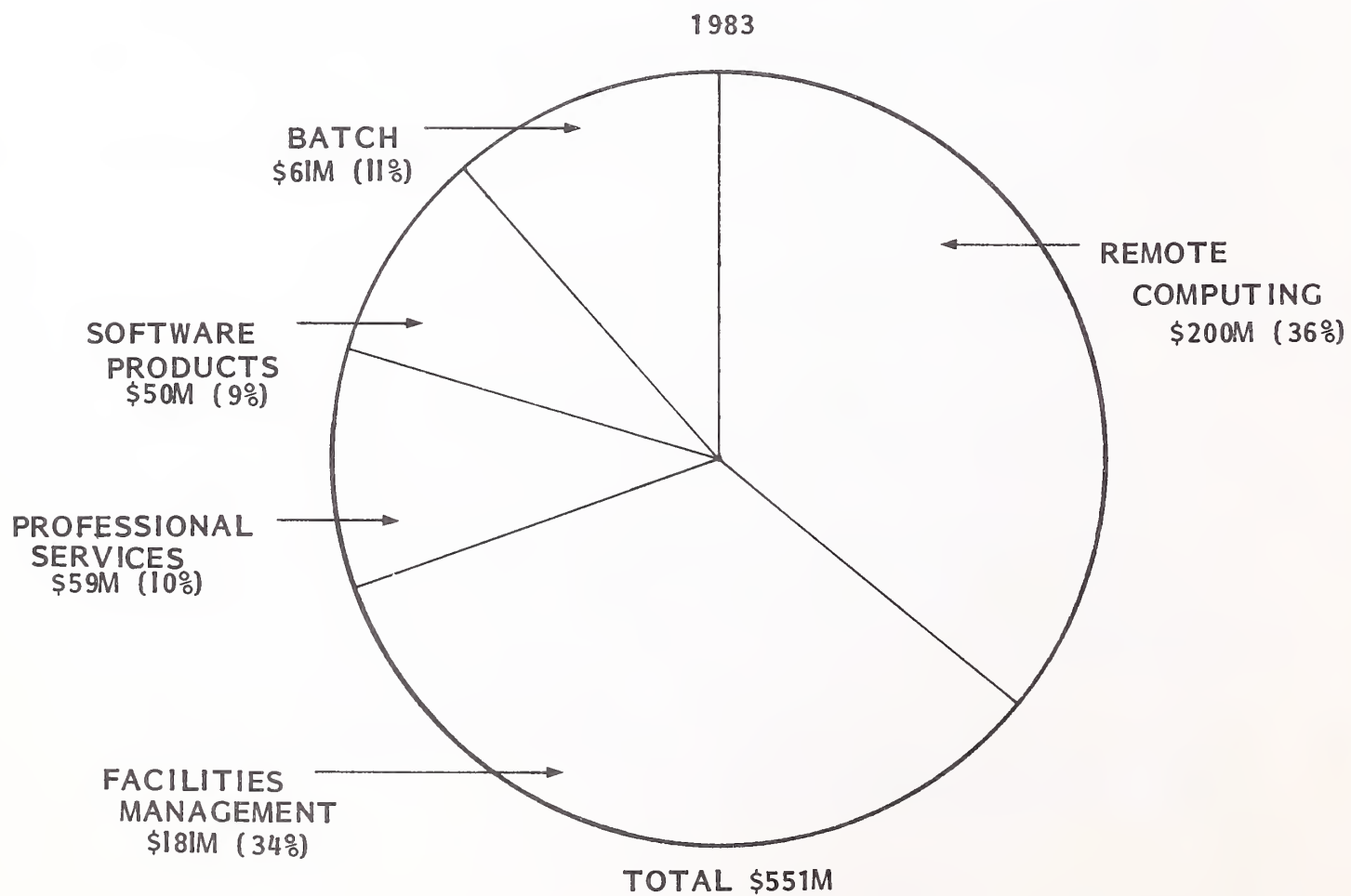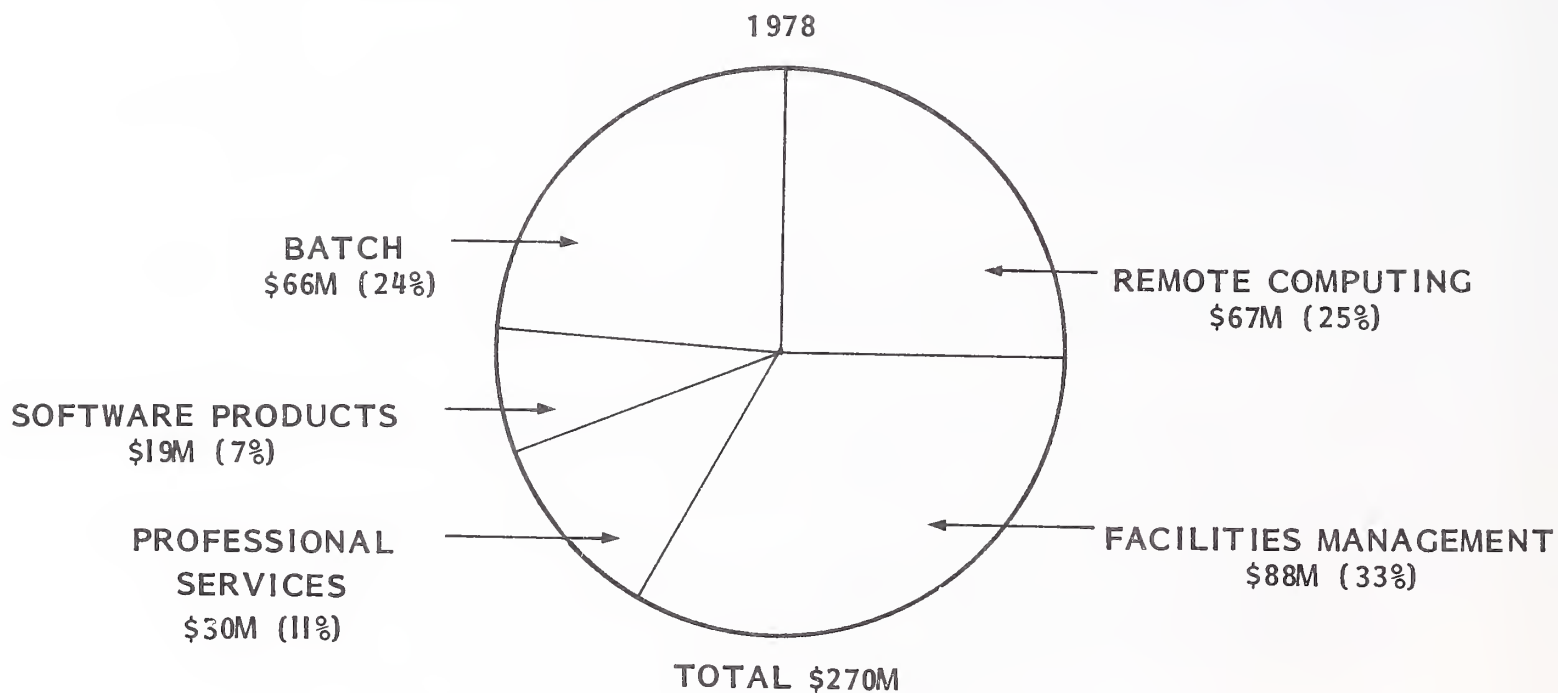
EXHIBIT II-2

COMPUTER SERVICES EXPENDITURES FOR HOSPITALS
BY TYPE OF SERVICE

1978

INDUSTRY
SPECIALTY
$202M (91%)

GENERAL BUSINESS
($11M (5%)

UTILITY
$6M (4%)

SCIENTIFIC &
ENGINEERING
$1M (<1%)

TOTAL $221M

1983

INDUSTRY
SPECIALTY
$406M (92%)

GENERAL
BUSINESS
$20M (5%)

UTILITY
$12M (2%)

SCIENTIFIC &
ENGINEERING
$4M (<1%)

TOTAL $442M

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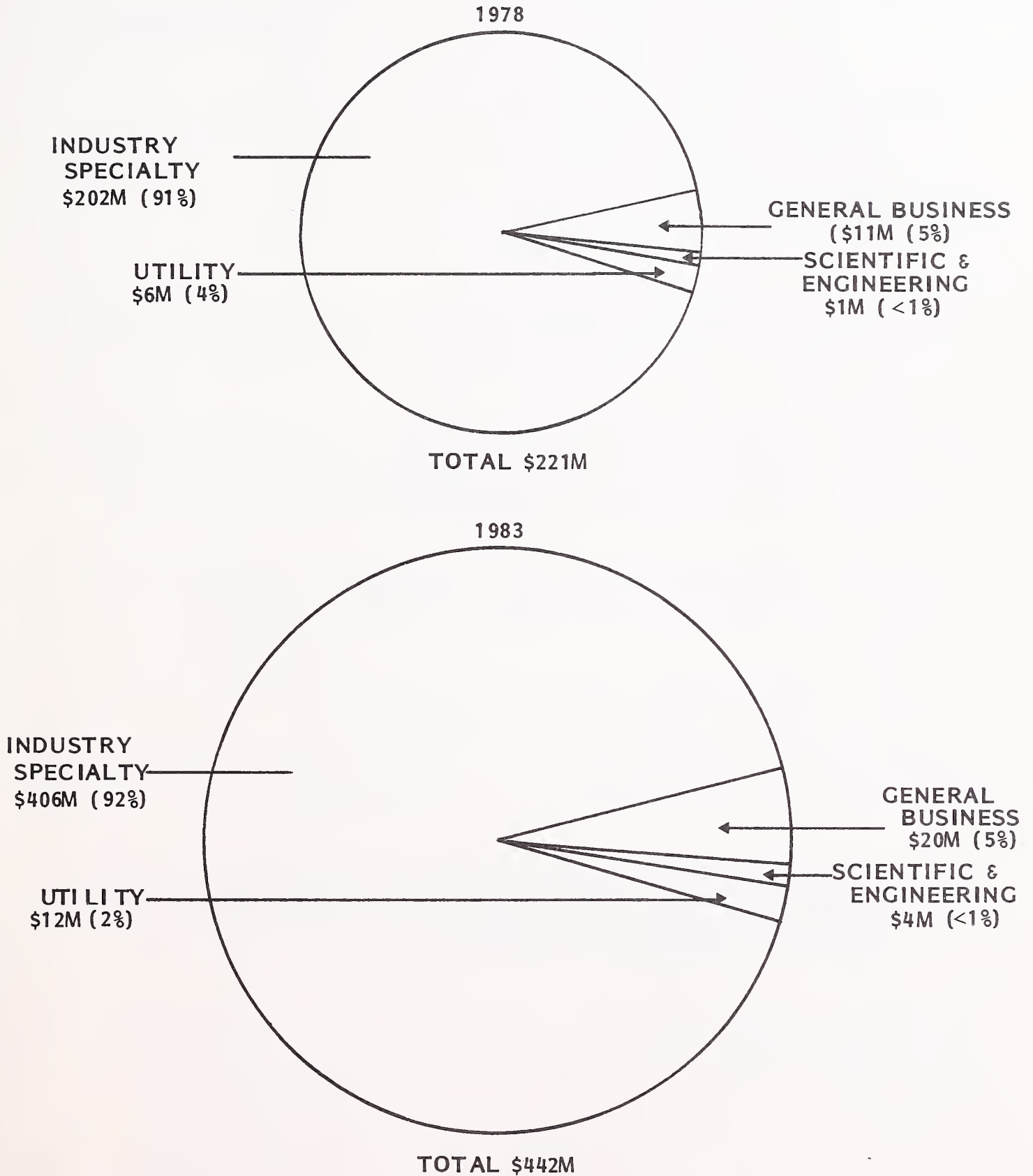
- The forecast indicates a shift from batch to remote computing services by 1983 as a result of hospitals moving more applications on-line.

- The incorporation of more hospital computer services to in-house or RCS supplied distributed data processing networks is another major contributing factor to this shift from batch delivery.

• Industry specialty applications will continue to be the dominant type of application supplied to this industry and will account for 90% of the applications.

  - More sophisticated business management applications will be introduced to assist hospital administrators in budget planning and resource utilization monitoring.

  - Patient management applications will increase in the area of admitting-discharge-transfer and on-line medical records.

  - Clinical applications will shift from standalone operations to an integration with business and patient management applications.

• The hospital subsector AAGR will be 1% less than the growth rate of 16% forecast for the total computer services market.

4. COMPETITIVE ENVIRONMENT

• Although the market for short-term general hospitals is highly competitive on a national and regional basis, there are sufficient opportunities to consider a concentrated effort toward this market.

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- The demand for increased use of EDP within the total hospital environment will strain the technological capabilities of many in-house EDP staffs, and more reliance will have to be placed on computer services vendors to provide the desired services.

- While government pressures will increase for holding down the cost of hospital services, this may have a positive effect on the use of EDP in hospitals.

  - This will be in the form of maintaining and reporting expanding information on hospital costs and resource utilization.

  - Hospital administrators will be required to develop and maintain more extensive budget and control systems.

- Competition will continue to be on both a national and regional basis, but it is expected that some of the smaller service vendors will not be able to keep pace with increased technology demands of the hospitals.

  - Hospitals will continue to move from a batch and remote batch environment to one of increased on-line applications, particularly for patient care.

  - There will be increased demands for bringing more computational capability into the hospital in a standalone mode as part of a distributed data processing network.

- MCAUTO and SMS (Shared Medical Systems) will continue to be the dominant firms providing services to the hospitals and it is expected that they will continue to expand their service offering to the hospitals.

- TYMSHARE with their recent acquisition of a regional RCS vendor, Medical Information Inc., will expand its services to over 50 hospitals and increase its geographic coverage.

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- HBO & Co. will be an important vendor of minicomputer turnkey systems for patient management applications.

- Software product vendors such as MSA and University Computing Company will continue their marketing efforts toward hospitals.

B.   RECOMMENDATIONS

- For established computer services vendors, expansion of current offering should be directed in the following areas:

  - Develop more sophisticated business management applications to permit hospital administrators to better plan and control hospital expenditures and resources.

  - Develop expanded user oriented patient management applications that will relieve medical staffs of time consuming manual recordkeeping and permit more time to be devoted to medical care. Of particular importance are admission-discharge-transfer applications and medical records.

  - Develop DBMS related information systems that will provide integration of current hospital information that exists in multiple standalone vertical file structures.

  - Analyze current batch offerings to determine candidate applications for conversion to on-line delivery.

  - Expand hospital site hardware offerings and examine the establishment or expansion of distributed data processing networks.

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- Implicit in the recommendations is the requirement for the integration of present and planned hospital computer services offerings into a hospital information system for all hospital users.

- For computer service vendors who do not have a current base of hospital related activities, entry into the marketplace will be more difficult because of the insistence of the hospitals on buying only demonstrable capabilities. However, there are at least three possible ways to accomplish the desired market entry.

    - Acquire regional computer service firms that generally provide service to small numbers of hospitals.

        . These companies usually have annual revenues from $500 thousand to $9 million and provide services to up to 50 hospitals.

        . This is the fastest method, but may also be the most expensive.

        . INPUT estimates that there are approximately 25 such vendors.

    - Jointly develop hospital information system capabilities on a cost sharing basis with a larger hospital (300-500 beds).

        . This would provide slower entry into the market than acquisition, but would permit the establishment of the necessary hospital credentials.

        . The developed information system could then be marketed to other hospitals with some royalty return to the hospital in which the system was developed.

        . This route is currently being used by a professional services vendor.

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- Examine medical service companies for the establishment of a contractual relationship for providing EDP services to their hospitals.

    . These service companies own, operate and/or manage about 13% of the short-term general hospitals.

    . According to their financial statements, these companies have extremely high profits and growth but little cash.

- Concentrate marketing efforts for computer services in hospitals greater than 100 beds and less than 500 beds.

    - Small hospitals under 100 beds have limited requirements for computer services.

    - Large hospitals over 500 beds have established in-house DP staffs, and the selling time to these hospitals can be extremely long. In some cases the time from initial market calls to sales close can be up to two years.

- Software product vendors have opportunities in several areas:

    - Expand marketing efforts of DBMS related products to hospitals larger than 200 beds with in-house systems. DBMS related medical records systems will become more prevalent in the hospital subsector in the next five years.

    - Current use of DBMS products are limited for these systems, but demand for more complex information within the hospitals is increasing.

    - Monitor Federal Government actions on the establishment of uniform billing requirements for new business management products.

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- These uniform billing requirements will require hospitals to modify existing software or acquire packages from software product vendors.

- Professional services vendors will have continued opportunities with hospitals. Concentrate marketing efforts on larger hospitals (over 300 beds) with large in-house mainframe or multiple mini-based systems.

  - Opportunities will range from short-term consulting tasks to long term software development activities.

  - These vendors should have established credentials in system networks, mini-based systems and DDP.

- Plan for long marketing cycles to hospitals with a minimum time to close of four months.

- Concentrate initial marketing efforts on the EDP manager but be prepared to sell to hospital administrators.

- Plan to provide marketing support to hospitals in their cost justification of new services or products to the state government agencies responsible for the monitoring and approval of capital expenditures.

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III INDUSTRY STRUCTURE

III   INDUSTRY STRUCTURE

A.   FUNCTIONAL DESCRIPTION

- The industry subsector that is the focus of this study is the non-Federal Government operated short-term general hospitals in the U.S.

- This subsector currently consists of 5,956 hospitals and ranges in bed size from only six beds to over 1,200 beds in some of the larger municipally operated hospitals.

- These hospitals are of three general types:

    - Non-government not-for-profit   56%

    - State and local   31%

    - Investor owned for profit   13%

- Exhibit III-1 provides a distribution of these hospitals as derived from statistics provided by the American Hospital Association (AHA).

- While these short term general hospitals represent only about 50% of the total U.S. hospitals, they do represent over 80% or 910,000 acute care beds in hospitals with over 50 beds.

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EXHIBIT III-1

DISTRIBUTION OF SHORT-TERM GENERAL HOSPITALS BY BED SIZE

BEDS PER HOSPITAL	NUMBER OF HOSPITALS	PERCENT TOTAL HOSPITALS	NUMBER OF BEDS	PERCENT/ TOTAL BEDS	OCCUPANCY RATE	AVERAGE PATIENT STAY
6-49	1,483	24.8%	48,282	5.0%	53.5%	6.0 DAYS
50-99	1,467	24.6	106,196	11.1	63.1	6.8
100-199	1,377	23.2	193,657	20.2	70.5	7.1
200-299	712	11.9	172,010	17.9	76.5	7.5
300-399	376	6.4	127,514	13.3	79.0	7.8
400-499	235	3.9	103,444	10.7	80.3	8.0
500+	306	5.2	210,072	21.8	80.9	9.0
TOTAL	5,956	100.0%	961,175	100%	74.7%	7.7 DAYS

(1) DERIVED FROM 1977 AHA HOSPITAL STATISTICS

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- Although 49% of the U.S. short-term general hospitals have fewer than 100 beds, they represent only about 16% of the total available hospital beds and only 12% of the inpatient days.

- Occupancy rates of short-term general hospitals with under 100 beds are significantly lower than larger hospitals. Occupancy rates for hospitals with less than 100 beds are currently around 53% while hospitals with over 100 beds have occupancy rates of 75-80%.

- Although there has been a slow decline in the total number of hospital beds in the U.S., the number of beds in short-term general hospitals has shown a moderate gain over the last 11 years.

- According to AHA statistics, there were 219,883 more beds in 1976 than in 1965.

- Decreases in hospital beds have been primarily in other types of hospitals as shown in Exhibit III-2.
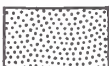
B.   HOSPITAL COSTS

- Total U.S. health care spending has risen dramatically since 1965 as shown in Exhibit III-3.

    - From a base of $39 billion in 1965, costs have risen to over $160 billion in 1977.

    - The Federal Government estimates health care spending in 1978 will increase to over $180 billion.

    - Total health care costs have risen to an estimated 9% of total GNP in 1978.

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EXHIBIT III-2

FIFTEEN YEAR TRENDS IN HOSPITAL COMPOSITION BY ALL HOSPITAL TYPES
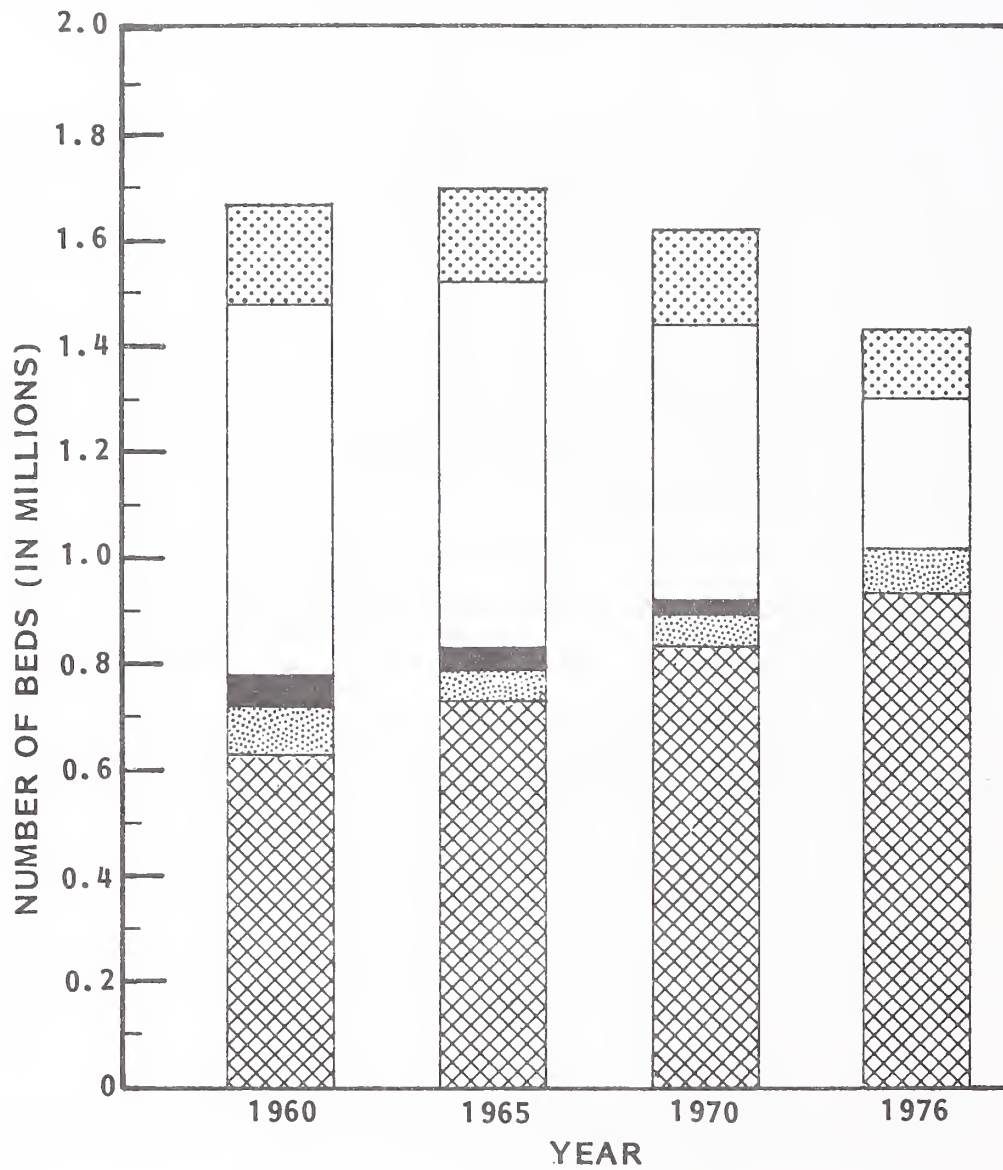
FEDERAL

NONFEDERAL PSYCHIATRIC

NONFEDERAL TUBERCULOSIS AND
OTHER RESPIRATORY DISEASES

NONFEDERAL LONG-TERM
GENERAL & OTHER SPECIAL

* NONFEDERAL SHORT-TERM
GENERAL & OTHER SPECIAL

* ALL INTERVIEWS CONDUCTED IN THIS GROUP

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EXHIBIT II-2

PAST AND PROJECTED TOTAL U.S. HEALTH CARE COSTS

TOTAL AS PERCENT OF GNP

TOTAL HEALTH COSTS

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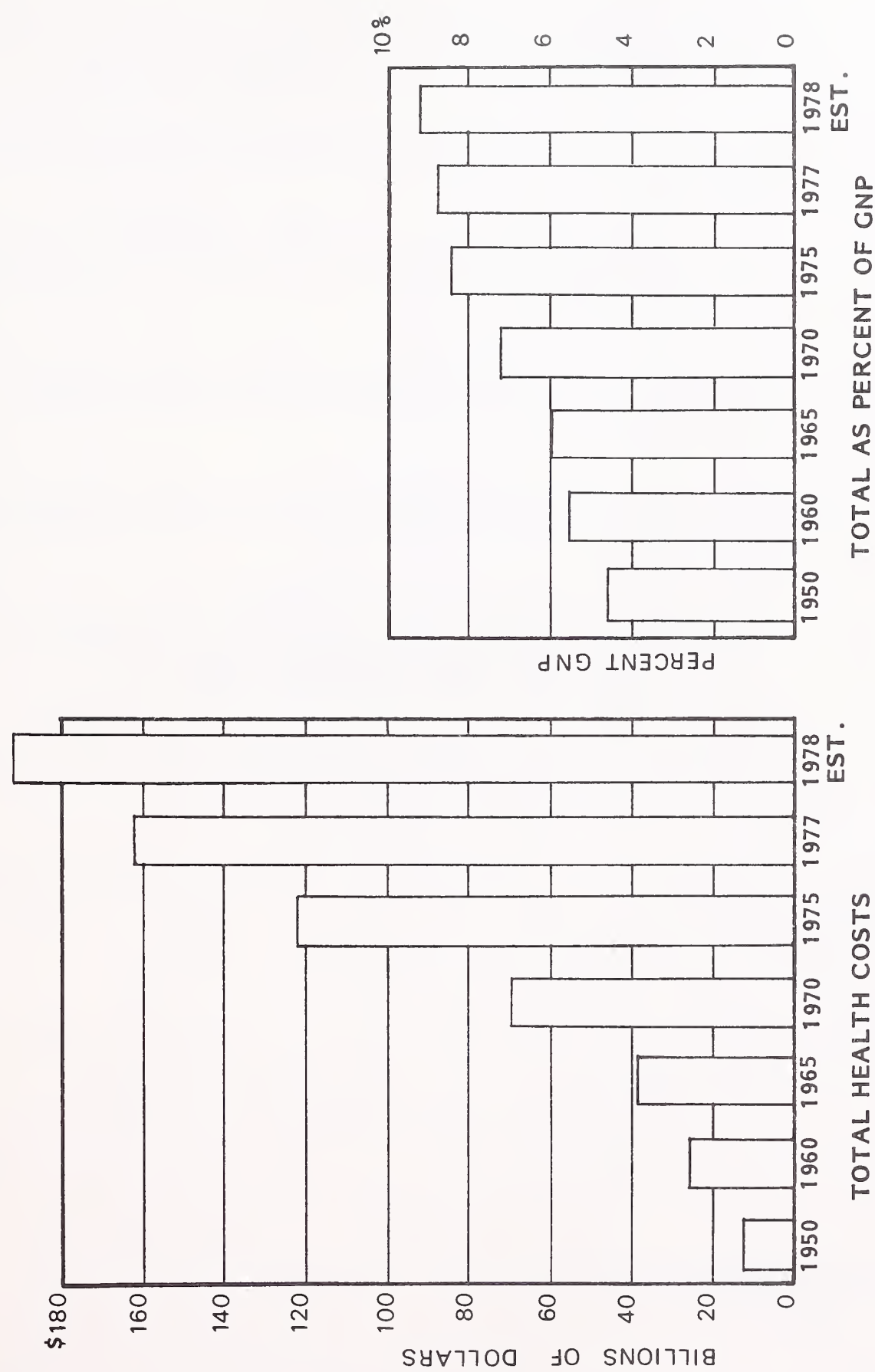
- As shown in Exhibit III-4, hospitals and nursing homes account for 47.5% of the total health care costs.

- Hospital care as shown in Exhibit III-4 is a major contributor to total health care spending.

  - In 1965 hospital care was about $15 billion, and in 1977 it had increased to $65.6 billion.

  - Between 1977 and 1978, it is expected to increase by slightly more than $10 billion.

- Short-term general hospital expenses derived from AHA statistics were $45.1 billion in 1976-77.

  - Exhibit III-5 provides a further breakdown of these costs in terms of contributing elements and per patient day cost.

- If the costs for short-term general hospitals follow the same trend as overall hospital costs, they should be in the range of $50-52 billion by the end of 1978.

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EXHIBIT III-4

PAST AND PROJECTED TOTAL U.S. HOSPITAL COSTS

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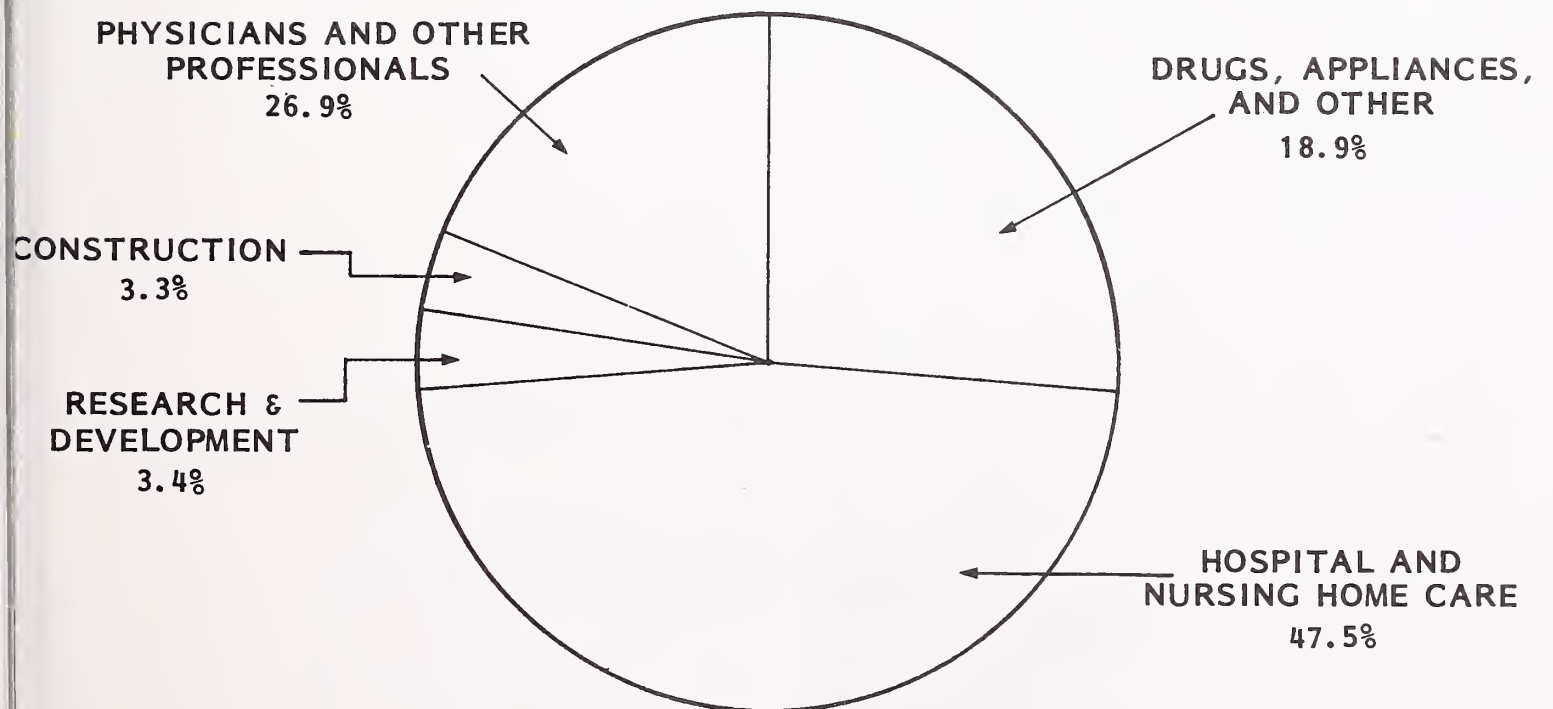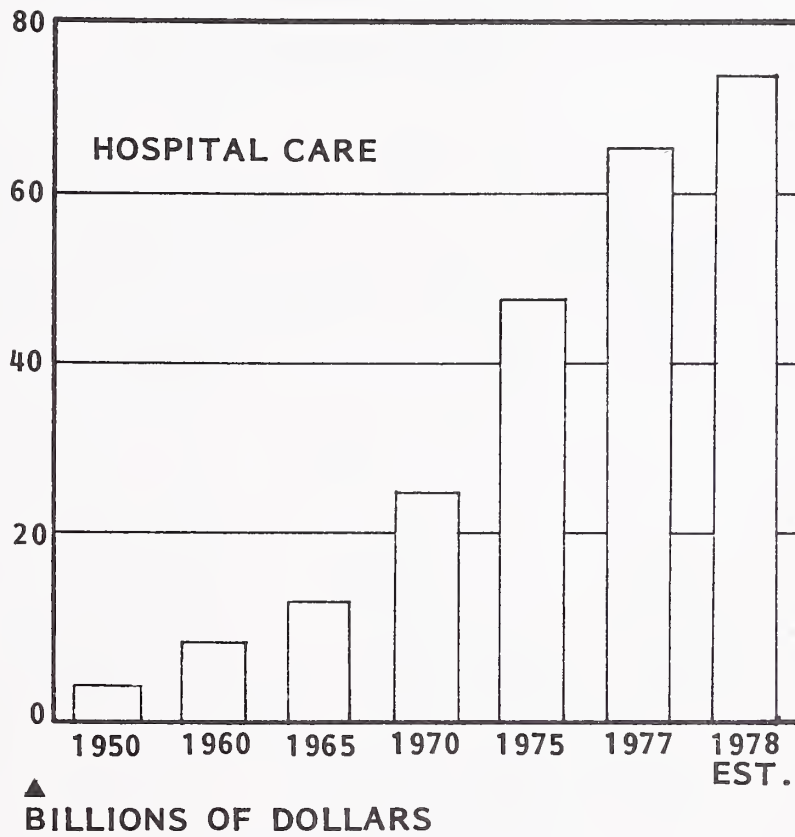
EXHIBIT III-5

DISTRIBUTION OF 1977 EXPENSES OF

SHORT-TERM GENERAL HOSPITALS BY BED SIZE

BEDS PER HOSPITAL	EMPLOYEE PERCENT OF EXPENSES	NON-EMPLOYEE PERCENT OF EXPENSES	PER PATIENT DAY AVERAGE EXPENSES
6-49	56%	44%	$113.47
50-99	55	45	117.06
100-199	55	45	134.71
200-299	58	42	148.21
300-399	60	40	155.99
400-499	60	40	159.28
500+	60	40	179.80
TOTAL/AVERAGE	58%	42%	$151.28

(1) DERIVED FROM AHA STATISTICS

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IV USE OF EDP IN HOSPITALS

IV   USE OF EDP IN HOSPITALS

A.   INTRODUCTION

● The users interviewed for this study were selected on a proportional basis derived from a study conducted by the Hospital Financial Management Association (HFMA) on the state of information processing in the health care industry in 1976.

● Users interviewed were either the responsible EDP executive or an associate hospital administrator responsible for data processing.

● There are three major uses of EDP in hospitals. These apply to hospitals of all sizes whether they use their own in-house EDP or use processing services from an RCS vendor. These three applications are:

-    Business management.

-    Patient management.

-    Clinical.

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B.   HOSPITAL EDP EXPENDITURES

- Total annual EDP expenditures for the hospitals interviewed for this study ranged from less than 1% to 4% of the total hospital expenditures.

- Actual dollars expended on an annual basis ranged from a low of $24 thousand to $875 thousand in 1977.

- Exhibit IV-1 provides a detailed tabulation of the annual expenditures of the hospitals interviewed.

- Considerable variability existed within all the hospital size groups interviewed.

    - This is partially a function of the number and type of EDP applications that each hospital was currently running.

    - In most cases it was not possible to obtain costs for the running of individual applications, because the hospitals did not have or would not provide that information.

1.   HOSPITAL PER PATIENT DAY EDP COSTS

- In order to gain some insight into EDP costs, approximate per patient day EDP costs were computed based on the current occupancy rate provided by the hospitals.

- For purposes of this analysis, hospitals were grouped into three categories for general comparative purposes:

    - Hospitals with business management applications only.

    - Hospitals with business management and patient management applications.

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EXHIBIT IV-1

CURRENT ANNUAL EDP BUDGET AND PERCENT OF TOTAL

HOSPITAL ANNUAL EXPENDITURES FOR RESPONDING HOSPITALS

HOSPITAL SIZE	CURRENT OCCUPANCY RATE	ANNUAL EDP BUDGET ($ THOUSAND)	ANNUAL HOSPITAL EXPENDITURES (%)	USED OUTSIDE SERVICES
69	60	$ 36	1.8%	
77	92	88	1.5	
96	40	24	N/A	
111	90	$120	1.2%	
135	50	78	1.0	YES
150	60	100	2.0	YES
163	73	96	0.96	YES
176	77	150	1.0	YES
200	40	$ 70	1.0%	YES
231	60	252	1.7	
265	88	240	1.2	YES
266	75	N/A	4.0	
286	82	175	N/A	
292	83	550	1.14	
295	85	470	1.5	
295	80	160	1.5	
297	57	224	1.5	
317	N/A	$N/A	2.4%	
360	70	400	1.6	
380	70	230	2.0	
392	92	300	1.3	YES
412	74	$478	1.8%	YES
450	48	360	1.8	YES
455	50	550	2.3	YES
467	85	875	1.9	
468	50	225	2.0	YES
492	58	300	1.2	YES
532	80	$N/A	1.0%	YES
569	75	385	1.0	YES
585	N/A	445	1.3	YES

N/A = NOT AVAILABLE

INPUT

- Hospitals with business management, patient management and clinical applications.

- Exhibit IV-2 provides a breakdown of the per patient EDP costs of all hospitals interviewed and indicates the general applications areas where EDP is employed.

    - Hospitals that were running only business management applications had a range of per patient day cost from $1.74 to $4.63.

    - One small hospital with an in-house Burroughs system was experiencing per patient day costs of $3.44 and was in the process of replacing the system.

    - There was no significant difference between in-house systems and outside services with costs of $2.53 and $2.44 per patient day respectively.

    - Hospitals that were running business and patient management applications had a per patient day range from $2.07 to $6.70.

        . The $6.70 cost was from an outside vendor, Technicon, Inc., and the hospital that is experiencing those costs is currently conducting a detailed study to look at in-house and outside alternatives to reduce these unacceptable cost levels.

    - There were only four hospitals interviewed that were currently running EDP applications in all three areas.

- The importance of the range of per patient day costs, independent of applications run, is that the selection and management of the mode of EDP service can significantly affect the hospital costs.

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EXHIBIT IV-2

CURRENT PER PATIENT DAY EDP COSTS

OF HOSPITALS INTERVIEWED

HOSPITAL SIZE	OCCUPANCY RATE	OUTSIDE SERVICES			IN-HOUSE SYSTEM	TYPE OF APPL.*		
		OUTSIDE COST	IN-HOUSE COST	TOTAL	TOTAL	BM	PM	C
69	60				2.42	X		
77	92.5				3.44	X		
96	40				1.74	X		
111	90				3.33	X	X	
135	59	2.50	0.21	2.71		X		
150	60	0.81	2.27	3.08		X	X	
163	73	1.96	0.28	2.24		X	X	
176	77	1.96	1.10	3.06		X	X	
200	40	0.42	2.01	2.43		X	X	
231	60				5.04	X	X	
265	88	1.14	1.72	2.86		X	X	
286	82				2.07	X	X	
292	83				6.31	X	X	X
295	85				5.20	X	X	
297	57				3.68	X	X	
360	70				4.40	X	X	X
380	70				2.40	X	X	
392	92	1.57	0.74	2.31		X	X	
412	74	1.29	3.06	4.25		X	X	
450	48	3.47	1.16	4.63		X	X	
455	50	5.26	1.44	6.70		X	X	
467	85				6.12	X	X	X
468	50	1.28	1.39	2.67		X	X	
492	58	1.54	1.38	2.94		X	X	
569	75	2.34	0.16	2.50		X	X	X
585	86	1.98	0.47	2.45		X	X	

* TYPE OF APPLICATION
   BM = BUSINESS MANAGEMENT
   PM = PATIENT MANAGEMENT
   C = CLINICAL

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- With the concern hospital administrators and EDP managers had for holding down costs, it was significant that most did not have sufficient information to audit their costs accurately.

- Although when certain cost threshold levels are reached the hospital administration does initiate some action, there did not appear to be an on-going monitoring of hospital EDP costs in any of the hospitals interviewed.

2. HOSPITAL EDP EXPECTED ANNUAL BUDGET INCREASES

- Only two of the thirty hospitals interviewed expected their budgets not to increase over their current 1977 levels during the next five years.

- The majority of the hospitals expected annual budget increases that ranged from 5-50%. Expected average and range of annual budget increases are presented in Exhibit IV-3.

- Hospitals in the 300-399 bed size had the highest expected annual increase in budget.

- After 1980, most of the EDP managers interviewed expected annual growth rates to be lower than from 1977 to 1980, but this may be because they have poorer visibility into that time period.

- Increase in budgets for other than inflationary reasons were:

  - Development of new applications   27%

  - Conversion of current batch applications to on-line   29%

  - Modification of current batch applications   6%

  - Development of DBMS patient/medical records   6%

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EXHIBIT IV-3

RANGE AND AVERAGE OF EXPECTED ANNUAL EDP BUDGET INCREASE
BY 1980 AND 1983 FOR RESPONDING HOSPITALS

☐ = 1978-80

▨ = 1980-83

▭ = AVERAGE

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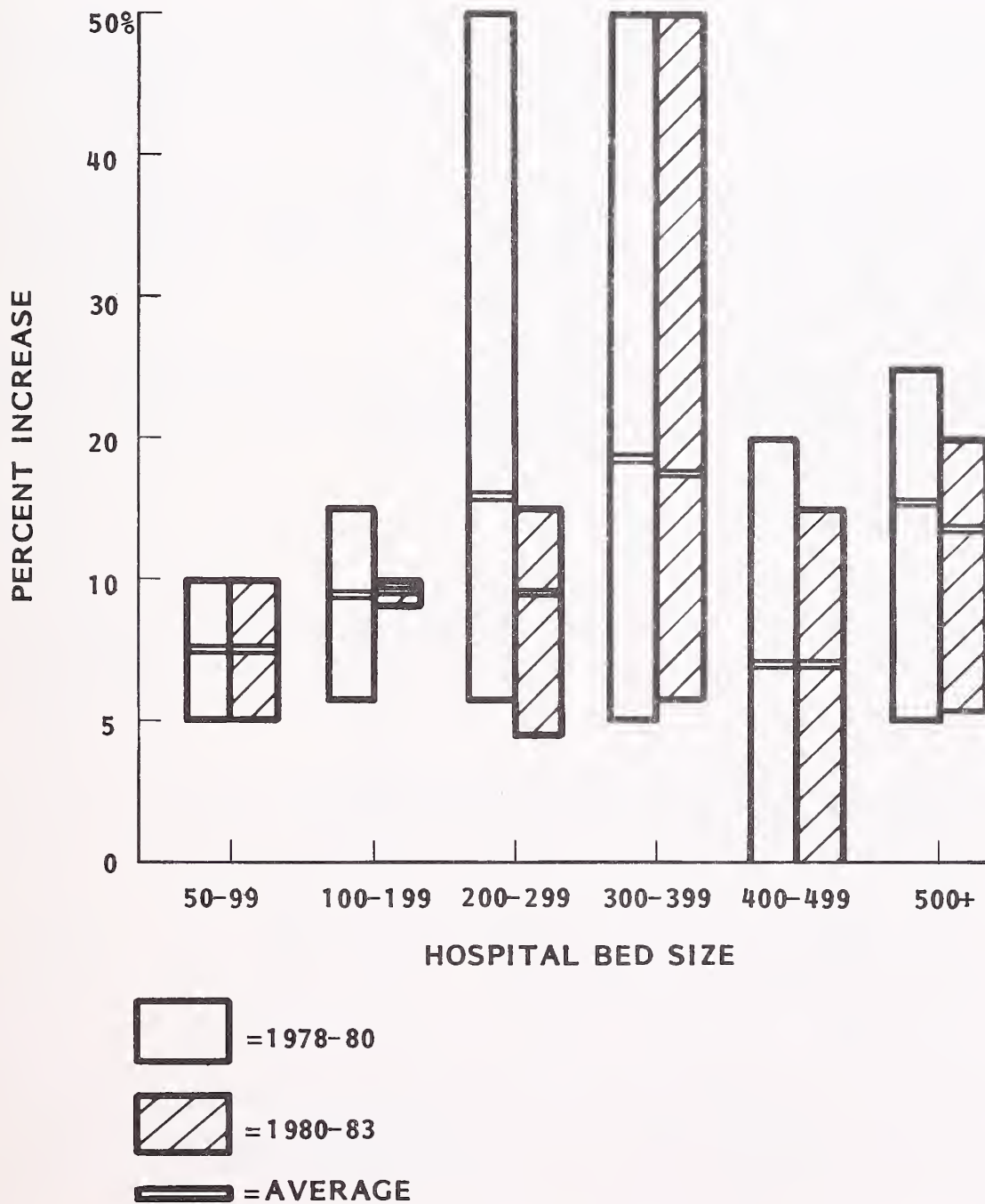
| - | Purchase/lease of new equipment | 27% |
| - | Government reporting regulations | 5% |

C.   CURRENT AND PLANNED USE OF EDP HARDWARE

- EDP hardware was used in all hospitals interviewed and significant plans exist for the upgrade and increase of this hardware over the next five years.

- This increased use by hospitals of installed hardware will occur both for hospitals that are using outside services and for those that have their internal hospital hardware.

- However, the characteristics of these hardware configurations will not follow the large centralized mainframe type of installation.

1.   LARGE MAINFRAME USE

- Large mainframes do not exist within hospitals in great numbers, and there are no major plans to add a significant number of mainframes during the next five years.

    - None of the hospitals in the 50-199 range have a large mainframe and none have plans to acquire one during the next five years.

    - In all the large hospitals sizes (200 beds and higher), less than 20% of the hospitals have large mainframes.

    - Exhibit IV-4 shows the number and type of large mainframes that are currently installed in the hospitals and their plans for upgrade by 1985.

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EXHIBIT IV-4

NUMBER OF LARGE MAINFRAMES INSTALLED

AND PLANNED UPGRADE BY 1983 FOR RESPONDING HOSPITALS

HOSPITAL SIZE	NUMBER OF MAINFRAMES	TYPE	PLANNED UPGRADE 1983
50 - 99	0	-	NONE
100 - 199	0	-	NONE
200 - 299	2	HONEYWELL 2040 / IBM 370/115	NONE
300 - 399	3	HONEYWELL 60/20 / IBM 370/138	NONE
		IBM 370/125	AN ADDITIONAL 370/138
400 - 499	1	IBM 370/148	370/138 NONE
500+	1	IBM 370/135	370/148

INPUT

- IBM and Honeywell appear to be the dominant hardware vendors in the hospitals interviewed.

2. MINICOMPUTER USE

- Ninety percent (27 of 30) of the hospitals interviewed have at least one minicomputer installed and plan to increase the use of this type of hardware during the next five years.

- Of the three users who do not currently have a minicomputer installed, all use an RCS vendor and one of the three is currently planning to acquire a mini to replace the RCS vendor.

- Exhibit IV-5 shows the distribution and expected increase by 1983 of the minicomputers for each of the hospital sizes interviewed.

- Sixty-six percent (20 of 30) of the hospitals interviewed are planning to increase the number of minicomputers currently installed in their hospitals.

- Users are planning these increases to expand their data processing services in the hospital and not just as a hardware upgrade for current applications. Typical comments are:

  - "Plan to add clinical applications over the next two years."

  - "Will increase the use of minis because we are planning on adding a patient admitting system as part of our long-range plan for the hospital."

  - "There is an increased demand by the administrators for more financial information to be used for their planning."

INPUT

- 33 -

CURRENT NUMBER OF INSTALLED MINICOMPUTERS &

PLANNED INCREASE BY 1983 FOR RESPONDING HOSPITALS

HOSPITAL SIZE	NO. INTER-VIEWED	MINIS INSTALLED		PERCENT INCREASE
		1978	1983	
50 – 99	3	3	4	33%
100 – 199	5	3	5	66
200 – 299	9	11	18	64
300 – 399	5	12	37	208
400 – 499	5	9	14	56
500+	3	8	11	37
TOTAL	30	46	89	93%

- Sixty percent (12 of 20) of the EDP managers interviewed are planning to increase the use of minis because they are bringing existing batch applications on-line or are planning to be tied into some type of distributed network.

3. DISPLAY TERMINAL USE

- There are clearly two dominant themes stated by users in their increased use of display terminals.

  - Decrease the amount of paperwork required by the medical staff in order to improve the quality of patient care.

  - Provide data entry and data access for all users of computer-based information within the hospital.

- Seventy percent (21 of 30) of the hospitals have at least one display terminal installed.

- In the larger hospitals (above 100 beds) the number of display terminals is significant both in terms of the number currently installed and the planned increase by 1983. (See Exhibit IV-6.)

  - If these larger hospitals are considered as a single group, the average number of current display terminals is 17 with a range from three to 120.

  - By 1983 this is expected to increase almost 300% to an average figure of 48 with a range from 15 to 240.

  - One hospital in the 500 bed range currently has 80 display terminals installed and is planning on increasing that to 200 terminals by 1983.

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EXHIBIT IV-6

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AVERAGE NUMBER OF DISPLAY TERMINALS INSTALLED AND

PLANNED INCREASE BY 1983 FOR RESPONDING HOSPITALS

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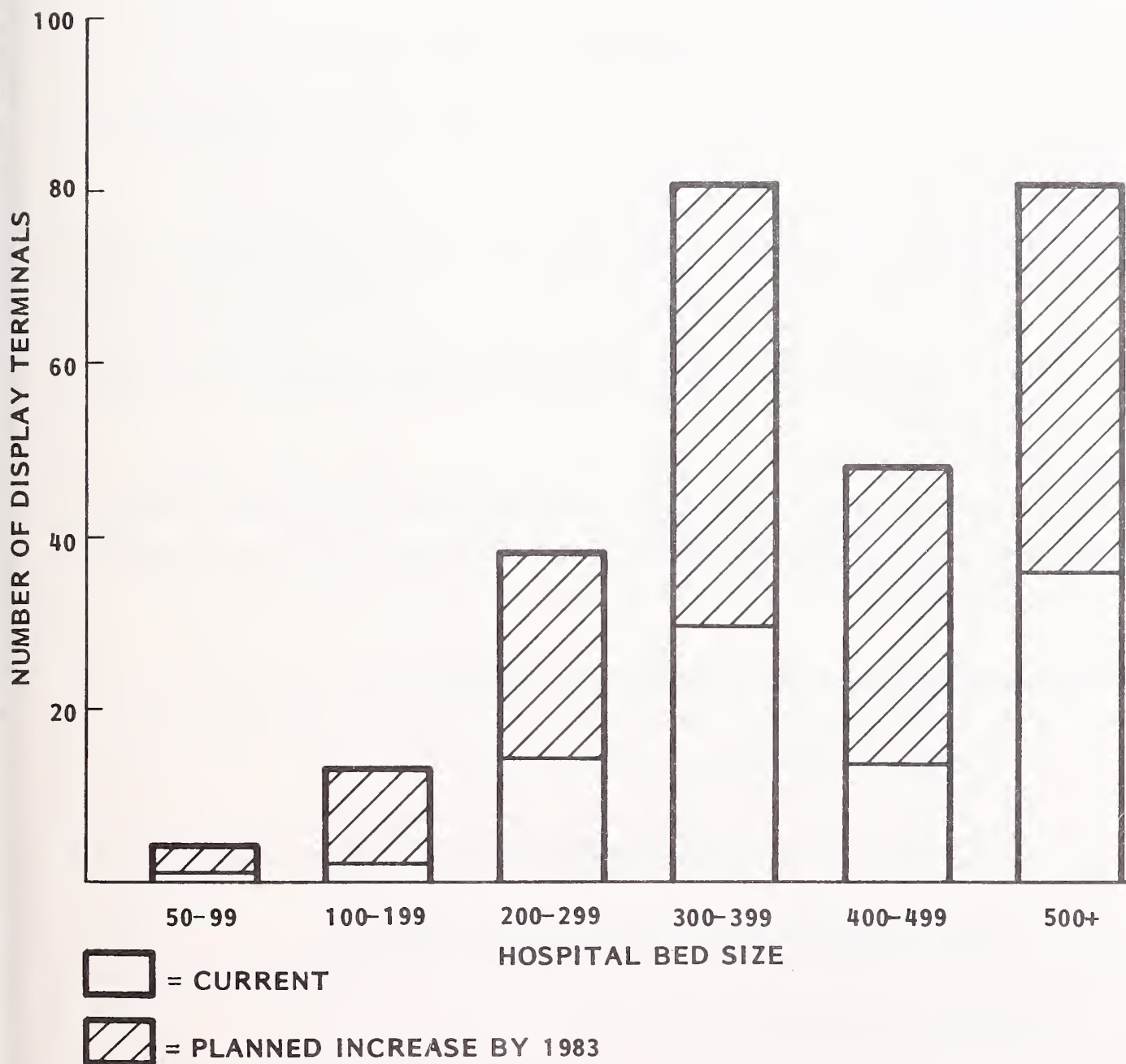
- A 317 bed hospital that also supports a number of dispersed outpatient clinics has a current base of 120 terminals and will double that amount within the next five years.

D. EMERGING USE OF DISTRIBUTED DATA PROCESSING (DDP) IN HOSPITALS

- There is an emerging trend in the use of distributed data processing within the larger hospitals.

- INPUT defines DDP as the deployment of programmable intelligence in order to perform data processing functions where they can be accomplished most effectively, through the electronic interconnection of computers and terminals, arranged in a telecommunications network adapted to the user's characteristics.

- It is expected that the number of larger hospitals that will become part of such a distributed data processing network will continue to increase over the next five years.

- The use of DDP will exist in hospitals as a result of:

    - Increased development of in-house systems.

    - DDP services provided by RCS vendors.

    - DDP services provided by medical service companies.

I. IN-HOUSE DEVELOPED DDP SYSTEMS

- Of the 30 hospitals that were interviewed, 34% currently have their mini-computers tied into a local or remote distributed network.

- 36 -

- One 467 bed hospital interviewed is embarking on a five-year joint development project with a major software vendor to develop a complete in-house distributed data processing system.

  - This system upon completion will be marketed on a national basis to other hospitals.

  - It will be an IBM 370 based system with up to 7 DEC minicomputers tied into the network with over 100 display terminals.

  - The system is expected to be a complete hospital information system and will provide information services to be used throughout all administrative, medical, nursing, pharmacy, laboratory, and patient management areas.

2. RCS SUPPLIED DISTRIBUTED DATA PROCESSING (DDP)

- Major RCS vendors use DDP as a primary method of supplying processing services to the hospital industry. A detailed case study that is representative of this approach is provided at the end of this chapter and is included because of its significance to the hospitals and the emerging DDP technology.

- For further details on DDP see INPUT's 1978 Impact Report #10, "Distributed Data Processing: Applications, Performance and Architecture."

E. CURRENT AND FUTURE EDP APPLICATIONS

I. INTRODUCTION

- Exhibit IV-7 provides an organization and further delineation of the modules that are contained within each of the functional application areas. This list is not intended to include all applications areas. Appendix E provides an

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EXHIBIT IV-7

ORGANIZATION AND FUNCTIONAL APPLICATIONS

OF HOSPITAL INFORMATION SYSTEMS

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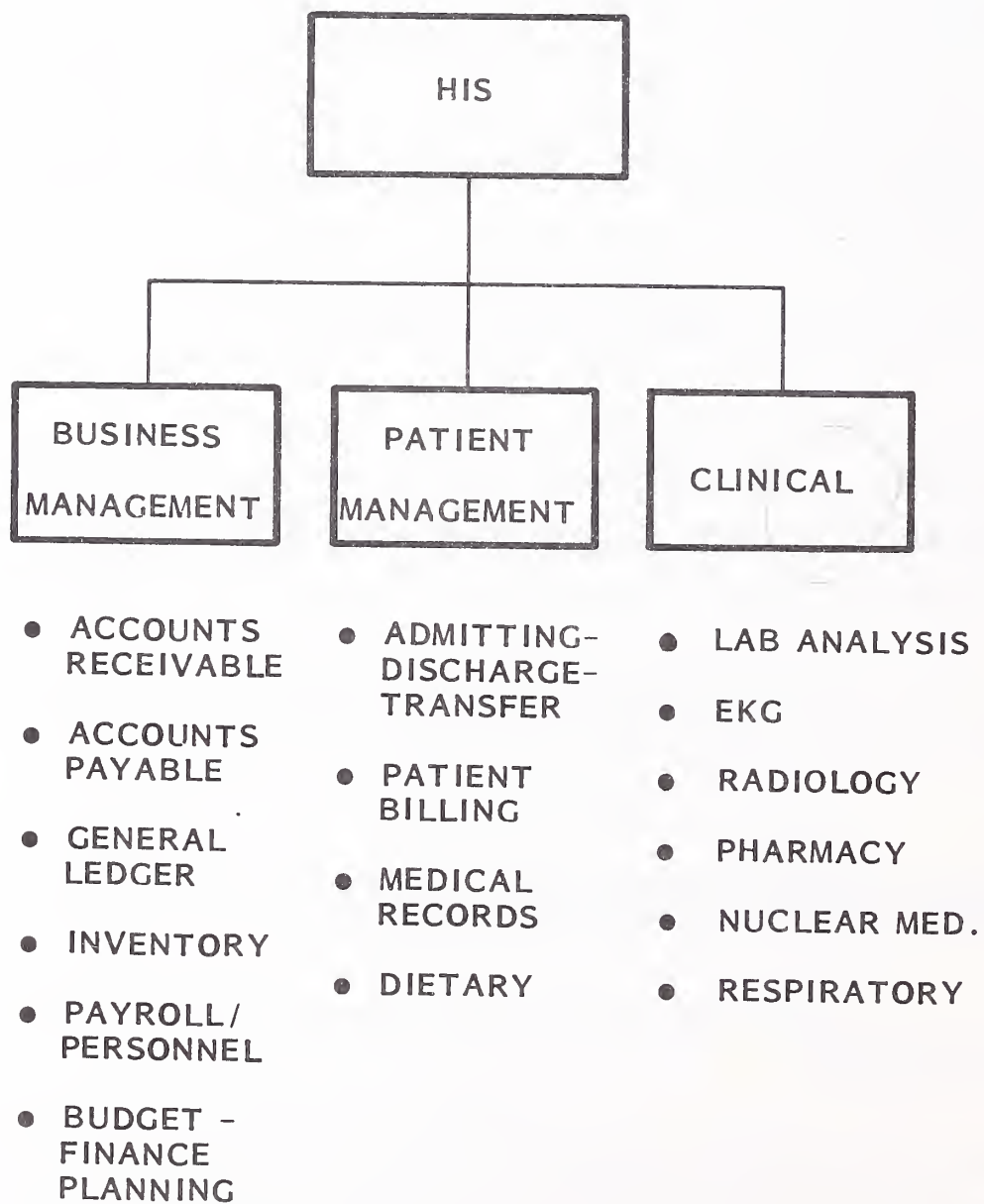
exhaustive list of all application areas. This list was compiled by the HFMA and is included for reference purposes.

- As in most organizations that utilize EDP, its starting point in hospitals begins with the automation of the accounting functions.

- As the system and the organization matures there is a gradual evolution to the use of EDP for the solution for other information based problems.

- The following sections summarize the current and planned applications for the hospitals inteviewed. Although the size of the sample is too small to be statistically valid, the interview results do point to some clear trends in the applications areas.

2. CURRENT EDP APPLICATION AREAS

   a. Business Management Applications

- The traditional business applications of accounts payable and receivable, general ledger, payroll and inventory are typically the first applications areas used by the hospitals.

- Among the hospitals interviewed this was the primary application area where EDP was found.

- Exhibit IV-8 provides a percentage distribution of these applications for the hospitals interviewed for both in-house systems and outside services.

  - The majority of these applications are being processed in a batch or remote batch mode.

  - For all applications, interactive delivery from outside services is almost twice that of in-house supplied services.

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INPUT

EXHIBIT IV-8

PERCENT USE AND DELIVERY MODE OF BUSINESS MANAGEMENT APPLICATIONS

BY IN-HOUSE SYSTEMS AND OUTSIDE SERVICES FOR RESPONDING HOSPITALS

FUNCTIONAL APPLICATION		DELIVERY MODE	
		BATCH AND REMOTE BATCH	INTERACTIVE
ACCOUNTS PAYABLE		87%	13%
		72	28
ACCOUNTS RECEIVABLE		75	25
		67	33
GENERAL LEDGER		85	15
		58	42
PAYROLL/ PERSONNEL		89	11
		90	10
INVENTORY		88	12
		71	29
OTHER BUSINESS APPLICATIONS		63	37
		50	50

10   20   40   60   80

PERCENT USE

☐ = IN-HOUSE

▨ = OUTSIDE SERVICES

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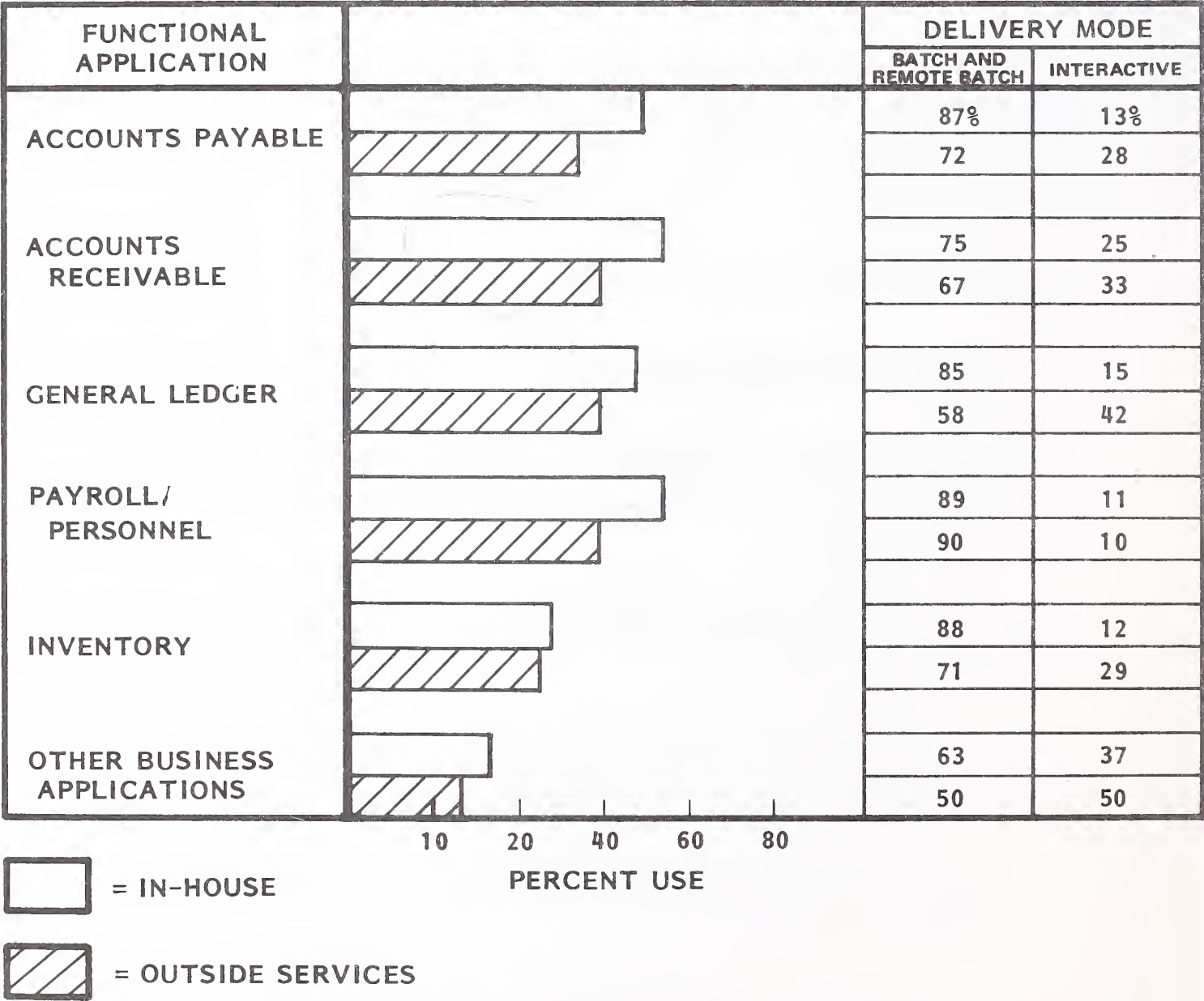
- This is attributable to the more advanced state of the operating system software available from the RCS vendors.

● It is expected that these business applications will continue to represent the majority of the hospital data processing load whether provided by in-house systems or outside services.

b. Patient Management Applications

● The existence of patient management applications within the hospitals interviewed is less than the business management applications.

● While 93% (28 of 30) of the hospitals interviewed were using some type of business management application, only 77% (23 of 30) were running some type of patient management applications.

- The most prevalent patient management application was patient billing, which is simply a logical extension of the business management applications.

- If the patient billing application is removed from the patient management subset of applications, then the percentage of hospitals with automated applications drops to 30% (10 of 30).

● Exhibit IV-9 provides a distribution of these applications.

c. Clinical Applications

● Only 13% of the hospitals were running any clinical applications in their hospitals.

● Typical clinical applications that were being run among this set of hospitals were:

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EXHIBIT IV-9

PERCENT USE AND DELIVERY MODE OF PATIENT MANAGEMENT APPLICATIONS

BY IN-HOUSE SYSTEMS AND OUTSIDE SERVICES FOR RESPONDING HOSPITALS

FUNCTIONAL APPLICATION		DELIVERY MODE	
		BATCH AND REMOTE BATCH	INTERACTIVE
PATIENT BILLING		47%	53%
		50	50
ADMITTING– DISCHARGE TRANSFER		0	100
		0	100
PATIENT CENSUS		75	25
		50	50
MEDICAL RECORDS		20	80
		0	0

PERCENT USE

10 20 40 60 80 100

☐ = IN–HOUSE

▧ = OUTSIDE SERVICES

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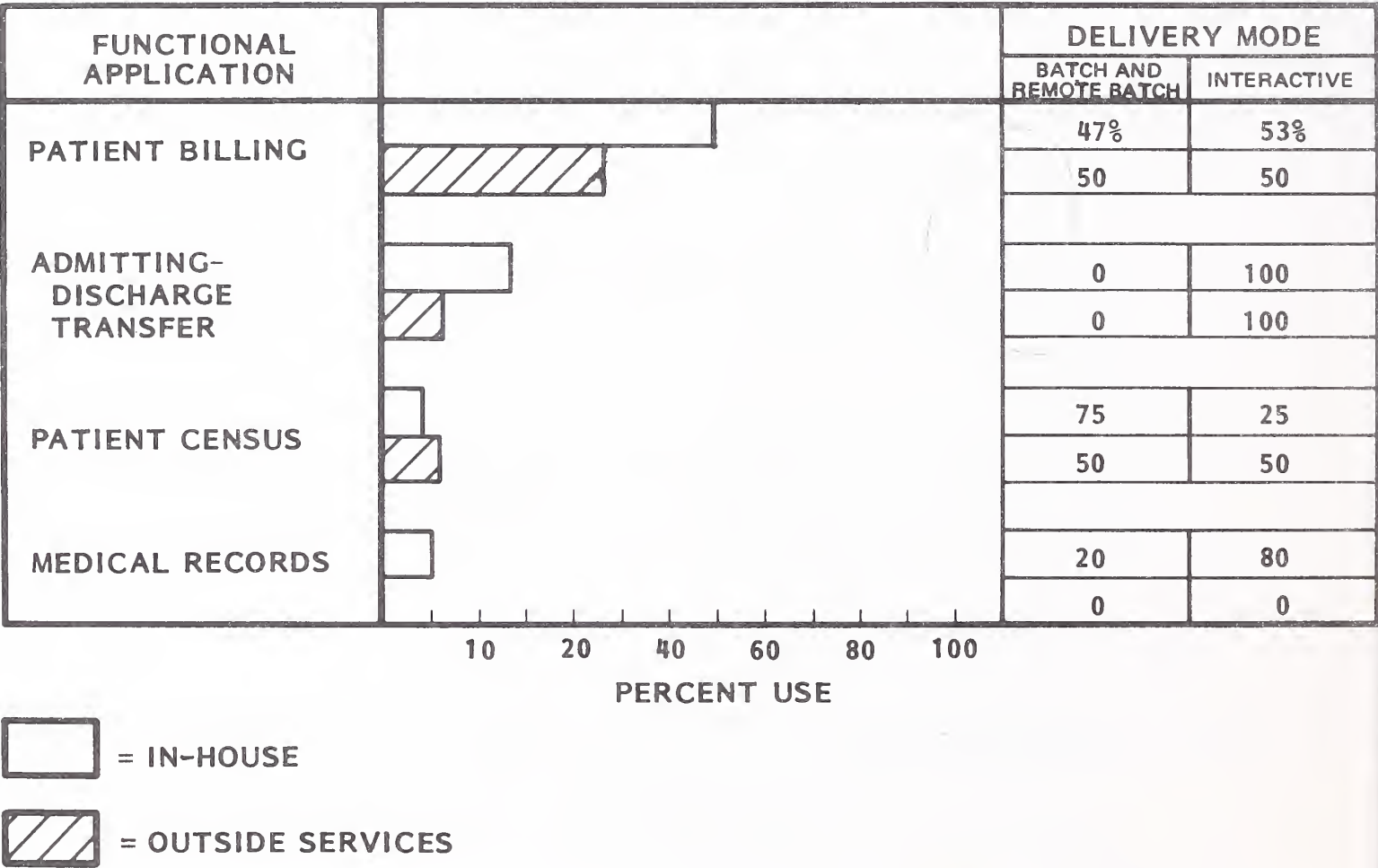
- Laboratory test analysis (4 hospitals).

- Radiology (4 hospitals).

- Pharmacy and unit dosage (3 hospitals).

- EKG Analysis (2 hospitals).

- Dietary and menu planning (1 hospital).

- Nuclear medicine (1 hospital).

- Except for two of the hospitals where the pharmacy and unit dosage was provided as part of the RCS service, all of these applications were run in batch modes.

- If the hospital did have an in-house computer, then clinical applications were not operating on the central processor, but typically on a standalone mini-computer.

- Although they were EDP based, they were isolated from the rest of the hospital with no electronic transfer of information.

- Another possible reason for the slow growth of EDP in this clinical area is that it is usually outside the direct control of the EDP manager and has not received the attention that is warranted.

3.   FUTURE TRENDS OF EDP APPLICATIONS

   a.   EDP Managers' Perceptions Of Future Hospital Information Systems

- While the current EDP applications are usually run in a batch or remote batch mode, there is, as stated earlier, a clear trend among hospital EDP managers to move to a more integrated system that will be used as an information resource for total hospital management.

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INPUT

- This is indicated by some typical comments provided by EDP managers about how they expect the characteristics of EDP to change in hospitals over the next five years:

    - "DP will become the central communications/information center for the hospital."

    - "EDP will be more integrated into hospital operations."

    - "Single hospital data base with automated records for all hospital operations."

    - "There will be increased use of the computer by the end users, the general medical staff."

- One EDP manager provided a good summary of the future trend of hospital EDP:

    - "Users will become an integral part of the data processing system. The movement to on-line systems will permit data entry at the sources. The role of the EDP manager will change to one of management of the information resources within the hospital and maintaining the standardization and integrity of the total system."

- What is evident from this study is the manner in which the information resource will be used and managed over the next five years in hospitals. The important characteristics are:

    - Information will still be required for the traditional business management applications, but the types of operations that will be performed on this information will be more sophisticated.

    - Hospitals will be using this information for cost management rather than just the historical accounting applications.

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- More emphasis will be directed toward planning and budgeting functions. Two of the hospitals interviewed were planning to develop cost models of their hospitals.

- Patient management applications will increase at a greater pace than business applications simply because there is more to do in this area.

  - The basic tracking function of admitting-discharge-transfer was the most prevalent application area that will be implemented in the next five years.

  - Over 60% of the hospitals who currently do not have this function were planning to implement it over that time period.

  - The second most important function is medical records, with over 50% of the hospitals who currently do not have such a function planning to implement it by 1983. Over half of the group planned to implement it before 1980.

  - Two hospitals were planning on developing a DBMS-based medical records system.

  - Specific DBMS packages had not been selected by either hospital.

- The present isolated nature of clinical management applications will tend to disappear with the integration of clinical information into the mainstream of EDP functions.

  - Two of the hospitals interviewed had significant plans in this area with the electronic transfer of clinical information into the patient records information.

  - This will permit the access of this information not only for billing purposes, but also for patient management use.

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INPUT

- It is also expected that hospitals presently not operating clinical management functions in a standalone mode will begin to bring these capabilities into their hospitals.

- While only 13% of the hospitals interviewed currently run any type of clinical applications, this was expected to increase to about 40% by 1983.

b.   Increased On-Line Applications

● Over the next five years it is expected that more EDP applications will be brought on-line by the hospitals.

● Exhibits IV-10 and IV-11 provide a percentage distribution of the number of business management and patient management applications currently on-line and their expected increase within the next five years.

- For business management applications the range of expected increase in percentage of applications on-line from 7 to 31%.

- Small hospitals (under 100) interviewed that now run in an exclusive batch mode will start to bring applications on-line.

● Except for the hospitals under 100 beds, there are a significantly greater number of current patient management and business management applications on-line.

- The range of current patient management applications on-line is from 16 to 70% while business management ranges from 5 to 30%.

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EXHIBIT IV-10

PERCENT OF BUSINESS MANAGEMENT APPLICATIONS CURRENTLY ON-LINE

AND PLANNED PERCENT ON-LINE BY 1983 FOR RESPONDING HOSPITALS

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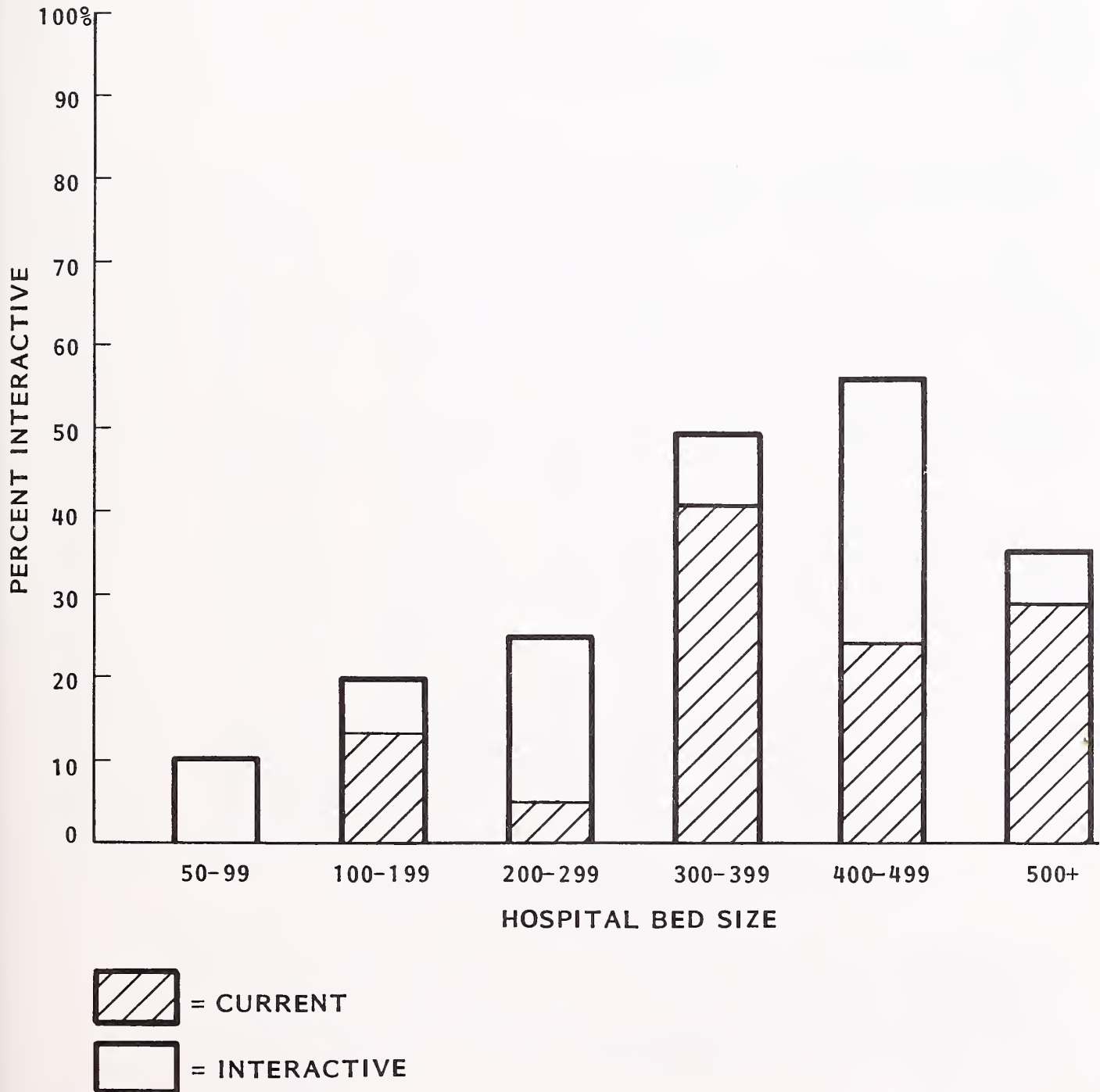
EXHIBIT IV-11

PERCENT OF PATIENT MANAGEMENT APPLICATIONS CURRENTLY ON-LINE

AND PLANNED PERCENT ON-LINE BY 1983 FOR RESPONDING HOSPITALS

INPUT
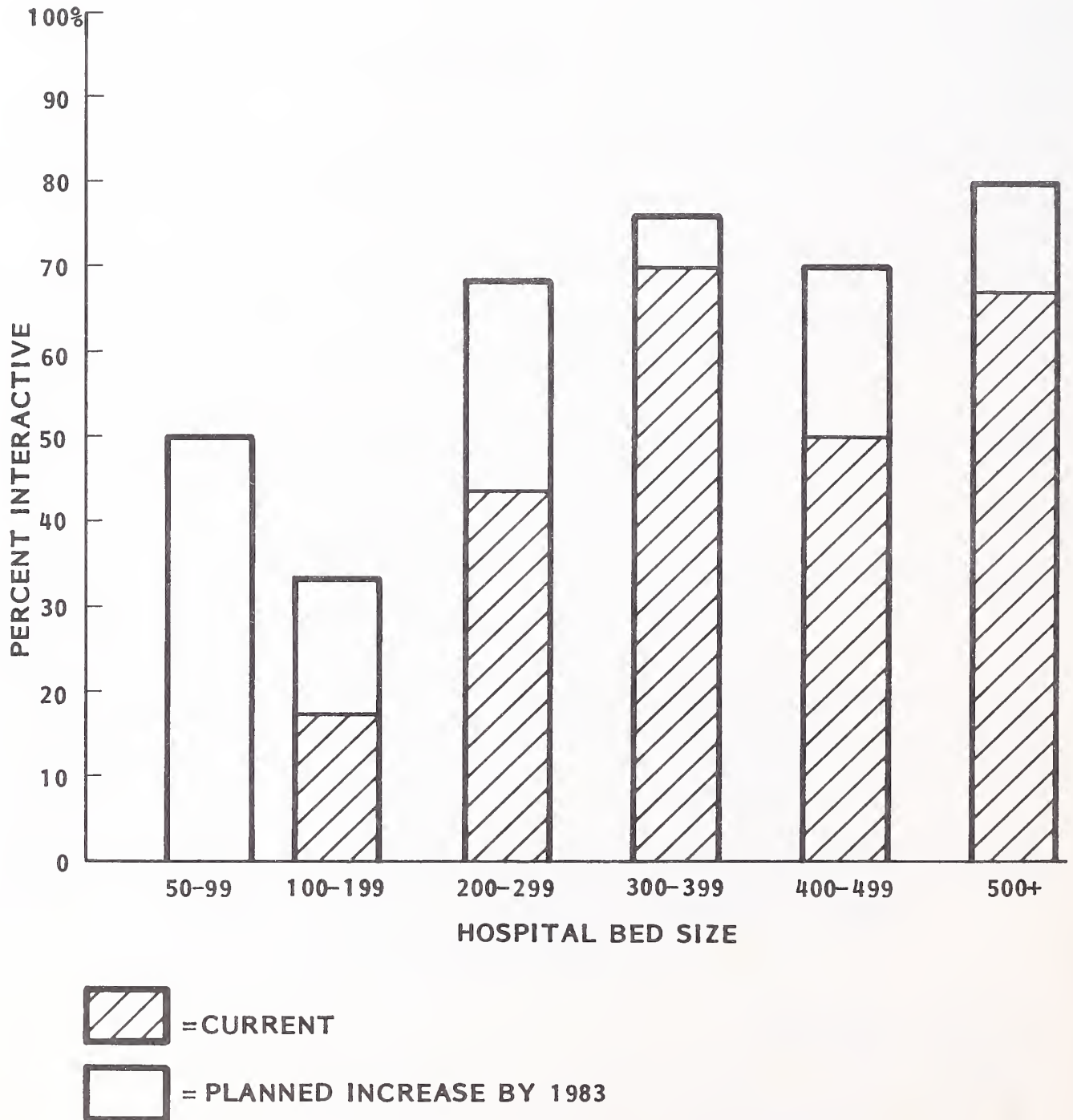
F.   HOSPITAL VENDOR SELECTION AND APPROVAL PROCESS

I.   VENDOR SELECTION METHODS

- Exhibit IV-12 provides a distribution of the various methods of selection for EDP products and services by the hospitals interviewed.

    - Formal bids are used by 51% of the hospitals interviewed for selection of vendors.

    - This formal selection process is dictated by the extreme pressures that are being brought on all hospitals for cost containment.

    - Significant formal documentation must be prepared by EDP managers to cost justify the procurement of EDP products and services.

    - This formal documentation is reviewed by hospital general management prior to the issue of a purchase order.

    - If purchases exceed more than $100,000 in annual capital costs, they must be reviewed by state government agencies prior to the issuance of the purchase order.

    - One hospital EDP manager who was currently in the selection process for a new vendor prepared an extensive RFP. The significant points of this RFP were:

        . It was issued to 21 EDP product and service vendors.

        . It contained 47 single spaced pages of information and required the bidding vendors to answer 277 detailed technical and cost questions about the system or service they planned to propose to the hospital.

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INPUT

EXHIBIT IV-12

EDP VENDOR SELECTION METHODS USED
BY RESPONDING HOSPITALS

SELECTION METHOD	PERCENT MENTIONED	NUMBER OF MENTIONS
FORMAL BIDS	51%	21
SALES PRESENTATION	26	11
REFERRALS	10	4
OTHER	13	5

INF

- This RFP was prepared by Mssrs. John J. Mayerhofer and Steven W. Walden of Sequoia Hospital in Redwood City, CA.

- The complete RFP is included in this report in Appendix D and provides an excellent check list of hospital EDP service requirements.

2. CENTRALIZATION OF EDP SERVICES AND PRODUCT SELECTION

- All hospitals surveyed indicated that the selection of EDP products and services were centralized within the EDP organization.

    - In the smaller hospitals of less than 200 beds, the EDP manager usually reported directly to the hospital administrator and only the administrator's formal approval was required prior to the procurement of the product or service.

    - In the larger hospitals of more than 200 beds, there was usually one or two levels of management approval required prior to purchase:

        - In those cases the EDP manager usually reported to an associate hospital administrator or business manager who in turn reported to the chief hospital administrator.

        - One hospital that was establishing an in-house DDP system had created a user group that was involved in the review of approval of the development of the system.

3. HOSPITAL EDP MANAGERS' RECOGNITION OF LEADING VENDORS

- Exhibits IV-13 and IV-14 provide a percentage distribution of the vendors of EDP products and services that hospital EDP managers believed were the leading vendors to hospitals.

INPUT

EXHIBIT IV-13

LEADING RCS AND SOFTWARE SYSTEM VENDORS

MENTIONED BY HOSPITALS INTERVIEWED

VENDOR	PERCENT MENTIONED	NUMBER OF MENTIONS
MCAUTO	35%	11
SMS	35	11
TECHNICON	9	3
HDS	3	1
HOSPITAL FINANCIAL SERVICES	3	1
HMS	3	1
ITEL MDD	3	1
MEDISTAT	3	1
PENTAMATION	3	1
PROMED	3	1
TOTAL	100%	32

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EXHIBIT VI-4

LEADING HARDWARE VENDORS
MENTIONED BY RESPONDING HOSPITALS

VENDOR	PERCENT MENTIONED	NUMBER OF MENTIONS
IBM	45.0%	18
NCR	20.0	8
BURROUGHS	15.0	6
DEC	5.0	2
UNIVAC	5.0	2
CDC	2.5	1
DATA GENERAL	2.5	1
HEWLETT-PACKARD	2.5	1
SINGER	2.5	1
TOTAL	100%	40

- MCAUTO and SMS are recognized as the leading RCS vendors by the hospitals and provide their services on a nationwide basis.

- As anticipated, IBM is recognized as the leading hardware vendor by all the hospitals.

- NCR ranks as a close second to IBM.

• The inclusion of the large number of firms with low percentage of recognition represents the fact that the hospital marketplace is regionalized, and many of the other companies do not have national recognition because their marketing efforts are concentrated in specific geographic areas.

• This is substantiated by the number of sales visits the EDP managers had experienced over the last year. Exhibit IV-15 provides a percent distribution of the sales calls made by the vendors of both products and services.

- As with the recognition of the leading vendors, the same firms - IBM, MCAUTO, and SMS - had made the highest percentage of sales calls.

• The sales calls were examined further to determine the level of concentration (Exhibit IV-15) for the various hospital sizes that were interviewed:

- Hospitals below 100 beds were only called upon by the hardware vendors as expected, since the RCS vendors concentrate their marketing efforts in hospitals larger than 100 beds.

- Hospitals above 399 beds were not contacted by any of the hardware vendors, which is somewhat surprising since earlier studies by the HFMA association indicated a high percentage of in-house systems in these hospitals.

- Major concentration of RCS vendor sales was in the 100-399 bed hospitals:

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INF

EXHIBIT IV-15

PERCENT OF SALES VISITS BY

EDP HARDWARE AND SERVICE VENDORS

AMONG HOSPITALS INTERVIEWED

VENDOR	PERCENT OF SALES VISITS	NUMBER OF MENTIONS
MCAUTO	23%	10
SMS	21	9
IBM	19	8
BURROUGHS	10	4
NCR	10	4
DEC	2	1
HBO	2	1
HDS	2	1
PENTEMATION	2	1
TECHNICON	2	1
OTHERS	7	3
TOTAL	100%	43

INPUT

- MCAUTO had over 60% of their sales calls in this category.

- SMS had a similarly high percentage of 65% sales calls in the same size category.

- The small number of sales calls made by the other vendors indicates that only the top three vendors are intensively covering the national market.

4. HOSPITAL EDP MANAGERS' RATING OF VENDOR SELECTION CRITERIA

- The most important single vendor selection criterion stated for RCS vendors is the level of customer support provided.

- Exhibit IV-16 provides the rating of various selection criteria by the EDP managers interviewed.

- Application knowledge, vendor reputation and response time of the vendors also received high ratings.

- Price did not receive a high rating among the selection criteria:

  - None of the hospital EDP managers rated price as the most important selection criteria.

  - This appears to be in conflict with the pressures that are being brought on hospitals to reduce costs.

- EDP managers' comments in selecting RCS vendors exhibit a strong requirement for vendors to provide a demonstratable system. Typical comments are:

  - "Would have to see a demonstration system and be shown how it would be used in my hospital."

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EXHIBIT IV-16

EDP MANAGERS' RATING OF

RCS VENDOR SELECTION CRITERIA

FOR HOSPITALS INTERVIEWED

SELECTION CRITERIA	RATING*	PERCENTAGE OF RESPON-DENTS GIVING IT A "MOST IMPORTANT" RATING
CUSTOMER SUPPORT	1.1	34%
VENDOR'S KNOWLEDGE OF APPLICATION	1.5	21
VENDOR'S REPUTATION	1.8	13
RESPONSE TIME	1.9	13
VENDOR'S KNOWLEDGE OF HOSPITAL	2.25	9
PRICE	2.4	0
CONTRACT TERMS	2.6	3
RANGE OF SERVICES	2.7	7

*(1=HIGH, 5=LOW)

INPUT

- "See an up and running system."

- "Must be able to see it run in another hospital."

- "Would have to be shown that it would save us money before we would even consider."

- "Prove that it is low cost and show that they have good local support."

- "Show that it is cost effective."

- "Show that the system works and can be cost justified."

● Only four of the fourteen hospitals currently using RCS services in their hospital had changed RCS vendors in last five years.

- Three of the hospitals had switched vendors because they were able to get the same services from a new vendor for less cost.

- One of the hospitals had switched because the previous regional vendor had terminated his RCS support to hospitals.

- Two other hospitals had switched from an RCS vendor to an in-house mini-based systems because the vendors had increased their service costs.

- Two current RCS users were planning to terminate their RCS services by the end of 1978.

   . One of these hospitals was planning to select another RCS vendor and was in the process of preparing a formal bid package.

   . The second hospital was in the final selection process and was planning to install an in-house mini-based system.

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G. EFFECTS OF GOVERNMENT ACTIONS ON HOSPITAL EDP

- Over 75% of the hospital EDP managers interviewed believe that current and pending Federal Government legislation will have an effect on the use of EDP in hospitals.

- Although EDP managers usually did not identify the specific legislative action, their concern was centered in two areas:

I. UNIFORM REPORTING SYSTEMS

- Public Law 95-142, officially known as the Medicare-Medicaid Anti-Fraud and Abuse Amendment, contains an important provision that mandates a federally-imposed hospital uniform reporting system.

- This uniform reporting requirement has not been imposed on hospitals yet, but is expected to come into effect within the next two years.

- The required System for Hospital Uniform Reporting (SHUR) was to be published in the Federal Register for public comment in June 1978, but still has not been released by HEW.

- The EDP managers interviewed were concerned about the uniform reporting. Their primary concern was the cost and workload impact on current operations. Typical comments were:

    - "When this is imposed it will mean that I will have to modify over 60% of my current financial packages."

    - "I estimate that it will take about four man years of effort to reprogram my current business application to meet these requirements."

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INPUT

2.   COST CONTAINMENT

●   The National Health Planning and Resources Development Act that was passed three years ago by Congress requires each state to establish a health planning board to authorize the purchase of medical equipment costing $100,000 or more.

●   The Hospital Cost Containment Act of 1977 which is currently in committee (House Bill 6575; Senate Bill 1391) would limit even further the funds that acute care hospitals could allocate each year for new capital expenditures.

●   The impact of these current and pending legislative acts are affecting planned EDP expansion by EDP managers. The main effects appear to be:

    -    More management time is required to expand the existing services because of the large amount of cost justification that is required by the hospital administration and the extended review cycle through state government agencies.

    -    EDP expenditures must compete with other organizations within the hospitals to have their capital budgets approved.

    -    Cost justification documents are imposing additional work loads on the EDP departments to prepare the necessary information for hospital administrators.

    -    EDP managers are becoming more actively involved in preparing detailed hospital budgets.

3.   PRIVACY OF PATIENT INFORMATION

●   Although there is no current federal or state legislation that will affect the handling of patient medical information, there was a concern expressed by about 20% of the hospital EDP managers interviewed.

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V COMPUTER SERVICES MARKETS

- Current patient medical information must have improved control to prevent unauthorized access of this information.

- Three EDP managers who were currently planning conversions from manual medical records to an automated system were planning to incorporate security provisions to prevent unauthorized access.

- It is expected that data security provisions that currently exist in other industry sectors will become increasingly more important in the hospital sector.

- This will be the result of increased demand for information from agencies and organizations outside the hospital community such as insurance companies and government agencies.

- Despite this demand for legitimate information, medical directors still will have a responsibility for protecting the privacy of the patients.

H.   CASE STUDY OF A HOSPITAL USING DDP FROM AN RCS VENDOR

1.   HOSPITAL OVERVIEW

- Mt. Diablo Hospital Medical Center is a non-profit district hospital located in Concord, California. It traces its origins back to 1930 although its current 303 bed facility was dedicated in 1975. Another 25 beds will be added shortly.

- The hospital employs 1,200 personnel and services an area populated by about 400,000 people. The current annual operating budget is approximately $34 million, with approximately 99% of funds derived from patient and third party billings.

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INPUT

- In addition to general medical/surgical nursing care units, the hospital offers a variety of critical care units, a Diagnostic-Therapy Center which provides cobolt treatments for cancer patients, a hemodialysis unit, and special maternity and infant programs.

- There are 36 specific medical departments within the hospital which are supported by 41 identifiable groups including:

  - Planning.

  - Personnel.

  - Finance.

  - Administration.

  - Education and training.

  - Public relations.

- The DDP department reports to the Director of Finance and currently operates with about eight staff members and a $24,000 per month budget. This does not include a separate budget for a laboratory minicomputer system which functions independently of the profiled DDP installation.

2. DDP BACKGROUND

- Mt. Diablo DP experience dates back more than ten years with its most recent installation (prior to installing a DDP node) consisting of a used NCR Century 200 and Hewlett-Packard 2100. The HP machine was used for data collection at nursing stations and provided information to the NCR "host" via computer compatible tape.

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- Both computers were physically separated by a city block and required a staff of six full-time programmers to satisfy software requirements.

    - The monthly operating budget under these conditions was approximately $32,000, which included $1,500 per month for maintenance of the NCR machine alone. The overall average hourly service cost was about $600.

- Difficulties were being encountered by the in-house programming staff in providing software in a timely manner to satisfy various use requirements.

    - Some programming tasks were estimated to require one year to become operational.

- Additional problems included:

    - Programmer difficulties in mastering the very diverse user requirements to be found in a hospital like Mt. Diablo with its large number of medical and administrative departments and functions.

    - Operating a multi-vendor environment with attendent service and maintenance problems.

- A variety of alternative solutions were examined approximately 18 months ago, including the possibility of upgrading the existing hardware. This latter approach was eventually rejected for the following reasons:

    - The relatively large depreciation charges associated with owned hardware.

    - The service and data accuracy problems associated with the installed keypunch equipment.

    - The costs and related difficulties of maintaining an in-house programming staff.

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- One of the alternatives examined (and eventually selected) was to exercise the option of choosing a remote computing service (RCS) vendor specializing in the health care field. The company chosen was Shared Medical Systems (SMS) headquartered in King of Prussia, Pennsylvania. SMS is described in Chapter VI, "Competitive Environment."

- Perhaps the most pivotal factors that contributed to the selection of an RCS vendor were the reduced operating cost and the immediate availability of speciality software packages to satisfy the diverse needs of a hospital.

- Participants in the decision to select an RCS approach (and SMS as the vendor) included the:

    - Director of Finance and Comptroller.

    - DP Manager.

    - Hospital Administrator.

    - Board of Directors.

- The equipment that was installed (on lease) within Mt. Diablo includes a Four Phase IV/40 clustered-video display processing system which controls four CRTs, a printer, and a 2.5 megabyte disk. The NCR and HP 2100 equipment were removed.

- Cost savings were achieved simply through reductions in staff (particularly programmers), increased accuracy in data entry by replacing keypunch machines with terminals, and eliminating equipment related depreciation charges.

- The system became operational in May 1977. Key applications and the time required for their implementation included:

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- Patient accounting and census - two months.

- Accounts payable - three days.

- General ledger - one month.

Most of the remaining applications required about two months to install/convert.

- In addition to the SMS packages, Mt. Diablo also uses two other (non-SMS) software services offerings including:

  - A statistical budgetary system providing payroll hours, average hourly salary per department, etc., and,

  - An inventory ordering and buying system.

3. RESULTS TO DATE AND FUTURE PLANS

- Average monthly charges for the SMS installation have been in the $9,000-13,000 range and include all lease, teleprocessing and service costs. This has resulted in about a 25% cost savings in the DP department.

- Vendor hardware and software service experience to date has been very good.

- Users are generally quite pleased with the sharp improvement in the timeliness of reports; e.g., census information is distributed by 7:00 AM which materially contributes to smoother routines in bed allocation and meal preparation.

- Alternatively, the hospital has lost some flexibility in being able to service special department requests.

- Within the next 12 months, Mt. Diablo expects to upgrade its existing installation to the equivalent of a Four Phase IV/70 cluster controller with a

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INPUT

capability to handle 20-24 distributed terminals. Emphasis is on increasing accountability (responsibility) of individual departments in the reporting and data entry functions. Two printers will be added in addition to upgrading disk capacity to ten megabytes or greater.

- The existing lab system (using a Digital Equipment Corporation processor) may be tied into the Four Phase equipment by means of a compatible tape. Laboratory charges (of which there are hundreds daily) are still keypunched with obvious room for improvement.

- Selected applications that are currently performed in a batch mode will be done on-line and will include:

  - Master patient index.

  - Patient admitting.

  - Bed availability.

  - Patient census and billing.

  - Pharmacy charges.

- Although the hospital has been well satisfied with the RCS approach and expects to continue using this method in the short term, it has not ruled out the possibility of reverting back to an in-house approach at some future date. This will be contingent upon further erosion in computer system pricing in conjunction with the availability of customized or packaged software systems.

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V COMPUTER SERVICES MARKETS

A.   ANALYSIS AND FORECAST

I.   GROWTH

- The expanded use of EDP, particularly in the patient management area and the movement of more applications to on-line delivery indicates that the computer services market for hospitals will keep pace with the annual growth rate for total computer services of 16%, forecasted by INPUT in the 1977 Computer Services Industry Annual Report.

- This market represents 3.3% of the total computer services market ($8.1 billion) in 1978 and will retain this share of the total ($16.7 billion) in 1983.

- The hospital subsector of the medical industry sector represents 73% of the current industry market ($365 million) but will decline to 54% of that market ($1 billion) by 1983 because of the faster growth in other areas and the expanded use of outpatient clinics.

- The growth of hospital computer services is shown in Exhibit V-1.

- The major portion (82%) of 1978 expenditures is used for processing services. There is a much smaller market for both software products ($19 million) and professional services ($30 million).

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EXHIBIT V-1

GROWTH OF HOSPITAL COMPUTER SERVICES

(1978/1983)

($ MILLION)

- $500
- 400
- 300
- 200
- 100

$221
$442
AAGR 15%

PROCESSING SERVICES

$19
$50
AAGR 21%

SOFTWARE PRODUCTS

$30
$59
AAGR 14%

PROFESSIONAL SERVICES

TOTALS:

� = 1978 $270M

☐ = 1983 $551M

15% AAGR

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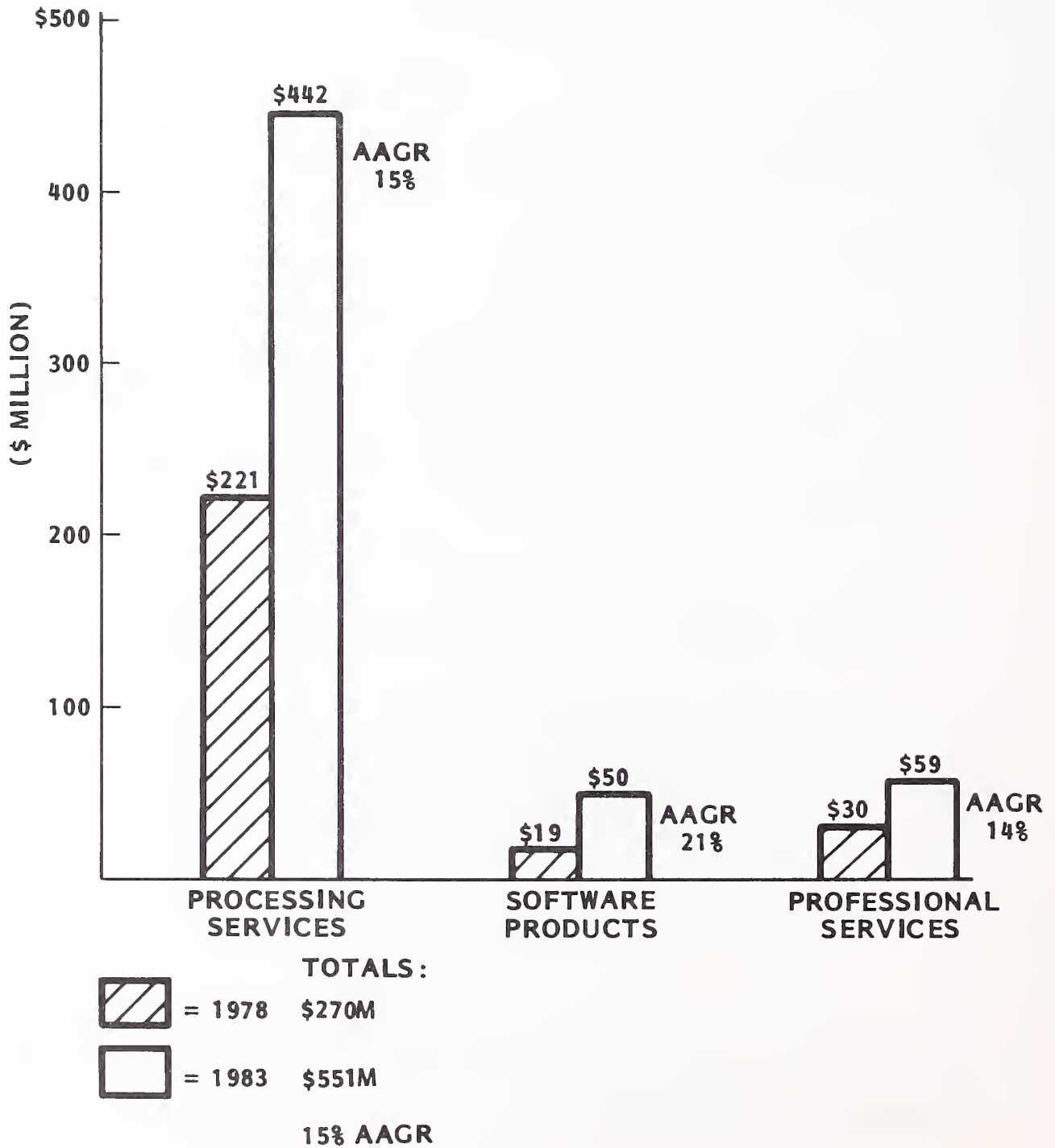
2. DELIVERY METHOD

- The growth of computer processing services for hospitals by mode of service delivery is shown in Exhibit V-2.

- The decline in batch services is due to the increased use of on-line systems and the implementation of distributed data processing networks within the hospital subsector.

- Remote computing services will expand its current market share ($67 million) of 25% to 36% of the 1983 market ($200 million).

- Facilities management will maintain the same level with about 34% of the 1978 market ($88 million) and the 1983 market ($181 million).

3. TYPE OF SERVICE

- As shown in Exhibit V-3 industry specialty applications are the dominant type of service provided to hospitals.

- For both 1978 ($202 million) and 1983 ($406 million) this will represent about 91% of the total market.

- Business management applications that have been tailored for the hospital subsector are included in the industry specialty category.

- Both scientific and engineering and utility represent very small segments of this market.

4. DISTRIBUTION

- Expenditures for computer services are concentrated in hospitals in the 100-500 bed range, as mentioned earlier.

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EXHIBIT V-2

GROWTH OF COMPUTER SERVICES

FOR HOSPITALS BY MODE OF SERVICE

(1978/1983)

TOTALS:

= 1978 $221M*

= 1983 $442M

15% AAGR

*ROUNDED TOTAL

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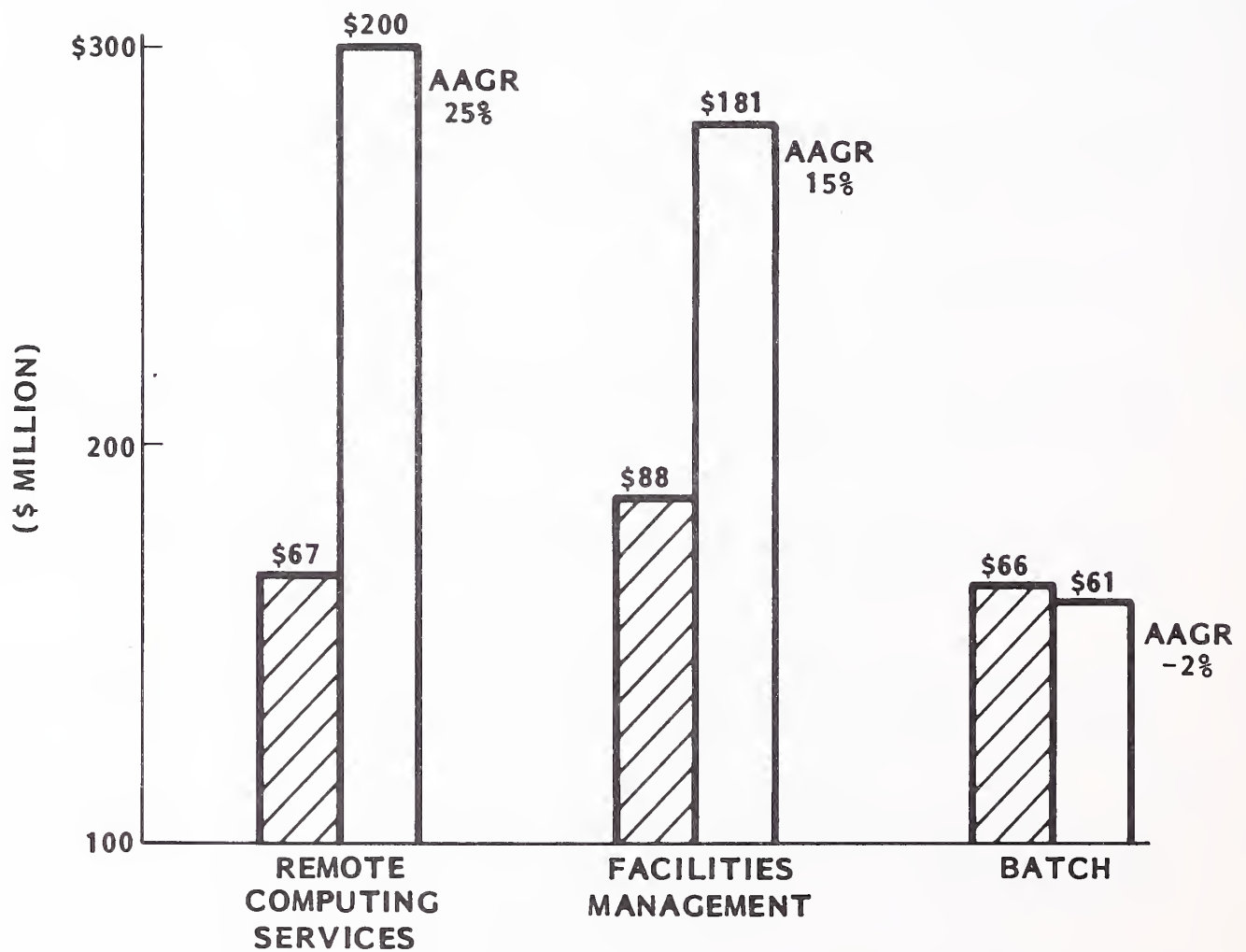
EXHIBIT V-3

GROWTH OF COMPUTER SERVICES

FOR HOSPITALS BY TYPE OF SERVICE

(1978/1983)

TOTALS:

▨ = 1978 $221M*

☐ = 1983 $442M

15% AAGR

*ROUNDED TOTAL

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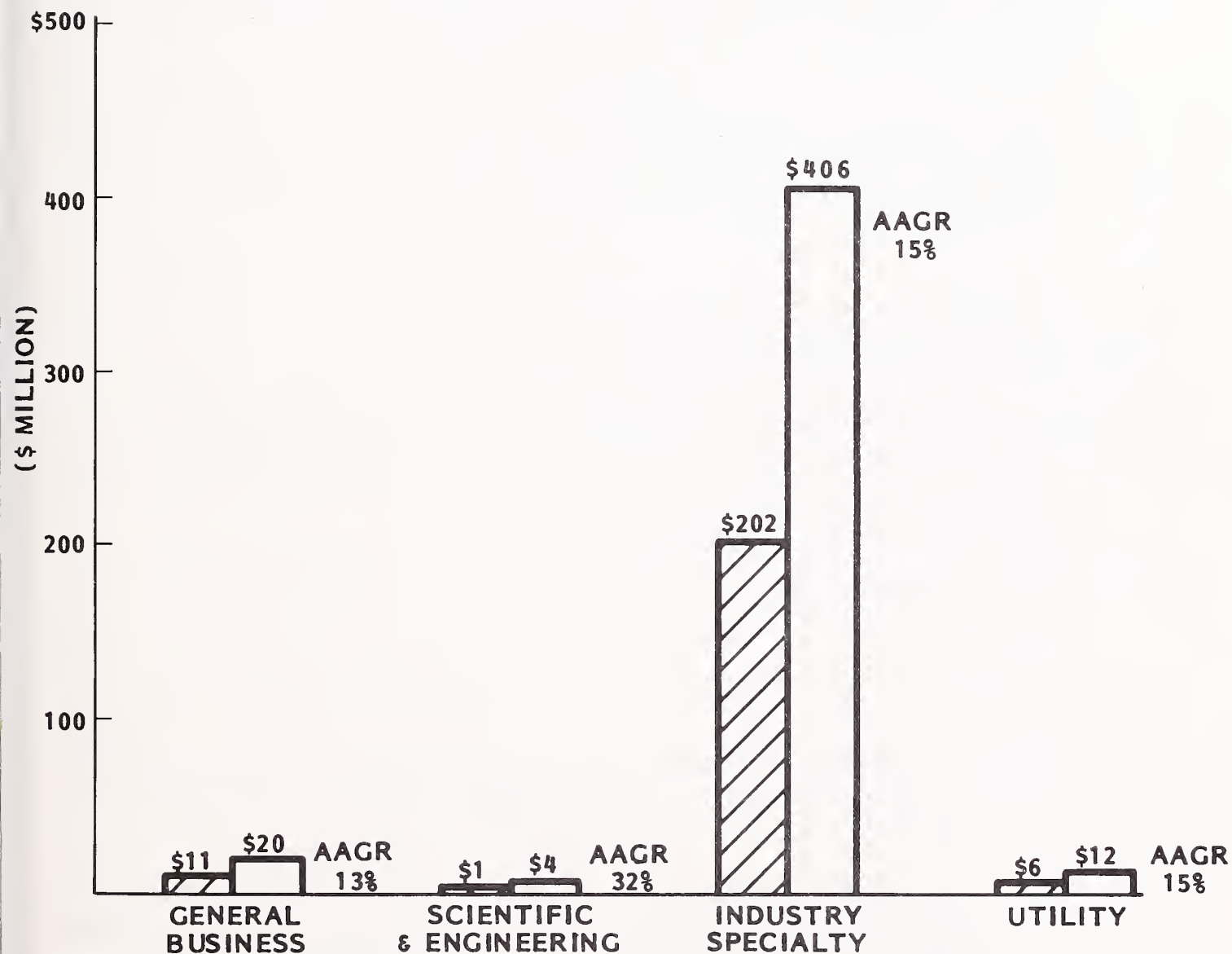
- Based on FHMA findings, about 53% of the hospitals in this size range use outside services.

- Hospitals smaller than 100 beds have very low annual EDP expenditures of less than $50 thousand.

- Hospitals of over 500 beds tend to have large in-house computer installations and associated EDP staff with no major use of outside services.

- For professional services and software product firms the same market restrictions do not exist, but again the small hospitals are not good sources of revenues because of their low EDP budgets.

B.   HOSPITAL MARKETING ISSUES

- The marketing of EDP products and services to hospitals impose some unique marketing problems for vendors.

I.   COST JUSTIFICATION

- All vendors interviewed indicated that cost justification was mandatory.

- This cost justification had to be based on actual past performance and not just on expectations based on the expected technical quality of the product:

    - Two vendors indicated the hospitals were requiring them to provide actual cost data from other hospitals where the system had been installed.

    - As one RCS vendor commented, "If you don't have the numbers to prove that the service is cost effective, it's impossible to close the sale."

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2.   PROVEN SERVICES

- All vendors indicated that they had to demonstrate the capabilities of their system prior to sales closure.

- Hospitals were not interested in features or capabilities that were currently under development, only those that had worked in other hospitals.

- The comment of one vendor was typical:

  - "You must have a good track record, and one horror story about your company can kill you with a hospital."

3.   SELLING POINTS WITHIN THE HOSPITAL

- While all hospital EDP managers interviewed indicated that the purchase of EDP products and services were centralized in their hospital, the selling points were dispersed.

- Vendors indicated that they were required to sell to a number of different organizations within the hospital and an inclusive list includes:

  - Board of Directors.

  - Hospital Administration.

  - Business Office.

  - Medical services and the associated physician.

  - EDP Department.

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INPUT

- Vendors characterized the environment in which they must sell as very conservative and indicated that a long education period problem is required, particularly if the physicians are involved in the decision.

- Two vendors indicated that the quality of the hospital management was poorer than in other industries they market, and were generally naive about how EDP could be used effectively in a hospital.

- Although the EDP manager may be the catalyst for considering the vendor, selling to the other hospital management personnel is required.

- Even after the hospital has been sold, there is a requirement in some hospitals to provide selling support to the hospital in the cost justification of their procurement to the necessary state and federal government agencies.

4.   LONG SALES CYCLE

- Vendors interviewed indicated that the average time required to close an individual hospital sale is about six months.

  - The range of times to sales closure is from about four months to over three years.

  - The vendor that indicated times of two to three years was selling an expensive turnkey system.

  - RCS vendors interviewed indicate selling cycles for four months to a year.

- With the current pressures being brought on hospitals for cost containment, it is expected that the selling cycles will continue to increase over the next five years, as more detailed justifications are required.

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VI COMPETITIVE ENVIRONMENT

VI   COMPETITIVE ENVIRONMENT

- Four types of service vendors compete in the short-term general hospital marketplace:

    - Remote computing services vendors.

    - Software products vendors.

    - Professional services vendors.

    - Turnkey systems vendors.

- There is some overlap among the vendors regarding the type of services offered, as some vendors are active in more than one of the above categories.

- INPUT estimates that there are about 50 vendors of all types who are concentrated on this marketplace as a single or major source of revenue.

- The following sections highlight some representative vendors.

INPUT

A.   REMOTE COMPUTING SERVICES (RCS) VENDORS

- There are three types of vendors that provide remote computing services to acute care hospitals:

    - National RCS vendors.

    - Regional RCS vendors.

    - Medical service companies that own, operate and manage hospitals for profit.

I.   NATIONAL RCS VENDORS

- MCAUTO, Shared Medical Systems, General Electric Information Services and TYMSHARE all provide significant RCS services to the short-term general hospital marketplace. Other RCS national vendors are also active in this marketplace.

- Shared Medical and MCAUTO are clearly the dominant firms in the delivery of remote computing services.

- Their concentration in the hospital marketplace is directed toward hospitals in the 100-500 bed range.

- In that area INPUT estimates that Shared Medical Systems has about 15% of the beds and MCAUTO about 12%.

- INPUT attempted to interview both firms about their participation and plans for providing remote computing services to short-term hospitals, but they both declined. Therefore, data presented is primarily from published sources.

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a.   Shared Medical Systems (SMS)

- SMS is the largest vendor of computing services to hospitals and has grown from $3.5 million in 1971 to estimated revenues in 1978 of $51 million.

- SMS provides a comprehensive service to hospital users in business management, patient management and clinical applications.

- These major service offerings are:

  - Financial Management System which consists of these modules:

    . Accounts payable.

    . Inpatient, outpatient and physician billings and receivables.

    . Financial patient index.

    . General ledger and financial reporting.

    . Financial and revenue statistics.

    . Patient insurance logs.

  - Resource Management System which consists of these modules:

    . Personnel administration.

    . Payroll.

    . Inventory.

    . Fixed asset accounting.

    . Plant maintenance scheduling.

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INPUT

- Patient Care Systems called <u>ACTION</u> and <u>FOCUS</u> which are used for the collection and reporting of medical, radiology clinical laboratory, pharmacy, bed control, patient location and medical statistical information.

- SMS's data center is located in King of Prussia, Pennsylvania, and consists of multiple IBM System/370 Model 168s.

- For the past two years SMS has been establishing a distributed data processing system, and INPUT estimates they currently have about 225 to 230 Four Phase 470-490 minis tied into this network on a nationwide basis.

- SMS is expected to upgrade its current central site in Pennsylvania during the third quarter of 1979 to include one IBM 370-168 AP, one IBM 3033 and one Amdahl V/7. A second 3033 will be installed at its subsidiary, Shared Stand By Systems.

b.   <u>MCAUTO</u>

- MCAUTO's Health Services Division provides the full range of business management, patient management and clinical applications to hospitals on a national basis and currently has clients in 41 states.

- INPUT estimates that MCAUTO will have 1978 hospital revenues of $49 million.

- Among the major services offered to hospitals are:

    - <u>Hospital Financial Control (HFC)</u>. HFC provides a series of on-line services to hospitals which consists of these modules:

        . Patient census.

        . Financial statements and reports.

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- Property accounting.

- Budgetary planning.

- Accounts receivable/patient billing.

- Accounts payable.

- Inventory control.

- Payroll.

- HFC/Basic is a version of HFC for smaller hospitals and includes accounts receivable/patient billing, payroll, accounts payable and financial statements and reports.

- MRII, ERII, and OPII are record information systems that are used for medical records, emergency room and outpatient information.

- They were developed by California Health Data Corporation and are provided on MCAUTO's network through an agreement with CHDC.

- Hospital Patient Care System (HPC) provides hospitals with data entry and retrieval for ordering, scheduling, reporting and monitoring patient data.

- DataStat is an application that accumulates historical information on each patient activity and is maintained for up to sixteen months. It provides a wide range of statistical planning information on revenue, physicians, and patients and can be tailored to individual hospital administrators' requirements through Report Express (Rx).

- EAS (Electrocardiogram Analysis Service) provides a medical telecommunications system for ECG analysis with 30 minute interpretive analysis.

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- MCAUTO provides its services to hospitals through its Health Services Data Processing Center in St. Louis.

- This center is a multiple IBM System/370 Model 168 installation and there was no information available on any planned upgrades of the hardware configuration.

- MCAUTO offers minicomputer-based applications for hospitals. Based on available information it is not clear if this system is part of a DDP network as in the case of SMS.

2. REGIONAL RCS VENDORS

- Regional RCS vendors provide services to a limited number of hospitals and do not appear to offer the complete range of services that firms like SMS and MCAUTO provide.

- As part of this study INPUT interviewed three of these regional vendors to determine their approach to the marketplace.

   a. Management Systems Corporation (MSC)

- Management Systems Corporation is based in Salt Lake City, Utah, and provides remote computing services to seven hospitals in Utah and two hospitals in Idaho under a three year contract:

   - These hospitals range in size from 100 to 550 beds.

- In 1977, Management Systems Corporation sales were about $7 million, which were derived from business management and patient management applications. Patient management applications were limited only to patient billing.

- Management Systems is planning to introduce a distributed data processing system to the seven hospitals it currently serves.

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- The system will consist of an IBM System/370 Model 168 and Model 158 at the central site with Four Phase 490s installed at each of the hospitals. The 490s will operate in a standalone mode during the day and switch to a 3720 emulation mode in the evenings for remote batch.

- MSC estimates that this new hardware system introduction will reduce total system costs to all hospitals by about 10% because of decreased telecommunications expenditures.

b.   MEDITECH

- MEDITECH is a privately held company based in Cambridge, Massachusetts, that provides three types of servies to hospitals: remote computing services, software products, and professional services.

- Although revenue figures are not publicly available, INPUT estimates its current annual revenues to be $3.7 million.

- MEDITECH provides interactive remote computing capabilities to about 40 hospitals in the New England area from its computer center in Cambridge.

- This computer center contains fifteen PDP-15s, twelve DG Eclipse C-330s, and three DEC 1170s.

- MEDITECH's library of applications programs for hospitals is based on an operating system and programming language called MEDITECH Interpretive Information System (MIIS).

    -    MIIS is a timesharing, data base management system designed for on-line applications requiring the simultaneous entry and retrieval of data from a large number of independent sources.

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- MIIS can be acquired on a licensed basis for $15 thousand, plus 1% per month for maintenance and upgrade. MIIS is the basis for the business management, patient management, and clinical applications.

- MEDITECH has about 250 current installations where various subsets of their application programs operating under MIIS have been installed. Some of these installations include the installation of only MIIS.

- MEDITECH is not involved in the purchase of the required hardware for any of these installations, but does provide professional programming services in the development of application programs.

c. MEDISTAT

- MEDISTAT is a small RCS vendor based in Milwaukee, Wisconsin, with annual sales in 1977 of only $500 thousand.

- This revenue is derived from a limited set of business management and medical insurance processing applications to about 23 hospitals in Wisconsin, Michigan, and Indiana.

- However, this vendor has aggressive marketing plans for the next two years through the packaging of its patient admission-discharge-transfer application program and marketing to hospitals.

- In January of 1979, it plans to introduce to its client hospitals a distributed data processing system with IBM System 3s netted to the IBM System/370 Model 168 in Milwaukee.

    - This system is being planned to reduce the amount of remote processing provided to the hospitals.

    - MEDISTAT hospitals are currently doing about 80% of their processing in a remote batch mode.

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- With the introduction of DDP, MEDISTAT estimates that 50% of all processing will be done at the hospitals with the System 3s.

3. MEDICAL SERVICES COMPANIES

- Medical service companies own, operate and manage hospitals on an international basis, and it is estimated that their total revenues in 1978 will be over $2 billion from a base of only $541 million in 1973.

- The significance of these companies to the delivery of remote computing services to short-term general hospitals is that they all have the potential to sell their corporate remote processing capabilities to hospitals outside their corporation:

    - One of these companies, American Medical Enterprises, is already active in this area through one of its subsidiaries, Professional Hospital Services.

a. American Medical Enterprises (AMI)

- American Medical Enterprises, based in Los Angeles, owns and operates 42 acute care hospitals (28 in California and Texas) and derived 93% of its $46.1 million revenues in 1977 from these hospitals.

- AMI is planning to have about 50% of its hospitals established on a distributed data processing system by the end of 1979. These mini-equipped hospitals will be linked to an IBM System/370 Model 155 installation in Los Angeles.

- Although AMI would not provide details of the marketing of its services to non-owned hospitals, they did indicate that they plan to have about 58 such hospitals tied into their network by the end of 1981.

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b.   Humana Inc.

- Humana Inc., with the recent acquisition (August 1978) of American Medicorp, is now the largest hospital management corporation in the U.S. with estimated combined revenues in 1978 of over $1 billion dollars.

- It owns and operates about 100 acute care hospitals of approximately 11,000 beds in the U.S.

- Humana is currently establishing its own distributed data processing system and will have about 60 hospitals as part of this system by the end of 1979.

- Although Humana will be responsible for development and management of the total system, the hospital based minis will be the MEDPRO system from HBO, Inc. (see Section C of this Chapter for summary of MEDPRO system).

    - The central node (IBM System/370 Model 168) operates in the corporate offices in Louisville, KY.

c.   Hospital Corporation of America (HCA)

- HCA owns and operates about 100 hospitals in 24 states and two foreign countries. These hospitals consist of over 15,000 beds and accounted for about $40 million in revenue in 1977.

- HCA has elected to use General Electric Information Services (GEIS) to provide the required data processing services to these hospitals.

- GEIS and HCA are currently in a joint development of a distributed system for these hospitals. Although HCA declined to provide any technical amplification of the system, they did indicate that two sites will be brought up on a pilot program in a test mode as part of a one year pilot program that will run through 1979. At that time HCA will decide on corporate wide implementation.

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B. PROFESSIONAL SERVICES VENDORS

- This class of vendors provide services to hospitals that range from EDP consulting to the development and operation of hospital information systems.

1. KEANE ASSOCIATES, INC.

- Keane Associates, Inc., derives about 30% of its current $7.3 million in revenue from the development and operation of hospital information systems on a five-year fixed price contract basis.

- This company currently provides this service to twenty hospitals with an average of 200 to 300 beds.

- The system consists primarily of business management and patient management applications:

    - The business management system runs in a prime batch mode with some interactive capabilities.

    - The patient management applications permit both on-line A-D-T functions and medical records.

- The applications software is written in RPG and operates on the Burroughs 1700-1800 class of machines.

- In the contractual relationship with the hospital, Keane provides EDP management and operations staff on-site, and the hospital provides data entry and data control personnel.

- If an individual hospital requires customized applications, these services are provided.

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C.   TURNKEY SYSTEM VENDORS

● This class of vendors provides prepackaged total systems that they market to hospitals for operation by hospital personnel.

● The systems marketed by these vendors range from total hospital information systems to ones that satisfy only part of the total hospital information requirement.

I.   HBO, AND COMPANY

● HBO was founded in February of 1974 and has installed about 100 MEDPRO systems.

  - 1977 annual sales were $15 million with purchase price of the system ranging from $300 thousand to $1.5 million depending on the system capabilities purchased.

● MEDPRO is a Four Phase 470-490 mini-based system which provides inpatient admissions and census, nursing and departmental order entry, outpatient registration and billing and serves as a data communication and collection system.

● It is also possible to add other custom applications to the system for pharmacy, nursing service, central services, and dietary planning.

● The system does not include any business management applications but is capable of interfacing with these systems.

● MEDPRO systems have been linked with remote service vendors such as MCAUTO, SMA and TYMSHARE and IBM, Honeywell, and NCR hospital based computer systems.

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- As indicated earlier, HBO provides its system to Humana Inc., and until recently was marketed by SMS under a licensing agreement to HBO.

2. TECHNICON CORPORATION

- Technicon is a multi-division, $240 million (1977) corporation that provides a number of products and services to the medical, pharmaceutical and industrial quality control markets.

- Technicon derived about $13 million in 1977 from the sale of a system called TMIS (Technicon Medical Information System).

- The capabilities of this system can be delivered to a hospital either in the form of a turnkey system or as RCS:

    - The system is modular, and various subsets of the system can be provided to hospitals based on their requirements.

    - The system consists of both business and patient management applications.

    - The system is IBM System/370 based and is currently installed as a turnkey system in about nine hospitals, primarily in the 400-500 bed size.

    - Major installations of this system are at El Camino Hospital in Mountain View, California; National Institute of Health in Bethesda, Maryland; and Nebraska Methodist Hospital in Omaha, Nebraska.

    - In 1977, Technicon announced an $8 million agreement with the Medical Colleges of Virginia Hospital for TMIS.

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- In addition to supporting the development of these turnkey systems, Technicon currently provides RCS support to approximately 40 hospitals from its IBM 370 installations on the East and West Coasts.

- Since the cost of the total TMIS is high ($1-3 million purchase), Technicon is expected to announce in the third quarter of 1978 a scaled down version of the system.

D.   COMPUTER SERVICES REVENUES FROM HOSPITALS

- Shared Medical Systems and MCAUTO clearly dominate the hospital sector and account for 37% of the forecast market for 1978.

- Exhibit VI-1 provides INPUT's estimate of the major revenues of the leading vendors who provide computer services to hospitals.

- It is expected that these two companies will retain their national leadership positions through the expansion of existing services to existing hospital users and capturing more hospitals.

- Firms such as HBO and Company are expected to expand (AAGR of 20%) over the next five years in the area of mini-based patient management systems that can operate in a standalone mode or networked into a DDP system.

- Software products vendors selling DBMS software packages that are adaptable to integrated hospital information systems are expected to increase their share of the market.

- Regional RCS vendors are most vulnerable either by acquisition or by their lack of funds to invest in upgrading their current offerings to accommodate expanding hospital information requirements. This will be particularly true of the smaller vendors who offer only batch service.

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EXHIBIT VI-1

COMPUTER SERVICES REVENUES BY
KEY VENDORS IN HOSPITALS

VENDOR	EST. 1978 HOSPITAL REVS. (U.S.)
SHARED MEDICAL SYSTEMS	$ 51 MILLION
MCAUTO, MEDICAL SERVICES DIVISION	49
VARIOUS BLUE CROSS ORGANIZATIONS	19
REGIONAL RCS VENDORS	19
HBO & COMPANY	16
TECHNICON	14
HEALTH MANAGEMENT SERVICES	9
MANAGEMENT SYSTEMS CORP.	6
TYMSHARE, MEDICAL SYSTEMS	7
MEDITECH	4
KEANE ASSOCIATES, INC.	4
AMERICAN MEDICAL ENTERPRISES, PROFESSIONAL HOSPITAL SERVICES	2
TOTAL	$200 MILLION
TOTAL HOSPITAL COMPUTER SERVICES REVENUE	$270
PERCENT ACCOUNTED FOR	74%

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APPENDIX A: INTERVIEW SAMPLE

EXHIBIT A-1

USER AND VENDOR INTERVIEWS

NUMBER OF HOSPITAL BEDS	NUMBER OF USERS INTERVIEWED	
	TELEPHONE	ON-SITE
50 - 99	3	
100 - 199	5	
200 - 299	9	
300 - 399	5	
400 - 499	3	2
500 +	3	
TOTAL	28	2

TYPE OF VENDOR	NUMBER OF VENDORS INTERVIEWED
REMOTE COMPUTING SERVICES	4
MEDICAL SERVICE COMPANIES	3
PROFESSIONAL SERVICES	2
TURNKEY SYSTEMS	2
TOTAL	11

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APPENDIX B: MARKET FORECAST DATA

EXHIBIT B-1

FORECAST OF USER EXPENDITURES FOR COMPUTER SERVICES

FOR HOSPITALS

(1978-1983)

MODE OF SERVICE	EXPENDITURES ($ MILLION)					AVERAGE ANNUAL GROWTH RATE (%)
	1978	1979	GROWTH RATE	1981	1983	
REMOTE COMPUTING	$ 67	$ 86	28%	$130	$200	25%
FACILITIES MANAGEMENT	88	104	18	142	181	15
BATCH	66	67	1	75	61	-2
TOTAL PROCESSING SERVICE	$221	$257	16%	$347	$442	15%
SOFTWARE PRODUCTS	$ 19	$ 23	21%	$ 32	$ 50	21%
PROFESSIONAL SERVICES	30	33	10	44	59	14
SUB-TOTAL	$ 49	$ 56	14%	$ 76	$109	
TOTAL	$270	$313	16%	$423	$551	15%

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EXHIBIT B-2

FORECAST OF USER EXPENDITURES FOR COMPUTER SERVICES

BY TYPES OF SERVICES FOR HOSPITALS

(1978-1983)

TYPE OF SERVICE	EXPENDITURES ($ MILLION)		ANNUAL AVERAGE GROWTH RATE (%)
	1978	1983	
GENERAL BUSINESS	$ 11	$ 20	13%
SCIENTIFIC & ENGINEERING	1	4	32
INDUSTRY SPECIALTY	202	406	15
UTILITY	6	12	15
TOTAL	$221*	$442	15%

*ROUNDED TOTAL

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DISTRIBUTION OF USER EXPENDITURES FOR

PROCESSING SERVICES FOR HOSPITALS

(1978)

TYPE OF SERVICE	EXPENDITURES ($ MILLION) MODE OF SERVICE			
	REMOTE COMPUTING	FACILITIES MANAGEMENT	BATCH	TOTAL
GENERAL BUSINESS	$ 5	$ 0	$ 6	$ 11
SCIENTIFIC & ENGINEERING	1	0	0	1
INDUSTRY SPECIALTY	58	88	56	202
UTILITY	3	0	3	6
TOTAL	$67	$ 88	$65	$221*

*ROUNDED TOTAL

INPUT

DISTRIBUTION OF USER EXPENDITURES FOR

PROCESSING SERVICES FOR HOSPITALS

(1983)

TYPE OF SERVICE	EXPENDITURES ($ MILLION) MODE OF SERVICE			
	REMOTE COMPUTING	FACILITIES MANAGEMENT	BATCH	TOTAL
GENERAL BUSINESS	$ 13	$ 0	$ 7	$ 20
SCIENTIFIC & ENGINEERING	4	0	0	4
INDUSTRY SPECIALTY	173	181	52	406
UTILITY	10	0	2	12
TOTAL	$200	$181	$61	$442

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APPENDIX C: DEFINITIONS

APPENDIX C: DEFINITIONS

● **COMPUTER SERVICES**

These are services provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

● **REMOTE COMPUTING SERVICES (RCS)**

Provision of data processing to a user by means of terminals at the user's site/s connected by a data communications network to the vendor's central computer. The three sub-modes of RCS are:

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

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

3.   DATA BASE is characterized by the retrieval of information from a vendor-maintained data base. This may be owned by the vendor or a third party.

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- **BATCH SERVICES**

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

- **SOFTWARE PRODUCTS**

This category is for users' purchases of systems and applications packages for use on in-house computer systems. The figures quoted include lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in professional services. The two sub-categories are:

1. SYSTEMS PACKAGES are operating systems, utilities, and language routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special-purpose routines. This classification includes compilers, data base management software, communications packages, simulators, performance measurement software, diagnostic software, and sorts.

2. APPLICATIONS PACKAGES are software which perform processing to serve user functions. They consist of general purpose packages, such as for accounting and inventory control, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.

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INPUT

- **PROCESSING SERVICES**

Processing services encompass FM, RCS, and batch services: they are categorized by type of service, as distinguished from mode of service, bought by users as follows:

- GENERAL BUSINESS services are processing services for applications which are common to users across industry categories. Software is provided by the vendor; this can be a complete package, such as a payroll package, or an application "tool," such as a budgeting model, where a user provides much of the customizing of the finished product it uses. General business processing is often repetitive and transaction oriented.

- SCIENTIFIC AND ENGINEERING services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is non-repetitive, except in the sense that the same packages or "tools" are used to address different, but similar, problems.

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

INPUT

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

APPENDIX D: SEQUOIA HOSPITAL RFP

APPENDIX D: SEQUOIA HOSPITAL RFP

- The RFP contained in this Appendix is a reproduction of an RFP produced by Sequoia Hospital in 1978.

- Sequoia Hospital is a 492 bed hospital located in Redwood City, California, and is operated as a local hospital district of the State of California.

- The RFP was authored by Mssrs. Steven W. Walden and John J. Mayerhofer, CPA of Sequoia Hospital.

INPUT

INPU

REQUEST FOR PROPOSAL TO FURNISH DATA PROCESSING
SERVICES TO SEQUOIA HOSPITAL DISTRICT, A LOCAL
HOSPITAL DISTRICT OF THE STATE OF CALIFORNIA

TABLE OF CONTENTS

REQUEST FOR PROPOSAL TO FURNISH DATA PROCESSING
SERVICES TO SEQUOIA HOSPITAL DISTRICT, A LOCAL
HOSPITAL DISTRICT OF THE STATE OF CALIFORNIA

Date: JUNE 30, 1978

I. General Conditions

    A. Bidders are invited to submit their proposals for furnishing the
date processing services called for in these specifications at the office
of the Director of Purchasing, Sequoia Hospital, Whipple and Alameda,
Redwood City, California, not later than 5:00 p.m.   JULY 31, 1978

    B. Bidders may not withdraw their bids within a period of sixty (60)
days after the time set for receipt of bids.

    C. Sequoia Hospital District reserves the right to reject any and all
bids and to waive any informality of any bid received.

    D. Bidders are advised to discuss the data processing services required
by these specifications with the Director of Data Processing at Sequoia
Hospital, as subsequent allowance will not be made for lack of knowledge
concerning details which are essential to the proper fulfillment of these
specifications.

    E. The Bidder agrees, by submitting a signed Form of Proposal, to execute
a contract to perform for a period of four (4) years, data processing services,
as described in these specifications, within ten (10) days of receipt of
a written notice of acceptance of his proposal, provided the Bidder receives
such notice within the sixty (60) day period during which bids may not be
withdrawn, or at anytime thereafter before he withdraws his bid. The Bidder
also agrees that the prices included in his proposal for providing this
service as stated above will remain in effect for a period of four (4) years
if this proposal is accepted, except that such prices shall be adjusted
annually on the contract anniversary date for the next ensuing 12 month period
in the same ratio as the Consumers Price Index for All Urban Consumers -
U. S. City Average, all items - for the calendar month preceding the said
anniversary date, shall have increased or decreased over the said Index for
the calendar month twelve months prior to said anniversary date. Said index
as published shall be used herein whether or not certain items may hereafter
be added or deleted therefrom by the Bureau of Labor Statistics, or whether
a successor index is published. The Bidder further agrees that the District
may terminate this contract at any time for cause.

    F. While the District may permit non-material variances from the specifi-
cations contained herein that may be proposed by the Bidder, the District
will be required to consider only those Bidders whose proposals are responsive
to all of the specifications contained herein.

G. General Duties of District

(1) Staffing of District Facility: District shall be responsible for staffing, training, and maintaining a competent organization necessary to operate the system described herein, which includes selection of supervisory personnel, the organization of necessary staff under that supervision, and continuing training and monitoring of the performance of such personnel. District shall designate a key person to act as a coordinator with Bidder under this Agreement. That person shall be responsible for establishing and maintaining a mutually agreed upon system of documentation, books, records, and internal controls. Bidder will provide assistance and guidance in the selection, training, and organization of the District's personnel directly involved in the implementation, maintenance, and operation of the systems.

(2) Printed Forms: District is responsible for ordering and paying for all pre-printed forms used at either the District or the Bidder's data processing center.

(3) Hardware Installation: District shall be responsible for site preparation and cable connections to terminal equipment throughout the District. Bidder will advise District as to necessary site preparation requirements and related cost.

(4) Data Input and Preparation: District shall use its facilities, personnel, equipment, and supplies to convert all data to be transmitted to Bidder's computer facility via magnetic tape, punched cards, or other means of input approved by Bidder. District will be solely responsible for the accuracy and adequacy of the information and data furnished to Bidder.

H. General Duties of Bidder

(1) Bidder shall assume responsibility for conversion of existing financial systems masterfile. District will assume the cost of acquiring masterfile and other files required for conversion.

(2) Alterations and Modifications: Bidder agrees to make available, at District's expense and option, changes and improvements made by Bidder to the system from time to time as such are completed. The price to be paid for such changes and improvements shall be at the then current reasonable market value for said services and materials. Any alterations or modifications to programs that may be required in order to comply with any applicable law or any governmental rule or regulation shall be at Bidder's expense.

(3) Conversion of Files: At the request of District, Bidder will convert files to another format. The cost to District of such conversion will be quoted in writing at the then prevailing programming rates and computer rates.

(4) Responsibilities for Implementation of System: Bidder will provide the necessary system support required for defining the requirements, systems design, implementation of the system, and initial training of the District's personnel.

(5) Hardware Installation: Installation of the equipment, including freight, connection and equipment startup shall be the responsibility of Bidder.

(6) District shall obtain at no cost to Bidder any and all necessary permits or other licenses required in connection with the installation of the equipment.

(7) The Bidder and District will jointly prepare a specification sheet for each function prior to the signing of a contractual agreement. The District will not incur costs for software applications until the performance meets these functional specifications.

II. Background

Sequoia Hospital District serves the health care needs of the central San Francisco Peninsula area from its location in Redwood City, California. Sequoia Hospital is a 492-bed institution with a full complement of services provided at one site (including emergency treatment, outpatient services, home care, ambulatory care, extended care and convalescent services). The hospital has relied upon a national systems vendor the last eight years for the batch processing of Patient Billing/Accounts Receivable, General Ledger, Payroll/Personnel and Accounts Payable applications. The Data Processing Department consists of a Director, a Control Clerk and four Keypunch Operators. The District has no programming capability currently and does not plan to develop any in the future. All Data Entry is now accomplished on 4-IBM Model 129 (card) machines. About 130,000 line items are punched and verified each month. A copy of the physical site plan of the department is attached.

Sequoia Hospital District has determined a need to expand the use of data processing technology in the coming years to meet the spiraling demand for management information. Basic data processing functions that are required by the District are described in the attached plan along with a timetable for implementation. Please respond as briefly as possible to the questionnaire which follows the functional descriptions. (Answers to these questions may be accompanied by supporting materials.) All bids should be in the form of a single monthly service fee based on patient day statistics and payable by the District at the end of each month. A successful vendor will present the best combination of the following criteria: (1) a total product line which meets the District's functional needs, (2) individual applications which meet or exceed the enclosed specifications, (3) an expressed willingness to develop new applications to meet identified needs, (4) lowest total cost to the District. Systems should be modular packages which fit together in a final and complete system. These modules should be currently installed and working well in numerous hospitals.
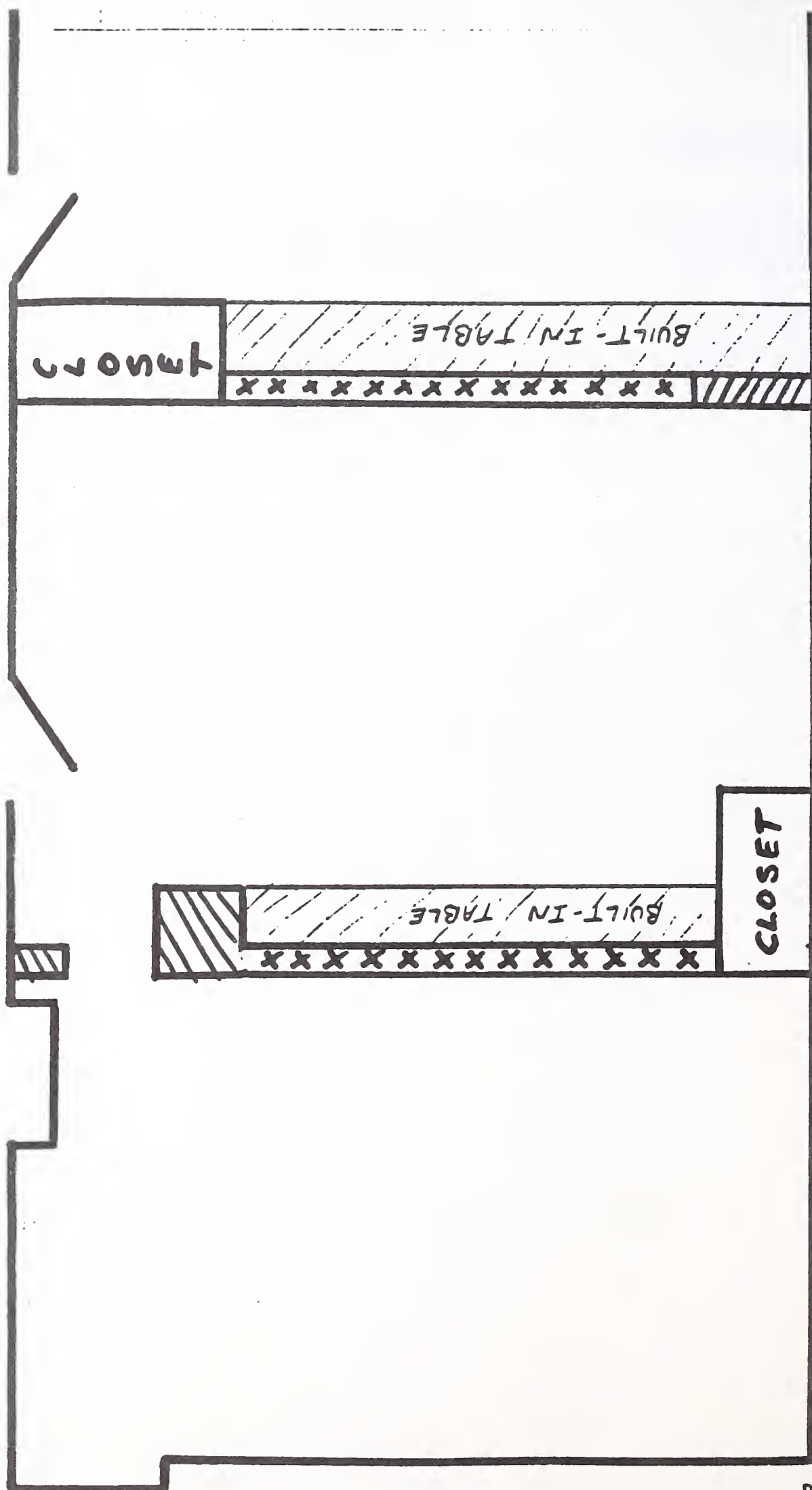
OFFICE
(10½ × 18½)

DATA ENTRY
(13 × 18½)

OPERATIONS
(11½ × 18)

BUILT-IN TABLE

BUILT-IN TABLE

CLOSET

CLOSET

SEQUOIA ..JSPITAL DISTRICT
LONG TERM DATA PROCESSING PLAN
IMPLEMENTATION TIMETABLE

APPLICATION	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Data Entry	███				
PB/AR	███				
ADT - Inpatient	███				
Long Term Data File	███				
Med. Rec./Util. Review	███				
Payroll/Personnel		███			
Accounts Payable		███			
General Ledger		███			
CA/FM		███			
Log System		███			
Property Accounting			███		
ADT - Outpatient			███		
Long Term Patient Index			███		
Long Term Radiology Retrieval				███	
Pharmacy				███	
Inventory					███

Administrator
Sequoia Hospital
Whipple and Alameda
Redwood City, California

Gentlemen:

1. AMOUNT. We, the undersigned, doing business under the firm name of

    _____

    having examined the specifications of the project entitled "Furnish Data
    Processing Services to Sequoia Hospital District, a Local Hospital District
    of the State of California," dated _____propose to furnish
    all services complete as required thereby.

    The proposed cost per patient day is _____ Dollars ($_____)

2. TIME. Services acceptable to Sequoia Hospital District shall be made
    available to the District within the time specified in Section II. A.,
    unless such time period be extended by delays caused by the District.

3. EXPERIENCE. We hereby certify to the following hospital experience:

    Name and Address of Hospital

    1.
    2.
    3.
    4.
    5.

4. LOCATION. The location of the service vendor's facility is:

    _____
            (Street and Number)   City   Telephone

5. EXECUTION OF CONTRACT. If written notice of the acceptance of this Proposal
    is mailed, telegraphed, or delivered to the undersigned within the time
    limit stated in paragraph I, B. of the specifications, or any time there-
    after before this Proposal is withdrawn, the undersigned shall within
    ten (10) calendar days after the time of receipt of such written notice,
    execute and delivery a contract on a form to be presented by the hospital.

                                    Signed _____

                                    Title _____

                                    Signed _____

                                    Title _____

Name and Business Address of Firm [   ] , Co-Partnership [   ] , or Corporation [   ] :

_____

Date Signed: _____

IV. FUNCTIONAL SPECIFICATIONS

A. DATA ENTRY   (DE)

B. PATIENT BILLING/ACCOUNTS RECEIVABLE   (PB/AR)

C. ADT - INPATIENT (ADT-I)

D. LONG TERM DATA FILE   (LTDF)

E. MEDICAL RECORDS   (MR)

F. UTILIZATION REVIEW/PSRO   (UR)

G. PAYROLL ACCOUNTING SYSTEM   (PAS)

H. PERSONNEL ACCOUNTING & CONTROL   (PAC)

I. ACCOUNTS PAYABLE   (AP)

J. GENERAL LEDGER   (GL)

K. COST ALLOCATION   (CA)

L. FINANCIAL MODELING   (F

M. THIRD PARTY LOG   (TPL)

N. PROPERTY ACCOUNTING   (PROP)

O. ADT - OUTPATIENT   (ADT-

P. LONG TERM PATIENT INDEX   (LTPI)

Q. LONG TERM RADIOLOGY RETRIEVAL   (LTRR)

R. PHARMACY SYSTEM   (PS)

S. MATERIALS MANAGEMENT   (

T. HARDWARE CONSIDERATIONS

A. Data Entry (DE)

The entry of all file maintenance input to any system module would be accomplished via any terminal connected to the system. The Data Entry function would provide flexible format control and capabilities for pre-edit and batch control. All input would be stored until processing had occurred and the output verified. All output would be stored to permit later reprinting.

B. Patient Billing/Accounts Receivable (PB/AR)

The following statistics define the activity in the present automated system:

1. Total beds: __492__

2. Average daily census: __256__

3. Average length of stay: Acute __6.6__
   ECU __15.5__

4. Outpatient visits/month: Em. Room __2300__
   Ref. Ambulatory __1300__

5. Average number of charges per: Inpatient __60__
   Outpatient __5__

6. Average number of open accounts receivable: Inpatient __3500__
   Outpatient __6000__

7. Percentage of inpatients pre-admitted: __30%__

8. Percentage of returning inpatients: __80%__

9. Percentage of recurring outpatients: __15%__

10. Size of hospital procedure table: __4000__

11. (Available) financial classes: __100__

12. (Available) accommodation codes: __100__

13. Size of room/bed number: __4__

The following features and capabilities should be available:

-1. Daily in-house patient charge summary.

2. Weekly patient guarantor cross-reference, alphabetic by guarantor.

3. Weekly trial balance sequenced in any of the following: patient name, patient type, financial class, insurance plan, physician - balance forward or full detail.

4. Weekly trial balance summary sequenced by patient type within financial class.

5. Daily and monthly departmental revenue reports.

6. Monthly general ledger summary by account number.

7. Daily edit list.

8. Accounts receivable exception report sequenced in any of the following: patient name, financial class, patient type, account age group, account balance range.

9. Automatic production of fiscal year end Medicare interim bills.

10. Free formatting of all patient statements and claim forms.

11. Production of interim bills, final bills, activity bills, cycle bills, and data mailers.

12. Produce different physical forms based upon: patient type, financial class, account balance, age criteria.

13. Allow statement message logic based on: patient type, financial class, account balance, age criteria, specific input.

14. Production of Medicare 1453A, 1453C, 1483C, 1490, 1554; California UB-16, Medi-Cal M10-200, M10-201, MC-170, MC-180.

15. Allow control over statement production sequence.

16. Ability to use 2-tiered room rates: District or Non-District

17. Calculation of time-based charges.

18. At least three levels of insurance proration.

19. Dollars and units interfaced to General Ledger.

20. Ability to calculate labor units by procedure.
21. Ability to calculate and report professional components by financial class.

C. ADT - Inpatient (ADT-I)

The Admissions/Discharge/Transfer Module (ADT) would be responsible for gathering patient information and effectively communicating this information to all departments with a "need-to-know." The first contact with the patient would be when the surgeon calls the Operating Room for a surgery time. The system would provide time slots for each room on a given day and contain 5 weeks of such information. (Each time slot would contain the physician's name, patient name, physician's phone number and patient phone number, Operating Room number, date, time.)

Five days before the admission, the Admitting Department would call the patient for the pre-admission process over the phone - the first contact for non-surgery patients would occur at this point. If available, previous information from the Long Term Data File would assist in the admission process. By the time the patient arrives in the hospital, the bulk of the processing would have been accomplished. Copies of the Admitting Form would be produced on a printer in Admitting. Census detail and summary information would be available to system users on-line and through scheduled reports. Certain ancillary departments would be notified on their own printers of patient admission, transfer or discharge. Appropriate patient information would be interfaced to the PB/AR Module on a daily basis. ADT information would be purged several days after the patient is discharged.

D. Long Term Data File (LTDF)

The Long Term Data File (LTDF) would be a real time patient data base consisting of approximately 100,000 records of 340 characters each. A LTDF record would be created automatically as each patient is purged from the ADT module and would be updated with any information changes from subsequent admissions. This file would be used to simplify future registrations by carrying forward pertinent data about the patient. At the same time, the LTDF would be the beginning of a total hospital data base to improve the availability of patient information - especially in emergency situations. Only one LTDF record would be created for each patient to compile medical demographic and financial information from several visits. Patient records would be purged from the LTDF after 2 years have elapsed since the last visit. The data base would be available at all terminals but each record would be segmented into three divisions to restrict user access. The record format of the LTDF as we envision it is attached. (See APPENDIX A.)

E. Medical Records (MR)

The ADT Module would provide the Medical Records Department with a real time copy of the Admitting Forms for inpatient and outpatient registrations. Detail and summary type census reporting would be available on-line and on a production reporting basis. A weekly report from the PB/AR Module would indicate patient accounts which had not been billed and were being held in Medical Records. This report would show dollars and quantities, in detail and summary, and be sequenced by physician name. It is important that the ADT Module have a real time capability to indicate patients which have an incomplete admission or discharge, i.e. missing data. The following information from the patient stay would be entered at a terminal by Medical Records and be interfaced to PB/AR after a patient discharge but before a bill is produced: admitting, primary, secondary diagnoses, dates, and descriptions of surgical procedures, dates and circumstances of accidents or employment related injuries and the reason for a late discharge.

F. Utilization Review/PSRO (UR)

Utilization Reviews would be triggered by an exception report produced by the system. This report would be produced as a result of a Length of Stay Table using diagnosis coding entered upon admission. Medical professionals

would then, as a result of the review, input a new diagnosis code or next review date to trigger a new exception report. Printed review worksheets would also be produced to assist the reviews. 'Certified Days' and 'Denial Date' would be input by Utilization Review and interfaced to PB/AR. The hospital should have the option of modifying the LOS tables and should have a choice of diagnosis coding methods. The following review criteria should be available:

(1) Financial classes of patients to be included/excluded.
(2) Number of days between reviews.
(3) Review at LOS percentiles: 50, 60, 70, 75, 80, 85, 90, 95
(4) Daily review.

The following reports should be produced:

(1) Exception Report - in nursing station sequence showing patient name, bed, diagnosis, physician, next review data and reason or reasons for current review. Up to (10) different types of these reports should be available to operate with different review criteria.

(2) Review Type Summary - number of reviews accepted and reviews denied by each of the 10 review types.

(3) Financial Class Summary - number of reviews accepted and reviews denied by certain financial class groupings.

(4) Reviewing Physician Summary - number of reviews accepted and reviews denied by each reviewing physician (code).

(5) Reviewing Nurse Summary - number of reviews accepted and reviews denied by diagnosis (with average LOS) within each reviewing nurse (code).

(6) Admitting Physician Summary - number of reviews accepted and reviews denied by diagnosis (with average LOS) within each admitting physician (code).

G. Payroll Accounting System (PAS)

The hospital pays 1100 employees on a bi-weekly basis. Approximately 30 deduction codes, 20 pay codes, 10 tax codes, and 10 union codes are now used. Approximately 100 departments and 250 job codes are used. The hospital is interested in having a system with the following features:

(1) Benefit accrual for vacation, sick and holidays.

(2) Automatic interface general ledger of both payroll dollars and hours.

(3) Exception payroll generation.

(4) Customized printing of checks, timecards, mailing labels.

(5) Production of 941A, W-2 and other forms conforming to regulations.

(6) Deduction registers for employer and employee contributions.

(7) Totals by shift within cost center within department, for hours and dollars.

(8) Year-to-date totals by job code for hours and dollars.

(9) Year-to-date totals by C.H.F.C. designation (subclassification) for both hours and dollars.

(10) Bi-weekly summary of departmental totals of hours, FTE's and dollars (both productive and paid) as compared to budget figures - with variances.

H. Personnel Accounting & Control (PAC)

The hospital would like to have a flexible data base of employee information to solve the fast-growing information demands placed upon the Personnel Department. Custom reporting capabilities should be available on a demand basis. The following features should be available:

(1) Salary distribution by position.

(2) Employee and union rosters.

(3) Salary/performance/license review reporting.

(4) Position control reporting.

(5) Employee skills inventory reporting.

(6) Production of EEO-4 report showing employee data by sex, race, job class and salary.

(7) Employee sort criteria for custom reporting capabilities should be available by: employee type, job status, shift, union, job code, etc.

I. Accounts Payable (AP)

The hospital issues about 510 checks based on about 1500 invoices each month. 15,000 vendors have been set up in the present system. The hospital is interested in having a system with the following features:

(1) Customized design of checks.
(2) Interfaces to General Ledger and Materials Management.
(3) Expense distribution to multiple departments.

(4) Forecasting of cash requirements.
(5) Multiple processing cycles per accounting period.
(6) Flexible payment terms available.

J. General Ledger (GL)

The following features and reporting capabilities should be available:

(1) Design control available in report formats.
(2) Payroll hours and PB/AR units interfaced to Operating Statements.
(3) Full 12-month detail available on trial balance.
(4) Four levels of operating statements.
(5) Balance sheets by hospital and by fund.
(6) Detail and summary income statements.
(7) Capabilities of 12 or 13 period reporting.
(8) Revenue contribution percentage by department on operating statements.

K. Cost Allocation (CA)

The following features and reporting capabilities should be available:

(1) A monthly allocation report specifying step-down routines and allocation bases should be produced.

(2) Automatic posting of indirect expenses should take place in the General Ledger.

(3) Allocation should take place based on: account balances, percentages, statistics or calculations.

L. Financial Modeling (FM)

The following features and reporting capabilities should be available:

(1) Budget worksheet preparation showing actual, budget and variances.

(2) Flexible budgeting system with capacity for adjusting to volume fluctuations.

(3) Managerial control/exception report for budget comparisons - identifying variances which exceed predetermined standards.

(4) Ability to run multiple iterations of budget process - testing supporting criteria such as room rates, ancillary rate increases, union contract expense increases, etc. to determine their effect on profit/loss.

(5) Departmental statements showing actual and budget detail - inter-
faced to General Ledger.

(6) Multiple regression analysis of departmental statistics for the
purpose of forecasting trends in patient activity.

M. Third Party Log (TPL)

The Medicare and Medi-Cal logging function is currently being done
manually and have been identified by the Accounting Department as a likely
candidate for automation. All dollar and quantity information should be
interfaced monthly from PB/AR: payments, charges, allowances, deductions,
co-insurance, write-offs, and patient days. Accommodations should indicate
categories for routine care and each of the special care areas. All charges
should be broken out by over/under 65. All revenue and non-covered charge
data should be identified by General Ledger cost center designations. The
following reporting capabilities should be available:

(1) Input Edit List - showing detail and balancing totals.
(2) Patient Log - showing full detail and balancing totals.
(3) Log Summary - showing totals by category.
(4) Each of the above reports should be produced for:

    a) Medicare Inpatient
    b) Medicare Outpatient
    c) Medi-Cal Inpatient
    d) Medi-Cal Outpatient
    e) Others as needed

N. Property Accounting (PROP)

The Accounting Department currently maintains manual property records and
would like to automate this function. Straightline depreciation should be
calculated for at least 4 classes of assets: Land, Building and Fixtures,
Major Movable, and Minor Equipment. The system should be processed monthly
and produce depreciation entries to General Ledger automatically. Four
reports should be produced as output on either a monthly or demand basis:

(1) Edit List - showing transactions input on a single processing
cycle. The report should provide hospital totals by asset
class (MTD and YTD) for additions, deletions and adjustments.

(2) Cost Center Report - showing all property records on file
sequenced by asset type within cost center. Sub-totals should
be provided for asset types within each cost center. Hospital
totals should be provided by asset type.

(3) Numeric Listing - showing all property records on file sequenced
by hospital tag number. A Grand Total only is needed.

(4) Alphabetic Listing - showing all property records on file
sequenced by asset description. A Grand Total only is needed.

(5) Preventative Maintenance - weekly listing of assets needing attention
by maintenance staff or outside vendors.

PROPERTY ACCOUNTING DESIGN

'DATA ELEMENTS

Description	Function	Format	Length
Hospital Tag Number	literal	N	6
Asset Description	literal	A/N	40
Department/Cost Center	literal	N	5
Building/Location	special coding	A/N	5
Asset Class	special coding	N	1
Acquisition Date	'MMYY'	N	4
Original Life	(months)	N	3
Extended Life	(months)	N	3
Remaining Life	(months)	N	3
Quantity	literal	N	3
Vendor and PO #	literal	A/N	1
Manufacturer	literal	A/N	1
Model and Serial Number	literal	A/N	2
Guarantee	special coding	A/N	3
Preventive Maint-Contract Renewal Date	'DDMMYY'	N	6
Preventive Maint-Frequency of Service	special coding	A/N	3
Cumulative Maintenance Time	literal	N	3
Comments	literal	A/N	2
Total Cost	literal	N	1
Salvage Value	literal	N	10
Monthly Depreciation	literal	N	1
YTD Depreciation	literal	N	1
Accumulated Depreciation	literal	N	1
Unrecovered Cost	literal	N	1

(there would be approximately 12,000 property records)

O. **ADT - Outpatient (ADT-O)**

The Admissions/Discharge/Transfer Module (ADT) would be responsible for gathering patient information and effectively communicating this information to all departments with a need to know. If available, previous information from the Long Term Data File would assist in the registration process. Registration would take place in any of five locations within the hospital. Copies of the Registration form would be produced on a printer. Statistical detail and summary information would be available to system users on-line and through scheduled reports. Appropriate patient information would be interfaced to the PB/AR Module on a daily basis - information for emergency patients being admitted to an inpatient status would be transferred automatically. ADT information would be purged several days after the patient visit has occurred.

P. **Long Term Patient Index (LTPI)**

The Long Term Patient Index (LTPI) would be a real time medical records index consisting of approximately 275,000 records of 56 characters each. A LTPI record would be created automatically as each patient is purged from the Long Term Data File (LTDF). The purpose of this file would be to replace the current card index in medical records in order to provide speedier, more accurate and more cost effective retrieval of records. Only one LTPI record would be created for each patient to index numerous visits. (Medical Records would manually enter the entire contents of the index at start-up time.) Patient records would never be purged from the LTPI such that the file size would increase approximately 5% per year. The record format of the LTPI as we envision it is attached (See APPENDIX B).

Q. **Long Term Radiology Retrieval (LTRR)**

The Long Term Radiology Retrieval (LTRR) will be a real time radiology film index consisting of approximately 125,000 records of 150 characters each. The purpose of this file would be to replace the current card index in radiology in order to provide speedier, more accurate and more cost effective retrieval of films. Each LTRR record would be manually created and updated by the clerical staff. (Radiology would manually enter the entire contents of the file at start-up time.) Film records would be purged from the LTRR after 7 years have elapsed since the last procedure date. The record format of the LTRR as we envision it is attached (See APPENDIX C).

R. **Pharmacy System (PS)**

The hospital Pharmacy issues about 27,000 items each month and is a prime candidate for automation. The hospital is interested in having a system with the following features:

(1) Patient Medication and IV Admixture Profiles.
(2) Drug Interaction Information.
(3) Hospital Formulary.
(4) Automatic interface of charges to PB/AR Module.
(5) Inventory Control.
(6) Automatic printing of labels.

S. **Materials Management (MM)**

   An automated Materials Management system is required to improve control over hopsital inventories. The Purchasing Department keeps 1500 stock items on file. Approximately 560 receipts and 1800 issues are made each month. Three areas of concern for information purposes have been identified: stock information, stock status and stock history. Stock information includes: stock number, unit of issue/purchase, price, description, etc. Stock status specifies: quantity on hand, quantity on order, inventory valuation, etc. Stock history information provides input to long term planning decisions with monthly, semi-annual, and annual usage. The system should provide multiple methods of inventory valuation and calculation of the stock re-order point. Purchase order forms should be printed by the system. This module should provide a two-way interface with Accounts Payable.

T. **Hardware Considerations**

   Due to the rapid advancements in hardware technology, Sequoia Hospital District does not wish to own or lease data processing hardware. All vendor proposals should be presented in the form of a service contract which may provide certain hardware as part of that service. Hardware may be presented with a shared service concept, an in-house approach, or any combination in between as long as the proposal meets our functional requirements as described herein. Attached is our view of the communications hardware necessary to meet our needs. (The need for such hardware in areas indicated with an asterisk will depend upon the financial system approach chosen by the vendor - batch versus real time.) All hardware must meet state and local electrical safety codes and OSHA requirements.

SEQUOIA HOSPITAL DISTRICT
LONG TERM DATA PROCESSING PLAN
COMMUNICATIONS HARDWARE COMPLEMENT

Department	Terminals	Printers	Timetable
Accounting *	1		Phase 2
Administration	1		Phase 1
Admitting	2	1	Phase 1
Business Office *	2		Phase 1
Data Processing	4		Phase 1
Dietary		1	Phase 3
ER - OP	1		Phase 3
Housekeeping		1	Phase 3
Laboratory	1		Phase 3
Medical Records	2		Phase 1
Medical Staff	1		Phase 1
Nursing Office	1		Phase 1
Operating Room	1		Phase 3
Payroll (Personnel) *	1		Phase 2
Pharmacy	1	1	Phase 4
Purchasing *	1	1	Phase 5
Radiology	1		Phase 2
(Spares)	1	1	Phase 1

(Total: 22 terminals, 6 printers)

* (This hardware would only be required for real time financial applications)

V. APPLICATION QUESTIONNAIRE

A. DATA ENTRY (DE)

B. PATIENT BILLING/ACCOUNTS RECEIVABLE (PB/AR)

C. ADT - INPATIENT (ADT-I)

D. LONG TERM DATA FILE (LTDF)

E. MEDICAL RECORDS (MR)

F. UTILIZATION REVIEW/PSRO (UR)

G. PAYROLL ACCOUNTING SYSTEM (PAS)

H. PERSONNEL ACCOUNTING & CONTROL (PAC)

I. ACCOUNTS PAYABLE (AP)

J. GENERAL LEDGER (GL)

K. COST ALLOCATION (CA)

L. FINANCIAL MODELING (FM)

M. THIRD PARTY LOG (TPL)

N. PROPERTY ACCOUNTING (PROP)

O. ADT - OUTPATIENT (ADT-O)

P. LONG TERM PATIENT INDEX (LTPI)

Q. LONG TERM RADIOLOGY RETRIEVAL (LTRR)

R. PHARMACY SYSTEM (PS)

S. MATERIALS MANAGEMENT (MM)

T. HARDWARE CONSIDERATIONS

U. OTHER CONSIDERATIONS

A.   <u>Data Entry (DE)</u>

A-1   Do you have Data Entry (DE) software applications operational?

A-2   If operational, provide a list of client contacts and telephone numbers of those who currently use this capability.

A-3   If not operational, is a similar application currently under development?

A-4   If not under development, would you be willing to develop this function to our specifications for a fixed price paid on a monthly basis?

A-5   Is some type of user identification or program limitation provided for security of data?

A-6   Are real time update and real time inquiry provided for?

A-7   Can data be automatically interfaced to all other modules?

A-8   Do all terminals have the capability to enter data for update to any system module?

A-9   Is there hospital control over data entry formats?

A-10 Are pre-edit and batch control capabilities available?

A-11 Can input be stored automatically until output is verified?

A-12 Can output be stored automatically for later reprinting?

A-13 Can statistics be accumulated by record type, system module, user, location, etc. for usage of terminals and printers?

A-14 Can microfilm and magnetic tape backup be provided?

A-15 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

A-16 Would any one-time charges be involved in the implementation of this application?

B. Patient Billing/Accounts Receivable (PBAR)

B-1 Do you have Patient Billing/Accounts Receivable (PBAR) applications operational?

B-2 If operational, provide a client contact and telephone number below who is currently using this capability.

B-3 Is this a batch or a real time application?

B-4 Please attach supporting materials to describe available reporting (output) capabilities.

B-5 Can patient statements and claim forms be custom printed?

B-6 Can different physical forms be used for patient statements?

B-7 Can different messages be used on patient statements?

B-8 Does the system use time-based charge calculation?

B-9 How many levels of insurance proration are used?

B-10 Please attach supporting materials to describe how the hospital would best use your insurance proration.

B-11 Can dollars and quantities be interfaced to General Ledger?

B-12 Does the system have a report generator?

B-13 Can the system calculate labor units by procedure?

B-14 Does the system have the ability to report billing status of unbilled accounts?

B-15 How many physical files are used in the architecture of the system?

B-16 Can microfilm and magnetic tape backup be provided?

B-17 Does the system support tape-to-tape billing?

B-18 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

B-19 Would any one-time charges be involved in the implementation of this application?

B-20 How does this system handle one-day patient stays?

C.   ADT - Inpatient (ADT-I)

C-1   Do you have Admission/Discharge/Transfer (ADT) applications operational?

C-2   If operational, provide a client contact and telephone number below who is currently using this capability.

C-3   Is some type of user identification or program limitation provided for security of data?

C-4   Are real time update and real time inquiry provided for?

C-5   Is your firm willing to develop the Surgery Scheduling function as part of a contract?

C-6   Please attach supporting materials to briefly describe pre-admission capabilities currently available.

C-7   Would information from the Long Term Data File be available for the Admission process?

C-8   Would this module automatically print Admitting Forms (on a real time basis) on a printer in the Admitting area?

C-9   Would admission/discharge/transfer notices be printed in ancillary departments on their own printers?

C-10 Would ADT information be automatically interfaced to PB/AR nightly?

C-11 Please describe briefly any purge options available for ADT patient information after discharge.

C-12 Would an automated bed status function be available?

C-13 Please describe any features which would assist Nursing in staffing calculations.

C-14 Can microfilm and magnetic tape backup be provided?

C-15 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

C-16 Would any one-time charges be involved in the implementation of this application?

C-17 Please attach supporting materials to describe your firm's experience with Infection Control Reporting.

D. Long Term Data File (LTDF)

D-1 Do you have Long Term Data File (LTDF) applications operational?

D-2 If operational, provide a client contact and telephone number below who is currently using this capability.

D-3 If not operational, is a similar application currently under development?

D-4 If not under development, would you be willing to develop this function to our specifications for a fixed price paid on a monthly basis?

D-5 Is some type of user identification or program limitation provided for security of data?

D-6 Are real time update and real time inquiry provided for?

D-7 Can this file be updated by interface with ADT or PB/AR modules?

D-8 Can file purging criteria be based on length of time since last patient visit?

D-9 Can microfilm and magnetic tape backup be provided?

D-10 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

D-11 Would any one-time charges be involved in the implementation of this application?

E. Medical Records (MR)

E-1 Do you have Medical Records (MR) functions available?

E-2 If so, in which module or modules are these functions contained?

E-3 If not currently available (or under development), would you be willing to develop these functions as part of the contract?

E-4 Would automatic and timely preparation of Admitting Forms be accomplished?

E-5 Would census reporting be available to Medical Records on both a batch and real time basis?

E-6 Please attach supporting materials to briefly describe reporting flexibility of census information which you provide.

E-7 Does your ADT Module allow Medical Records to enter patient information (diagnosis, etc.) for interfacing to PB/AR?

E-8 Does your PB/AR Module produce a report stating value of accounts receivable being held by Medical Records?

E-9 Does your ADT Module provide real time inquiry to indicate patients having incomplete data for admission or discharge?

E-10 Does your firm provide software products to assist with the Incomplete Chart Control function?

E-11 Does your firm provide software products to assist with the Medical Abstract function?

F.   <u>Utilization Review/PSRO (UR)</u>

F-1   Do you have Utilization Review/PSRO (UR) applications operational?

F-2   If operational, provide a chart contact and telephone number below who is currently using this capacity.

F-3   If not currently available (or under development), would you be willing to develop these functions as part of the contract?

F-4   Is this a batch or a real time application?

F-5   Please attach supporting materials to describe available capabilities.

F-6   How many different review reports can be produced?

F-7   Can the length of stay tables be modified?

F-8   What diagnosis coding methods are supported?

F-9   Is this application interfaced to ADT and PB/AR?

F-10 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

F-11 Would any one-time charges be involved in the implementation of this application?

G.   Payroll Accounting Systems (PAS)

G-1   Do you have Payroll Accounting Systems (PAS) software applications operational?

G-2   If operational, provide a client contact and telephone number below who is currently using this capability.

G-3   Is this a batch or a real time application?

G-4   Please attach supporting materials to describe available reporting (output) capabilities.

G-5   How many deduction codes, pay codes, tax codes, union codes, job codes and departments can be used?

G-6   Is benefit accrual available for vacation, sick and holidays?

G-7   Is there an automatic interface to General Ledger of both dollars and hours?

G-8   Is the system conducive to exception payroll generation?

G-9   Can checks and timecards be custom designed?

G-10 Are payroll and personnel files separated or combined?

G-11 Does the system have a report generator?

G-12 Is Direct Deposit supported by the system?

G-13 Is there a check reconciliation function?

G-14 Can microfilm and magnetic tape backup be provided?

G-15 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient' basis?

G-16 Would any one-time charges be involved in the implementation of this application?

G-17 .-What data security would be available where Payroll is a real time application?

H.   Personnel Accounting & Control (PAC)

H-1   Do you have Personnel Accounting & Control (PAC) software applications operational?

H-2   If operational, provide a client contact and telephone number below who is currently using this capability.

H-3   Is this a batch or a real time capability?

H-4   If a batch process, is a custom report writer subsystem available?

H-5   Please attach supporting materials to describe available reporting (output) capabilities.

H-6   Can microfilm and magnetic tape backup be provided?

H-7   What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

H-8   Would any one-time charges be involved in the implementation of this application?

I.   Accounts Payable (AP)

I-1   Do you have   Accounts Payable (AP) software applications operational?

I-2   If operational, provide a client contact and telephone number below who is currently using this capability.

I-3   Is this a batch or a real time application?

I-4   Please attach supporting materials to describe available reporting (output) capabilities.

I-5   How many vendors can the system handle?

I-6   Does the system provide for customized checks?

I-7   Does the system interface to General Ledger and Materials Management?

I-8   Can expenses be distributed to multiple departments?

I-9   Is there cash requirements forecasting capabilities?

I-10 Can multiple processing cycles take place each period?

I-11 Does the system have a report generator?

I-12 Does the system handle Patient refund checks?

I-13 Does the system have a check reconciliation function?

I-14 Can microfilm and magnetic tape backup be provided?

I-15 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

I-16 Would any one-time charges be involved in the implementation of this application?

J. General Ledger (GL)

J-1 Do you have General Ledger (GL) software applications operational?

J-2 If operational, provide a client contact and telephone number below who is currently using this capability.

J-3 Is this a batch or a real time application?

J-4 Please attach supporting materials to describe available reporting (output) capabilities.

J-5 Can report formats be custom designed?

J-6 Can quantities as well as dollars be interfaced from other systems?

J-7 Can full 12-month detail appear on the trial balance?

J-8 How many reporting levels are available on the operating statements?

J-9 Does the system have a report generator?

J-10 Can 12 or 13 period reporting be accommodated?

J-11 Does the system have automatic posting of standard journal entries?

J-12 Can microfilm and magnetic tape backup be provided?

J-13 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

J-14 Would any one-time charges be involved in the implementation of this application?

K.   Cost Allocation (CA)

K-1   Do you have Cost Allocation (CA) software applications operational?

K-2   If operational, provide a client contact and telephone number below
        who is currently using this capability.

K-3   If not currently available (or under development), would you be willing
        to develop these functions as part of the contract?

K-4   Is this a batch or a real time application?

K-5   Please attach supporting materials to describe any available capabilities.

K-6   Is there an automatic interface of data to General Ledger?

K-7   What portion of the total service fee quoted has been allocated to
        this software application: on a 'per patient day' basis?

K-8   Would any one-time charges be involved in the implementation of this
        application?

L.   Financial Modeling (FM)

L-1   Do you have Financial Modeling (FM) software applications operational?

L-2   If operational, provide a client contact and telephone number below who is currently using this capability.

L-3   If not currently available (or under development), would you be willing to develop these functions as part of the contract?

L-4   Is this a batch or a real time application?

L-5   Please attach supporting materials to describe any current capabilities.

L-6   Is there an automatic interface of data to General Ledger?

L-7   What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

L-8   Would any one-time charges be involved in the implementation of this application?

M.   Third Party Log (TPL)

M-1   Do you have Third Party Log (TPL) software applications operational?

M-2   If operational, provide a client contact and telephone number below
      who is currently using this capacity.

M-3   If not currently available (or under development) would you be willing
      to develop these functions as part of the contract?

M-4   Please attach supporting materials to describe available capabilities.

M-5   Is this application interfaced to PB/AR?

M-6   What portion of the total service fee quoted has been allocated to
      this software application: on a 'per patient day' basis?

M-7   Would any one-time charges be involved in the implementation of this
      application?

N.   Property Accounting (PROP)

N-1   Do you have Property Accounting (PROP) software applications
           operational?

N-2   If operational, provide a client contact and telephone number below
           who is currently using this capability.

N-3   If not operational, is a similar application currently under
           development?

N-4   If not under development, would you be willing to develop this function
           to our specifications for a fixed price paid on a monthly basis?

N-5   Would this function be interfaced to General Ledger?

N-6   Please attach supporting materials to describe reporting capabilities
           of your current product, if any.

N-7   Can microfilm and magnetic backup be provided?

N-8   What portion of the total service fee quoted has been allocated to
           this software application: on a 'per patient day' basis?

N-9   Would any one-time charges be involved in the implementation of this
           application?

N-10   Please attach supporting materials to describe reporting capabilities
           of Preventative Maintenance functions.

O.   <u>ADT - Outpatient (ADT-O)</u>

0-1   Do you have ADT-Outpatient (ADT-O) software applications operational?

0-2   If operational, provide a client contact and telephone number below who is currently using this capability.

0-3   Is some type of user identification or program limitation provided for security of data?

0-4   Are real time update and real time inquiry provided for?

0-5   Does your firm have an Outpatient Scheduling function currently available?

0-6   Would the hospital be able to admit inpatients through the outpatient department each night?

0-7   Would re-entry of data be required for emergency patients who are later admitted as inpatients?

0-8   Would information from the Long Term Data File be available for the registration process?

0-9   Would this module automatically print Registration Forms on a real time basis?

0-10   Would ADT information be automatically interfaced to PB/AR nightly?

0-11   Please describe briefly any purge options available for ADT patient information after the visit.

0-12   Can microfilm and magnetic tape backup be provided?

0-13   What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

0-14   Would any one-time charges be involved in the implementation of this application?

P. Long Term Patient Index (LTPI)

P-1 Do you have Long Term Patient Index (LTPI) software applications operational?

P-2 If operational, provide a client contact and telephone number below who is currently using this capability.

P-3 If not operational, is a similar application currently under development?

P-4 If not under development, would you be willing to develop this function to our specifications for a fixed price paid on a monthly basis?

P-5 Is some type of user identification or program limitation provided for security of data?

P-6 Are real time update and real time inquiry provided for?

P-7 Can microfilm and magnetic tape backup be provided?

P-8 What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

P-9 Would any one-time charges be involved in the implementation of this application?

Q.   <u>Long Term Radiology Retrieval (LTRR)</u>

Q-1   Do you have Long Term Radiology Retrieval (LTRR) software applications
      operational?

Q-2   If operational, provide a client contact and telephone number below
      who is currently using this capability.

Q-3   If not operational, is a similar application currently under development?

Q-4   If not under development, would you be willing to develop this function
      to our specifications for a fixed price paid on a monthly basis?

Q-5   Is some type of user identification or program limitation provided
      for security of data?

Q-6   Are real time update and real time inquiry provided for?

Q-7   Can file purging criteria be based on length of time since last radiology
      exam?

Q-8   Can microfilm and magnetic tape backup be provided?

Q-9   What portion of the total service fee quoted has been allocated to
      this software application: on a 'per patient day' basis?

Q-10 Would any one-time charges be involved in the implementation of this
      application?

Q-11 Will you commit to interface this application with the District's
      General Electric Rapport system (in Radiology)?

R.   Pharmacy System (PS)

R-1   Do you have Pharmacy System (PS) software applications operational?

R-2   If operational, provide a client contact and telephone number below
      who is currently using this capability.

R-3   Is some type of user identification or program limitation provided
      for security of data?

R-4   Are real time update and real time inquiry provided for?

R-5   Please attach supporting materials to describe features and capabilities.

R-6   Would this system interface charges with PB/AR?

R-7   Is maintenance of patient profiles provided?

R-8   Is Drug Interaction provided for?

R-9   What are the capabilities involving ongoing medication audits and
      utilization review of drugs (attach materials).

R-10 What are the capabilities involving administration records, order
      review and stop orders for medications (attach materials).

R-11 Are drug labels printed automatically?

R-12 Are dosage calculations aided by the system?

R-13 Are antibiotic sensitivity surveys provided for?

R-14 Will the system maintain the Hospital Formulary, Drug Coding and
      Drug Classifications?

R-15 Attach materials to describe inventory functions including order levels,
      bid prices, drug usage.

R-16 Do price changes automatically update the drug charge list?

R-17 Does the system have an Adverse Drug Reaction status report?

R-18 Can microfilm and magnetic tape backup be provided?

R-19 What portion of the total service fee quoted has been allocated to
      this software application : on a 'per patient day' basis?

R-20 Would any one-time charges be involved in the implementation of this
      application?

S.   Materials Management (MM)

S-1   Do you have Materials Management (MM) software applications operational?

S-2   If operational, provide a client contact and telephone number below who is currently using this capability.

S-3   Is this a batch or real time application?

S-4   Please attach supporting materials to describe available reporting (output) capabilities.

S-5   What methods of inventory valuation are available?

S-6   What methods of re-order point calculation are available? Describe EOQ calculations briefly if available.

S-7   Are purchase order forms printed by the system?

S-8   Is this application interfaced with Accounts Payable?

S-9   Briefly describe how this application should be used to be most effective.

S-10   Can microfilm and magnetic tape backup be provided?

S-11   What portion of the total service fee quoted has been allocated to this software application: on a 'per patient day' basis?

S-12   Would any one-time charges be involved in the implementation of this application?

S-13   Is a report produced which indicates price changes which have occurred since the previous month?

T.   Hardware Considerations

T-1   Is your hardware approach: a) shared, b) in-house, c) combination?

T-2   Where would the processing of the financial systems take place?

T-3   Who would be responsible for the bursting/decollating of output?

T-4   Would trained hospital operators be required?

T-5   Would 24-hour operator coverage (hospital) be required?

T-6   What model/configuration/core size of central processor is being proposed, if any?

T-7   What model/configuration/speed of line printer is being proposed, if any?

T-8   What model of video terminal is being proposed?

T-9   What model/speed of character printer is being proposed?

T-10   Who would be responsible for hardware maintenance and where is their nearest service location?

T-11   What portion of the total service fee quoted has been allocated to processing hardware (if any): on a 'per patient day' basis?

T-12   What portion of the total service fee quoted has been allocated to communications hardware: on a 'per patient day' basis?

T-13   Would any one-time charges (other than site preparation) be involved in the installation of this hardware?

T-14   Please describe briefly the insurance risks, if any, that would be incurred by the District for any hardware.

T-15   What monthly hardware maintenance costs (if any) would be incurred by the District on an ongoing basis?

T-16   Please attach supporting materials to specify the expected run time (or turnaround time) of each application proposed.

T-17   Would the hospital receive upgraded hardware versions free of charge when such upgrades occur?

U.   Other Considerations

U-1   Where is your corporate headquarters located?

U-2   Where is the medical systems division located?

U-3   Where is the nearest customer service center located?

U-4   During what periods would customer service be available?

U-5   What level of on-going support do you propose?

U-6   What product warranty is available?

U-7   Will general on-going software maintenance and development be provided within the price quoted?

U-8   Will you commit to meet all government regulations (local, state, federal; present and future) with the capabilities of your software?

U-9   Will there be some form of system parallel with the conversion of each system module?

U-10   Will Sequoia Hospital District be the sole owner of all data files with access to file format information?

U-11   Please attach supporting materials specifying level of support offered for installation and training along with quantity and type of user manuals provided.

U-12   Who would pay for courier service of input and output - if such delivery is being proposed?

U-13   Would discounts of any type be available to the District as part of the payment terms?

U-14   Please attach supporting materials to describe microfiche reporting capabilities.

U-15   Please describe the anticipated Data Processing Department staffing requirements including personnel functions and backgrounds required.

U-16   Please provide audited financial statements for your firm from the past two years.

U-17   Please provide personal data sheets for your firm's top management and hospital support positions.

U-18   How will the hospital be billed for custom reports?

U-19   Please explain Order Entry and Laboratory Systems capabilities of your firm.

- |45 -

VI. <u>APPENDIX</u>

A. LONG TERM DATA FILE DESIGN   (LTDF)

B. LONG TERM PATIENT INDEX DESIGN   (LTPI)

C. LONG TERM RADIOLOGY RETRIEVAL DESIGN   (LTRR)

APPENDIX A

LONG T... D......
(...)

Demographic (access by all users)

Patient Name	last ... ... first name	A	23
Birthdate	...	N	6
Sex	"... ... ..."	A	1
Marital Status	"... ... ... , ."	A	1
Nearest Relative	last ... ... first name	A	23
Relation to Patient	"M, ..., D, ., S, ., U"	A	1
Patient Phone	"... ..."	N	7
Patient S.S.#	"... ..."	N	9
Patient-Street, City, State	(list	A/N	40
Patient - Zip Code	"...	N	5
Previous Name	last ... . first name	N	23
Previous Admission Date	..	N	6
Previous Admission Time	"...	A/N	5
Previous Discharge Date	...	N	6
Previous Discharge Time	"...: ..	A/N	5
Medical Record #	(... ..	A/N	6
Radiology File #	(list ... .)	A/N	6
Physician Name	last ... ... initial ... ... initial	A	15
Previous Admission Type	(see ... .)	A/N	1
Previous Discharge Type	(... .. .. \	A/N	1
Religion	(spec.. coding)	A/N	5

Financial (Business Office and Admitting areas only)

Guarantor Name	Last name comma first name	A	23
Guarantor-Street, City, State	(literal)	A/N	40
Guarantor - Zip Code	"12345"	N	5
Financial Class	(special coding)	N	2
Financial Grading	(special coding)	A/N	1
Previous Insurance Coverage	(literal)	A/N	10
Patient Employer	(literal)	A/N	20
Employer Phone	"1234567"	N	7
Guarantor Phone	"1234567"	N	7

Medical (restricted use)

Allergies	(15 specific positions: "Y, N, b")	A	15
Pulm. Therapy	file indicator "Y, N"	A	1
Oncology	file indicator "Y, N"	A	1
Blood Type	(literal abbreviation)	A/N	3
M.R. Chart location	(literal)	A/N	6
Previous Diagnosis	(H-ICDA coding)	N	4
Critical Diagnosis	(literal)	A/N	10

Total Record Size: <u>350</u>

APPENDIX B

LONG TERM PATIENT INDEX
(LTPI)

Patient Name	Last name comma first name	A	23
Birthdate	DDMMYY	N	6
Medical Record #	(literal)	A/N	6
Radiology File #	(literal)	A/N	6
S. S. #	"123456789"	N	9
Previous Discharge Date	DDMMYY	N	6

Total Record Size: 56

APPENDIX E: HOSPITAL FINANCIAL MANAGEMENT
ASSOCIATION (HFMA) LISTING OF
EDP APPLICATIONS

APPENDIX C

LONG TERM RADIOLOGY RETRIEVAL

(LTRR)

Patient Name	Last Name comma first name	A	23
Birthdate	DDMMYY	N	6
Radiology File #	(literal)	A/N	6
Medical Records #	(literal)	A/N	6
A.C.R. Coding	(literal)	A/N	6
Last Exam. date	DDMMYY	N	6
Last Exam. type-1	(literal)	A/N	10
Last Exam. type-2	(literal)	A/N	10
Last Exam. type-3	(literal)	A/N	10
Physicians Code	(special coding)	A/N	3
Film Location	(special coding)	A/N	3
Iodine Allergy	"Y,N,b"	A	1
Comments - 1	(literal)	A/N	20
Comments - 2	(literal)	A/N	20
Comments - 3	(literal)	A/N	20

Total Record Size: 150

APPENDIX E: HOSPITAL FINANCIAL MANAGEMENT ASSOCIATION (FHMA) LISTING OF EDP APPLICATIONS

- The following list of EDP applications for hospitals was produced by the HFMA in conjunction with its 1976 study of the state of information processing in the health care industry.

- It is included in this report for reference purposes.

HOSPITAL EDP APPLICATIONS

A. FACILITY UTILIZATION

1. Inpatient Pre-Admission
2. Outpatient Clinic Appointments
3. Inpatient Daily Census Report
4. Inpatient Monthly Reports
5. Surgery (O.R.) Facility Schedule
6. Patient Transaction - Dep. Reports
7. Patient Service Requests

INPUT

B.   PATIENT ACCOUNTING

8   Inpatient Billing
9   Outpatient Clinic Billing
10   Emergency Room Billing
11   Accounts Receivable
12   Automatic Posting Of Charges
13   Proration 3rd Party Benefits
14   Revenue Analysis And Mgt. Acct.
15   Transaction Register - Audit Trails
16   A/R Analysis By Physician
17   3rd Party Claim & Billing - Inpatient
18   3rd Party Claim & Billing - Outpatient
19   Bad Debt Reporting
20   Aged Trial Balance Reports
21   Physicians Group Billing

C.   PAYROLL/PERSONNEL

22   Personnel, Management Reporting
23   Time And Attendance Recording
24   Payroll Accounting & Reporting
25   Turnover Reports
26   Available Vac., Sick & Other
27   Employee Evaluation Review Sch.

D.   PAYABLES AND INVENTORY

28   Purchase Order Management
29   A/P Voucher And Payment
30   Central Stores Perp. Inventory
31   Pharmacy Perpetual Inventory
32   Capital Equipment Inventory
33   Cash Flow Forecasting
34   Equipment Preventive Maintenance

INPUT

E.   FINANCIAL MANAGEMENT

35   General Ledger Accounting

36   Financial Statements

37   Bank Account Reconcilations

38   Cost Accounting

39   Budget Preparation (Annual)

40   Budget (Control By Position)

41   Budget Comparison

42   Budget Modeling

43   Specific Fund Reporting

44   Contribution Mgt. Fund Reporting

F.   PARAMEDICAL

45   Dietary, Menu Selection

46   Inpatient Drug Profile

47   Inpatient Drug Administration

48   Nursing Staff Scheduling

49   Clinic Laboratory Pickup

50   Clinic Laboratory Results

51   Radiology, Procedure Scheduling

52   Radiology, Interpretation

53   Radiation Therapy, Dosage Cal.

54   Pulmonary Functions Reporting

55   Cardiogram Interpretations

56   EEG Interpretations & Results

57   Poison Control And Antidote

INPUT

G.   MEDICAL RECORDS

H.   ENERGY SAVING

I.   OTHER

APPENDIX F: QUESTIONNAIRES

HOS-USER

HOSPITAL DESCRIPTION

1. Please provide the following information:

	Current	1980	1983
Number of Beds:	_____	_____	_____
Occupancy Rate:	_____	_____	_____

EDP BUDGET

1. What percent of your total hospital expenditures is for EDP? _____%

2. What is your current annual EDP budget? _____ No. of EDP Employees _____

3. What is the division of this budget between in-house and outside services?

	Current	1980	1983
In-house (% or $)	_____	_____	_____
Outside services (% or $)	_____	_____	_____

4. Do you expect your EDP budget to increase by 1980?

    Yes ☐   No ☐   Percent increase _____ %

    by 1983?

    Yes ☐   No ☐   Percent increase _____ %

5. What will be the primary reasons for this increase in budget?

    1980: _____

    _____

    _____

    1983: _____

    _____

    _____

EDP HARDWARE CONFIGURATION

1. What type of large mainframe do you currently have in-house? [ ] None

    Mfg. _____ Model _____ Date Installed _____

2. Do you plan any major mainframe change in the next five years? No [ ]

    If yes:

    Mfg. _____ Model _____ When _____

3. Why will you make this change?

    _____

    _____

    _____

4. Do you currently have any minicomputers installed? No [ ]

    If yes:

    No. _____ Mfg. _____ Model _____

    Date Installed _____

5. Are any of these minicomputers tied to your mainframe?

    Yes [ ]   No [ ]

6. What applications are you running on your minicomputers?

    _____

    _____

    _____

INPUT

7. Do you plan to purchase more minicomputers in the next five years?

    No ☐

    If yes:

    No. _____ Mfg. _____ Model _____ When _____

8. Why will this increase in purchases be required?

    _____

    _____

    _____

9. Do you currently have display terminals installed?   No ☐

    If yes:

    No. _____ Mfg. _____ Model _____ Date Installed

10. Do you plan to increase the number of display terminals in the next
    five years?   No ☐

    If yes:

    No. _____ Mfg. _____ Model _____ When _____

11. Why will this increase in purchase be required?

    _____

    _____

    _____

    _____

CURRENT EDP APPLICATIONS

Please indicate which EDP applications are used in your hospital?

Application	In-house	$/monthly Outside	Mode of Delivery (B, RB, IA)	Vendor	When Started	Satisfaction Level (1 = high, 5 = low)
Business Management						
Parient Management						
Clinical						

PLANNED EDP APPLICATIONS

Please indicate what new EDP applications you are planning in your hospital in the next five years:

Application	In-house	Outside	Mode of Delivery (B, RB, IA)	When	Software Development			Estimated Cost
					In-house	Prof. Services	Software Package	
Business Management								
Patient Management								
Clinical								

VENDOR SELECTION

1. How are vendors selected for the various EDP products/services that you purchase?

    ☐ Formal Bids

    ☐ Sales Presentations

    ☐ Referrals

    ☐ Other

2. Is the purchase of EDP products/services centralized in your hospital?

    ☐ Centralized

    ☐ Decentralized

3. If centralized, where in the organization is this accomplished?

    _____

    _____

    _____

4. If decentralized, which organizations have the authority to purchase products/services?

    _____

    _____

    _____

5. Who would you say are the leading vendors who provide EDP products and services to hospitals?

    _____

    _____

    _____

6. Please rate the following selection criteria (1 = high, 5 = low) in evaluating an EDP vendor?

	RCS	S/W PROD.	PROF. SERVICES
Vendor's Knowledge of Application	_____	_____	_____
Vendor's Knowledge of Hospitals	_____	_____	_____
Vendor's Reputation	_____	_____	_____
Customer Support (documentation, maintenance, etc.)	_____	_____	_____
Price	_____	_____	_____
Contract Terms	_____	_____	_____
Response Time	_____	_____	_____
Range of Services	_____	_____	_____
Others (please specify)	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. Have you changed vendor in the last five years?

RCS: ☐ Yes   ☐ No

S/W Prod. ☐ Yes   ☐ No

Prof. Services ☐ Yes   ☐ No

Why? _____

_____

_____

INPUT

MAJOR HOSPITAL ISSUES

1. What federal and/or state government legislation will have an affect on your use and development of EDP within the hospital community?

_____

_____

_____

_____

2. How do you believe that this legislation will effect your hospital?

_____

_____

_____

3. What other major factors do you believe will inhibit or enhance the use of EDP within your hospital? (please describe)

_____

_____

_____

_____

4. Currently, most EDP applications are directed toward the business management of a hospital. What new major areas to you see EDP being used within your hospital?

_____

_____

_____

_____

INPUT

5. What will vendors have to do to demonstrate that they can move into these new major areas?

    _____

    _____

    _____

6. Do you currently have a long range EDP plan (five years) for your hospital?   ☐ Yes   ☐ No

7. What would you say will be the major differences between your current use of EDP and where you expect your hospital to be five years from now?

    _____

    _____

    _____

    _____

SMALL HOSPITALS - If you were going to use EDP in your hospital...

1. What type of EDP would you implement?

    ☐ In-house   ☐ Batch   ☐ Remote Batch   ☐ Interactive

2. What type of applications would you implement first?

    _____

    _____

    _____

    _____

INPUT

3. Which vendors would you consider for your EDP applications?

_____

_____

_____

_____

4. Please indicate which of these vendors have called on you.

_____

_____

_____

_____

5. How much would you be willing to spend for EDP on a monthly or annual basis?

_____

6. If current prices are too expensive for your hospital, how much would you pay for EDP on a monthly or annual basis?

_____

INPUT

HOS-VENDOR

1. What types of EDP products and services do you provide to hospitals?

☐ Remote Computing Services

Type of Applications	Mode of Delivery	Percent
_____	☐ Batch	_____
_____	☐ Remote Batch	_____
_____	☐ Interactive	_____
_____		
_____		

☐ Software Products

Product Name	No. of Packages Sold in 1977	Price
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

☐ Professional Services

Type of Applications		
_____	No. of Hospital Clients	_____
_____	Range/Average Size	_____
_____		
_____		
_____		

☐ Turnkey Systems

	No. Installed	Price
_____	_____	_____
_____	_____	_____
_____	_____	_____

☐ Facilities Management

_____	_____	_____
_____	No. of Hospital Clients	_____
_____	Range/Average Size	_____

INPUT

2. What percent of your revenues are derived from hospitals? 1977: _____ %

    1978 Forecast _____ %

3. What percent of your revenues from hospitals is derived from each of the following sources?

	Now	1980	1983
Remote Computing	_____	_____	_____
Interactive	_____	_____	_____
Batch	_____	_____	_____
Batch Processing	_____	_____	_____
Software Products	_____	_____	_____
Professional Services	_____	_____	_____
Facilities Management	_____	_____	_____
Turnkey Systems	_____	_____	_____

4. How much do you believe is the total market of hospitals for outside services and products for this year? $ _____

5. How much do you believe hospitals will spend for EDP products and services that you offer? $ _____

6. What do you expect to be the growth rate of EDP expenditures for hospitals on an annual basis for the next five years?

    In-House _____ %

    Outside Services _____ %

7. How does the growth rate for hospital EDP products and/or services compare with other industries that you serve?

    _____

    _____

    _____

INPUT

8. Please describe any unique product or service requirements imposed by hospitals?

_____

_____

_____

_____

_____

9. Please describe any unique hardware problems that hospitals impose?

_____

_____

_____

_____

_____

10. Are you planning on offering any user site hardware as part of your marketing approach to hospitals? ☐ Yes ☐ No

11. Please describe these user site hardware offerings? (Obtain sales brochures, if possible)

_____

_____

_____

_____

_____

INPUT

12. When do you plan to introduce these user site hardware offerings to hospitals? _____

13. Do you view these user site hardware offerings as a means of expanding your hospital base or are they a means of protecting your service clients?

   ☐ Expand   ☐ Protect   ☐ Both

14. What percent of your hospital revenues do you expect to derive from these user site hardware offerings to hospitals? _____ %

   In what year? _____

15. Please describe any unique marketing problems in selling to hospitals?

   _____

   _____

   _____

   _____

   _____

16. What size hospital is the primary thrust for your marketing efforts?

   _____

   Why?

   _____

   _____

   _____

   _____

   _____

INPUT

17. Are you aware of any major trends within hospitals to take more EDP work in-house and away from the various EDP vendors?

_____

_____

_____

_____

_____

18. Who are your major competitors in the hospital marketplace?

Competitor	Products Offered
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

19. During the next five years will you increase or decrease your marketing efforts towards hospitals?

[ ] Increase   [ ] Decrease   [ ] No Change

Why?

_____

_____

_____

_____

_____

INPUT

20. Do you plan to introduce any new applications to hospitals in the next five years?

☐ Yes   ☐ No

Please describe:

_____

_____

_____

_____

_____

21. Please rank the following sources of competition in order of importance:

Large Mainframe Vendors   _____

Mini Hardware Vendors   _____

Local Service Bureaus   _____

Software Product Vendors   _____

Other RCS Vendors   _____

Banks   _____

Comments: _____

_____

22. Please describe any major economic or legislative action (federal or state) which could significantly impact the size of the hospital EDP market in the next five years

_____

_____

Examples: _____

_____

INPUT

23. Do you plan any involvement in:

     Medical Claims Processing - When? _____

     National Health Insurance - When? _____

24. Have you acquired any companies in the hospital business in the last five years?

    [ ] Yes   [ ] No

       Company Name   When Acquired

   _____   _____

   _____   _____

   _____   _____

   _____   _____

   _____   _____

INPUT

Company Name	Type	Annual Revenues 1977	Medical Related
Pentamation Bethlehem, PA	RCS	$7.5M	35%
Management Systems Corp. (Desert Management Corp.) Salt Lake City, UT	RCS	$7.0M	95%
Computer Management Systems Indianapolis, IN	RCS	$4.7M	10%
Safeguard Business Systems Ft. Washington, PA	RCS	$4.5M	20%
Commerce General Corp. Memphis, TN	RCS	$4.2M	15%
Neotronics Cleveland, OH	RCS/PS	$3.0M	10%
Mid-State Computer Services Harrisburg, PA	RCS	$1.5M	10%
Computer Services Corp. Birmingham, AL	RCS	$930K	30%
B-H Computer Systems, Inc. York, PA	RCS	$750K	30%
Burlington Data Processing Burlington, VT	RCS	?	$800K
Hospital Financial Services	PS/SWP	< $500K	All