Future Influence of Technology on Customer Service

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FUTURE INFLUENCE OF TECHNOLOGY ON CUSTOMER SERVICE

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FUTURE INFLUENCE OF TECHNOLOGY ON CUSTOMER SERVICE

EXHIBITS

I INTRODUCTION

A. SCOPE

- The report is produced by INPUT as part of the 1984 European Field Service Program. The purpose of the report is to identify, summarize, and discuss the influence of technology development on customer service in the mainframe, mini, and office computer market sectors.

- While the report reflects the European field service marketplace, much of the research was directed towards recent findings in the U.S., particularly as technology affects service pricing and user attitudes towards service.

- This report is not intended to be a technical description of the latest customer service developments such as telecommunications or remote diagnostics. Rather, the report focusses on the effect of such technological developments on the service market.

- Since the influence of technology will not be restricted to any one market sector, INPUT has included separate sections on large- and small-system computers (mainframe and mini- and superminicomputers), and office product equipment. Each section discusses the technology trends that are unique to that market as well as new products that demonstrate service technology trends "in action."

- Finally, the report concludes with strategic recommendations. These recommendations centre around three major trends that are affected by service technology development: service pricing, vendor dependence on service, and user pressure in the service marketplace. INPUT believes that new technological developments, per se, will not ensure a successful service programme. Vendors must conform to an increasingly assertive user population, and a more competitive service marketplace if they are to use service technological developments to their fullest advantage.

B. METHODOLOGY

- This report is the result of ongoing customer service research conducted both in Europe and the United States. As part of its research, INPUT interviewed over 30 of the top computer manufacturers' service organisations. In addition, over 1,000 user interviews specifically dealing with service were conducted by INPUT in 1984 and the results are cited in the report.

- Some of the information presented in this report is derived from publicly available information sources including vendor annual reports, U.S. Securities and Exchange Commission reports, press releases, and other media information. Additional information was the result of ongoing vendor analysis conducted by INPUT in multiclient and custom research.

II CUSTOMER SERVICE TECHNOLOGY TRENDS

A. LARGE-SYSTEM

1. THE CHANGING STRUCTURE OF LARGE-SYSTEM SUPPORT, 1984-1989

- Ever since the advent of commercial mainframes, some industry observers have been predicting the demise of the large system. At first, observers questioned the necessity of such large, expensive machines. Then, with the introduction of "easy-to-use" minicomputers, many people said that the day of the bulky, hard-to-use mainframe was gone. Now microcomputers are proclaimed to be the heir apparent. However, the mainframe as a species has proved to be suprisingly resilient and, to paraphrase Mark Twain, reports of its death are greatly exaggerated.

- One of the major reasons that mainframes--and selected mainframe vendors--have been able to survive is that they have been adaptable to ever-changing market conditions. Higher-level languages, real-time reporting systems, and distributed processing are just a few examples of developments that have helped to make mainframes the largest segment (by far) of the entire computer market.

- As the mainframe market has grown, so has user dependence on the mainframe. Twenty years ago, a system failure would have created havoc in the

data processing department, but few others in the company would have realized there was a problem. Today, entire departments (other than DP) are dependent upon constant system availability; downtime is much more recognizable.

- The value of mainframe service has increased in direct relation to the increase in user dependence on it. Consequently, service is currently one of the most important system selection criteria used by potential customers (second only to system capabilities). INPUT believes that by 1989 service (including factors affecting reliability and availability) will be the single most important system selection issue for most users.

- Despite the fact that service is becoming increasingly important to users, vendors must be quick to adapt to changing service conditions, requirements, and technologies. INPUT has found that users are not currently service price sensitive but this condition will change as equipment becomes more reliable and users become more reluctant to spend ever-increasing amounts for fewer required services.

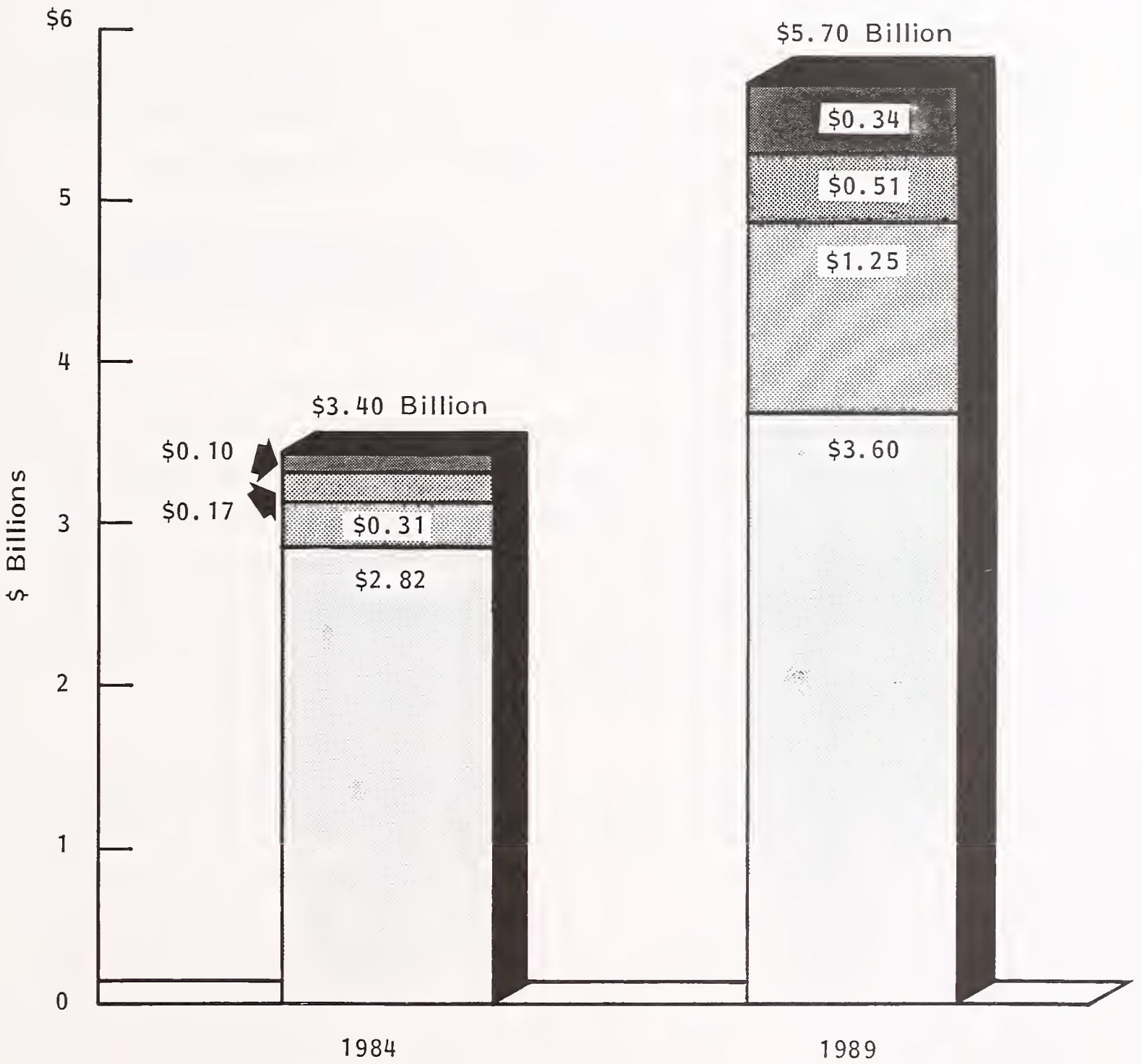
- Changes in service technologies will have a substantial effect on service revenue, as shown in Exhibit II-1. The mix of revenues will change dramatically between 1984 and 1989; hardware service revenue will decrease in importance while the importance of software service will increase substantially. Professional and educational services will increase in revenue, but will remain a relatively small component of the service revenue mix.

- Hardware service revenue (also discussed below) will suffer a substantial decrease in revenue as the result of several different factors:

  - Between 1984 and mid-1986 there will be a gradual decrease in revenues, resulting from increasing user pressure for lower service prices.

EXHIBIT II-1

LARGE-SYSTEM SERVICE REVENUE* MIX CHANGING RAPIDLY



* U.S. Market Only

= Hardware Maintenance
= Software Service and Support
= Professional Services
= Educational Services

- After 1986 there will be a sharp decline in mainframe hardware service revenue as a result of the strong competitive service pricing of IBM.

- Increasingly reliable mainframes that require less hardware maintenance have resulted in user expectations for lower service prices and competitive service pricing from IBM.

- Exhibit II-2 demonstrates the long-term effect of changing growth rates on incremental revenue. By 1989 incremental revenue from software service and support will be $940 million--21% more than new revenues derived from hardware service. Revenues for both educational and professional services are expected to increase dramatically as a result of high growth rates.

- As Exhibit II-3 demonstrates, vendor software revenues are expected to increase 32% annually from 1984 through 1989--moving software from 9% of total service revenue in 1984 to 22% in 1989.

- We are already beginning to see a substantial increase in both system and application software revenue. IBM, long a leader in software support, has announced it plans no further enhancements to OS/VSI systems software and has encouraged users to migrate to the more expensive MVS/XA (370 Extended Architecture) systems software. However, along with the XA upgrades, IBM has increased maintenance fees considerably. IBM justifies the increases by offering more frequent updates and improved support.

- After-sales professional services such as consulting and planning will become an increasingly important revenue source for mainframe service vendors, particularly as users are required to adapt to a multisystem environment. Some large-system vendors, such as NAS, have already introduced single-source services in order to increase service revenue growth (which had been limited by a relatively small installed base). Other vendors, such as DEC, have introduced very profitable supply sales operations--another example of a lucrative, nontraditional service opportunity.

EXHIBIT II-2

LARGE-SYSTEM SERVICE GROWTH BY SECTOR

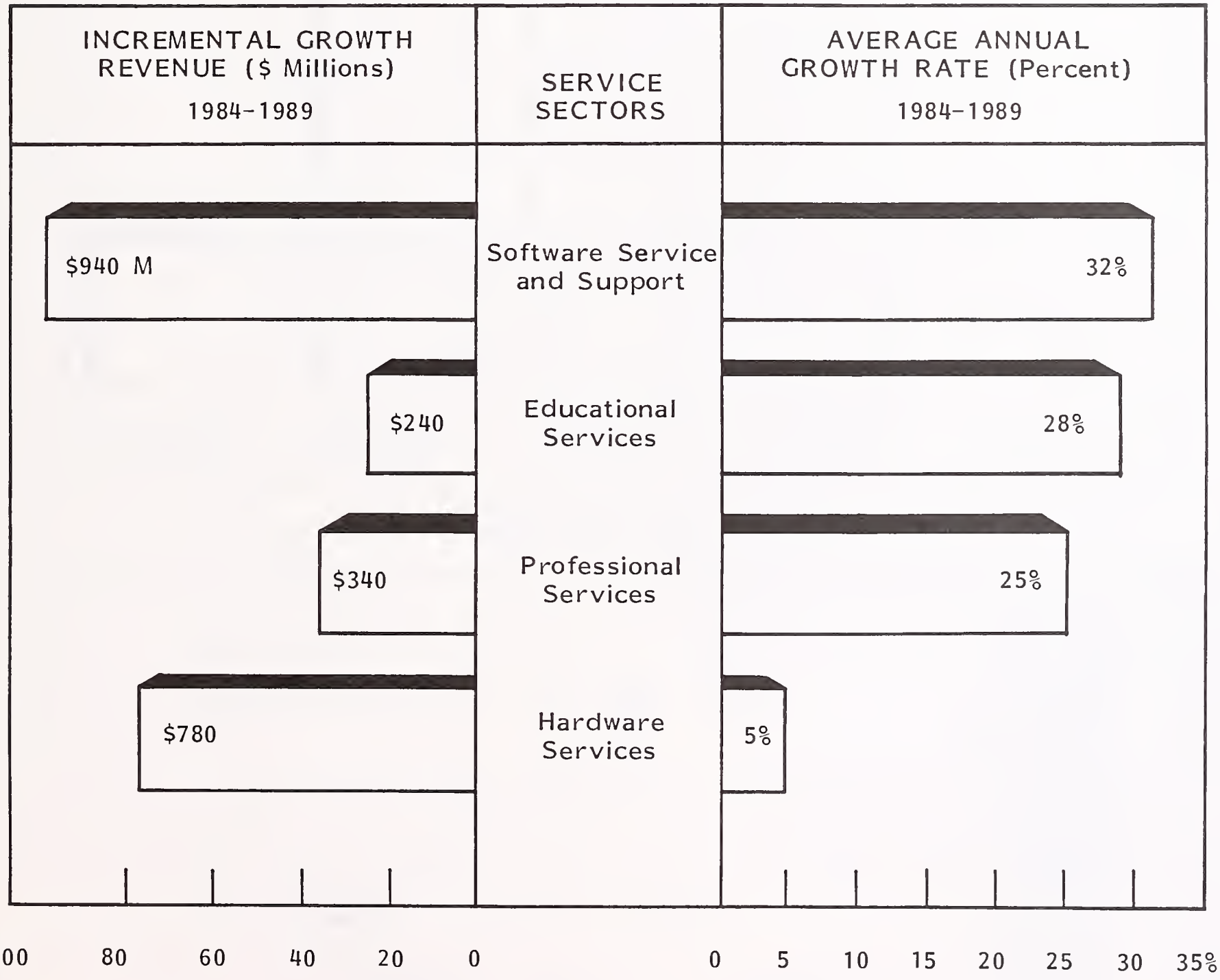
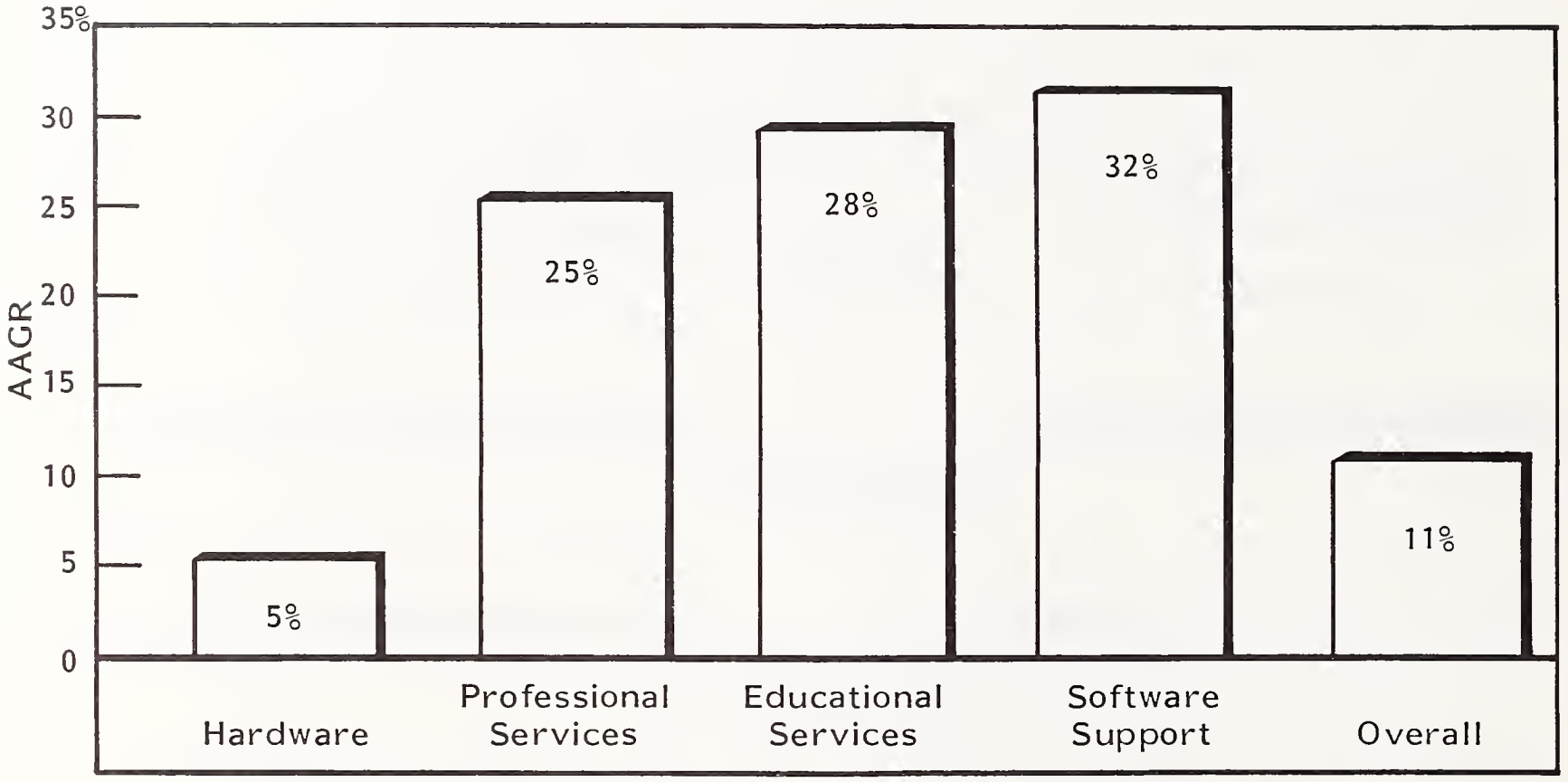


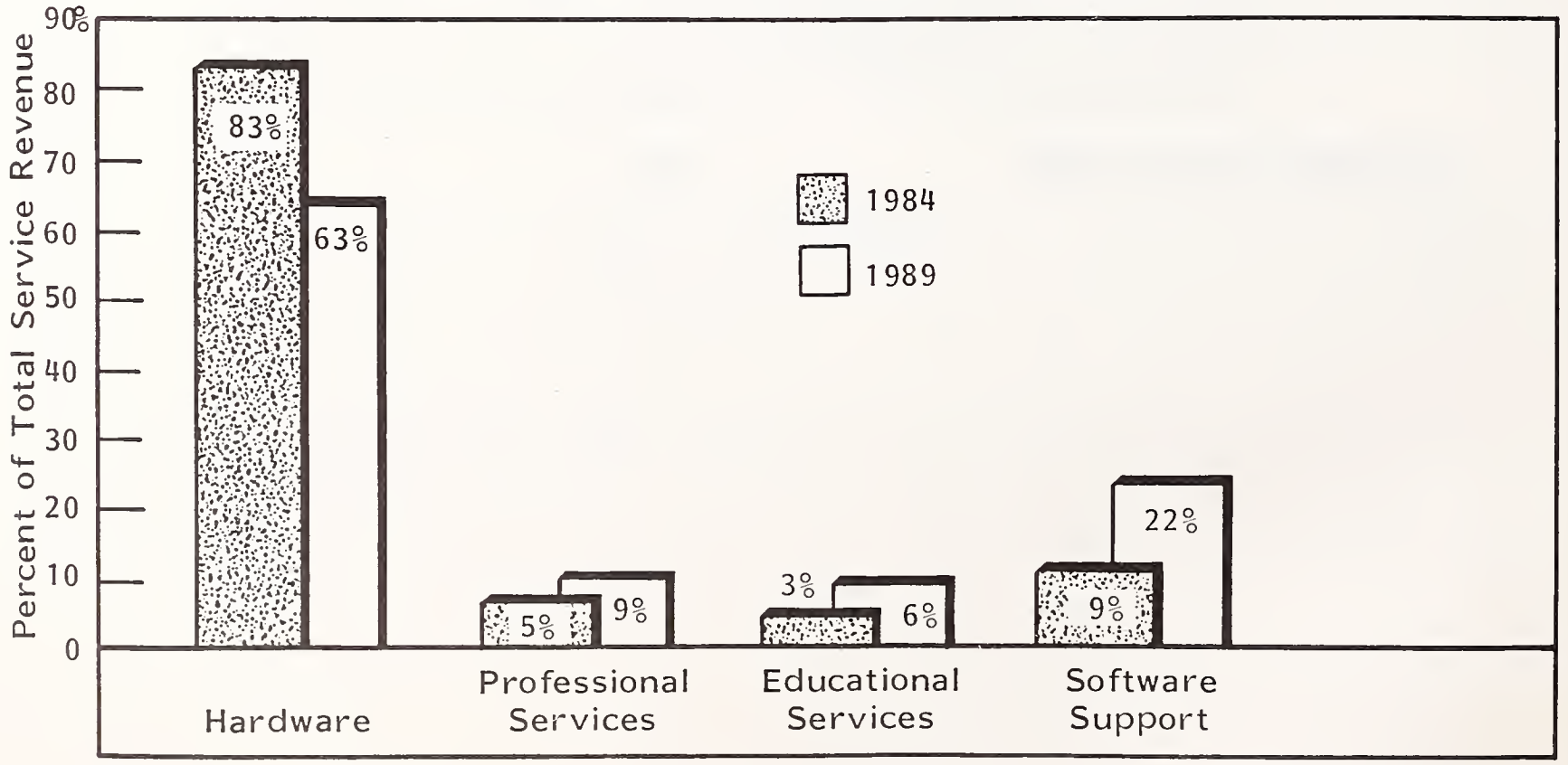
EXHIBIT II-3

LARGE-SYSTEM SERVICE GROWTH, 1984-1989

Average Annual Growth Rate
for Large-System Service Sectors, 1984-1989



Large-System Service Revenue
Mix by Sector, 1984-1989



- Educational services represents the smallest service component in Exhibit II-1, yet it is the second fastest growing service, as shown in Exhibit II-2. Educational revenue growth will result from three factors:

  - As mainframe vendors continue their penetration of the commercial market, there will be increasing user demand for training departmental workers in hardware as well as systems and applications software utilization.

  - Because training materials are easily maintained and do not require frequent updates, educational services provide high profit margins once the initial programme development is established.

  - Educational programs are not necessarily tied to just one product. These programs can be spun-off as totally separate products (such as the CDC Plato products), or can be used to support several of the vendors' hardware product lines.

- The continued development of new hardware service techniques will be prompted in large part by the large-system vendor's need to reduce the cost of providing service and thereby maintain profitability. Large-system service profitability was a given in the late 1970s and early 1980s, but starting in 1982 hardware service prices began to fall, particularly for new products and, to a lesser extent, for older machines as well. As a result of falling hardware service prices, profitability is no longer assured.

- Currently, overall large-system hardware service prices are falling at 7-10% per year. INPUT projects that this trend will continue at least through mid-1986. Between 1987 and 1990, hardware service prices will continue to fall, but at a slower rate (5-7%) than at present.

- Exhibit II-4 demonstrates that many large-system service vendors have been slow to react to this fundamental change in service pricing. Consequently, vendors are experiencing reduced profitability from hardware service or have reduced services in order to remain profitable. It is possible that vendors might mistake the recent trend in service price decreases as only a temporary aberration in pricing patterns. Considering the importance of service, vendors might assume that prices will again resume their upward spiral. Vendors are erroneous in this assumption, however. As demonstrated in Exhibit II-4, this type of analysis could result in sharply reduced hardware service revenue and, ultimately, the loss of service profitability.

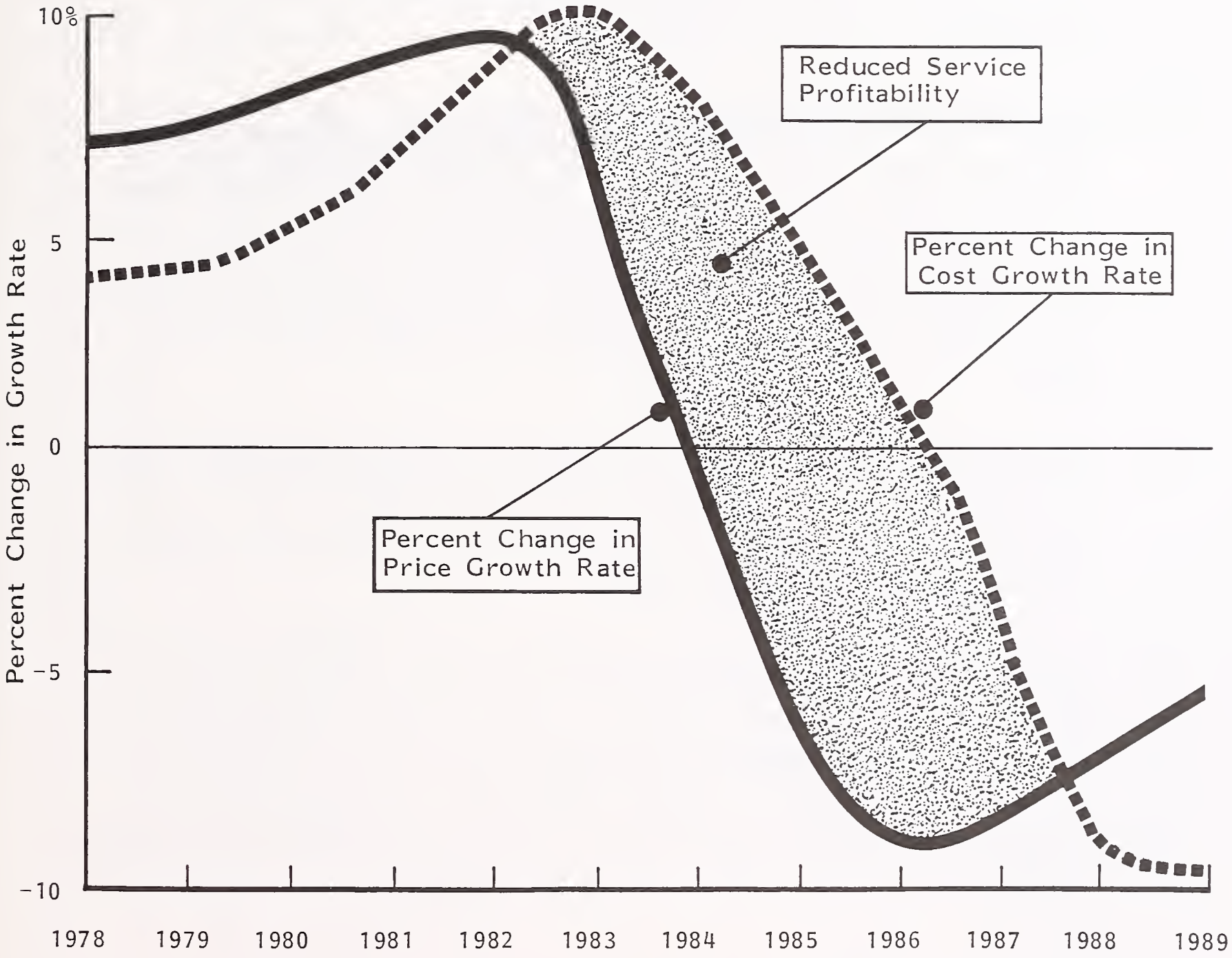
- The decrease in hardware service pricing will not have an immediate impact on service profitability, primarily because Exhibit II-4 refers to the percent change in the growth rate rather than the actual revenue and costs growth rate. For this reason, large-systems service vendors may continue to report profitable hardware service operations long after profitability has ceased to grow and is actually declining.

- The decrease in hardware service prices that began in 1982 and will continue through the end of the decade has been caused by technological advances resulting in vastly improved hardware reliability. This trend has become even more noticeable as vendors have accelerated the introduction of products that are not only more reliable, but have the latest service technology, such as fault-tolerant subsystems, self-diagnosing boards, and "user friendly" diagnostics capabilities.

- Technological advances introduced in the late 1970s or early 1980s were designed primarily to lower the cost of service (and thereby increase profitability)--not to decrease the price of service. Currently, and for the next four to five years, there will be a tremendous pressure exerted on the vendors by users and competitors to lower service costs and ultimately reduce service prices. Service pricing will become an important weapon in the mainframe vendor's competitive arsenal.

EXHIBIT II-4

LARGE-SYSTEM HARDWARE SERVICE PRICE
VERSUS COST, 1978-1989



- Service pricing will become a major competitive issue because the improved reliability of mainframe hardware will result, quite naturally, in user expectations of reduced or at least stable service prices. Growth in the third- party maintenance market is evidence of increasing concern by users regarding service price increases. Several vendors have indicated that users not only expect lower hardware maintenance costs, but are also applying sophisticated cost-accounting techniques to analyze the true cost of service over the life of the machine.

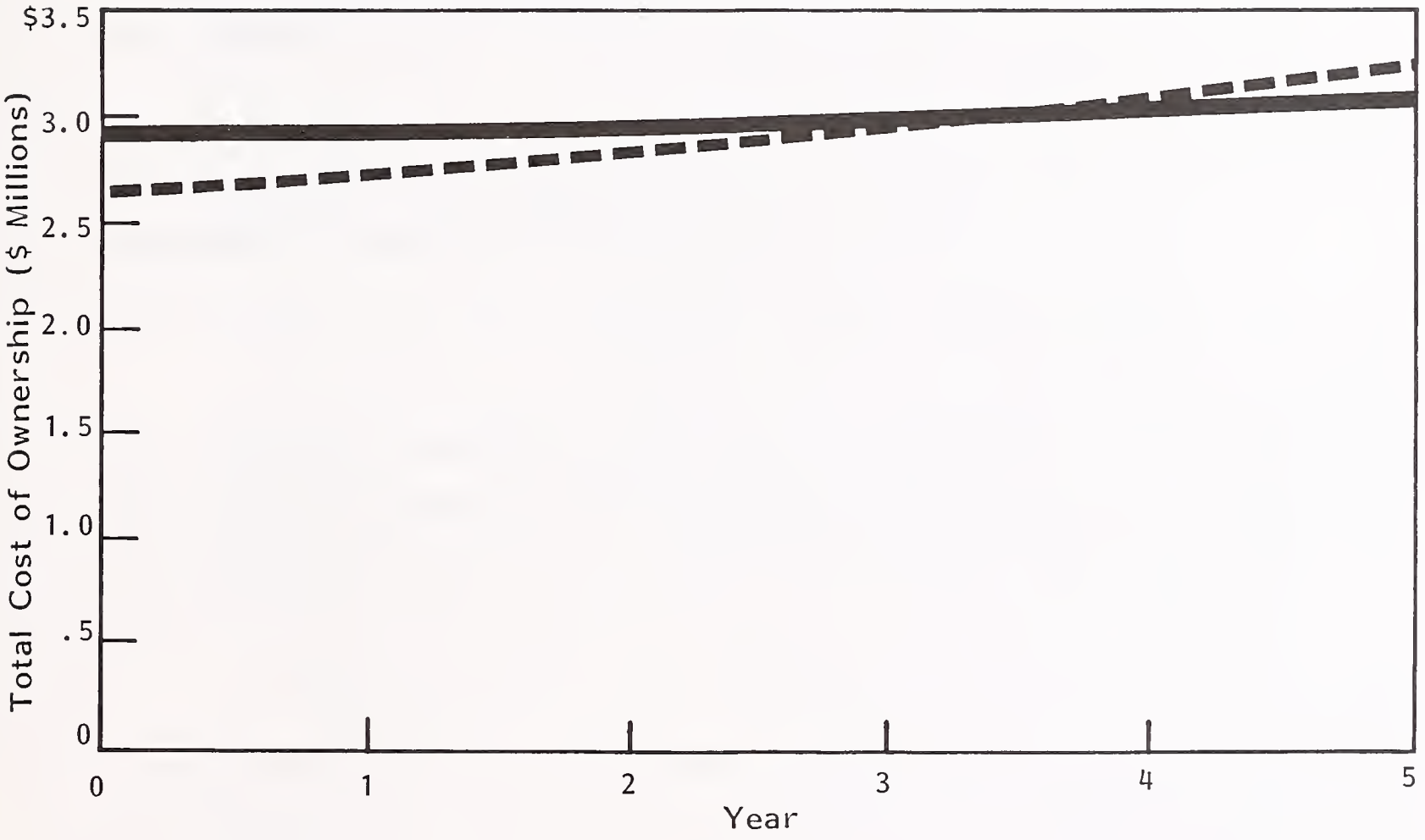
- Exhibit II-5 demonstrates the type of evaluation used by many customers in making equipment selection decisions. Rather than basing purchase decisions only on the initial cost of the machines, many users are now including long-term costs of service as well. The exhibit shows that even though the initial cost of a mainframe may be less than the competition's (as with example B), the total cost--which includes service--can be much more than the competition's.

- The essence of Exhibit II-5 is that Company A charges significantly lower maintenance fees for its mainframe than does Company B for its CPU. Reduced maintenance fees will allow Company A to be much more competitive in the long term than other vendors.

- As large-system service competition heats up, it will be more and more necessary for vendors to conserve resources in order to keep maintenance prices competitive. Technological developments in the service environment will be the most important, and in some cases they will be the only way for vendors to reduce hardware maintenance costs. New service technology is discussed below.

EXHIBIT II-5

TOTAL COST* OF LARGE-SYSTEM OWNERSHIP



Vendor	Purchase Price ($ Millions)	Annual Maintenance as a Percent of Purchase Price	Maintenance Over 5 Year Life of Machines ($ Thousands)	Total Cost ($ Millions)
A	$2.84	1.35%	$254.0	$3.09
B	2.60	3.79	652.0	3.25

* As viewed by the user; total cost includes purchase price and maintenance.

2. REDUNDANT AND FAULT-TOLERANT SYSTEMS

- All of the large-system vendors are investigating or developing fault-tolerant or redundant systems in order to improve system reliability. IBM, NCR, DEC, and other mainframe vendors have been experimenting with both loosely and tightly coupled multiprocessors.

  - A loosely coupled multiprocessor is a system in which each processor has its own memory, whereas in a tightly coupled system each processor shares a control memory.

  - The major advantage of a loosely coupled multiprocessor is that it suffers less performance degradation as the number of subsystems increases. Tightly coupled multiprocessors have the advantage of being less expensive due to shared components.

- From a service standpoint, redundant and fault-tolerant systems are most useful in on-line transaction processing (OLTP) industries such as banking, the federal government, and discrete manufacturing. These and other industries that require 100% system availability are typically service price insensitive and therefore offer tremendous growth potential for service vendors.

- INPUT believes that the market for fault-tolerant systems will grow dramatically in the next five years, primarily as the number of downtime-sensitive, on-line system users grows. Total revenues for fault-tolerant systems will increase from less than $1 billion in 1984 to almost $13 billion in 1987.

- In addition to providing improved reliability, fault-tolerant systems are much more adaptable to modular expansion than are conventional mainframes. This will have a significant impact on the way service is delivered, particularly to loosely coupled modular systems.

- Service on fault-tolerant systems will be considerably different than on conventional systems because of the resident self-diagnostics resulting from redundant component technology. Fault-tolerant systems will usually require less technical training for the FE and more component exchange activities. INPUT expects fault-tolerant systems to lead the market in the application of remote-diagnostic, remote-fix technology.

- As the market for redundant systems and fault-tolerant technology grows, there will be a corresponding decrease in the necessity for unscheduled mainframe maintenance. Individual CPU failures will still occur (although with less frequency than now), but these failures will be unnoticed by users, due to the efficiency of multiprocessor tasking. The vast majority of repairs will be attended to during scheduled maintenance periods.

- A much more efficient allocation of service resources will result from the scheduling of maintenance calls. Currently, this is not possible even on fault-tolerant systems because of the general lack of system reliability. However, as modules of multiprocessors grow, the failure of one CPU will not require immediate service because system performance and data integrity will not be improved.

- The ability to schedule on-site maintenance will provide fault-tolerant manufacturers with a substantial competitive advantage over conventional mainframe vendors. Manufacturers of fault-tolerant mainframes will be able to reduce service prices at a much more rapid rate than conventional mainframe vendors because they will be able to reduce the number of on-site calls--which currently represent the most expensive component of service.

3. SELF-DIAGNOSING COMPONENTS

- The development of self-diagnosing components, such as circuit boards, will have a significant effect on repair times, logistics operations, and FE skill levels. Currently, self-diagnosing boards are being used with great success by

a number of vendors, and INPUT expects this technology to be integrated into all new mainframe products developed after 1986.

- Self-diagnosing technology's major advantage is that it will promote more efficient use of remote support and response times. Vendors that are currently using this technology report that FEs have a much lower call-back rate because on their first call they are prepared with the right tools and parts.

- Reduced service expenditures from lower inventory costs are another result of using self-diagnosing components. A major service-related problem reported by numerous vendors is the field replacement of functioning equipment. One vendor reported that almost 70% of the circuit boards replaced by engineers in the field were tested as good at repair depots. Self-diagnosing components help to reduce the in-field replacement of functioning equipment, thereby reducing the pipeline transportation, testing, storage, and redistribution costs.

4. REMOTE DIAGNOSTICS

- There will be continuing user pressure to improve hardware remote diagnostics so that:

  - They are easier to apply, particularly in a mixed-vendor environment.

  - They address user concerns about data security.

  - They are more effectively coordinated with other service components such as dispatching, parts distribution, etc.

- INPUT expects that all new mainframe products introduced from now on will have extensive remote diagnostics capabilities built-in. Users will not only accept, but demand remote support as they begin to experience improved hardware response and repair times. Improved service performance resulting from remote support should be used as a marketing tool to advertise the

product and as a profit generator (because users will pay premium service prices to receive improved repair time).

- One crucial issue is whether remote diagnostics will be vendor proprietary or whether there will be a standard diagnostic routine that can test an entire multivendor system. Users clearly want a standard diagnostic routine because that will provide them with some of the benefits of large-system diagnostics (e.g., improved response time, parts availability, etc.) on their peripheral devices.

- Despite the fact that users want standard remote diagnostic packages, INPUT does not expect vendors to give up their competitive advantage in this area. In fact, it is likely that remote support products (software, hardware, and firmware) will be made proprietary when possible, in order to protect the service vendor's market.

- One point that INPUT continues to stress about remote diagnostics (and remote support, in general) is that the vendors must market these service/system capabilities. Many users still resist using remote support because they do not understand the benefits. However, INPUT has found that when users experience the benefits of remote support (e.g., improved response time or increased system availability), they become converts and almost refuse to accept traditional on-site service.

5. OTHER TECHNOLOGY FACTORS AFFECTING THE SERVICE MARKET

- INPUT expects mainframe technological development to continue increasing through the end of the decade. Leading-edge semiconductor technologies currently used in the supercomputer market will find their way into the mainframe market as well. ECL logic circuitry will become increasingly popular, but vendors are also exploring alternative technologies such as CMOS and Gallium Arsenide devices for use in mainframes.

- The choice of semiconductor technology will probably not affect service to any great extent, but it does point out the increasing emphasis on improving system performance. This emphasis has already become critical with the introduction of a new generation of 3380-compatible disk drive storage devices. Several vendors have indicated that they believe this technology was brought to market too soon (i.e., before it was adequately tested) in order to gain market share.

- Increasing competitiveness in the industry will make it much more likely that products will be introduced before adequate testing has been conducted. This could have an adverse effect on service, particularly during the "burn in" periods. Service management must become more involved in service planning during the product development stage in order to improve service responsiveness on new products. Service management involvement is particularly important when radically new technology is applied.

- Another hardware factor affecting the mainframe service market is the growing trend towards multivendor user sites. As this trend grows, users will become much more adamant in demanding an end to "finger pointing" between various service vendors. Users will expect the CPU service vendor to coordinate service on--if not actually service--"foreign" peripherals. Vendors (apart from IBM and possibly DEC) that do not offer this service will operate at a considerable competitive disadvantage.

- Mainframe vendors can take care of two approaches in offering multivendor sevice. First, like National Advanced Systems, the vendor can actually perform the maintenance and become a third-party maintenance company. The second option is the approach followed by Amdahl: carry out problem determination on all facets of the system, but rely on the original manufacturer to actually service any failed component.

- The major advantage to the NAS approach is that this is a very profitable option. The CPU vendor effectively controls the user's site and is more likely

to sell additional services and/or equipment than in an open-competition environment. The main disadvantage to this approach is that it requires extensive training and logistics support.

- The Amdahl approach is advantageous because it results in a high level of user satisfaction without requiring extensive capital resources. However, by only providing problem determination services, Amdahl foregoes extensive revenues--i.e., this option is not nearly so profitable as the NAS alternative discussed above.

B. SMALL-SYSTEMS

1. THE CHANGING STRUCTURE OF SMALL-SYSTEM SUPPORT, 1984-1989

- Service and support of 16-bit minicomputers, small business systems, and now superminicomputers, has traditionally been quite different than support of the larger and more expensive mainframes. Large-system users typically required very extensive service such as on-site engineers and parts, rigid escalation and dispatching procedures, and, in general, a great deal of "hand holding" by the service vendor.

- Initially specializing in scientific and technical markets, small-system vendors had a certain amount of chauvinistic pride in the fact that their users did not require "hand holding" as did the large-system users. Because the small-system vendors did not need to offer extensive services they could charge lower prices for service. When combined with the substantially lower cost of hardware, price becomes a major competitive advantage of small-system vendors.

- In the late 1970s, three factors occurred, almost simultaneously, that proved to have a tremendous impact on small-system service:

- Microcomputers were introduced and began to take market share away from the low end of the minicomputer market.

- The popularity of 32-bit superminicomputers began to take away market share at the upper end of the traditional 16-bit market.

- IBM introduced its successful 4300 series that set a new price/performance standard for mainframes--no longer did minicomputers, as a group, have lower operating costs than mainframes.

- In addition to the extraneous factors impacting the small-system market, minicomputer vendors found that they needed new high-growth markets (other than scientific and technical) to continue high growth rates. The markets that the minicomputer vendors (either themselves or via OEM vendors) went into, such as education, manufacturing, and office automation, required high levels of service and support--levels that some of the vendors were not prepared to offer.

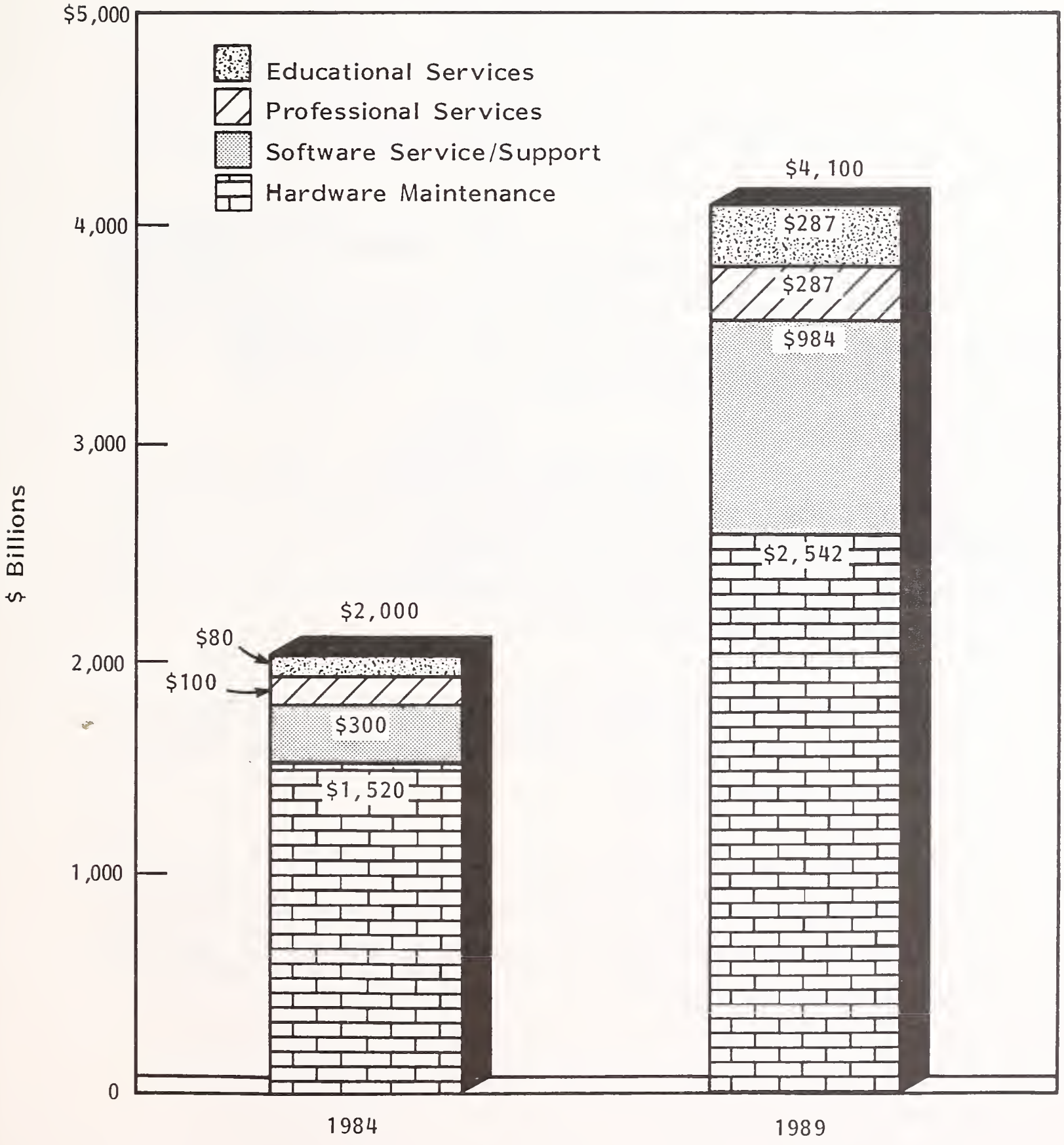
- All of these factors have combined in the mid-1980s to produce a small-system service environment which is dramatically different--both in quality and quantity--than anything existing previously. As Exhibit II-6 demonstrates, small-system service is continuing its evolution. In the future there will be a substantially reduced dependence upon hardware maintenance revenue and a sharp increase in dependence on software maintenance. Both educational and professional services will become more important in direct relation to the small-system vendors' success in entering the systems integration and site-management markets.

- Hardware maintenance revenues will be increasing at a much slower rate (11% average annual growth rate) than other maintenance components such as software support (27% AAGR), professional services (23% AAGR), and educational services (29% AAGR). As a result, hardware maintenance revenues will

EXHIBIT II-6

SMALL-SYSTEM CUSTOMER SERVICES REVENUE SOURCE MIX

1984-1989



become proportionally less important by 1989--when they will represent 62% of all small-system service revenues--than they are today (representing 76% of all service revenues).

- The relative decline in importance of small-system hardware maintenance is the result of several major factors which will be discussed in detail below. It is important to note, however, that hardware maintenance still represents the most substantial incremental revenue increase (over $1 billion) in the small-system service market. Exhibit II-7 demonstrates that even though educational and professional services are growing at over twice the rate of hardware maintenance, their incremental revenue is less than one-fifth that of hardware maintenance.

- Software maintenance and support--as shown in Exhibit II-8--is growing at 27% per year and by 1989 will represent 24% of the total customer service revenues for large system vendors. Growth in software support--also discussed below--will result from three major factors:

  - In order to maintain high service growth rates despite declines in hardware maintenance growth, vendors will be looking for new revenue sources. Since users have consistently--and vocally--demanded improved software support, it seems likely that this will be a potential source of new revenue.

  - Some large-system vendors--who frequently identify trends before they impact the small-system market--have begun to announce sharp increases in software support.

  - Small-system users are particularly dependent on software support. As equipment becomes more complex (e.g., 32-bit superminis) and interrelated (office automation), the opportunity will arise to offer new software support services.

EXHIBIT II-7

SMALL-SYSTEM SERVICE GROWTH BY SECTOR, 1984-1989

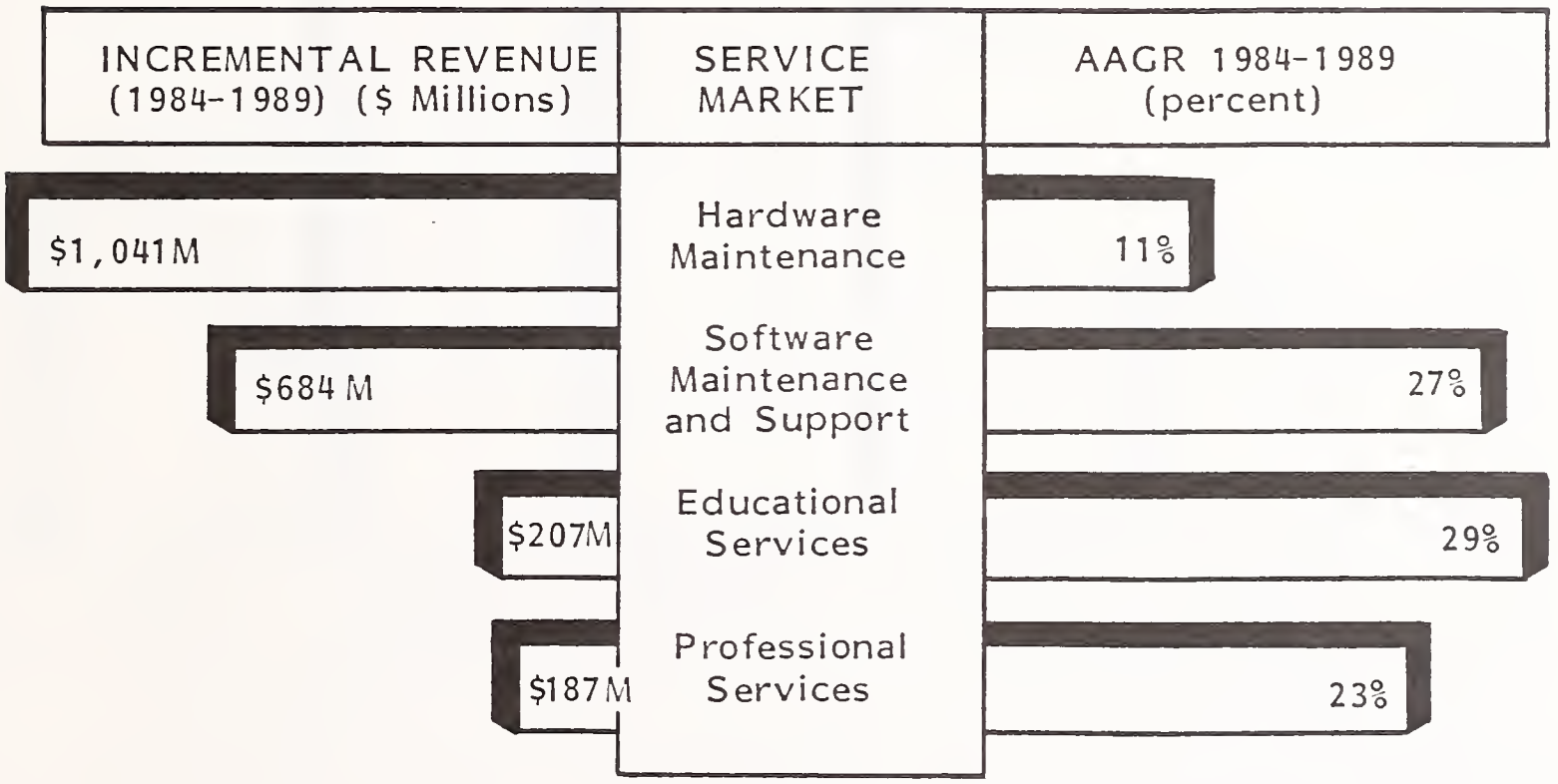
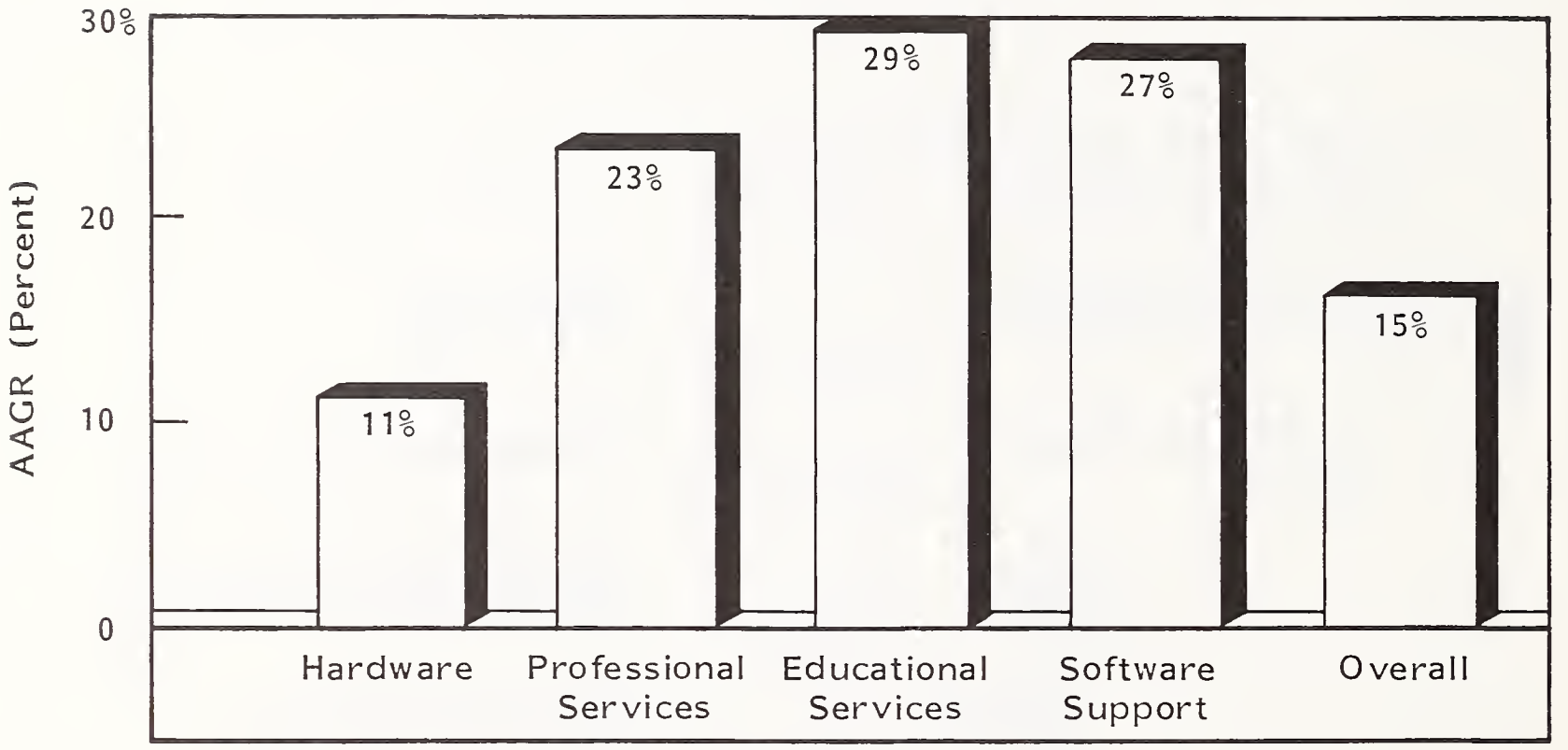


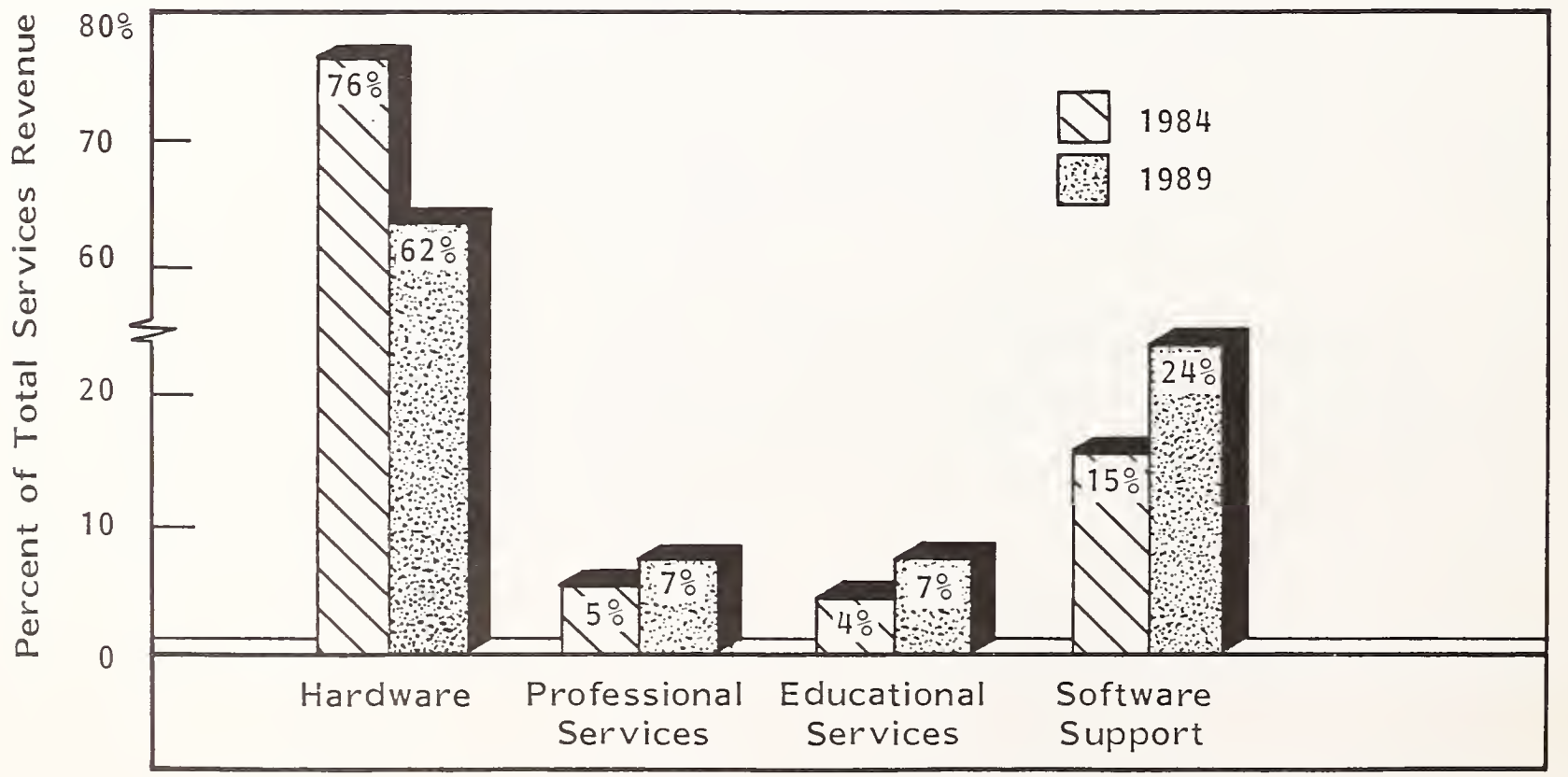
EXHIBIT II-8

SMALL-SYSTEM SERVICE GROWTH, 1984-1989

Average Annual Growth Rate (AAGR)
for Small-System Service Sectors, 1984-1989



Small-System Service Revenue Mix by Sector, 1984-1989



- Exhibit II-9 demonstrates that while users are clearly dissatisfied with software support, documentation, training, and even consulting are problem areas as well. User dissatisfaction with professional and educational services will fuel much of the 20+% growth in these areas. Educational services will be the fastest growing service sector (29% AAGR) as a result of three main factors:

  - As vendors continue their penetration of the commercial market, there will be increasing demand by users for training departmental workers in hardware as well as systems and applications software utilization.

  - Because training materials are easily maintained and do not require frequent updates, educational services provide high profit margins once the initial program development is established.

  - Educational programs are not necessarily tied to just one product. These programs can be spun off as totally separate products, or can be used to support several of the vendors' hardware product lines.

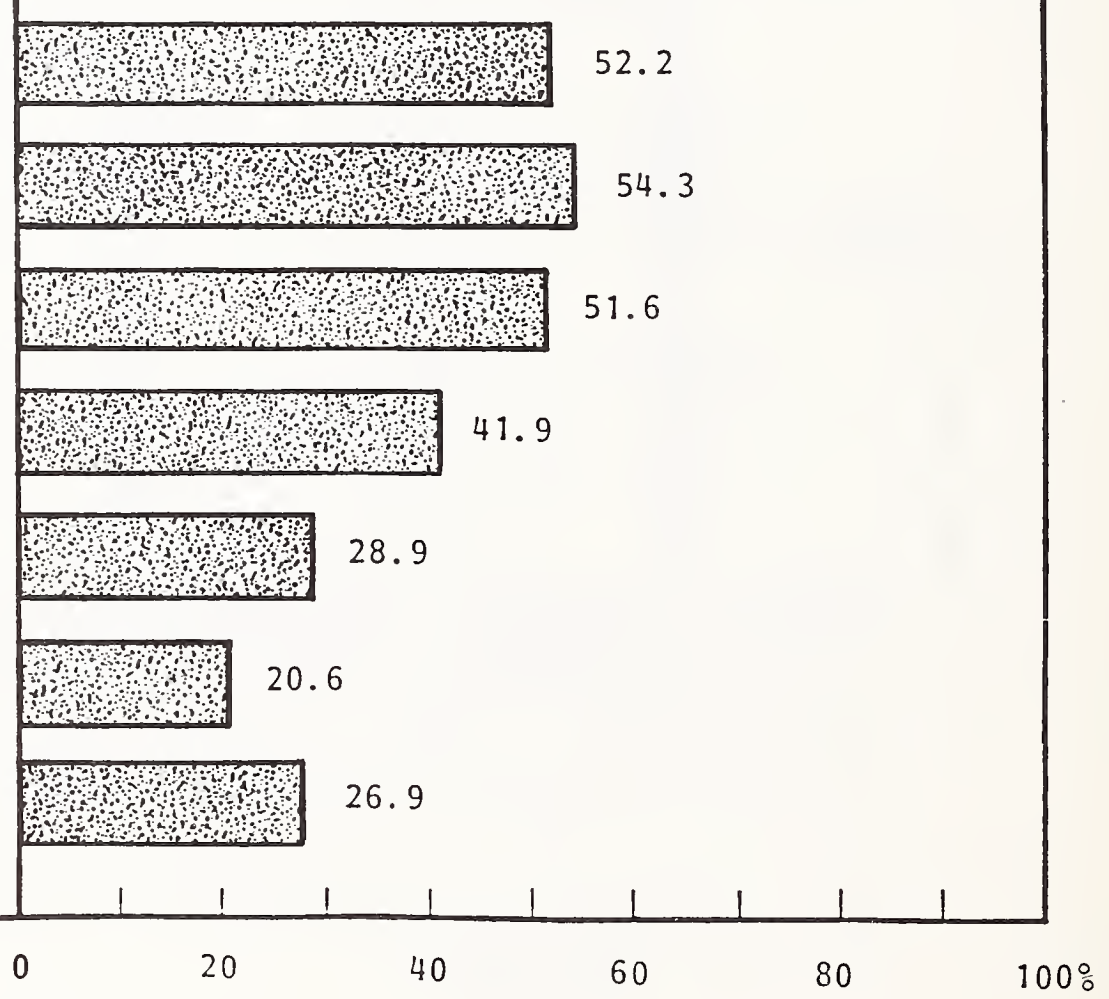
- Professional services, as noted above, will grow primarily as the result of increased user demands for system integration and site-management. Most users in Exhibit II-9 appear to be relatively satisfied with services such as consulting and planning, but at the same time, they do not have a high requirement for these services. INPUT expects small-system users, in particular, to become much more demanding in terms of professional services as their requirements increase.

- Hardware maintenance is and will continue to be for quite some time the number one service requirement for small-system users. As noted above, hardware support currently represents over three-quarters of all small-system service revenue and, even with substantial gains made by software support and other services, hardware maintenance will equal well over 60% of small-system service revenue by 1989.

EXHIBIT II-9

SMALL-SYSTEM USER POSTSALE SERVICE REQUIREMENTS

SERVICE COMPONENT	LEVEL* OF SERVICE REQUIRED BY USER	PERCENT OF USERS DISSATISFIED WITH SERVICE
Hardware Maintenance	8.9	52.2
Software Support	7.2	54.3
Documentation	6.9	51.6
Training	5.8	41.9
Consulting	5.1	28.9
Planning	5.0	20.6
Site Audits	3.6	26.9



* Rating: 1 = Low, 10 = High

- While user attitudes and satisfaction levels with service are affected by a number of different factors, there is a high correlation between user satisfaction with hardware maintenance and satisfaction with overall service. And yet, despite the obvious emphasis users place on hardware maintenance, they are exerting substantial pressure on vendors to lower prices. This pressure is comprised of several very different components.

  - Users feel that as the price of equipment falls, so too should the price of maintenance. This feeling is supported by the fact that service prices are tied directly to equipment prices at time of purchase.

  - As the equipment becomes more reliable, users also expect a reduction in service prices. Typically, users see little or no reason for prices to even remain stable, not to mention increase, when their machines are not breaking down.

- In addition to user expectations of lower service prices, vendors have been encouraged to lower prices as a result of technological advances which have reduced the marginal cost of service. These advances--which were introduced in the late 1970s and early 1980s--were designed primarily to lower the cost of service and increase profitability, not to decrease the price of service. However, under pressure from users and in order to remain competitive, vendors are utilising this cost savings to reduce prices rather than increase profitability.

- The trend towards falling hardware service prices is not unique to the small-system market: prices are falling dramatically in both the mainframe and personal computer market as well. INPUT estimates that hardware maintenance prices for mainframes will fall by over 10% a year through 1987. The decline in personal computer hardware maintenance prices will be even sharper--from an average of $550/year for on-site support in 1982 down to approximately $200/year in 1989, an average annual decline of almost 20%.

- Although the decline in the growth rate of hardware service prices is consistent between the product sectors, there are different causes and reactions for each product type. The reduction in personal computer on-site service, for example, is primarily the result of the sharp decreases in PC equipment prices. Maintenance as a percent of PC purchase price actually only falls from 17% in 1982 to 15% in 1989. Mainframe hardware service prices are falling in reaction to new competitive pressures from industry leader IBM, increased equipment reliability, and improved service technology.

- Small-system hardware service prices are not expected to decline as sharply as either mainframe or PC prices. Exhibit II-10 demonstrates that the overall hardware pricing trend changed from growth to decline in the 1980s. From 1978 through 1983 prices were still increasing, but at a slower and slower rate. Currently, overall hardware prices are declining and will continue to decline--though at varying rates--through the end of the decade.

- It is understandable, considering the unbroken record of service price increases, that some small-system vendors have been slow to react to this fundamental change in service pricing. Many vendors (particularly the small service vendors) have failed to reduce service costs in concert with service price reductions believing that the price reductions are only a temporary aberration. The trend in hardware service prices is, however, not a temporary aberration; prices will continue to fall and vendors that do not compensate with lower hardware service costs will be faced with reduced service profitability.

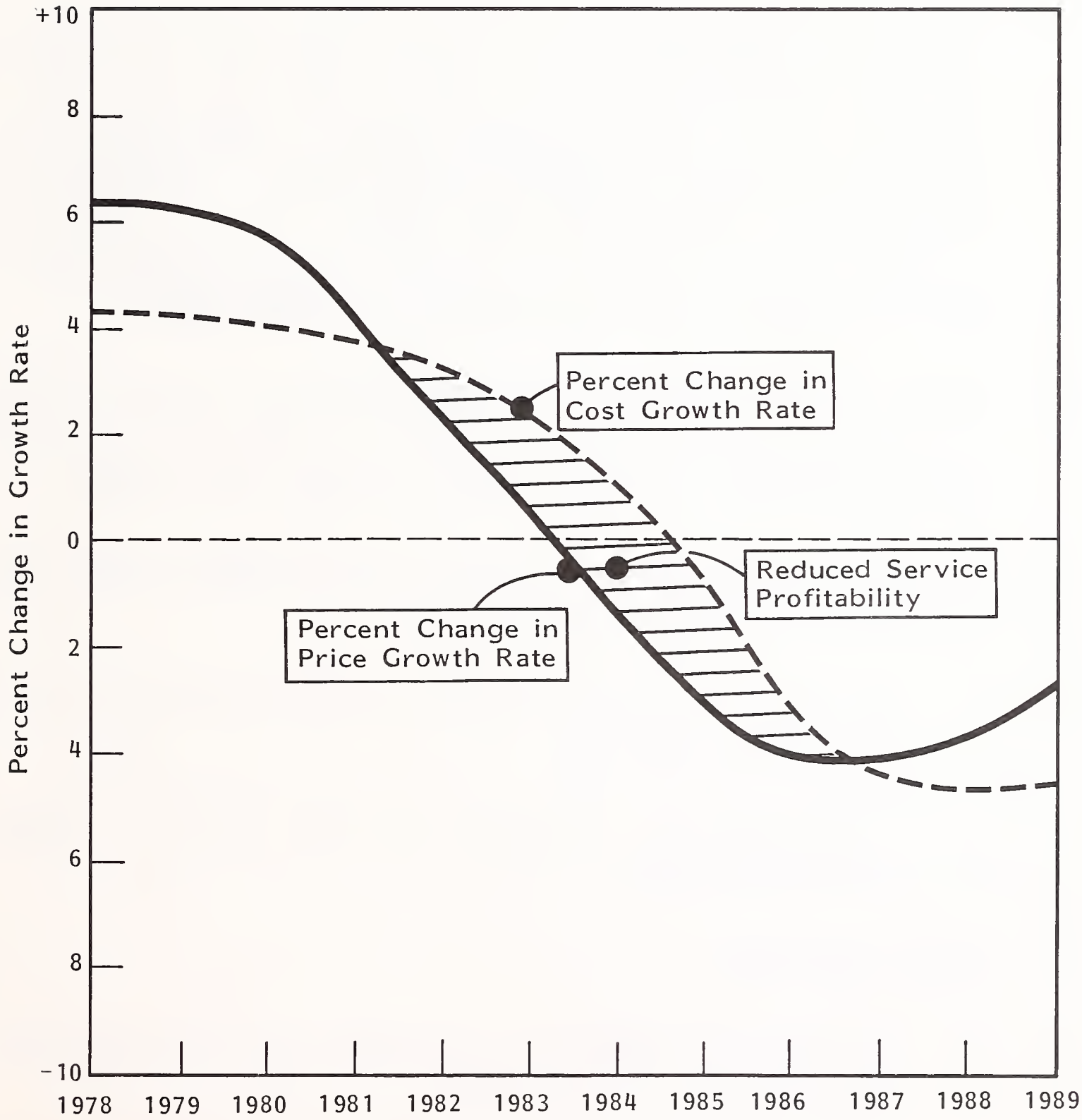
- There are two primary components of the reduction in small-system hardware service prices:

  - A higher level of user sophistication in analysing service costs resulting in increased pressure for lower service prices and increased vendor competition in service pricing.

  - Technological advances that permit vendors to lower costs.

EXHIBIT II-10

SMALL-SYSTEMS HARDWARE SERVICE PRICE
VERSUS COST GROWTH, 1978-1989



- Of the two, technological advances represent the lion's share of hardware service price reductions, but vendors should not discount the importance of remaining service price competitve with regard to their older installed base. Exhibit II-11 demonstrates that while the average service price has declined only slightly (1.3% of purchase price) between 1982 and 1984, the actual savings to the customer is quite substantial considering the cost of inflation and the decline in purchase price of small-system equipment.

- In general, small-system users are becoming much more adept at analysing the long-term cost of equipment (of which service is one of the most important components). Exhibit II-12 demonstrates the type of analysis used by many small-system customers in making equipment selection decisions and the importance of the cost of service in that decision. The exhibit shows that although the initial purchase prices of the equipment may be equal, long-term costs make vendor C much more competitive than vendors A and B.

- As competition for small-system service begins to heat up, it will be more and more necessary to use price as a competitive tool. Vendors must be prepared to react more quickly to user requirements in the area of service pricing.

- By remaining service price competitive on older machines, vendors must consider several factors--on the positive side:

  - Competitive service prices will help to fight off TPM penetration into the vendor's service market.

  - Lower service prices will contribute to a higher level of user satisfaction with the vendor.

- On the negative side:

  - By maintaining artificially low service prices, vendors may not achieve desired levels of service profitability.

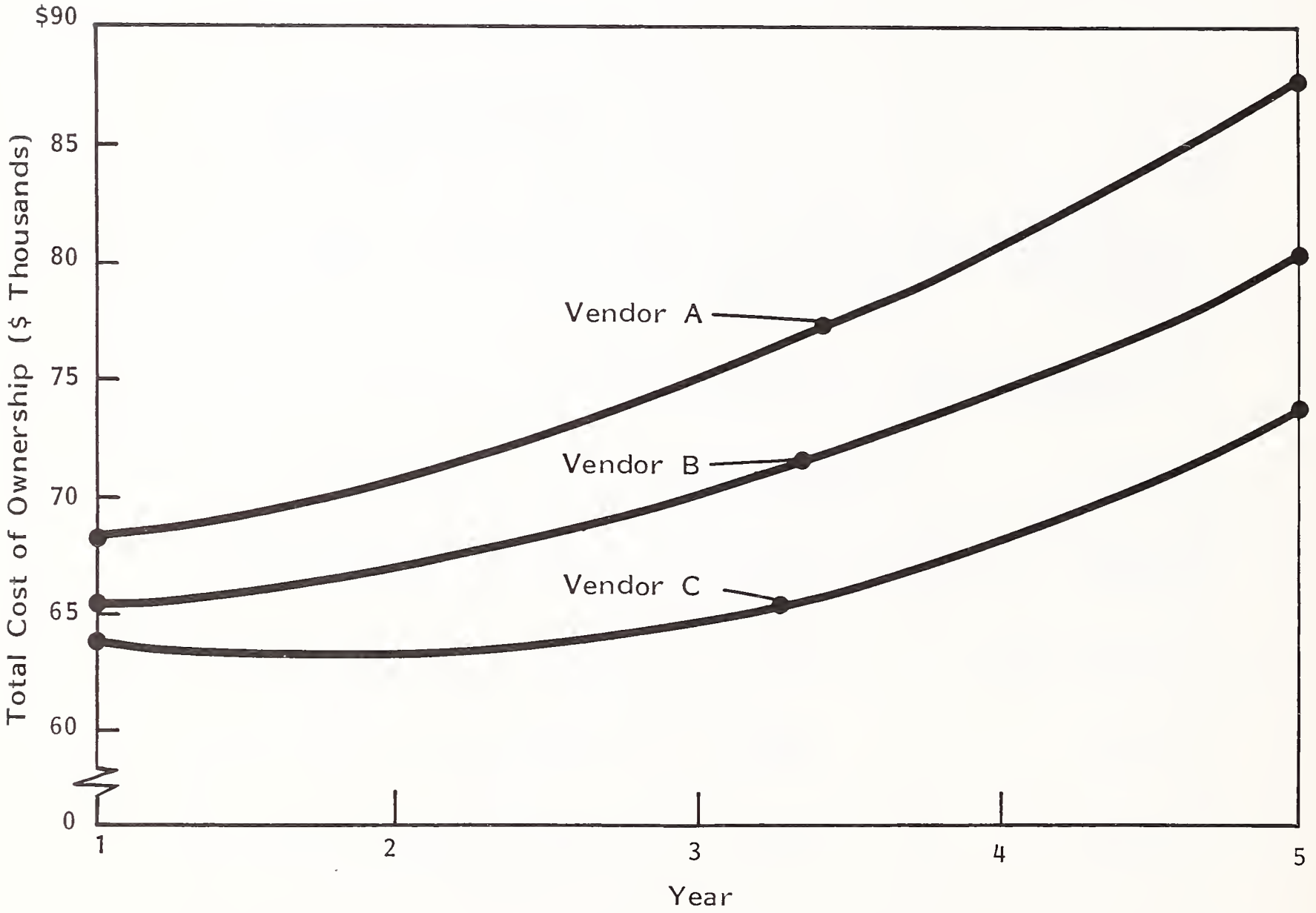
EXHIBIT II-11

SMALL-SYSTEM AVERAGE CONFIGURATION SERVICE PRICE TRENDS

VENDOR	PRODUCT	SERVICE AS PERCENT OF PURCHASE PRICE		
		1982	1984	△
CDC	480-II OME GA	8.2	7.0	(1.2)
Hewlett-Packard	3000/30	10.6	7.0	(3.6)
IBM	System 38/3-21	7.3	7.9	0.6
NCR	8150	12.6	9.7	(2.9)
Perkin Elmer	8/32	9.0	10.5	1.5
Prime	150/II	6.0	6.0	-
Wang	VS-100	12.8	9.1	(3.7)
	Average	9.5	8.2	(1.3)

EXHIBIT II-12

TOTAL COST* OF SMALL-SYSTEM OWNERSHIP



Vendor	Purchase Price ($ Thousands)	Annual Maintenance as a Percent of Purchase Price (Percent)	Cost of Maintenance Over 5 Year Life of the Machine ($ Thousand)	Total Cost ($ Thousands)
A	$63,400	7.8%	$24,600	$88,000
B	62,100	6.2	19,275	81,375
C	62,100	4.0	12,540	74,640

*Total cost includes initial hardware cost and maintenance cost.

- Low service prices on the older installed base will act as a deterrent to new equipment sales, particularly as vendors increase the use of service pricing as a sales feature.

- Ultimately, user and competitive pressure will force vendors to reduce hardware maintenance prices on some machines; however, INPUT does not expect any radical reductions. With the dramatic increase in new small-system product announcements, it is likely that vendors will attempt to placate their users until their next new system is unveiled, at which time the vendor will use service pricing as a tool to encourage user migration from the older to the newer machine.

- As noted above, most decreases in hardware service prices will result from technological advances in services that, in turn, make equipment more reliable and reduce service-related costs. Service-related technology that will impact costs the most in the next five years includes:

  - Remote support.

  - Development of fault-tolerant subsystems.

  - Increased modularisation of systems.

2. REMOTE SUPPORT

- Seventy-seven percent of the small-system vendors interviewed by INPUT currently offer some form of remote support services (RSS) and although the level of support is not as sophisticated as in the large-system environment, small-system vendors have expressed a definite commitment to the development of RSS.

- INPUT expects all major small-system vendors to offer extensive remote support services by 1989. RSS is important to vendors because it reduces on-site service costs while improving overall service performance. Users, on the other hand, are considerably more reserved in their attitudes towards remote support. (Users ranked RSS at 5.6 on a scale of one=unimportant and ten=very important, in a recent survey conducted by INPUT).

- Exhibit II-13 lists the various advantages and disadvantages of remote support as reported by small-system users and vendors.

- The importance of RSS could take on additional significance in the future as it affords the vendor protection from TPM competition. This protection will be based primarily on proprietary software developed for the diagnostic/repair process. Several vendors noted that TPM competition would have to expend substantial sums of R&D capital in order to develop an RSS capability. This provides the vendor a considerable competitive advantage over TPM vendors.

- Sixty-three percent of the small-system vendors interviewed indicated that they expected extensive growth in remote support services by 1989. Vendors typically believe that users will become more involved in the RSS process as a way to improve service. Vendors must realize that--as shown in Exhibit II-13--users may not be ready to accept RSS wholeheartedly.

- One point that INPUT continues to stress about remote diagnostics (and remote support, in general) is that the vendors must market these service/system capabilities. Many users still resist using remote support because they do not understand the benefits. However, INPUT has found that when users experience the benefits of remote support (e.g., improved response time or increased system availability), they become converts and almost refuse to accept traditional on-site service.

EXHIBIT II-13

SMALL-SYSTEM USER AND VENDOR ATTITUDES TOWARDS REMOTE SUPPORT

VENDOR ATTITUDE	
RSS COMPONENT	PERCENT VENDORS
Improves Response Time	63%
Improves Repair Time	75
Increases Uptime	50
Decreases Work Force Levels	25
RSS COMPONENT	PERCENT USERS
Advantages	
Improves Response/Repair Time	46%
Increases Support Levels	26
Convenience	12
Disadvantages	
Reduces Person-to-Person Contact	33
Insufficient Security	31

3. REDUNDANT TECHNOLOGY

- Fault-tolerant and redundant technology has been most readily applied in the small-system environment for several reasons:

  - Small systems are less expensive and therefore are not as great a drain on the user's financial resources as mainframes. (This reason was particularly true in the early 1970s when "redundant system" meant one CPU was unused, acting only as a back-up to the primary CPU.)

  - The market, even today, is not large by mainframe or minicomputer standards.

  - Established mainframe vendors were already committed to standalone technology.

- Despite or perhaps because of the fact that most vendors chose not to enter the fault-tolerant market, companies such as Tandem and Stratus have been growing rapidly in a market that could equal $13 billion by 1987. But more important for the purposes of this report, redundant and fault-tolerant technology will have a tremendous impact on service.

- Some small-system vendors, such as Four Phase, are already applying fault-tolerant and component self-diagnosis technology to their systems with impressive results. The number of functioning circuit boards replaced by field engineers fell by almost 70% and parts testing and inventory costs were reduced as were parts testing and transportation.

- Service on fault-tolerant systems will be considerably different than on conventional systems because of the resident self-diagnostics resulting from redundant component technology. Fault-tolerant systems will usually require less technical training for the FE and more component exchange activities. INPUT expects fault-tolerant systems to lead the market in the application of remote-diagnostic, remote-fix technology.

- As the market for redundant systems and fault-tolerant technology grows, there will be a corresponding decrease in the necessity for unscheduled CPU maintenance. Individual CPU failures will still occur (although with less frequency), but these failures will be unnoticed by users, due to the efficiency of multiprocessor tasking. The vast majority of repairs will be attended to during scheduled maintenance periods.

- A much more efficient allocation of service resources will result from the scheduling of maintenance calls. Currently, this is not possible even on fault-tolerant systems because of the general lack of system reliability. However, as modules of multiprocessors grow, the failure of one CPU will not require immediate service because system performance and data integrity will not be improved.

4. INCREASED SYSTEM MODULARISATION

- The growing trend towards modularisation in the small-system environment will have a significant impact on service in the future. This impact will be felt primarily in two major areas. First, as noted above, individual modules will be self diagnosing. Rather than repairing these modules, vendors will send relatively unskilled technicians to replace parts or the users will replace the parts themselves.

- The second important impact of modularisation will be in the area of compatibility of peripherals without a major product line. DEC, for example, has ensured peripheral compatibility for its PDP and VAS lines of mini- and superminicomputers. This improves the overall system attractiveness to the user and allows for a certain stability when servicing total systems.

- Modularisation leads to--in the eyes of many vendors--increased user participation in maintenance. Stratus Computers, for example, expects their users to become involved in maintenance even though Stratus offers one of the most

sophisticated remote diagnostics and support packages on the market. As noted above, over 40% of small-system vendors expect their users to become more involved in maintenance. Increased modularisations will make this increased involvement possible.

- Overall, INPUT expects small-system hardware maintenance prices to fall as a result of competitive pressure (primarily from DEC and IBM) and from user demands for lower prices. Vendors must not ignore this trend or they will experience an erosion of small-system service profitability. INPUT recommends the following hardware service strategy to compensate for lower service prices.

  - Initiate cost reduction plans particularly with the goal of reducing on-site service expenditures.

  - Segment the user base and understand each group's needs. With the advent of the supermini, many vendors are neglecting their traditional 16-bit minicomputer users. This is a very substantial revenue source that should not be neglected or taken for granted.

  - Redesign hardware service contracts so that they more accurately reflect user needs. In some cases, users are willing to pay additional fees for selected services--vendors should know what those services are.

- Most importantly, small-system vendors must accept the fact that hardware service is becoming more competitive and that, for continued overall service revenue growth, new sources of revenue must be found. One of the most significant sources of small-system service revenue in the future will be software maintenance and support.

C. OFFICE PRODUCTS

- A major factor in the growth in office product service will be the continuing sophistication of the equipment sold. As the equipment becomes more sophisticated, and the applications become more integrated, the user will expect better quality service from vendors.

- Already, the office products market has developed into an office systems market, with products that combine two or more of the fundamental applications of office automation: data processing, word processing, voice processing, image processing, and human interaction. In the personal computer market, application software for word processing is approaching the quality of dedicated word processors. Also, inexpensive modems and electronic mail software are being used to provide telecommunications capabilities to the personal computer user.

- Current word processor systems include improved data processing capabilities, as well as spreadsheet analysis and rudimentary database management applications. Word processor vendors also have recognized the importance of integrating electronic mail and other telecommunication capabilities into their systems.

- Both the personal computer and the word processor markets should continue towards the integration of their respective applications. Exhibit II-14 summarizes the direction taken by personal computer and word processor vendors towards the eventual goal of office automation.

- Of greater importance to the customer service operations of office product vendors is the effect of these product changes on service, particularly how the user views services and how these changes will effect the user's service requirements. Obviously, as office products become more sophisticated and integrated, users will assign a greater value to service, and will begin to

EXHIBIT II-14

OFFICE PRODUCTS BECOMING OFFICE AUTOMATION SYSTEMS

Personal Computer Market

- Increasing in Sophistication
- Expanding Multiuser Capabilities
- Networking, Micro/Mainframe Connections

+

Word Processor Market

- Multifunction, Multitasking
- Networking with Personal Computers

↓

OFFICE AUTOMATION

require more and better service. This has already been demonstrated in the personal computer market; as more businesses dominate the personal computer market, more on-site service is required.

- Moreover, as individual products evolve into networked systems, whether as a LAN or as a micro-to-mainframe (or minicomputer) connection, users will expect even more service, since any individual problem will impact a much larger system. Users of personal computers or workstations connected to a mainframe will expect the same level of service from their vendor as they receive on their mainframe.

- At the same time, user requirements for such postsale support items as consulting, training, and documentation services will dramatically increase as the sophistication and importance of applications run on office systems grows. These services are already major decision factors for word processor users; in the next five years these services will become a major competitive service factor for all office systems.

1. PERSONAL COMPUTERS

- 1984 proved to be an important year for the major participants in the personal computer industry. Unlike 1983, which was marked by the introduction of integrated software products, most notably Lotus 1-2-3, during the past year hardware manufacturers, especially AT&T, Apple, and IBM stole the spotlight with important and innovative products.

- Apple started the ball rolling in January of 1984 by introducing their 128 K version of the Macintosh computer. Built around the powerful and fast Motorola MC 68000 (32-bit) microprocessor and LISA-like windowing technology, the Macintosh was targetted to attract business (and home) users who felt that the IBM PC was either too slow, too difficult to use, or both. With the Motorola's chips' 8 MHZ clockspeed, along with applications that utilized windows, menus with easily to interpreted icons, and mouse-driven input, the

Macintosh proved to be a very popular computer for executives with limited computer experience or keyboard skills.

- In fall of 1984, Apple released the expanded memory (512 K) version of the Macintosh, known as the "Fat Mac." Considering the attraction of integrated software programs, the "Fat Mac" should continue to prove popular with businesses, as it meets a serious need for addressable memory.

- The success of the Macintosh has provided Apple with complete product offerings that can be separated into two main groups: the 8-bit machines--Apple IIe, Apple IIc (a semi-portable computer targeted to the home and educational user; and its 32-bit machines--the Macintosh and the LISA 2 series.

- The advantages of the Macintosh are many. The machine is extremely easy to use, since the user does not have to learn computer systems commands, and the software is designed to take advantage of Apple's screen and mouse technology.

- Apple's use of bit-mapped graphics is also an attractive advantage of the machine, somewhat qualified by the unavailability of colour graphics (apparently to be remedied as early as this year), and the print quality of Apple's two current printers.

- A significant disadvantage of the Macintosh to the business user is its incompatibility with MS-DOS software which happened as a result of Apple's attempt to provide a completely separate alternative to IBM (their advertisements refer to the Mac as the computer "for the rest of us"). Apple hopes to provide enough third-party software to counter this criticism.

- Another disadvantage of the Mac is its lack of diskspace, currently limited to a single 3.5 inch that provides 400 K of storage. Apple is expected to provide a double-density (800 K) drive by 1985, along with hard disks that should alleviate disk storage problems.

- Perhaps the largest rumble in the personal computer industry occurred in 1984 when AT&T "entered the personal computer game" with its PC 6300, an enhanced version of the Olivetti models M-21 and M-24. The arrival of AT&T brings into the marketplace a competitor larger than IBM, with a strong distribution network of independent retailers and its own AT&T Phone Centers, innovative research and development capabilities, and unquestionable communications expertise.

- The PC 6300 supports MS-DOS, but the operating system that AT&T is preparing for its own UNIX-based machine will create a business standard for micro-, mini-, and mainframe equipment. In fact, AT&T has publicly stated that its corporate strategy is to build a UNIX marketplace and then enter it with the best UNIX hardware.

- UNIX has a number of advantages over current operating systems. It can handle large multiuser loads, address a number of different hardware configurations, and grow with the user. Thus, software compatibility will cease to be a major stumbling block to the corporate user.

- The PC 6300 currently supports Microsoft's MS-DOS version 2.11; however, the PC 6300 has a software option known as AT&T's Context Switching, which in effect turns the PC 6300 into a terminal in order to communicate with the UNIX-based 3B minicomputer series. Other AT&T products are available to network the PC 6300 around a central AT&T minicomputer.

- The major gamble for AT&T will be the acceptance (or not) of the UNIX operating system encoded on the processor chip, which is already being worked on by a number of chip manufacturers, including AT&T. The inevitability of this is demonstrated by the large number of independent software vendors (ISVs) already translating software packages for use in the UNIX operating environment.

- 1984 was a dramatic year in both the single and multiuser personal computer industry, as many vendors introduced either their first system (i.e., AT&T, Sperry) or significantly improved systems (i.e., Apple, NCR, Compaq, and Wang). Not surprisingly, the biggest shockwave occurred when Big Blue made its first significant entrance into the multiuser world, with the introduction of the IBM PC AT and its first broadband local area network.

- Throughout 1984, industry experts anticipated the arrival of the AT (given the code name "popcorn") which was expected to be very powerful, with loads of memory, and with a very high price tag. Instead, IBM shook the industry by releasing its first real multiuser machine with a surprisingly low ($3,995 for base model) price tag.

- The actual machine differed from the existing PC products in many ways. The AT utilized an Intel 80286 microprocessor that could initially support up to three users. The base model comes with 256K RAM and 1.2 M-bytes of disk storage. The AT offers six 16-bit expansion slots, which will allow users to add high speed 16-bit expansion RAM cords. Finally the machine is geared up for the soon-to-be available PC Xenix (Microsoft) multiuser, multitasking operating system which should compete with AT&T's UNIX for the multiuser operating system standard.

- The expandability of the AT is impressive, both in terms of sheer memory strength and in its multiuser capabilities. The AT can be expanded to 3 megabytes of RAM storage and 41.2 megabytes of disk storage. To expand the system beyond three users, IBM introduced its IBM PC network, which will let the AT act as a file series for up to 72 PC AT, PCs, PC XTs, or other members of the PC family (excluding the jr.) Thus IBM has provided an important link between its personal computer products and its small minicomputer systems.

- The PC AT provides stiff competition in two marketplaces: at the high-end single-user business computer market, because of its relatively low price tag, and (more significantly) at the multiuser microcomputer market.

- In the multiuser marketplace, the AT should have an impact on sales of existing multiuser vendors, most notably Altos, AT&T, and Tandy (Model 16B). In fact, the competition in this marketplace will help determine whether the AT's Xenix or the AT&T PC 6300's UNIX will become the dominant multiuser operating system in the next few years.

- The second significant announcement that IBM made during 1984 was the introduction of its own PC network, designed to optimize the power of the AT but able to walk around any hard disk-based PC. Even though it is scheduled for shipment in the first quarter of 1985, IBM's network has had immediate impact on an already unsettled marketplace.

- As stated earlier, the network will allow up to 72 PCs in a 1,000 foot radius using broadband coaxial cable. The number of workstations and the distances covered can be increased significantly if broadband amplifiers are added. An added feature of the network is the fact that no one PC needs to act as a dedicated file server.

- A significant concern to users of IBM's PC network, especially as a maintenance and support issue, will be IBM's policy on servicing non-IBM equipment located on the network, especially in the area of output devices, which is one area where IBM has not dominated.

- Other vendors did provide significant new products during the past 12 months. Radio Shack changed its name to parent company's Tandy and introduced its first IBM-compatible, the Model 2000, in December 1983. NCR introduced its IBM-compatible personal computer in May 1984. And Compaq, after entering the PC-compatible marketplace with a portable, added a full line of desktop machines, the Desk Pro Models 1, 2, 3, and 4, which were designed to be, and marketed as, significantly superior machines to the IBM PC.

- Two traditional minicomputer competitors entered the truly portable market in 1984 with innovative lap computers. Hewlett Packard, after receiving mixed reviews (and sales) of its touch screen 150, introduced its nine pound HP 110, a true 16-bit (National Semiconductor) that utilizes CMOS technology (which quickly became the standard for lap and portable computers) and ROM-based software. Then in September, Data General also entered the lap computer marketplace with its nine pound Data General/One, which also added the advantage of IBM-compatibility. The true test of these machines will be their acceptance by those sections of the business community who, due to constant travel, would be attracted to the machine's compactness yet would be willing to make the tradeoffs inherent in their designs.

- Several significant trends have been demonstrated by the personal computer vendors during the past year. First, a number of vendors who have traditionally been associated with other markets have entered the personal computer market. This movement, which can be traced back to IBM's entrance in 1981, followed by Digital Equipment Corporation, Hewlett Packard, and NCR, and most recently Data General and Sperry, demonstrates an equipment vendor strategy that could open potential new larger-systems sales through the sales of personal computers. In this respect, the personal computer has become a necessary product to larger-systems vendors, even if the actual sales of the personal computer are not high.

- Second, some vendors have begun to release products with the goal of alerting the marketplace to their presence. In this respect, companies can release products that, while technologically innovative, do not satisfy a particularly pressing business need. Examples of this strategy are the Data General/One, and the Hewlett Packard 110 and 150, which have introduced nice features (compactness, touch screen) but, at least at the introduction price, do not truly address a business user's needs. What these products do provide is a signal to computer users familiar to these vendors that vendors are coming out with innovative products. This will attract these users to other personal computer products within their product line.

- Third, the issue of standardization has been grudgingly addressed as more vendors release products with some degree of IBM PC-compatibility, with the notable exception of Apple. This is especially true of vendors of personal computers who also manufacture larger systems, as these vendors attempt to curb the flow of IBM PCs into their systems.

2. WORD PROCESSORS

- 1984 proved to be a rebuilding year for many vendors in the word processor market. With much improved word processing software in both the micro- and minicomputer markets, along with the increased desire for total office automation, dedicated word processor sales slowed in 1984. In trying to combat this trend, word processor vendors have begun to emphasize and enhance the integration of data processing capabilities of their systems, while still highlighting the improved word and text processing advantages of their equipment over micro- and minicomputer packages.

- An example of this trend towards multifunction word processors is Wang's OIS 40 (single-user WP) and OIS 50 and 60 (multiuser WPs) which provide the user with spreadsheets, scheduling, and other capabilities not available on their earlier Wang Writer systems. An added feature is compatibility with the recently released Wang Professional (personal) computer.

- NBI, once one of the most successful dedicated word processor vendors, has taken a two-prong approach to the office systems market.

  - First NBI released a microcomputer that not only is IBM-compatible, but can be used with its existing OASys clustered systems.

  - The second step will be the release of its much anticipated product family known as System One, which will include a file server, an Ethernet-based LAN, and workstations known as Integrated Work Stations

(IWS), and which will integrate word processing, graphics, database management, and spreadsheet analysis.

- Lanier followed suit by introducing an IBM-compatible microcomputer and a base-band LAN built around its System 5000, which will offer word processing, electronic mail, graphics, and other rudimentary office automation applications.

- Honeywell, who helped pioneer the multicapability, clustered word processing market with its OAS series, is moving away from the word processing end and into office automation by enhancing its equipment's data, voice, and imaging processing capabilities.

- Honeywell appears to be moving towards this goal through two product lines. Its first new product is the 16-bit Office Management System (OMS), based upon its DPS 6 minicomputer. The system, which runs under Honeywell's GCOS 6 operating systems, has expanded memory supplies, OAS software for word processing, a spelling checker program, communications capabilities including electronic mail, and compatibility with IBM's SNA protocol. An expanded version, with twice the memory and more communications and networking capabilities, is also available.

- The second product, due in early 1985, is a UNIX-based workstation that is designed more for the technical environment. Based upon the Motorola 68000 microprocessor, Honeywell's Microsystem NX will include word processing applications.

- The key trend indicated by word processor vendors is the realization of the decline in the "dedicated" word processor market, especially in the standalone segment. Both microcomputer and minicomputer vendors are making strong inroads into the word processing market, with much improved software products and the additional benefits in data processing and communications capabilities inherent in their machines. Thus, users are seriously questioning

the cost-effectiveness of purchasing machines whose applications can be adequately covered by other equipment (micros and minicomputers) that offer many other capabilities.

- To satisfy the users' desire for integrated word, data, and communications processing, word processor vendors have moved towards becoming office systems vendors, or more precisely office automation companies. In making this move, vendors either had to integrate already existing data processing and communications products into their word processing offering, as was the case with small-systems vendors, such as Wang and Honeywell, or by introducing new products, like microcomputers, and LANs, as was the case with traditional word processor vendors, such as NBI and Lanier.

- In either case, the successful strategy became the introduction of complete office automation solutions. Ironically, the very product that provided the most competition for new word processor sales (the personal computer), has become the product that helped word processor vendors successfully integrate data processing capabilities within a network and move towards office automation.

- It is highly unlikely that today's personal computers will ever completely replace standalone word processor stations. The personal computers are not as physically well laid out for word processing, do not yet approach the functionality of a dedicated word processor, and, perhaps most importanly, do not come with anywhere near the level of training, service, and support that word processor vendors provide. Still, these differences between word processors and personal computers are lessening, thus the need for word processor vendors to move towards incorporating the advantages of the personal computer into their systems.

3. PRINTERS/TERMINALS

- Office product printer vendors have made great strides in bringing out printers that will match the technological improvements that have occurred in the microcomputer market. Daisy wheel printers are now available below the $500 price level, dot matrix printers are becoming faster and of higher resolution, and more exotic forms of print technology, such as ink jet and laser printers, are appearing.

- The printers that arrived amidst the most interest were Hewlett Packard's ink jet printer, known as the Think Jet, and their laser printer, known as the Laser Jet. Utilizing nonimpact technology, these printers provide fast, quiet, and affordable printers to the office user.

- The Think Jet, at $495, competes well against the traditional dot matrix printers that dominate that price range. With a 125 character per second print speed, compatibility with most popular personal computers, including IBM and Apple personal computers, and 50 db sound level, the Think Jet printer should challenge market leaders Epson and Okidata for printer sales.

- The revolutionary aspect of the Think Jet is the low cost of the print head, which at $8, enables HP to offer the Think Jet at a price considerably lower than other ink jet printers. In addition, HP utilizes disposable ink cartridges that can print 500 pages of copy. The combination of print head and ink cartridge can be installed more easily than changing printer ribbons.

- Another benefit provided by the Think Jet is its compact size (11.5 inches by 8 inches by 3.5 inches high) and its light weight (at under six pounds). Its compactness makes it an ideal printer for lap computers, since it comes with a 200-page average battery life.

- A potential problem has been reported with the Think Jet printer print head, which tends to clog after extended periods of nonuse.

- HP's second bombshell was the delivery of its Laser Jet printer in June 1984. Based upon the Canon LBP-CX Laser printer made available to OEMs in 1983, the Laser Jet is very fast (eight pages per minute), very quiet (55 db), and very inexpensive ($3,495). Thus HP has provided the office system user with a printer that has the speed and graphics capabilities of dot matrix printers combined with the print quality capabilities of daisy wheel printers.

- HP's use of the Canon electronic control, which translates the computer's input into laser movement, is the main reason that HP is able to offer the Laser Jet at the $3,495 price, compared with the next least expensive laser printer at four times the price.

- The Laser Jet design also makes it relatively maintenance free. The Laser Jet utilizes disposable ink and tone cartridges (as does the Think Jet) which greatly reduces the amount of cleaning and self maintenance necessary, requiring the brushing of only one exposed printing surface and the changing of cartridges every 3,000 pages.

- At this time, the graphics capabilities of the Laser Jet are rather limited. The only reliable software support for graphics is available for the HP 150 personal computer. This limitation will surely be addressed by software vendors, however.

- Nonimpact printers were not the only ones that saw tremendous price reductions and/or technological advances. The price of daisy wheel printers has dropped considerably as printer vendors attempt to gain ground in the microcomputer marketplace--just two years ago a daisy wheel under $1,000 was news, now they can be purchased for under $500.

- A technological advance that has helped the personal computer reduce systems cost was the introduction of modular interface in the Qume Sprint 11/40 and 11/55, which allows the printer to be compatible with virtually any

computer. This allows users to change or upgrade their computer without requiring a new printer.

- An example of the new, low-price daisy wheel is the Juki 6100, introduced in 1983 for $599, but now available for $495. It has an 18 cps, which is adequate for business applications, and it provides an excellent letter quality printer for both the home and business user. For this reason, Kaypro has started to bundle this printer into its transportable computer system, offering an even greater saving to the purchaser.

- A number of other vendors offer daisy wheel printers that range between $500 and $700, including Bytewriter (the Praxis 35 and 40), Dynax, Inc. (DX-15), NEC (15-LQ), Olympia (Compact RO), Sanyo (PR 5000), Smith Corona, (TP-II Plus), Teletex Communications Corp., (TTX-1014), Televideo Systems Inc. (TP 720), and Transtar (120). All of the above printers print at an acceptable speed (14-16 cps) for most business applications, making them an excellent value for the money.

- NEC Information Systems manufactures a family of letter-quality printers that do not use a daisy wheel design; instead, NEC printers use interchangeable thimble-shaped elements that can be snapped easily in place. In fact, all NEC Spinwriter printers have user-replaceable ribbons, carriages, and any of 70 NEC print thimbles.

- The NEC printers also incorporate interchangeable slide-in interfaces, that allow dealers to stock the basic printers and install the interfaces to suit particular system needs. NEC is planning to offer the slide-in interface modules to end users in order to allow them to interface their printers to any computer system.

- Another feature of the NEC line is the reliability of all the printers in their Spinwriter line, which average 5000 hours between failures (or 50 million characters) and a mean time to repair of less than 30 minutes. This is due in

part to a reliance on servo, stepper and DC motors, which require less moving parts than gear- and pulley-driven printers, and the fact that repairs can be effected by component exchange after which the defective components can be sent to depot repair locations.

- One reason for the drop in daisy wheel printer prices is the improvements offered in traditional dot matrix printers. The print quality of many dot matrix printers is approaching correspondence, even "letter" quality. Dot matrix printers have the additional advantages of speed (they range between 50-400 cps while daisy wheel printers rarely exceed 50 cps) and flexibility, since daisy wheel printers cannot do graphics.

- Methods currently being used by dot matrix printer vendors to bridge the gap between dot matrix and daisy wheel printers include multirowed 24-wire print heads, extremely dense dot matrix configurations, double and triple passing, and more. For example, some dot matrix printers can switch between a 7-by-9 dot matrix for faster printing and a denser 18-by-18 dot matrix for slower printing but a higher quality text.

- One vendor, Compac Microelectronics Inc, utilizes square pins in its print head instead of round ones. The stacked block of print creates a more solid figure than those made from a round-pin print head. While not having the print quality of other technologies, the Compac CP. 80, at $329, provides the microcomputer user with better than average dot matrix print quality.

- Epson America, the leading manufacturer of dot matrix printers, released their first correspondence quality printer, the LQ-1500, in April of 1984. The LQ-1500, utilizing a 24-pin print head to generate a 9-by-17 in draft and 15-by-17 character in letter quality, can print at 200 cps in draft quality mode while still at 67 cps in correspondence quality mode. The LQ-1500 also offers bit-imaged graphics capabilities. At a $1,395 list price, the LQ-1500 can provide the user with an excellent alternative to separate dot matrix and daisy wheel printers.

- The Epson printers are known for their reliability, and the LQ-1500 is no exception. The LQ-1500 print head has a life expectancy of 200 million characters and a mean time between failures of 6,300 hours.

- The terminal's role in the office place is under attack from personal computers, who offer end users all the advantages of "dumb" terminals while adding many additional advantages that the display terminal can't. Nevertheless, it would be highly unlikely that personal computers will completely replace the "dumb" terminals, and, in certain markets, the terminal market can actually be expected to demonstrate high growth rates.

- The terminal market has obviously been affected by the quantum price/performance advancements of the personal computer market. Software programs that provide popular terminal emulation formats (DEC VT-100 or IBM 3270), have helped personal computers replace some terminals in the market.

- An additional assault on the terminal market was signaled in 1983 by IBM, who released two upgraded personal computer products, the IBM 3270/XT and the 3270-PC. These offered not only the connection to the company mainframe, but also the ability to load microcomputer software into seven windows, four of which could be used for mainframe applications.

- Terminal vendors responded to the microcomputer assault by dramatically reducing their prices. In the past, pricing of terminals corresponded fairly closely to the capabilities of the terminals. When personal computers entered the market, the prices of dumb terminals plummeted as users looked at the advantages of personal computers.

- An additional influence on the dramatic drop in terminal pricing has been technological advances in terminal production, such as increased use of standard off-the-shelf LSI functions and replacement of multichip design with CRT-controller chips. Vendors reduced costs by taking advantage of off-shore assembly, where labour rates and overhead are much lower than in the U.S.

4. ANTICIPATED NEW PRODUCTS

- With all of the technological advances that have occurred in the personal computer industry it should come as no surprise that the most eagerly awaited new products are also in this market. The expected arrival of new machines is creating the kind of excitement that stirred the marketplace before the releases of LISA, Macintosh, and PC AT.

- Expected new products from Apple for 1985 include its first laser printer, at an approximate $7,000 list price. In keeping with Apple's reluctance to release "me too" products, this printer is not expected to be IBM-compatible.

- 1985 might also mark the introduction of a colour version of the "fast Mac" (512 K Macintosh). The combination of the laser printer and the colour Macintosh should make for a powerful graphics computer.

- The most persistent, and perhaps feared, product rumour concerns a new IBM PC with proprietary operating system. This should not cause too much of a problem for IBM PC owners, who can expect some sort of compatibility with the new operating system (or at worst a conversion process), but it might cause significant problems for IBM PC-compatible users, who already find that software compatibility is not always assured. The greatest impact of this potential product will obviously hurt the PC-compatible vendors, who will find it exceedingly difficult to produce new compatibles economically, since IBM will no doubt use more proprietary hardware inside its new personal computer.

- The actual size and price of the new machines is still being debated. Some rumours place the new PC between the old PC and the PC/XT. Others feel the new PC will be priced competitively, creating what could become known as the "great fallout", as many vendors (especially of the current compatibles) will not be able to compete either as PC-compatible vendors or as a less expensive alternative to IBM.

- It is certain that the new PC will be a true 16-bit machine, not like the current 8/16-bit machine. This will provide a 16-bit standard at both ends of the price spectrum (with the AT at the upper end).

- IBM is likely to enter the area of the lap-size computer, especially if the HP 110 and Data General One achieve popularity with business users. Considering the failure of the IBM portable, which hasn't achieved popularity due to compatibility problems, any move by IBM into this market will be a considered one, since IBM does not enter a market until the demand for such a product ensures success.

III STRATEGIC RECOMMENDATIONS

A. EFFECTS OF SERVICE TECHNOLOGY DEVELOPMENT ON PRICING

- The dramatic advances made in service technology development and equipment design will have a very substantial effect on the pricing of service. The effect on price will be most apparent in large-scale system service, but will also be felt in smaller systems.

- As systems become more reliable, there will be increased pressure, both from users and competitive vendors to keep maintenance prices down. Successful service vendors will be forced to use new technology, such as remote diagnostics, in order to keep costs down and remain competitive.

- Prices will also be affected by the fact that users are increasingly viewing maintenance as a commodity. As Exhibit III-1 demonstrates, service is moving from a specialized maintenance activity to generalised commodity status because:

  - The hardware is becoming more reliable and this encourages users to think of maintenance as a declining need.

  - When hardware does not need to be repaired, users see fewer on-site repairs, and more component "swaps." As the skill level of the FE decreases, users typically see a reduced need to commit themselves to one particular vendor.

MAINTENANCE BECOMING A COMMODITY

- Sharp Increases in Reliability Encourage Users to Think of Maintenance as a Declining Need.

- Service as "Commodity" Means:

  - Brand Name Loyalty Decreases

  - Service Market Opens to Competition, That in Turn . . .

  - Causes Pressure on the Price of Maintenance

- Equipment Manufacturers/Service Vendors Must:

  - Distance Themselves from "Maintenance Only" Image

  - Develop the Image of a Total Service Company

  - Integrate all Postsale Services

- Increasing competition has also led users to think of service as a commodity. Price-sensitive users started this trend, but as TPM vendors become more aggressive in promoting their cost-effective services, INPUT expects a growing number of large-sytem users to move away from comparisons based on the reputation of the service vendor, towards comparisons based on price of service.

- In order to withstand the pressures to lower service pricing (resulting from maintenance becoming a commodity), vendors must move quickly to distance themselves from a "maintenance only" image. Service vendors should integrate all postsale services into one department (particularly the customer services department) in order to develop an image of a total service company.

- The primary advantage of offering a total package is that it allows the vendor to understand the user's needs and "control" the user's site. However, it is also important to note that the total service vendor will retain name and service product loyalty among users, while strictly hardware maintenance vendors will be forced to do business in an increasingly price-competitive market.

- In addition to site control, a total-support package can contribute to overall service profitability. INPUT has found that even though users are becoming more resistant to hardware service price increases, there is little or no evidence that this trend is being carried over to other postsale support areas. In fact, INPUT has found that users are willing to pay premiums (over and above BMMC) of up to 50% for improved postsales support services like software support. Users have noted, however, a high level of dissatisfaction and a lack of support coordination between departments (i.e., finger-pointing).

- INPUT recommends that service vendors should accommodate user requirements for a single access point for all postsales support services. This type of support organisation will not only improve user satisfaction but will also

increase service revenues and profitability. In addition, by developing an image of a total support vendor, manufacturers will be able to distinguish themselves from the highly competitive, hardware-only service vendors.

- Technological development of service (and service pricing) will also be affected by the active market leadership of IBM.

- IBM has created a new era in system design and support. This new era is characterised by increased competitiveness, both in pricing and new product development. As noted above, the Armonk-based company has invested huge sums of money in new mainframe and peripherals technology. Extensive planning, dating back to the early 1970s, has helped to make IBM's strategy an overwhelming success. Obviously, the success of new product sales will have a major impact on IBM service, but INPUT expects IBM to carry this new competitive spirit into the service environment as well.

- Service pricing has been, and continues to be, one of IBM's major competitive strengths. For example, the basic monthly maintenance (BMMC) on IBM's 4381 L1 is approximately 1.5% of purchase price, compared to 3.2% for Burroughs' comparable A9 mainframe. IBM maintenance on some mainframes is up to $10,000 per month less expensive than competitive models from other mainframe vendors.

- Even though IBM has dominated the service market for the last 20 years, INPUT expects the company to increase competitive pressure on the market substantially in 1985-1989. As Exhibit III-2 demonstrates, IBM will drive the hardware maintenance price umbrella down in order to maintain its position in the market.

- The number one computer manufacturer has been able to squeeze the hardware service market because it has a lower cost structure and is more flexible in taking advantage of service opportunities than other vendors. Considering that IBM controls almost 70% of the installed base of mainframes, for

IBM DRIVING MAINTENANCE PRICE UMBRELLA DOWN

- Target for IBM: Number 1 Competitive Force in Every Market It Participates in. Includes Hardware (Not Total Customer Services Yet)

- Vehicle for Increased Competition Is Dramatic Improvement in IBM Product Reliability

- Will Progressively Impact Ability of Other Equipment Companies to Continue to Generate the Same Level of Profits from Hardware Maintenance as Before: Cost Structure for Most Is Higher and Less Flexible than IBM's

- In Some Cases will Impact Total Profit Picture Because of High Contribution of Maintenance Profitability

INPUT

example, it is easy to see that with higher product densities, greater service economies of scale and improved efficiency is possible. In addition, a continuing flow of new products and a shortened product life cycle have resulted in dramatic improvements in system reliability.

- INPUT believes that IBM will increase pressure on hardware service prices in order to force competitive reactions from other mainframe vendors. The result will be lower profitability for these vendors because they cannot match IBM's cost structure. Currently, IBM is restricting service price decreases to hardware maintenance. This is to be expected since hardware represents the largest service revenue source for most of IBM's competitors.

- It is unlikely that IBM will expand its competitive service pricing policy into areas such as software support, education/training, or professional service. These service sectors are not highly profitable for most mainframe vendors and represent only a small portion of the total service revenue. However, as services like software support become more profitable, mainframe vendors should expect increasing price competition from IBM.

B. INCREASING VENDOR DEPENDENCE ON SERVICE TECHNOLOGY

- As Exhibit III-3 demonstrates, service revenue is becoming an increasingly important component of small-systems vendors bottom-line revenue growth. This dependence on service revenue is not exclusive to small systems but is reflected throughout all of the computer markets. INPUT expects that service revenue will continue to grow in relation to total revenues and that by the late 1980s service could represent up to 30% of total revenues for major computer manufacturers.

- Increased dependence on service revenues is a two-edged sword. On the one hand, vendors will be somewhat less vulnerable to the market changes in

EXHIBIT III-3

SMALL-SYSTEM VENDOR SERVICE REVENUE, 1983

	Total Information Systems Revenue ($ Millions)	Estimated Customer Service Revenue Worldwide ($ Millions)	Customer Service Growth Rate 1982-1983 (Percent)	Customer Service as a Percent of Total Information Services Revenue 1983
Burroughs	$4,390	$1,073	4%	24%
Control Data	3,508	303	6	9
Data General	829	198	23	24
Datapoint	540	75	8	14
DEC	4,272	1,053	29	25
Hewlett-Packard	2,420	460	12	19
Honeywell	1,666	460	2	28
IBM	40,200	7,300	14	18
MDS/Qantel	364	102	16	28
NCR	3,731	1,171	8	31
Perkin-Elmer	214	35	8	16
Prime	517	125	47	24
Tandem	418	58	49	14
Texas Instruments	1,069	160	1	15
Wang	1,538	220	62	14

equipment sales in that service seems to be relatively "recession proof." On the other hand, however, service is a very labour intensive function and is not as responsive to cost-cutting techniques as other areas such as manufacturing. The need to hold down service costs and maintain high levels of service profitability (along with the continuing need to improve systems reliability) will be the prime motivation behind the development of improved service technology.

- Currently, vendors are enjoying, on average, a 17% profit on service as demonstrated in Exhibit III-4. However, as the exhibit shows, almost 50% of all expenses are labour-related. In general, INPUT has found an inverse relationship between labour and service profitability--the higher the level of labour intensiveness, the lower the profitability. Vendors have tried a variety of techniques to lower labour costs including:

  - Expand service options by entering TPM markets in order to use service personnel more efficiently.

  - Laying-off or furloughing service employees.

  - Encouraging "cross-training" in new high-growth service areas such as software maintenance.

- While all of the labour-saving techniques listed above have worked to some extent, none has been as successful in lowering labour expenses as improved service technology. One of the most dramatic examples of improvements made in service technology is in the area of software support. IBM, long a leader in software support, decided in the early 1970s that it simply was not feasible to continue on-site support for its system software customers. In fact, the company was forced into this decision, as there simply were not enough software engineers available to meet the growing need for support. As a result of this decision, an extensive network of remote support centers, diagnostic routines, and ancillary support databases was established. This new

EXHIBIT III-4

AVERAGE EXPENSE AND PROFIT PROFILE FOR CUSTOMER SERVICE ORGANISATIONS

ITEM	1983 PERCENT OF REVENUE
• Labour	37%
- Direct, Hardware	24
- Direct, Software	10
- Remote Support	3
• Management/Supervision	6
• Benefits	6
• Parts	19
- Usage	16
- Inventory Depreciation	3
• Overhead/Miscellaneous	8
• Travel/Other	7
• Net before Tax Profit Margin	17
Total	100%

technology has left IBM with not only reduced support costs, but also with one of the best software support reputations in the industry.

- Centralisation, the key to IBM's software support effort, is also an important component of other new maintenance technologies. In the area of parts supply and logistics, centralisation (or at least regionalisation) has allowed use of much more efficient supply techniques such as "just in time" inventory procedures, and a more coordinated, faster dispatching effort.

- A number of vendors are centralising a variety of support functions in order to improve customer satisfaction. Typically, this will include both maintenance and postsales support activities. Postsales support focusses on such issues as parts and supplies sales, consulting, training, etc. while maintenance would include customer-accessible maintenance databases, and toll-free hotlines.

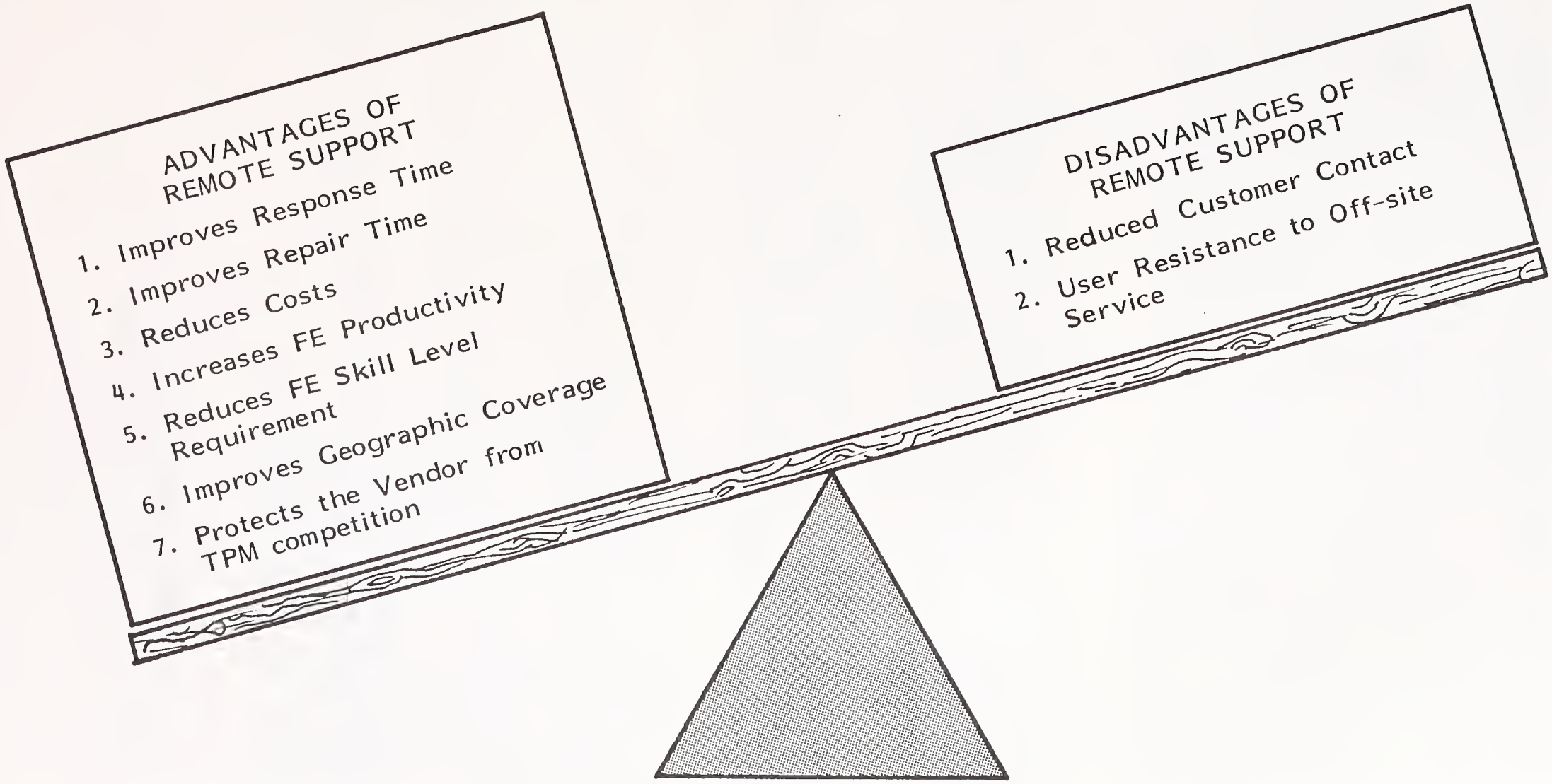
- One of the most successful applications of centralized support technology is remote support services.

- Virtually all of the large-system and small-service vendors said that remote support is essential to improving service and containing maintenance costs. One vendor reported that the largest productivity improvements in the department resulted directly from remote diagnostics and support. That same vendor doubted seriously whether the company could remain in the service business were it not for the efficiency of remote support.

- Vendors report that the advantages of remote support far outweigh the disadvantages, as shown in Exhibit III-5. The primary advantage cited by all the vendors interviewed by INPUT was the ability to improve response time by initiating diagnostics at the time of the initial problem call. DEC, for example, was advertising--as early as 1980--a 15-minute response time as a result of remote support.

EXHIBIT III-5

VENDOR ATTITUDES TOWARDS REMOTE SUPPORT



100% of Vendors
Offer Remote Support

- Improved repair time was also cited as an advantage of remote support. Vendors reported that an increasing number of "fixes" on hardware and software are now being made from remote locations without involving an on-site FE. Amdahl, for example, reports that over 50% of problem calls can now be resolved before the FE arrives and that the company delays FE dispatching to avoid wasted on-site calls. In addition, repairs are expedited because the FE knows what spares to bring along as a result of remote diagnostics. Honeywell operates "Technical Assistance Centers" throughout the U.S., and TAC personnel can dispatch parts when the FE is dispatched, thereby reducing delays in parts availability.

- Reducing no-fault calls, callbacks, and on-site calls in general results in a much more efficient application of the FE's time and thereby increases productivity. In addition, the level of skill required of the FE is reduced because the FE is more easily supported by experts at remote support centers.

- Although remote support offers a number of economic and performance advantages to the service vendor, there are some disadvantages as well. These disadvantages can be divided into two basic areas:

  - Reduced customer contact and hand holding.

  - User resistance to off-site service.

- Clients that require on-site support are nevertheless likely to be alienated by extensive use of remote support. INPUT has interviewed numerous users that regard an on-site FE as a measure of prestige. There are also many users that "grew up" with on-site FEs in their data processing departments. These users expect the vendor to continue on-site support. Finally, there are users that simply require a good deal of hand holding.

- Users with critical applications most frequently fit into this category. If the vendor replaces the on-site FE with remote support, users are likely to

become dissatisfied at the loss of personal contact--even if the support from remote locations is superior to on-site service.

- Vendors recognize that users are concerned with several different issues apart from the technological complexities of remote support. First, users are concerned with the security of their data, which could be violated from unauthorized remote access. Second, many users feel that it is their responsibility to understand at least the problem determination process on their system. These users are typically familiar with traditional diagnostic procedures but feel excluded from the interactive diagnostics between the remote expert and the systems.

- Several vendors expressed the opinion that it is not security that underlies users' reluctance to support remote diagnostics, but rather a misunderstanding of the diagnostics process. Users attempting to conceal their ignorance of remote diagnositcs would therefore not support it. This opinion was confirmed by INPUT interviews among experienced users of remote support. These users typically give high ratings to remote services and many indicate they now prefer remote support to on-site support because of greater parts accessibility and improved escalation procedures.

- There is no question that service vendors are going to increase their reliance on remote support. INPUT estimates that 80% of large systems currently produced are remote-support-compatible; by 1987 this figure will jump to almost 100%. User acceptance of remote support will be the determining factor in the implementation of remote services.

- Dispatching is a second specific area that will be greatly affected by service technology. IBM, again, is a market leader by establishing (in partnership with Motorola) a sophisticated radio communications system that can accommodate both voice and data transmission.

- Most other large- and small-system vendors in the U.S. have established central or regional dispatch centers that are closely tied to "hotline" and parts distribution centers. Many vendors report that customers are initially dissatisfied with centralised dispatching but begin to appreciate the efficiencies of this approach after a short time.

- INPUT believes that vendors must take a more active approach in demonstrating the advantages of centralised dispatching before users will fully appreciate the value of this service. In the long term, however, centralised/automated dispatching will be absolutely necessary if vendors are to use service resources in an efficient manner.

- The final factor increasing vendor dependence on service technology will be user requirements for flexibility. Increased user pressure on the market will be discussed in greater detail below, but there is a growing indication that at the low end of the market, users want to be more involved in alternative forms of maintenance. This would include depot maintenance, some user-initiated repairs, and some user-initiated diagnostics.

- As a consequence of this user pressure (and in order to make machines more reliable), vendors are significantly changing the design of the equipment. More and more, vendors are taking service into consideration at the equipment design stage so that parts are modular and easily diagnosed and replaced. This conforms to user requirements for service flexibility (i.e., the user can perform some maintenance) and it also reduces the vendor's labour costs (FEs spend less time on-site because they can now replace rather than repair individual modules).

C. USER IMPACT ON THE SERVICE MARKET

- Perhaps the most important trend in the service market as a whole is the growing influence users are exerting on the vendor's service-related decisions. The user's influence is growing as a result of two major factors:

  - Increased user sophistication regarding service (resulting from a growing dependence on their computer system).

  - A higher level of competition for users' service business from both the manufacturers and TPM vendors.

- Vendors must accept that the era of the passive service customers is gone and will, in all probability, never return. Users are becoming much more active in driving the market in areas like service pricing, flexible levels of support, response times, etc. While some vendors can take an imperious attitude and ignore user demands, the successful service vendor will attempt to understand the user's needs and design the company's programs around those needs.

- Currently, the most pressing user demand for service improvements are in the area of software support. INPUT recommends that vendors take an aggressive stance on supporting software (primarily system software). As shown in Exhibit III-6, one of the first steps in improving software support is to integrate software maintenance into the Customer Support Program. INPUT is not suggesting that vendors cross-train hardware and software engineers--quite the contrary, INPUT believes that specialisation is the key to profitable service. However, it is important that users perceive that they have a single source of report.

- Although cross-training is not necessary, hardware and software engineers must work together effectively so that users feel that they have one central support group solving problems. Users that suffer from finger-pointing

EXHIBIT III-6

SOFTWARE SUPPORT — VENDORS MUST IMPROVE SERVICE

- Integration of Software Maintenance into Customer Support Program
- Increased Remote Support
- Greater User Involvement in Software Maintenance
- Development of Software Databases for Access by Users
- Combine System and Applications Software Support into One Department; Increase Support for Applications Software
- Consolidation of Software Support into National Service Centers

between hardware and software support departments have, on average, the lowest satisfaction rate of all customers interviewed. Conversely, vendors who have successfully integrated hardware and software support have the highest user ratings in the industry.

- A consolidated software support center--as opposed to regional centers--is recommended because of the efficiencies inherent in one central location. Vendors can provide a variety of different services economically from one location that they may not be able to offer if regional centers were used. For example, one small-system vendor maintains a central support center in the same building with the company's software R&D staff; even the most minor software support problems can have a rapid turnaround time when the original programmer is available.

- Vendors have often neglected another important software support resource--the end user. INPUT has found that many users will not object to becoming involved in their own software support, if they are given the proper support. User-accessible tools, such as databases of software fixes or vendor sponsorship of user group meetings can be very effective in both reducing software support calls and improving user satisfaction with service. Not all users will be interested in this option, but if the vendor segments the user base properly, substantial opportunities will come from encouraging some self-maintenance of system software.

- Hardware maintenance is an area in which users expect substantial improvements in the future. Exhibit III-7 lists what INPUT believes are the most important components of a successful adjustment in hardware maintenance. Essentially, the exhibit emphasises that vendors must become more efficient in delivering hardware maintenance (i.e., cut down on on-site repairs, increase inventory turnover, etc.) while at the same time becoming more flexible in meeting user needs. Low-demand services (e.g., annual site audits) should be unbundled from the basic service contract so that only those users that require the service will pay for it.

EXHIBIT III-7

HARDWARE MAINTENANCE - INCREASE EFFICIENCY AND MAINTAIN FLEXIBILITY

- Centralise Dispatching, Logistics Operations, and Remote Support
- Decrease Spare Parts Distribution Centers
- Increase Remote Support
- Expand Menu of Service Products
- Enhance Contrast Flexibility
- Unbundle Low-Demand Services

About INPUT

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

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs.

Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

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

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

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