U.S. TURNKEY SYSTEMS MARKETS 1987 - 1992

INPUT

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U.S. Turnkey Systems Market, 1987-1992

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Abstract

This annual report provides insight, analysis and expenditures forecasts for the U.S. turnkey systems market from 1987 through 1992. Market size and growth rates are provided for 14 industry-specific market segments as well as for six cross-industry market segments.

The issues, trends, and events driving the market are presented and analyzed. Market factors are discussed to provide a basis for the turnkey business and its future growth and direction. Business and market strategy suggestions are provided.

The report contains 37 pages and 16 exhibits. It is part of a four-volume series describing the information services market and its mode of delivery. The three other volumes are: *U.S. Processing/Network Services, 1987-1992*; *U.S. Software Products, 1987-1992*; and *U.S. Professional Services, 1987-1992*.

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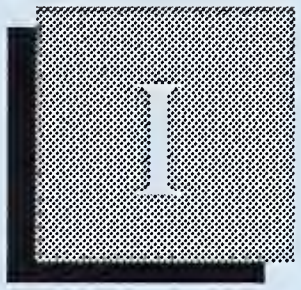


Introduction

Introduction

This report is produced as part of INPUT's Market Analysis and Planning Service program for the information services industry. This report is one of four annual reports on the delivery modes that comprise the information services industry. The others are software products, processing/ network services and professional services.

A

Purpose of Report

The report investigates the turnkey systems mode of delivery for the information services market.

Vendors in the information services market will benefit from this report in the following ways:

- By identifying possible new markets and product opportunities to complement existing strategies.
- By assessing the risk and investment risk/exposure.
- By assisting in the business planning function to determine overall business perspective.
- By providing information on the issues, trends, and developments shaping the turnkey systems market.

B

Scope

The report reviews the U.S. market for events, issues, and developments that impact the turnkey systems market. User expenditures provided are those that are non-captive. Non-captive expenditures are those made to organizations outside of the company making expenditures and available to any and all competitive vendors.

The report is organized into five chapters as follows:

- Chapter II is an Executive Summary of the material presented in the entire report. It is designed for the executive or individual that requires the major/significant material yet does not have the time to read the entire report.

- Chapter III presents the five-year market forecast (i.e. 1987-1992) and analyzes the turnkey systems market in terms of the industry-specific and cross-industry sectors.

- Chapter IV provides a discussion of events, trends, and issues that are driving the market.

- Chapter V looks at the competitive structure of the turnkey systems marketplace and provides rankings of the leading vendors in size and in growth.

- Appendix A contains the INPUT definitions for terms used in the report.

- Appendix B contains the market forecast data base, showing market sizes and growth rates, used in the report.

Included in the report as participants in the turnkey systems market are the numerous value-added resellers (VARs) that sell and market hardware/software systems to provide solutions to the end user. The VAR organizations generally are selling industry-specific application solutions.

In Exhibit I-1 the structure of the software products market is shown. The portion of the chart under applications software is the area in which turnkey vendors provide their solutions.

C Methodology

At INPUT the forecasting process occurs on a continuous basis. There are two basic approaches INPUT has used over the years to analyze the information services industry. These approaches are:

- Using specific interviews of users and vendors of turnkey systems in each of the industries surveyed. This provides a direct interaction and dialogue that is key to an accurate understanding of issues, trends, needs, and developments shaping the markets.

- Using an ongoing monitoring approach of all turnkey systems vendors with annual revenue of more than $10 million. In addition, sampling of smaller firms provides an estimate of the size and growth of that portion of the industry, i.e. the smaller-firm contribution.

EXHIBIT I-1

SOFTWARE MARKET STRUCTURE

Applications Software

Cross-Industry

Accounting
- Accounts Payable
- Accounts Receivable
- Fixed Assets
- General Ledger
- Purchasing
- Other

Human Resources
- Benefits
- Payroll
- Personnel
- Other

Education & Training
- Authoring Languages
- Computer-Assisted Instruction
- Other

Industry Specific
- Banking & Finance
- Discrete Manufacturing
- Distribution (Retail & Wholesale)
- Education
- Federal Government
- Insurance
- Medical
- Process Manufacturing
- Services
- State & Local Government
- Telecommunications
- Transportation
- Utilities
- Other

Planning & Analysis
- Budgeting
- Financial Planning
- Forecasting
- Integrated Analysis Systems
- Modeling
- Spreadsheet Systems
- Project Management
- Other

Engineering & Scientific
- Chemical/Biological
- Electrical
- Mechanical
- Piping
- Nuclear
- Statistics/Operations Research
- Structural Analysis
- Other

Other Cross-Industry
- Business Graphics
- Sales, Marketing & Distribution
- Word Processing
- Desktop Managers
- Other

As these two approaches complement each other INPUT researchers are able to quantify the market size and growth and generate the forecasts included within the report. Industry trends, directions, and events are monitored and discussed with the vendors. Technology, governmental regulatory processes, standards, and other industry factors contribute to the forecast parameters and dimension.

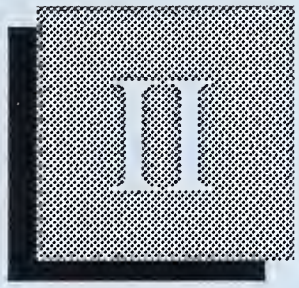
Forecast numbers are presented in current dollars (i.e. 1991 market sizes are in 1991 dollars). Inflation factors for the years 1987 through 1992 are shown in Exhibit I-2.

EXHIBIT I-2

INPUT INFLATION ASSUMPTIONS

YEAR	INFLATION RATE (Percent)	NOMINAL GNP (Percent)	REAL GNP (Percent)
1987	3.3	6.1	2.8
1988	4.1	7.5	3.4
1989	3.0	6.9	3.8
1990	3.0	6.6	3.6
1991	2.0	5.5	3.5
1992	2.0	5.4	3.4

Source: Department of Commerce



Executive Overview

II

Executive Overview

A

Turnkey Systems Market–Slowest Growing Delivery Mode

The turnkey systems market is the slowest growing of the four delivery modes that INPUT monitors. It will be growing from $8.6 billion in 1987 to $13.3 billion in 1992, representing a 9% average annual growth rate.

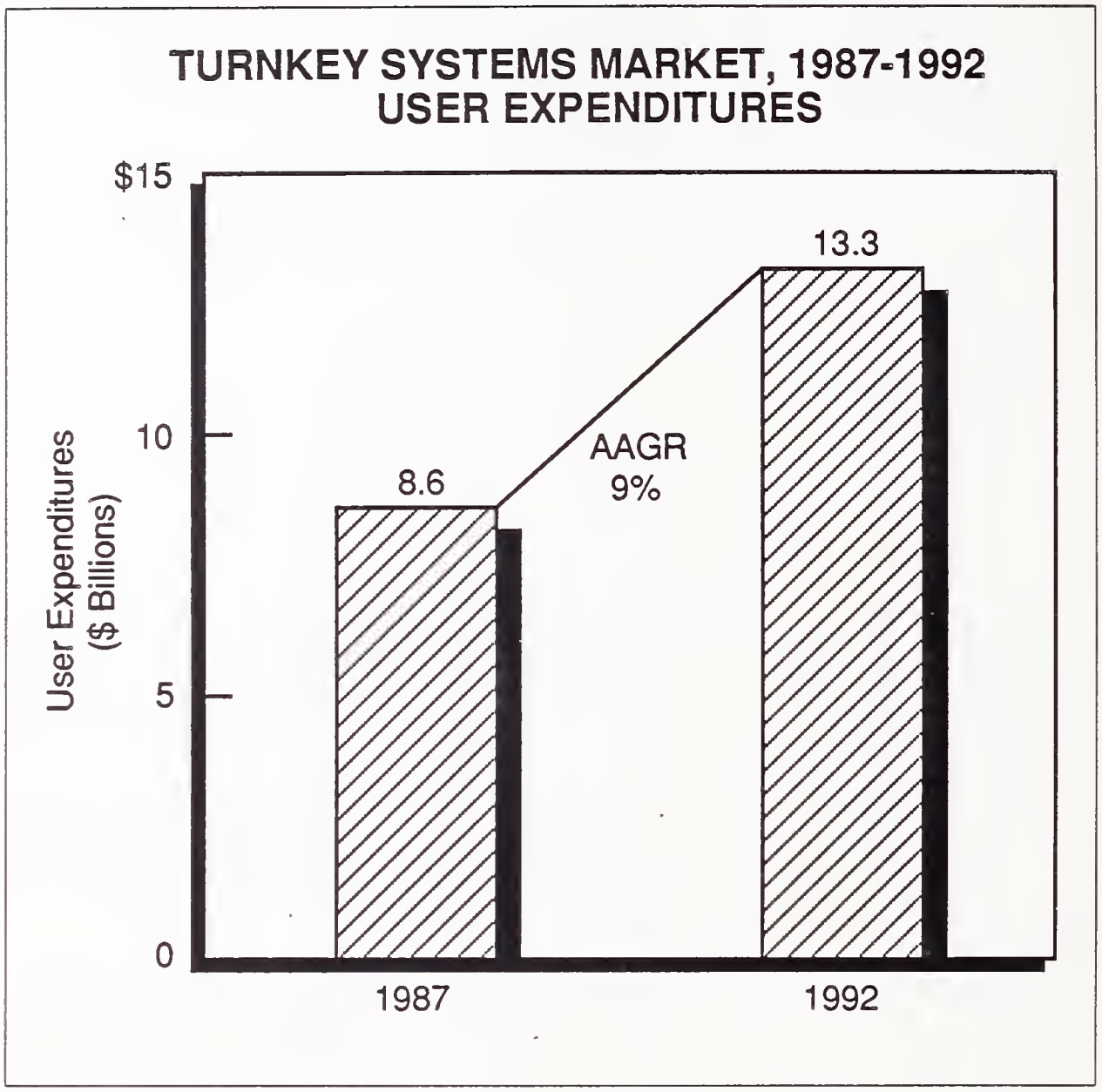
While this growth is the slowest growth when compared to processing/ network services, software products, and professional services, it should be noted that it still represents more than twice the growth rate of the U.S. gross national product.

The growth being forecast is down considerably from previous INPUT forecasts due in large measure to the competitive pressures and alternative solutions that will be offered that essentially cut out the turnkey systems vendor/VAR. Exhibit II-1 shows the market sizing in graphic form.

Another factor entering into the slower growth rate is the preponderance of hardware solutions that are becoming less and less expensive. The price/performance of workstations and microcomputers is becoming such that many more systems need to be sold to realize the previous year's revenues.

Turnkey systems solutions and VAR activity is still an important factor in the "automation" of the masses of the business world. The relationship of a VAR to a small business enterprise will not be any different than the services provided by an accountant or lawyer to the small business enterprise. VARs will become a service to the organization, in effect being an "hourly for hire" data processing environment for the small business.

EXHIBIT II-1



B

Turnkey Systems Vendor Focus

The turnkey systems environment has been predicated on an application system consisting of hardware and software solving a business problem. Based on the technology changes, the solutions will still be complex if not even more complex. What will happen is the hardware portion of the system will become less valuable and less a profit margin consideration. This will cause the turnkey vendor to move toward proprietary hardware (much like Intergraph has done) or move toward being more like a software vendor.

Currently a few major application areas account for the majority of the successful turnkey systems VAR participants. These applications are CAD/CAM/CAE, legal/administrative, banking/finance, and medical. Other areas are MRP and construction.

Some unique situations have brought success (or seem to be on the verge). Companies like Convergent and Ultimate have been performing successfully in the past year and will act as a linchpin for continued

success. Convergent bought itself into the turnkey systems market and created a hardware pull-through for its hardware systems. Ultimate has had major success with a non-standard O/S — the PICK O/S, which proves the small end user cares not what the operating system is if it means his or her business problem is solved.

Exhibit II-2 emphasizes the focus issues.

EXHIBIT II-2

TURNKEY SYSTEM VENDOR FOCUS

- More Focus and Purpose Required
- VARs Need to Solve Business Problems
- Special Circumstances Exist Providing Vertical Opportunity for Hardware Vendors

C

Custom and Service–Important Parameters

As the systems become more and more standard and features/functions less important to the sale process, the turnkey vendor/VAR will have to develop added value in the complementary parts of the sale. These will become important parameters for continued success as a turnkey systems vendor. The new areas of value-added will be in performing more service and in doing more consulting concerning the pre- and post-sale environments.

Turnkey systems providers and VARs will provide a more service-oriented function and over time will become an organization well-suited to support clients that are not in a position to justify their own internal IS group, yet need the benefits of automation.

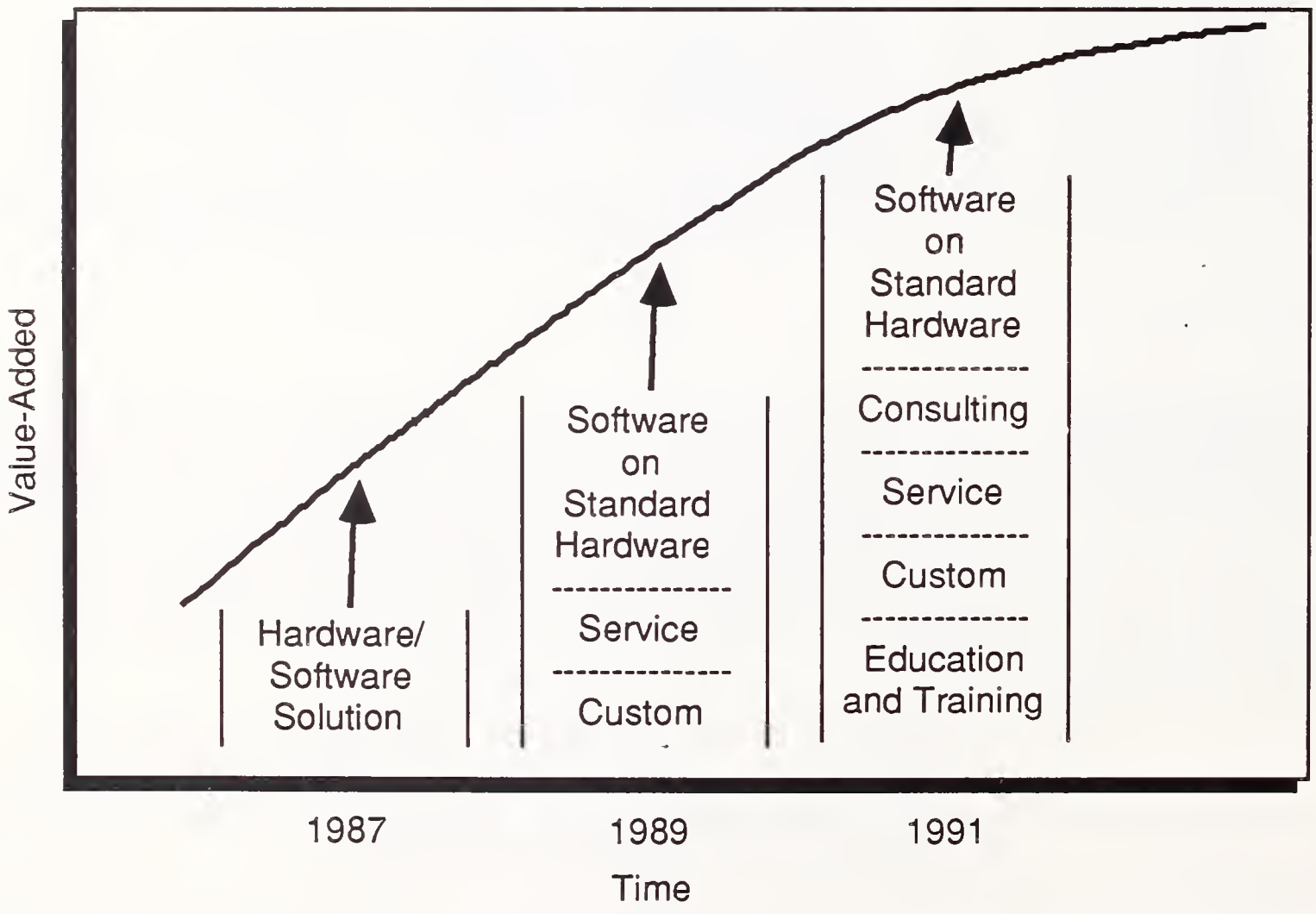
VARs and turnkey systems providers today obtain the majority of their success through their expertise in certain well-defined application or industry areas where they can relate to the specific needs of the client organization. By having this specific knowledge and industry awareness, a quicker bond and trust relationship is formed.

Over time, as shown in Exhibit II-3, the VAR organization will need to provide a multitude of services ranging from consulting, applications solutions, and hardware selection (on what will become standard platforms), to application customization, education and training, and hardware/software service and support.

The enterprising VAR and turnkey systems provider will be forced into providing these comprehensive services because the application sophistication will require it, because the VAR business dynamics will require alternative and additional sources of revenue production, and because the VAR clients will insist on these services.

EXHIBIT II-3

VALUE-ADDED SERVICES IN THE FUTURE



D

Recommendations for Future Success

The VARs and turnkey system vendors of today have an advantage for continued success, based on the installed base they already have in place. The mining of this installed base for new application system add-ons can be very lucrative and a lot easier than finding new business. By any measurement, selling into the installed base should be more profitable as well.

VARs/turnkey vendors need to develop add-ons by constantly looking at the new technologies that are coming on stream to see if there is a complementary nature. For example, the use of laser printer output to provide enhanced quality or quiet output is fairly commonplace today. But two or three years ago it was on the leading edge and those VARs that adopted or implemented laser printers not only had a differentiation point for new business but a reason to go back to the installed base for additional revenue.

VARs must continue to do what they do best, which is focus on an application or industry-specific niche that enhances and fits their expertise. VARs will need to become more aware of the business services they need to provide to continue the business relationship. The adding of new services in consulting, support, education, and training will provide an opportunity for increased revenue and more than make up for the possible loss of hardware revenue contribution.

VARs and turnkey vendors will need to discover the "standard" hardware platforms and take a product life-cycle view. There is a multitude of hardware systems that the VAR must wade through to make sure it can support the VAR's application needs as well as the end user's expectations. Hardware with perceived long life cycles will have more add-on potential for a longer period of time, thereby adding more revenue potential for the installed base. Currently the hardware part of the turnkey solution is mostly transparent to the user. INPUT believes this will change as the users become more educated and knowledgeable.

VARs must provide emphasis on service and not be reluctant to do more for the customer. Some large turnkey system providers have as a business goal the desire to become (in effect) the data processing arm of the client through continued development of the relationship. Becoming service-oriented should be part of all turnkey systems vendors' and VARs' business strategy.

Exhibit II-4 summarizes the INPUT recommendations.

EXHIBIT II-4

RECOMMENDATIONS

- "Mine" the Installed Base
- Develop New Services
- Focus on Industry-Specific Niche
- Discover Hardware Platforms with Life-Cycle View
- Develop Service Orientation
- Initiate Consulting Capabilities

Market Size and Forecast

III

Market Size and Forecast

A

Market Forecast

1. Five-Year Outlook: 1987-1992

The turnkey systems market will increase at an annual growth rate of 9% to become a $13.3 billion opportunity by 1992. This is an increase from $8.6 billion in 1987, which is a growth of 11% from 1986. These values are substantially below the forecast INPUT made in 1985 wherein the market was forecast to grow at 19% to be at $17.4 billion in 1990. The downsizing from the previous forecast will be discussed at great length throughout this report. Exhibit III-1 depicts the overall market sizing.

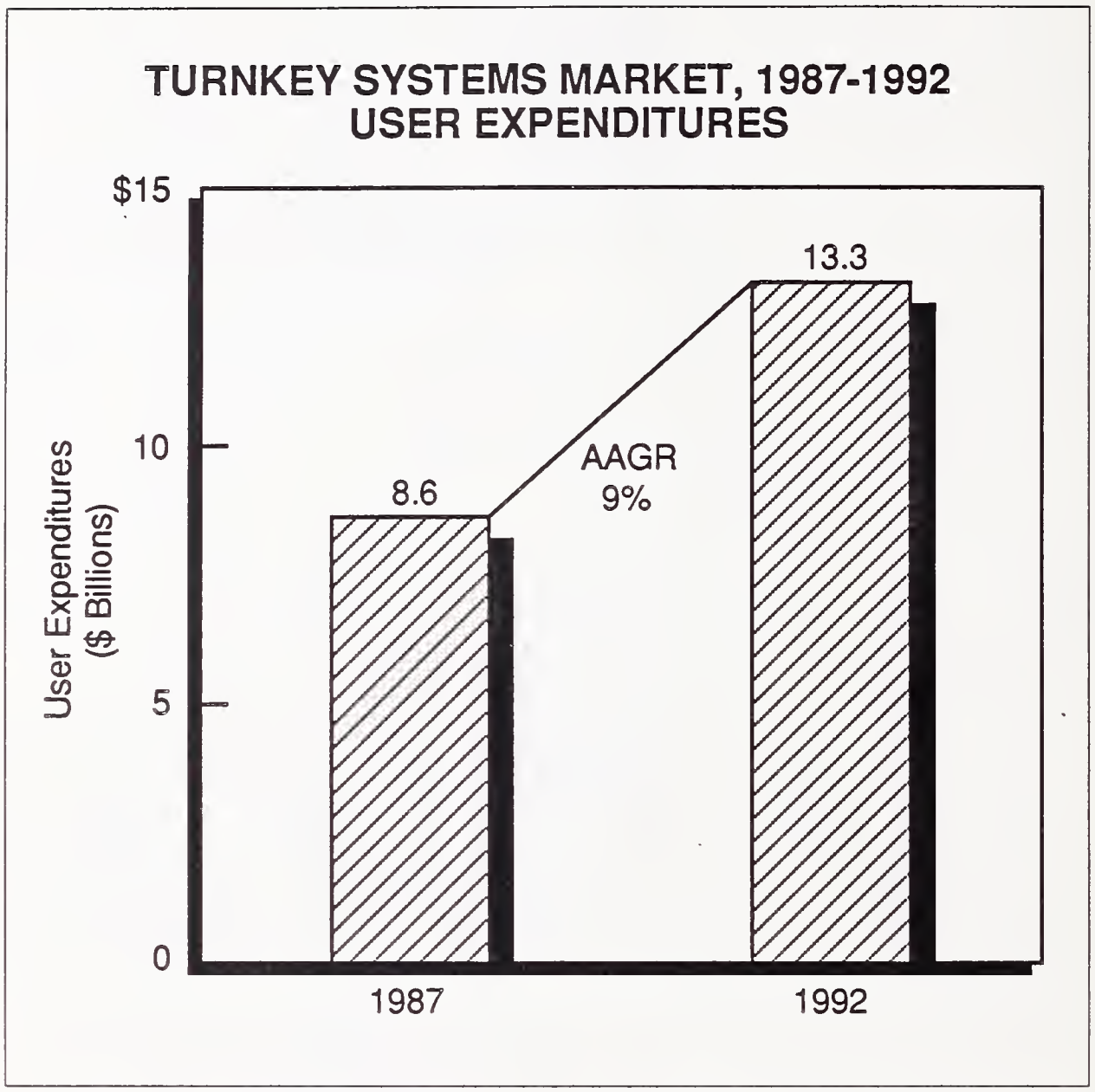
The turnkey systems market has become a very tough sellers' market as alternatives and competitors and application saturation have slowed down the originally forecasted growth.

Turnkey system suppliers and VARs have made an important contribution to assisting the ultimate users in obtaining viable automation capabilities. The fundamental needs are still there and the difficulty in the turnkey market is in the added value the turnkey vendor or VAR is offering.

Thus there will be growth of 9% over the forecast horizon. However, the providers of the solutions may not be providing it through the traditional turnkey approach. What has slowed down the growth is the factor that the hardware platforms are becoming relatively standard and easy to obtain and/or more available from the manufacturer itself. This makes the hardware portion of the turnkey solution less attractive (coming from the turnkey vendor) to the user and causes the business viability of handling hardware by the VAR to be less attractive.

INPUT believes the opportunities remaining for turnkey vendors and VARs are those that provide the maximum leverage of the industry

EXHIBIT III-1



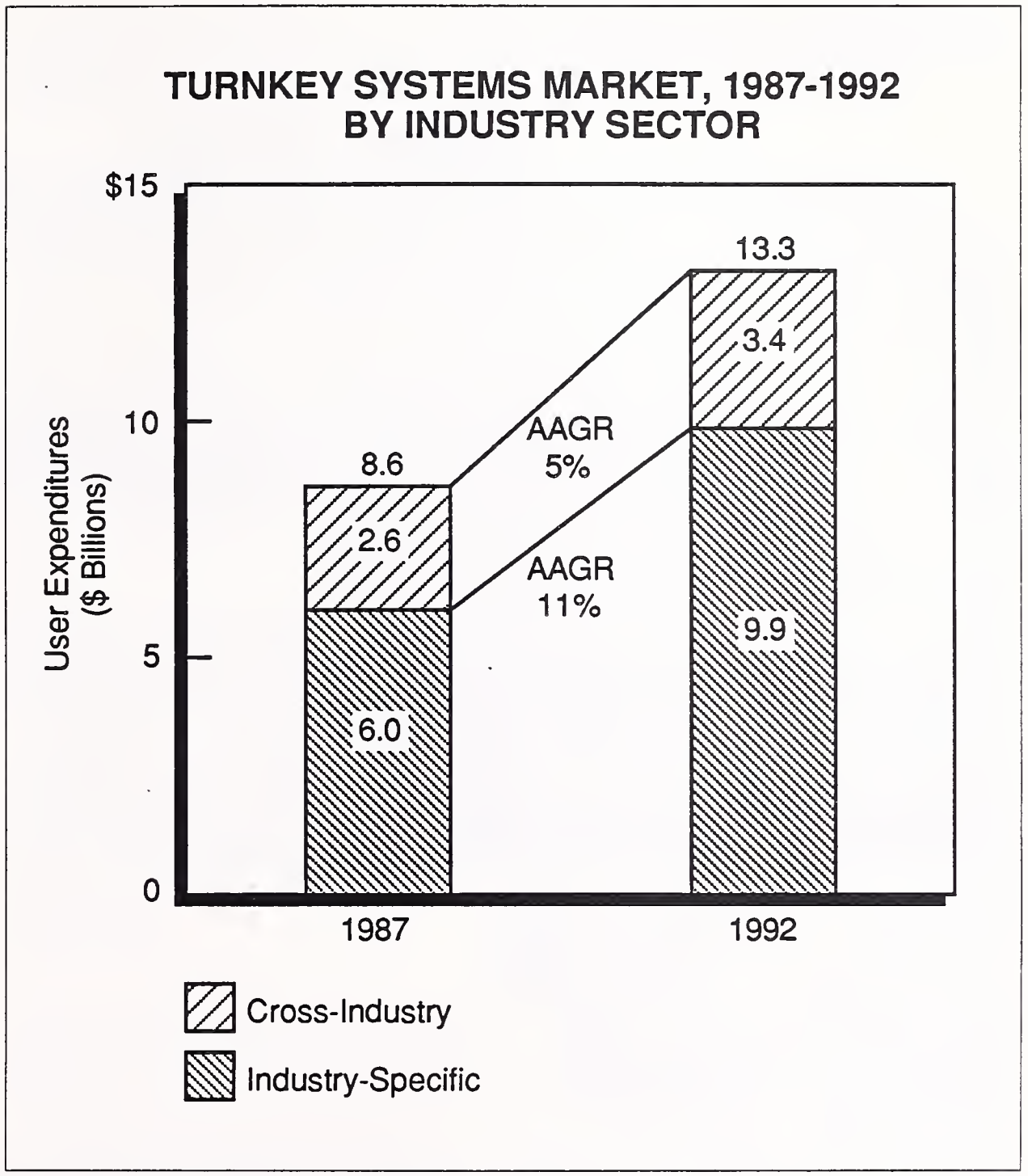
knowledge the turnkey vendor and VAR possesses, as well as takes advantage of the proximity factor the vendor can provide the end user.

2. Industry-Specific versus Cross-Industry

Exhibit III-2 shows the industry-specific versus cross-industry turnkey systems segmentation.

In 1987 industry-specific turnkey systems represent 69% of all the turnkey systems being marketed. Industry-specific expenditures will grow at an average annual growth of 11% to become 74% of the user expenditures for turnkey systems in 1992.

EXHIBIT III-2

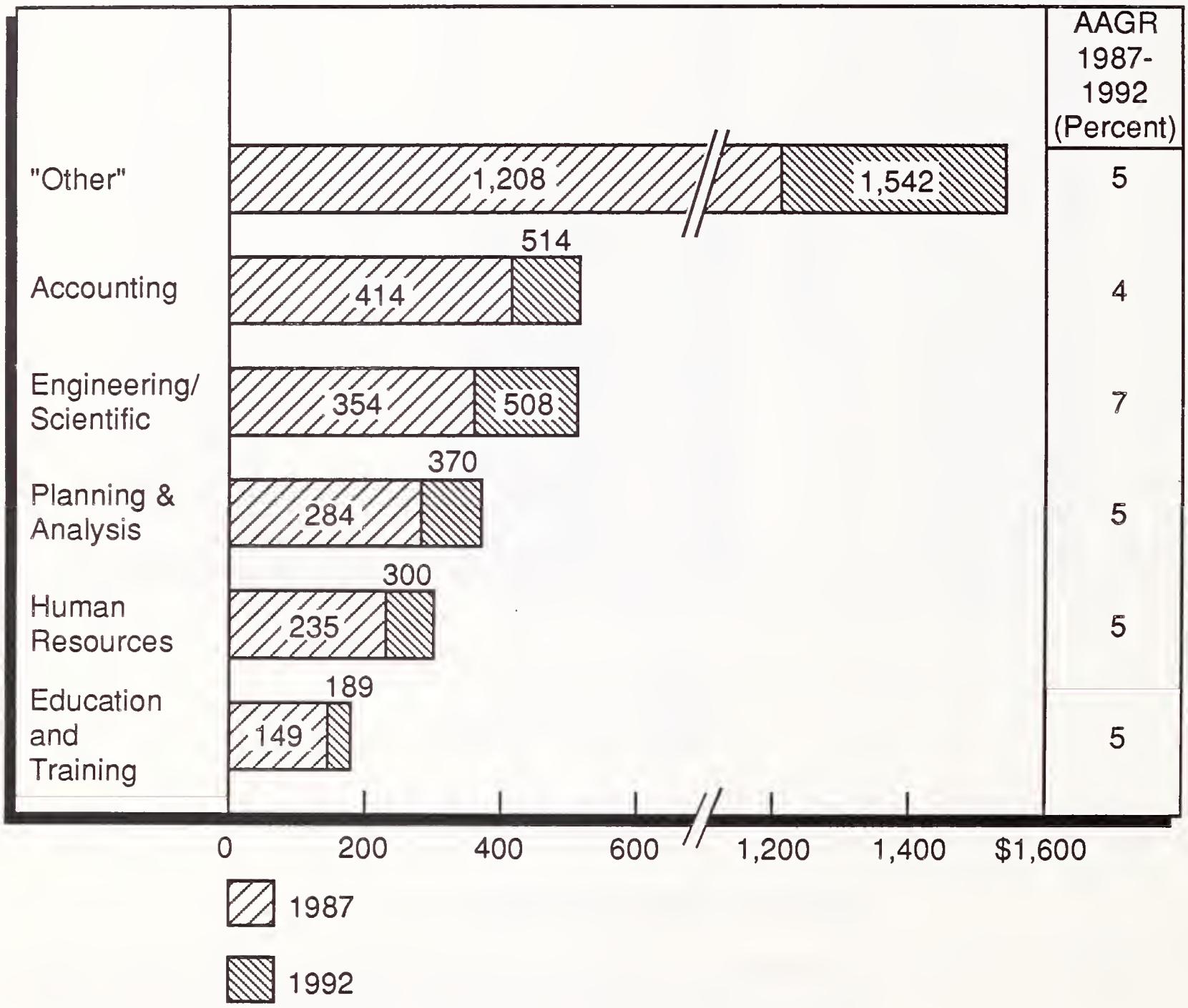


a. Cross-Industry Segmentation

Cross-industry turnkey systems will decline to 26% of the user expenditures in 1992 from the current (1987) percentage of 31%. Cross-industry applications segmentation is shown in Exhibit III-3. "Other" cross-industry is the largest segment consisting of work processing, desktop publishing, and graphics applications. While desktop publishing turnkey systems are a fast-growing, emerging application segment, it should be realized that its growth is coming in large measure out of the word processing systems market as these systems become obsolete and are being replaced. Previously highly successful vendors such as NBI, CPT, and Lanier (Harris) are seeing their business base soften and their functionality replaced by the desktop publishing vendors such as Interleaf, Penta, Xyvision and Texet.

EXHIBIT III-3

TURNKEY SYSTEMS
CROSS-INDUSTRY APPLICATIONS MARKETS, 1987-1992



The rest of the cross-industry segments are growing at average annual growth rates ranging from 4 to 7%–these cross-industry applications are reasonably mature and "sold."

b. Industry-Specific Segmentation

Industry-specific turnkey applications markets are shown in Exhibit III-4 (A&B). The largest application/industry segment is in discrete manufacturing based on the computer integrated manufacturing (CIM) applications strength as the factory floors become automated. The second largest industry segment is in the banking and finance area where cash management, trust accounting, and portfolio management systems have had considerable appeal. The third largest applications segment is in medical where hospital accounting systems, lab management systems, and doctor/dentist office systems have been important application growth areas.

Industry-specific applications are growing at a faster rate due to the emergence of the VAR distribution approach and the inherent need for specific applications that are integral to the user's business requirement. The proliferation of hardware systems with broad-based applications development tools and inherent price/performance hardware characteristics has opened a window of opportunity for enterprising individuals to nurture applications particular to an industry. These small, highly focused sales and marketing groups can sell solutions to users with sophisticated needs but without the computer sophistication to implement solutions for themselves.

The opportunity to sell industry-specific applications is due in part to the lack of internal resources available to implement the specific solution because of the applications backlog (typically found in a large corporate environment) or the smallness of the user's organization, there is little justification to engage an IS department.

Thus the turnkey vendor or VAR becomes, in effect, the technical expert and the pseudo information services department for the particular application or system solution being offered. This is a computer system sale that is based on applications fit, form, and function as well as the service and training to support the application.

Turnkey systems as sold through a VAR distribution channel have become an effective sales and marketing channel for many computer manufacturers. However, the managing of this channel and the deployment of a computer manufacturer's direct marketing/sales organization invariably produces conflict and channel cannibalization. This will be discussed further in another section.

EXHIBIT III-4A

TURNKEY SYSTEMS
INDUSTRY-SPECIFIC APPLICATIONS MARKETS, 1987-1992

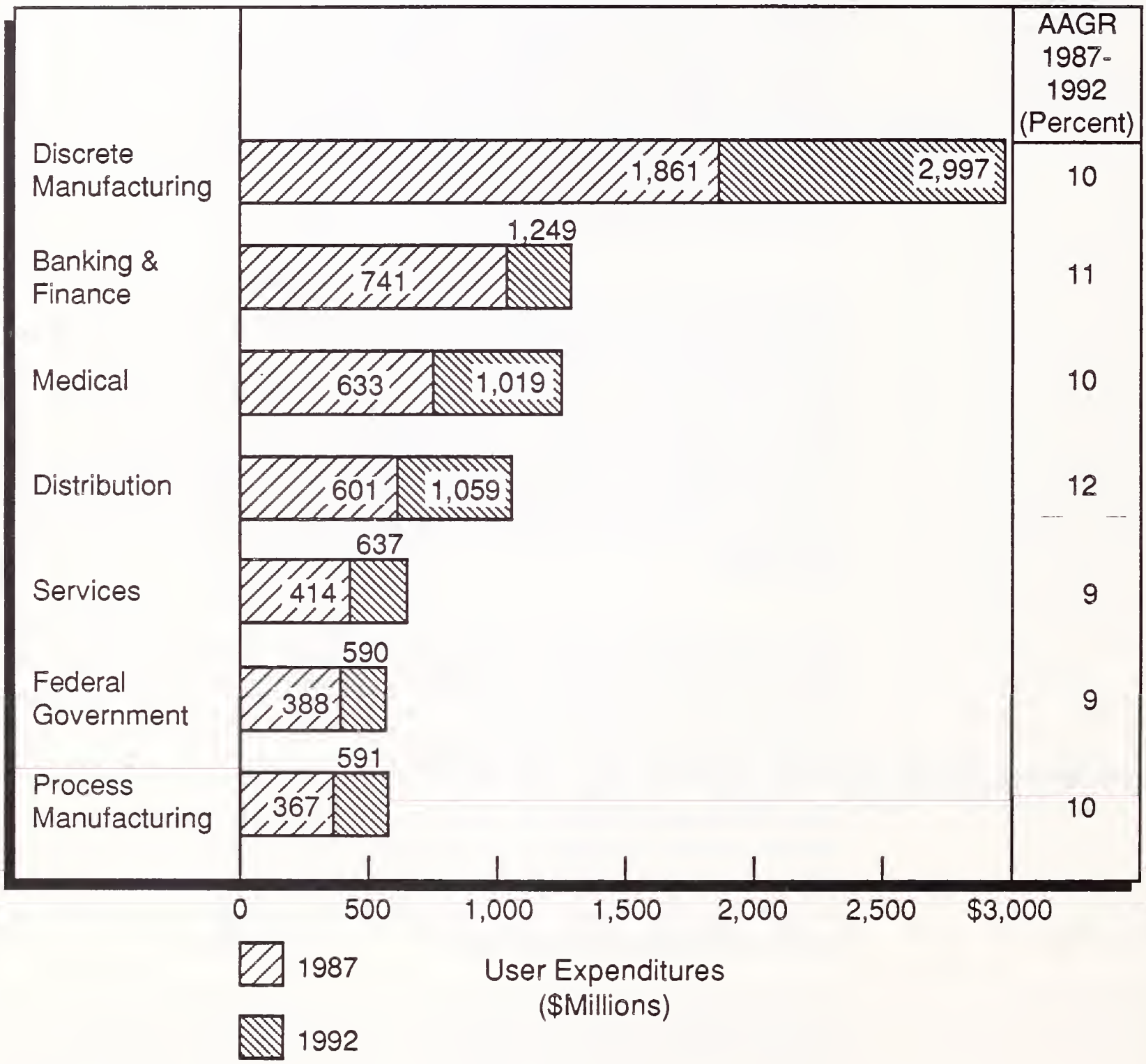
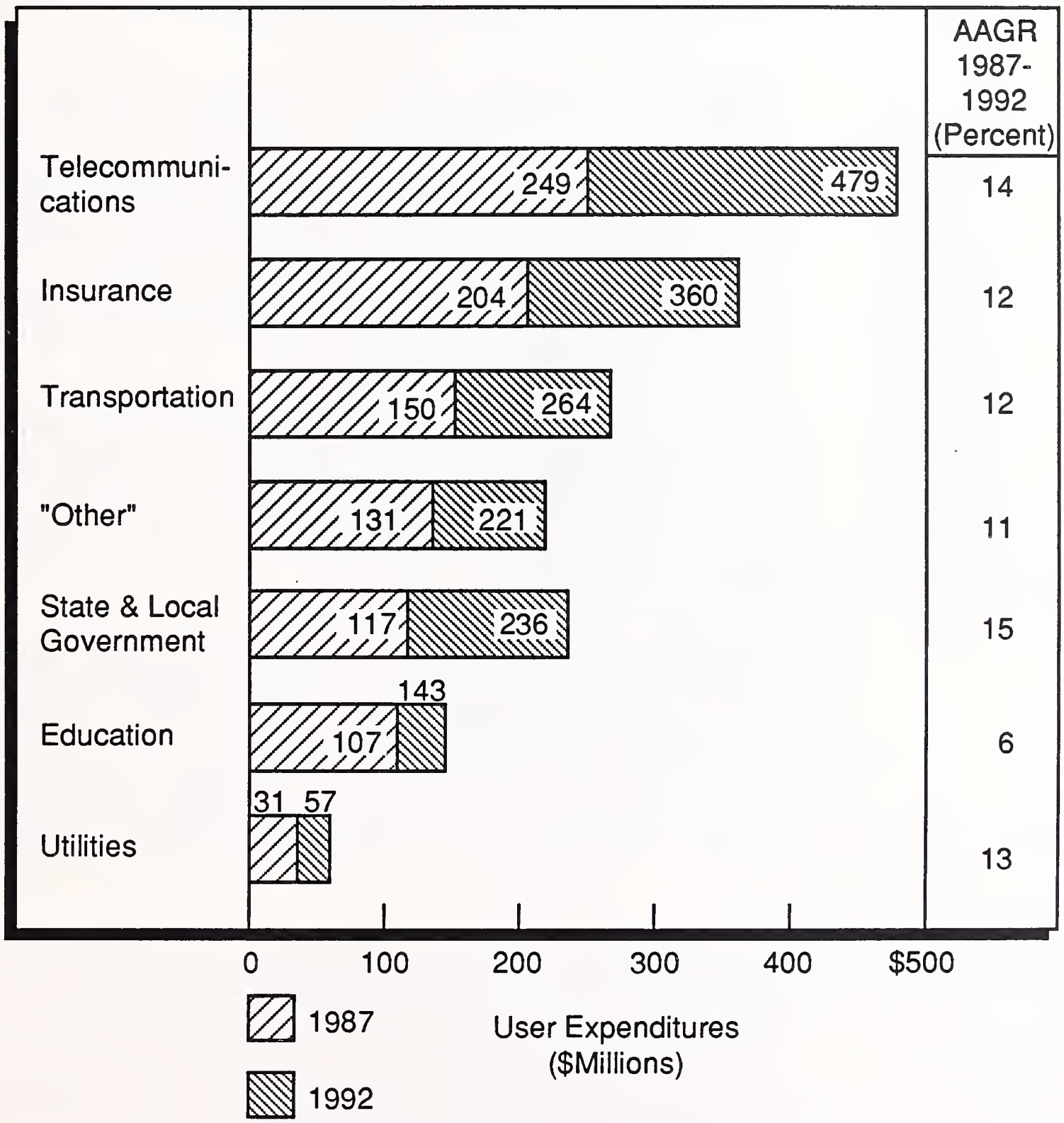


EXHIBIT III-4B

TURNKEY SYSTEMS INDUSTRY-SPECIFIC APPLICATIONS MARKETS, 1987-1992



3. Custom versus Packaged Turnkey Applications

The custom turnkey solution is one wherein the basic user's needs are available in the application system being offered but some special additions/ modifications/enhancements are necessary to precisely meet the end user's requirements. In a manner of speaking, the particular turnkey systems vendor of VAR has taken the marketing posture of producing a system that mostly meets the end user's requirements but needs to be or can be modified to better fit the requirements.

This may seem somewhat contrary to the definition of a turnkey system, which suggests an exact match already available and a vendor using a cookie cutter approach to sales/marketing. The situation is such that by using a small customizing approach the vendor can extract a high price from the user for meeting the user's exact requirements. The trade-off, of course, is the extra effort required to have the application finished so as to get final payment, the maintenance and support effort that is due to the non-standard part of the application, and the slowing down effect in the propagation of the application system.

It is INPUT's belief that the so-called customized turnkey systems is the one segment of the turnkey systems market that will be the easiest to defend against the competition and encroachment that seems to be occurring in the turnkey systems market. It allows the expert VAR to protect his investment and maintain account control due to the extra effort expended.

Exhibit III-5 shows the custom turnkey systems market growing from 9% of the total turnkey systems market to be 18% in the 1992 timeframe. INPUT has increased this aspect of the turnkey market as compared to the 1985 INPUT report on turnkey systems due to the change in market forces and directions taken by the computer hardware systems manufacturers. INPUT believes the complexion of the turnkey market will require the turnkey vendors and VARs to shift toward the customized approach as a means of survival.

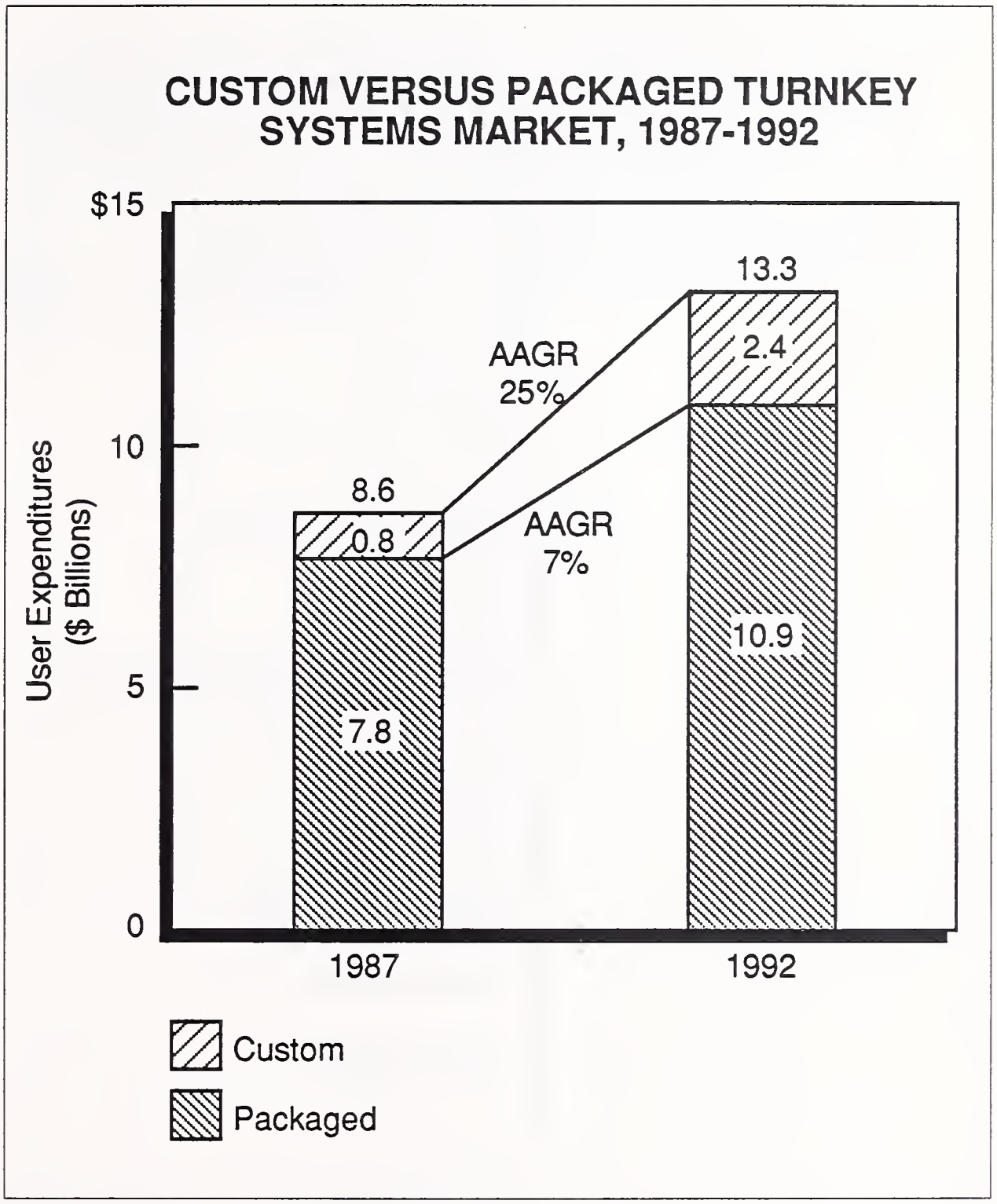
B

Market Structure

The turnkey systems marketplace continues to be comprised of very large vendors that have multiple offices, a large sales force, and significant applications market share and many small VARs that are very local and focused in their efforts. The large turnkey vendors when aggregated account for a significantly higher proportion of the turnkey systems marketplace than would a similar number of vendors in the other delivery modes in the information services industry.

The turnkey systems market has a similar demographics distribution to applications as it has to vendor size. There are several well-defined

EXHIBIT III-5



applications–e.g. CAD/CAM/CAE, automobile dealer systems, hospital accounting systems, etc. – that have had major success, and have allowed several turnkey systems vendors to grow to significant size. Exhibit III-6 shows the leading turnkey systems vendors.

There are numerous VARs who specialize in selling specific, very detailed application systems to customers with solutions that meet their requirements. Those VAR organizations that do not have annual revenue of $250,000 or consist of more than four people are considered to be independent consultants for the purposes of this report.

EXHIBIT III-6

LEADING TURNKEY SYSTEMS VENDORS
U.S. REVENUES - 1986

COMPANY NAME	REVENUE ($ Millions)	MARKET SHARE (Percent)
Intergraph	400	5
Reynolds & Reynolds	220	3
McDonnell Douglas	218	3
GE CALMA	180	2
National Computer Systems	161	2
ISC Systems	154	2
Ultimate*	138	2
Gerber Scientific	130	2
Computervision	122	1
Convergent	110	1
Triad	109	1

* Ultimate is unique in that it provides a computer system environment as well as sells applications through its own VAR distribution channel.

Intergraph has been the decided leader in the turnkey systems markets for several years. Reynolds and Reynolds has been in the number two position for several years as well. Convergent (formerly Convergent Technologies) has entered the list for the first time based on the multiple acquisitions made in 1986. Ultimate, which used to be a VAR, has had success building itself a computer system that is expressly marketed by VARs (Ultimate is a VAR itself, as well).

VARs have become an important part of the distribution channel strategy of most emerging companies; VARs are an alternative to the direct sales force approach. VARs have easier access and less overhead in selling in geographical areas or in specialized application niches and have been very effective in moving product in the minicomputer and microcomputer markets. The smaller VARs generally are not effective in moving large and/or expensive turnkey application systems. End users with large requirements are generally more comfortable dealing directly with the hardware vendor.

IV

Issues and Trends

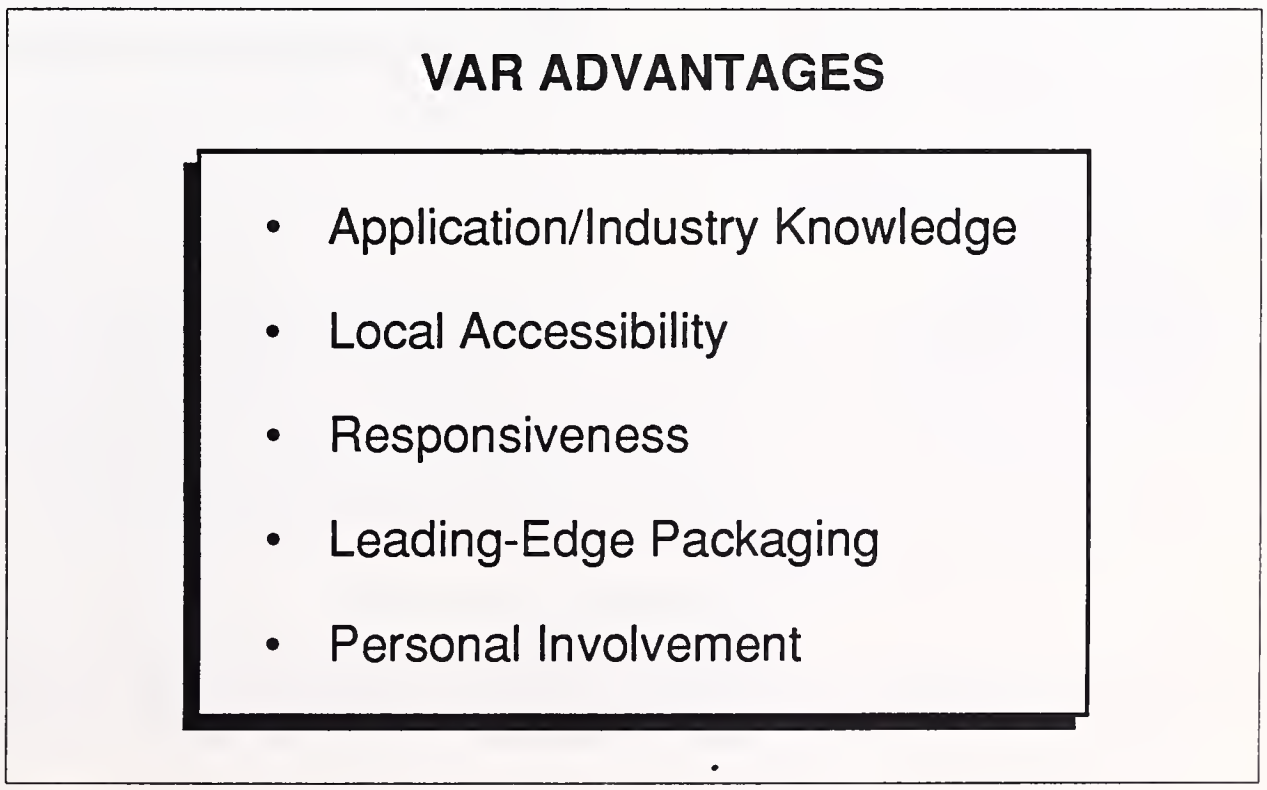
IV Issues and Trends

The turnkey systems market is surviving and growing through difficult times. There are numerous factors impacting the growth of the turnkey systems market–ranging from the economic climate, user requirements for application solutions, the competition for the user's business, and the effects of hardware computer systems vendors' distribution strategies.

A VAR Factors

Exhibit IV-1 lists the VAR advantages. These are fairly representative of the advantages a large turnkey systems vendor has as well. The essence is that the VAR becomes an extension of the user's organization, providing an easily installed (hopefully), simple-to-use application. The strength of the VAR and its ultimate success is based on support and service provided to the end user.

EXHIBIT IV-1



Implicit in the success of the turnkey systems vendor/VAR is the ability to use the application system repeatedly to solve a large number of user's requirements, sort of an application system cookie cutter approach. The "sameness" of the application minimizes support/service issues, sales and marketing, and numerous other parameters that can be standardized in the turnkey system.

Exhibit IV-2 lists some of the disadvantages of the turnkey systems and VAR delivery mode. Most of the disadvantages revolve around the smallness, locality, and lack of resources. These typically are not problems for very small enterprises that are struggling to receive computer automation. VARs are an important factor in providing these solutions to the very small enterprises.

EXHIBIT IV-2

VAR DISADVANTAGES (LACK OF)

- National or Multi-Locations
- Financial Resources
- Applications Breadth
- Support/Maintenance (Geographical)

B

Manufacturers' Strategy (or Non-Strategy?)

Most of the large hardware system manufacturers have utilized a VAR channel to augment their direct sales force approach. Companies like DEC, Prime, Data General and Hewlett-Packard (to name a few) have used VAR organizations to provide specific applications solutions coupled with hardware to sell a total turnkey system to the end user. This approach works reasonably well for a time.

When there is market uncertainty or a slowdown in a particular vendor's sales acceptance (or other circumstances), the situation called "channel conflict" will raise its head. This is the situation where the VAR and the manufacturer's direct sales force are directly competing for the same

customer. Since the hardware itself is procured from the manufacturer (typically at a discount), the turnkey systems vendor has little or no value added with respect to the hardware.

The hardware manufacturer's direct sales person generally has significant incentive to sell the hardware out from under the VAR (e.g., to obtain a commission) and the scene is set for an unpleasant sale. The turnkey/ VAR organization can still sell the software and support (hardware and software) but is still competing with the direct sales person.

Keeping the VAR happy is an important part of having an effective channel. Some hardware manufacturer organizations will provide their direct sales force with some sort of credit for VAR sales in their territory but it never works out quite the same and difficulties generally ensue. For example the direct sales person gets credit for the sale but at the discounted value of the hardware because, after all, the manufacturer cannot pay full commission for hardware that is sold at a discount. And due to the nature of sales plans there generally is a sliding commission rate which means the direct sales person gets a token commission for VAR/ turnkey system sales. This is a "no win" situation.

Furthermore, for many hardware manufacturers the VAR channel was added onto their distribution strategy and the original sales plans did not provide for "double commissions". Double commissions are an attempt to ameliorate the situation by giving both parties revenue and commission recognition. Most vendors have philosophical difficulty with providing double commissions.

Another potential conflict is the major customer situation that wants to use a turnkey system in multiple locations. Special cooperation is required by the hardware manufacturer. Now multiple territories and multiple direct sales people get into the picture and the corporate organization needs to get involved to close the sale. Many hardware manufacturers try to cut out or limit the ability of VARs to handle these situations, which invariably leads to animosity between the VAR channel and the manufacturer. After all, the VAR is supposed to sell only one system at a time!

Recently several hardware manufacturers have been putting together application solutions to market through their direct sales forces. Examples are IBM's SolutionPacs and Digital's SolutionSystems. INPUT believes Unisys, Hewlett-Packard, and others are close to doing the same thing. While the hardware manufacturers are reluctant to call these systems "turnkey" systems, they certainly look like what INPUT calls turnkey systems, albeit a horse of a slightly different color.

And, to add to the pressures of the turnkey market, the manufacturers are lowering the discount rate (or increasing the quota to get the same dis-

count) and enforcing minimums and bill backs as a way to better manage the economics of the VAR channel. While VARs do not become rich on the hardware discounts they receive, it certainly is part of the pricing equation.

If discounts are lower and the hardware direct sales person is made more aggressive, there is definite price/profit pressure for the VAR on the hardware. This could be a factor in a VAR organization that is shifting vendors or developing the application on more "standard" hardware. When this happens, the turnkey vendor needs to find alternative choices such as customizing; pricing the software at a higher rate; adding new services such as consulting, education and training; or developing complementary application thrusts.

Generally when there is "channel conflict," the hardware manufacturer announces a new program, new VAR channel marketing manager, or some such thing to get the conflict ameliorated. In most instances this works for a period of time. Altos, Compaq, and Ultimate have been immensely successful using a VAR channel because the VAR does get credit for everything.

C

Standards

The information services industry is passing through a time when standards are being used as a way to ensure compatibility and connectivity between different hardware and software capabilities. In the hardware part of the industry the recent introduction of the IBM PS/2 has hinted that the PS/2 will become a hardware platform standard. (Note: in the first seven months one million PS/2 systems have been sold and that is without the operating systems support (OS/2) that provides the performance and functionality that has been announced.)

A number of turnkey systems vendors have products that used proprietary hardware and software, e.g., Daisy, Texet, Display Data (Convergent), and HBO, among others. A good number will use the PS/2 opportunity to unbundle, i.e., allow the user to procure the hardware at the most favorable terms available and provide the software as a separate item. HBO is an example of a company that has made a conscious decision to separate hardware and software (i.e., unbundling) in the hopes of increasing its overall profit margins. Others are likely to follow.

Standards act as a catalyst to the unbundling as the software component is made compatible and connective to other hardware and software through the use of industry standards or defacto standards. Many information systems/services vendors are investigating how to take advantage of IBM's System Application Architecture (SAA) as a means to be compatible with IBM's long-range plans as well as ensuring applications, portability, and migration through the IBM hardware families.

A similar concept is taking hold with the UNIX environment which heretofore has had a dearth of application systems. Turnkey systems vendors are looking hard at how to use the UNIX "standard" as a means to offer their applications in this fast-growing operating system environment. UNIX and C provide the easiest porting environment. There is a large number of emerging hardware systems that need application solutions. Many of the new hardware systems are UNIX-based.

D

New Entrants

New hardware systems are designed to be price/performance competitive with DEC VAXen, Prime, Data General, and the other mid-range systems. Some workstation vendors such as Sun Microsystems, Apollo, and Masscomp can be very convenient platforms for VARs. Sun is making a concerted effort to attract VARs in both the engineering and commercial business sector to continue its meteoric rise and growth. The turnkey systems vendor Mentor Graphics, an almost $200 million/year company (worldwide), is Apollo's largest OEM.

Also the Japanese have not yet made a major effort to enter the U.S. market. Once the economic barriers and factors get sorted out it is expected that a major effort to penetrate the U.S. market will occur. An obvious forum or vehicle would be through the VAR channel. NEC is making a special effort to establish its PC and eventually mid-ranged product lines in the U.S. with a very aggressive VAR program. NEC is claiming good discounts, support, lead generation, etc., all important VAR success parameters, but most important of all, the VAR channel will be its only marketing channel. Thus, there cannot be channel conflict, at least not under the current plan.

New computer manufacturers such as Arete, Ridge, Plexus, and Celerity are competing for VARs that can provide applications and help sell their systems. VARs are looking for relationships and in many cases want to have several platforms to offer flexibility to their clients.

E

Turnkey Systems Industry Distribution Shakeout

In the distribution channel in which the VARs thrive there are also suppliers known as distributors. Examples are Arrow Electronics, Ducommun, Hamilton-Avnet, Anthem, etc., and they generally provide off-the-shelf electronics parts and components. In the past few years these distributors have also set up systems divisions which in effect supply computer systems and at times services that on occasion could compete with VARs that do not provide a great deal of value.

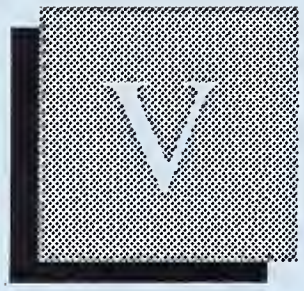
Some of these distributors handle computer systems such as AT&T, Texas Instruments, Altos, and Digital Equipment. These distributors have significant capital resources and stock the systems they sell. Most VARs are not in a position to be stocking much inventory.

The distributors are observing that there is intense competition, low profit margins, and products that are becoming more complex to sell and support. The distributors need to find qualified VARs to help move the products off their shelves.

Simultaneously the large manufacturers are not anxious to have small VARs and as a means to support the distributors they are requiring the small VARs to go through the distributors (who are acting like super-VARs). For example DEC announced that VARs with annual revenues below $500,000 will need to buy through distributors. This is an example of an action that is not meeting with excitement in the VAR channel, based on the perception that they are now one step removed from the hardware vendor. Furthermore, the distributors are not perceived as having technical support capabilities that exceed those of the VAR itself, providing another source of discomfort. And technical support has always been above contention when the VAR dealt directly with the vendor.

In addition, to make this event even more confusing there is the anticipated consolidation of the distributor-oriented entities that will cause concern over who the VAR will be buying from. An example would be the agreement reached between Arrow Electronics and several divisions of Ducommun wherein Arrow (approximately $570 million) would acquire three divisions of Ducommun (doing about $380 million) for approximately $130 million in cash and stock. [Note: these are the companies' total revenue and not IS revenues.]

Due to the above events INPUT is forecasting a consolidation of some of the systems divisions of distributors as a means to better manage the business.



Competitive Developments

Competitive Developments

As mentioned previously the turnkey systems market is growing in spite of the difficult environment and competitive factors it has. There are still some application areas that are prime candidates for significant growth as the requirement to automate becomes a competitive necessity.

It is reasonably apparent that the application areas that have been most successful have been CAD/CAM/CAE, automotive dealer and distributor systems, health care/medical systems and banking/finance processing applications (see Chapter III, Exhibit III-6). Each of the top ten vendors sells turnkey systems in one of the above application areas as its main source of turnkey revenue (except National Computer Systems, which is in the environment of optical mark code reading and data collection applications).

Other application areas found in the next ten largest turnkey vendors are more of the above plus telecommunications industry applications (directory assistance), legal applications, and MRP systems.

However, there are some fast-growing turnkey systems vendors that are developing new application areas that have significant promise. Among these are Interleaf, Xyvision, and Texet in corporate electronic publishing systems; plus Barrister Information Systems, Barondata (now Convergent), and Computrac in legal administration systems.

Other turnkey systems vendors are seeing a contraction in their core businesses and are having difficult times due to losing money because of poor revenue growth. This is most notable in the word-processing turnkey vendors such as CPT, NBI, and Lanier (acquired by Harris).

A

Specialized Turnkey Vendors

There are a few turnkey systems vendors that have special or unusual approaches to their market. Rather than profiling the ten major vendors mentioned in Chapter III this year, INPUT will profile/discuss several of these "special" vendors. Exhibit V-1 lists the special vendors and their circumstances that will be profiled.

EXHIBIT V-1

SPECIAL TURNKEY SYSTEMS VENDORS

COMPANY	CHARACTERISTIC	1986 REVENUE ($ Millions)
Ultimate	Provides Hardware with PICK-OS	138
Convergent	Hardware Vendor Acquired Several Turnkey Vendors	110
Altos	No Direct Sales People	87
IBM	SolutionPacs	NM
DEC	SystemsSolutions	NM
Intergraph	Largest Turnkey Vendor Goes Proprietary	400

Not included in the list but a perceived competitive threat to existing VARs is the large F1000 IS group that develops a turnkey system for its distribution channel to have the dealer/branch/franchise conform to the corporate application systems. This is viewed as mostly a captive situation. But this also is a factor in the tenacious nature of the turnkey systems market.

1. Ultimate Corporation (East Hanover, New Jersey)

Ultimate's fiscal year ends April 30, at which point it generated almost $173 million in revenue worldwide (note: it generated $138 million in calendar 1986 in the U.S.).

Ultimate's uniqueness is that it is a VAR, a super VAR, a hardware manufacturer, and a software developer and distributor all rolled into one.

Its marketing premise is the coupling of the PICK operating system with several different vendors' hardware to offer a computing system platform that in turn is sold through a VAR channel which adds an application solution. This then represents a turnkey system, and Ultimate has some 135 VARs and itself has no direct sales force. Thus there is no channel conflict except the possibility that some acquisitions Ultimate has made of troubled VARs could cause an application conflict. However, most of the Ultimate-owned VARs are in rather specific and somewhat obscure vertical application areas that have not been the cause of channel conflict.

The formation of Ultimate by Ted Sabarese, a former VAR for PICK O/S, practically ensures that the VAR channel developed will remain intact due to the sensitivity and awareness the company possesses from its inception. The claim of Sabarese is that company-owned VARs are treated like any other and the company will bend over backwards to protect the external VAR channel.

In recent years Ultimate has been enjoying annual revenue growth of 23-26%, with net income gains of 64-72%.

In addition, Ultimate has the exclusive rights to the use of the PICK OS with the IBM 9370 and a nonexclusive rights for the IBM mainframe hardware systems. IBM and Ultimate have entered into a multiyear contract for "thousands" of systems. In its most recent quarter ended October 1987, Ultimate moved some $5 to 7 million of IBM 9370 systems.

Ultimate also has entered into an agreement to OEM Tandem computer systems. This is in addition to the previously mentioned IBM hardware capabiiity, and in the last quarter Ultimate also had balanced sales performance from its traditional DEC and Honeywell-Bull platforms. In fact, Ultimate is believed to be Honeywell-Bull's largest OEM.

Adding to this success story are the considerations that PICK O/S is getting more attention as an excellent operating environment and that Ultimate is starting to have significant success overseas.

2. Convergent Business Systems Incorporated (San Jose, California)

Convergent started out as a OEM hardware supplier to Burroughs, NCR, C3, Systems Development Corp. (pre-Burroughs), A.B. Dick, GEC Reliance, and numerous other OEMs (many of which were really VARs).

A coup occurred in 1983 wherein AT&T selected a Convergent PC-like hardware system (PC 7300) that "spoke" UNIX. Unfortunately the product met with no success and became a revenue and profit drain. This coupled with the workslate product fiasco destroyed the foundation of success that Convergent had been building on.

Allen Michels, a founder and chairman, attracted Paul Ely, Jr. from HP (at the time Executive VP and key architect to the HP Computer Division success) to lead Convergent back to profitability.

A key element of Convergent's new marketing strategy is the establishment of a wholly-owned subsidiary that is a turnkey systems provider. Several acquisitions have been made, most notably Display Data (sells systems to the automobile dealer after market), Baron Data (legal systems), and some eight other smaller turnkey system vendors. Convergent has overnight become one of the largest turnkey system providers.

This strategy is quite novel as it guarantees a source of application-oriented VARs that can move Convergent iron. Most of the VARs acquired were not then current Convergent OEMs. Most have converted at this time.

Convergent sees the VAR subsidiary as a means to establishing a total systems solution environment that will provide maintenance, education, training, and systems leverage. Furthermore by consolidating office space and/or adding incremental sales and technical support to existing offices, Convergent is in a position to "nationalize" all the ten VAR business lines. This is believed to provide a greater comfort feeling to the CBSI clients, something the smaller turnkey system vendors and/or VARs will not be able to do. The turnkey systems client will see the look and feel of a $400-500 million organization.

3. Altos Corporation (San Jose, California)

Altos has had a unique approach among computer hardware system manufacturers in that it has no direct sales force. It does have some 1,200 VARs, with which it has succeeded in generating $100+ million/year over the past few years.

Altos made some investments–for example, buying Communication Solutions from CDC in 1986, investing in Informix Software (22% equity position), as well as purchasing an equity position in several other firms.

Altos offered UNIX hardware/software systems to its VAR channel and consistently received excellent ratings from its channel participants.

Altos was one of the first hardware manufacturers to implement 286 and 386 chip technology in its products. These products have accounted for some recent growth in Altos and prospects have looked better than in previous years.

4. IBM (Armonk, New York)

IBM has embarked upon a series of offerings called SolutionPacs that couple software with a hardware environment to offer a "solution" to the end user. IBM does not consider these solutions to be turnkey systems. Perhaps the subtle difference is that the typical SolutionPac is a hardware/software system that can and generally does offer more than the particular solution. This is viewed as a subtle technicality by INPUT. In fact, IBM is offering a SolutionPac to do desktop publishing by integrating an IBM PS/2 with Aldus' PageMaker and an IBM Postscript printing capability.

IBM has become quite aggressive from a marketing perspective, no doubt due to the lackluster revenue and profit growth (decline actually in 1986). Events like Systems Application Architecture (SAA) and Application Systems Division (ASD) should put considerable emphasis on applications and quite possibly turnkey systems.

IBM has informed its VAR channel that it will be telling the channel (in the fourth quarter) which vertical markets IBM intends to pursue. This is being done not to warn or scare VARs or software vendors in these vertical segments but rather to inform them of IBM intentions. There will be little surprise; IBM will definitely target manufacturing, banking and finance, and medical as three very key areas. INPUT research has identified these market segments as the three largest over the five-year planning horizon. IBM definitely will want to play in these markets.

A fourth likely target will be telecommunications, which IBM has long identified as a major strategic target. IBM showed its sincerity by buying Rolm several years ago and making major efforts to continue it under original Rolm management until Kenneth Oshman (the "O" in Rolm) left.

IBM has enjoyed considerable software success in the past few years, with software products revenue growing some 20% per year. Coupling software with hardware seems like a natural event. However, IBM will face considerable "political" problems from U.S. trade and industry organizations such as ADAPSO, which will lobby against bundling.

IBM has not yet had any appreciable success with SolutionPacs

5. DEC (Maynard, Massachusetts)

DEC has had considerable success from its VAR program over the years. Most of the successful VARs or turnkey vendors have used DEC computer hardware systems.

However, DEC has had some problems avoiding the channel conflict mentioned in previous sections of this report and in some instances has forced successful VARs to finds other hardware platforms. One graphic

example is Intergraph, which at one point was DEC's largest OEM. INPUT believes that DEC's VAR channel practices and marketing strategy forced Intergraph to go to a proprietary hardware environment.

In an effort to bolster its sales performance DEC has made a strong effort to provide its sales force with more product capabilities. DEC is actively selling System Solutions that are the same as those being marketed by VARs and turnkey system vendors. Product differentiation becomes very difficult when a small emerging company allows DEC to sell the same solution as that being provided by the small turnkey vendor itself. This is a calculated risk the turnkey vendor or VAR makes.

6. Intergraph (Birmingham, Alabama)

Intergraph has sustained a more than 46% annual growth rate for its revenue in the 1981 through 1986 timeframe. In the same period its net income has increased over 53% per year. What makes this increase fairly amazing is that in the last couple of years the annual growth in revenue and profit has fallen off.

Intergraph has done well in the CAD/CAM markets using DEC hardware systems as their predominant platform. In the 1984-1985 timeframe when the computer industry started to slump, there were some predatory practices, and DEC may have made life tough for some of its large turnkey vendors. This and other marketing and business factors such as account control, profitability, competitive edge, etc. made Intergraph opt for a proprietary solution.

Intergraph chose the Fairchild Clipper chip, which it used to build a 5-MIP workstation. Intergraph is trying to get other VARs to adopt this new high-powered workstation and so far has had insignificant reported success.

Recently Intergraph acquired the Clipper chip hardware design and fabrication facility when Fairchild Semiconductor sold off its operations to National Semiconductor.

As computer hardware pushes the physical limits and becomes even further technology-based, those manufacturers that can create their own proprietary chips, memory, etc. may have an edge over those that have to buy "off-the-shelf." This suggests that most turnkey vendors/VARs will be reliant on their hardware manufacturers for hardware performance. Intergraph is one of the few if not the only one that has the limited ability to control its destiny (at least for the time being).

B

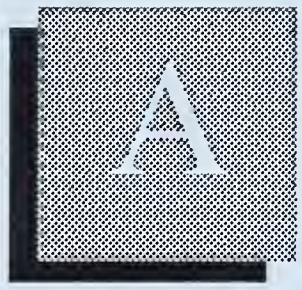
Software Products View

As the hardware portion of the turnkey systems solution becomes less a factor in the overall sale due to the "standards" effect previously mentioned and due to the limited impact the turnkey vendor has itself, it becomes apparent the turnkey vendor/VAR becomes essentially a software vendor.

There will be little, if any, incentive to sell the hardware as that part of the turnkey solution will essentially be a commodity. This being the case, the current turnkey vendor/VAR should take the longer-term view of being a software products vendor.

This suggests that the applications software portion of the sale is where all the value is and this value must be priced accordingly.

Furthermore the turnkey vendor/VAR must be thinking about ways to get more value out of what it offers to its customers.



INPUT Definitions

INPUT Definitions

Information Services - Computer-related services involving one or more of the following:

- Processing of computer-based applications using vendor computers (called "processing services").
- Services that assist users in performing functions on their own computers or vendor computer (called "software products" and/or "professional services").
- Services that utilize a combination of hardware and software, integrated into a total system (called "turnkey systems").

A

User Expenditures

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

Noncaptive Information Services User Expenditures - Expenditures paid for information services provided by a vendor that is not part of the same parent corporation as the user.

Captive Information Services User Expenditures - Expenditures received from users who are part of the same parent corporation as the vendor.

B

Delivery Modes

Processing services - This category includes remote computing services, batch services, processing facilities management, on-line data bases, and value-added networks.

- *Remote Computing Services (RCS)* - Provision of data processing to a user by means of terminals at the user's site(s). Terminals are con-

nected by a data communications network to the vendor's central computer. RCS includes four submodes.

- *Interactive* - Characterized by the interaction of the user with the system, primarily for problem-solving timesharing, but also for data entry and transaction processing; the user is on-line to the program/ files. Computer response is usually measured in seconds or fractions of a second.

- *Remote Batch* - Where the user hands over control of a job to the vendor's computer, which schedules job execution according to priorities and resource requirements. Computer response is measured in minutes or hours.

- *Proprietary Data Base* - Characterized by the retrieval and processing of information from a vendor-maintained data base. The data base may be owned by the vendor or by a third party.

- *User Site Hardware Services (USHS)* - Those offerings provided by RCS vendors that place programmable hardware at the user's site rather than at the vendor's data center. Some vendors in the federal government market provide this service under the label of distributed data services. USHS offers:

  ° Access to a communications network.

  ° Access through the network to the RCS vendor's larger computers.

  ° Local management and storage of a data base subset that will service local terminal users via the connection of a data base processor to the network.

  ° Significant software as part of the service.

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

- *Processing Facilities Management (PFM)* - Also referred to as "Resource Management," "Systems Management," or "COCO" (contractor-owned, contractor-operated). PFM is the management of all or part of a user's data processing functions under a long-term contract of not

less than one year. This would include remote computing and batch services. To qualify as PFM, the contractor must directly plan, control, operate, and own the facility provided to the user–either onsite, through communications lines, or in a mixed mode.

- *Value-Added Networks (VANs)* - VANs typically involve common carrier network transmission facilities that are augmented with computerized switching. These networks have become associated with packet-switching technology because the public VANs that have received the most attention (e.g., Telenet and TYMNET) employ packet-switching techniques. However, other added data service features such as store-and-forward message switching, terminal interfacing, error detection and correction, and host computer interfacing are of equal importance.

Processing services are further differentiated as follows:

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

- *Industry-specific* services provide processing for particular functions or problems unique to an industry or industry group. Specialty applications can be either business or scientific in orientation. Industry-specific data base services, for which the vendor supplies the data base and controls access to it (although it may be owned by a third party), are also included under this category. Examples of industry-specialty applications are seismic data processing, numerically controlled machine tool software development, and demand deposit accounting.

- *Utility* services are those for which the vendor provides access to a computer and/or communications network with basic software that enables users to develop and/or process their own systems. These basic tools often include terminal-handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

Software products - This category includes user purchases of applications and systems software packages for in-house computer systems.

Included are lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement and maintain the package at the user's sites. Expenditures for work performed by organizations other than the package vendor are counted in the category of professional services. Fees for work related to education, consulting, and/or custom modification of software products are counted as professional services, provided such fees are charged separately from the price of the software product itself. There are several subcategories of software products, as indicated below.

- *Applications Products* - Software that performs processing that services user functions directly related to solving a business or organizational need. The products can be:

  - *Cross industry Products* - Used in multiple-industry applications as well as the federal government sector. Examples are payroll, inventory control, and financial planning.

  - *Industry-Specific Products* - Used in a specific industry sector, such as banking and finance, transportation, or discrete manufacturing. Examples are demand deposit accounting, airline scheduling, and material resource planning.

- *Systems Software Products* - Software that enables the computer/communications system to perform basic functions. These products include:

  - *System Control Products* - Function during applications program execution to manage the computer system resources. Examples include operating systems, communication monitors, emulators, and spoolers.

  - *Data Center Management Products* - Used by operations personnel to manage the computer systems resources and personnel more effectively. Examples include performance measurement, job accounting, computer operations scheduling, and utilities.

  - *Applications Development Products* - Used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Examples include languages, sorts, productivity aids, compilers, data dictionaries, data base management systems, report writers, project control systems, and retrieval systems.

Professional Services - This category includes consulting, education and training, programming and analysis, and some facilities management as defined below.

- *Software development* - This service develops a software system on a custom basis. It includes one or more of the following: user requirements, system design, contract, and programming.

- *Education and Training* - Products and/or services related to information systems and services for the user, including computer-aided instruction (CAI), computer-based education (CBE), and vendor instruction of user personnel in operations, programming, and maintenance.

- *Consulting Services* - Information systems and/or services management consulting, program assistance (technical and/or management), feasibility analyses, and cost-effectiveness trade-off studies.

- *Professional Services Facilities Management (PSFM)* - This is a counterpart to processing facilities management, except the computing equipment is owned or leased by the client, not by the vendor. The vendor provides the staff to operate, maintain, and manage the client's facility.

Turnkey Systems (also known as integrated systems) - A turnkey system is an integration of systems and applications software with CPU hardware and peripherals, packaged as a single applications solution. The value added by the vendor is primarily in the software and support. Most CAD/CAM systems and many small-business systems are turnkey systems. This does not include specialized hardware systems such as word processors, cash registers, or process control systems, nor does it include Embedded Computer Resources for military applications. Turnkey systems are available either as custom or packaged systems.

- Hardware vendors that combine software with their own general-purpose hardware are not classified by INPUT as turnkey vendors.

- Turnkey systems revenue is divided into two categories.

  - *Industry-specific systems* - that is, systems that serve a specific function for a given industry sector such as automobile dealer parts inventory, CAD/CAM systems, or discrete manufacturing control systems.

  - *Cross-industry systems* - that is, systems that provide a specific function that is applicable to a wide range of industry sectors such as financial planning systems, payroll systems, or personnel management systems.

- Revenue includes hardware, software, and support functions.

Systems Integration - Services associated with systems design, integration of computing components, installation, and acceptance of computer/communication systems. Systems integration can include one or more of the major information services delivery modes - professional services, turnkey systems, and software products. System components may be furnished by separate vendors (not as an integrated system by one vendor, called the prime contractor); services may be furnished by a vendor or by a not-for-profit organization. Integration services also may be provided with related engineering activities, such as SE&I (Systems Engineering and Integration) or SETA (Systems Engineering and Technical Assistance).

C

Hardware/Hardware Systems

Hardware - Includes all computer and telecommunications equipment that can be separately acquired with or without installation by the vendor and not acquired as part of an integrated system.

- *Peripherals* - Includes all input, output, communications, and storage devices other than main memory that can be connected locally to the main processor and generally cannot be included in other categories such as terminals.

- *Input Devices* - Includes keyboards, numeric pads, card readers, light pens and track balls, tape readers, position and motion sensors, and analog-to-digital converters.

- *Output Devices* - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters.

- *Communication Devices* - Includes modems, encryption equipment, special interfaces, and error control.

- *Storage Devices* - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, solid state (integrated circuits), and bubble and optical memories.

Terminals - There are three types of terminals as described below:

- *User-Programmable* - Also called intelligent terminals, including:

  - Single-station or standalone.
  - Multistation shared processor.
  - Teleprinter.
  - Remote batch.

- *User Nonprogrammable*

  - Single-station.
  - Multistation shared processor.
  - Teleprinter.

- *Limited Function* - Originally developed for specific needs, such as point-of-sale (POS), inventory data collection, controlled access, and other applications.

Hardware Systems - Includes all processors from microcomputers to supercomputers. Hardware systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices, other than main memory and processors or CPUs not provided as part of an integrated (turnkey) system.

- *Microcomputer* - Combines all of the CPU, memory, and peripheral functions of an 8- or 16-bit computer on a chip in the form of:

  - Integrated circuit package.
  - Plug-in board with more memory and peripheral circuits.
  - Console including keyboard and interfacing connectors.
  - Personal computer with at least one external storage device directly addressable by the CPU.

- *Minicomputer* - Usually a 12-, 16- or 32-bit computer that may be provided with limited applications software and support and may represent a portion of a complete large system.

  - Personal business computer.
  - Small laboratory computer.
  - Nodal computer in a distributed data network, remote data collection network, or connected network, or connected to remote microcomputers.

- *Mainframe* - Typically a 32- or 64-bit computer with extensive applications software and a number of peripherals in standalone or multiple-CPU configurations for business (administrative, personnel, and logistics) applications; also called a general-purpose computer.

  - *Large Computer* - Presently centered around storage controllers but likely to become bus-oriented and to consist of multiple processors or parallel processors. Intended for structured mathematical and signal processing and typically used with general-purpose, von-Neumann-type processors for system control.

- *Supercomputer* - High-powered processors with numerical processing throughout that is significantly greater than the fastest general-purpose computers, with capacities in the vicinity of 10-50 million floating point operations per second (MFLOPS). Supercomputers fit in one of two categories:

• *Real Time* - Generally used for signal processing in military applications.

• *Non-Real Time* - For scientific use in one of three configurations:

- Parallel processors.
- Pipeline processor.
- Vector processor.

• *Newer Supercomputers* - with burst modes approaching 300 MFLOPS, main storage size up to 10 million words, and on-line storage in the one- to three-gigabyte class are also becoming more common.

• *Embedded Computer* - Dedicated computer system designed and implemented as an integral part of a weapon, weapon system, or platform; critical to a military or intelligence mission such as command and control, cryptological activities, or intelligence activities. Characterized by military specifications (MIL SPEC) appearance and operation, limited but reprogrammable applications software, and permanent or semipermanent interfaces. May vary in capacity from microcomputers to parallel processor computer systems.

D

Telecommunications

Networks - Electronic interconnection between sites or locations that may incorporate links between central computer sites and remote locations and switching and/or regional data processing nodes. Network services typically are provided on a leased basis by a vendor to move data, voice, video, or textual information between locations. Networks can be categorized in several different ways.

• *Common Carrier Network* - A public access network, such as provided by AT&T, consisting of conventional voice-grade circuits and regular switching facilities accessed through dial-up calling with leased or user-owned modems for transfer rates between 150 and 1200 baud.

• *Value-Added Network (VAN)* - (See listing under Section B, Delivery Modes.)

• *Local Area Network (LAN)* - Limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within

such as a building, complex of buildings, or buildings distributed within a metropolitan area. Uses one of two signaling methods.

- *Baseband* - Signaling using digital waveforms on a single frequency band, usually at voice frequencies and bandwidth, and limited to a single sender at any given moment. When used for local-area networks, typically implemented with TDM to permit multiple access.

- *Broadband* - Transmission facilities that use frequencies greater than normal voice-grade, supported in local-area networks with RF modems and AC signaling. Also known as wideband. Employs multiplexing techniques that increase carrier frequency between terminals to provide:

  ° Multiple (simultaneous) channels via FDM (Frequency Division Multiplexing).

  ° Multiple (time-sequenced) channels via TDM (Time Division Multiplexing).

  ° High-speed data transfer rate via parallel mode at rates of up to 96,000 baud (or higher, depending on media).

Transmission Facilities - Includes wire, carrier, coaxial cable, microwave, optical fiber, satellites, cellular radio, and marine cable operating in one of two modes depending on the vendor and the distribution of the network.

- *Mode* - may be either:

  - *Analog* - Transmission or signal with continuous-waveform representation, typified by AT&T's predominantly voice-grade DDD network and most telephone operating company distribution systems.

  - *Digital* - Transmission or signal using discontinuous, discrete quantities to represent data, which may be voice, data, record, video, or text, in binary form.

- *Media*- May be any of the following:

  - *Wire* - Varies from earlier single-line teletype networks, to two-wire standard telephone (twisted pair), to four-wire full- duplex balanced lines.

  - *Carrier* - A wave, pulse train, or other signal suitable for modulation by an information-bearing signal to be transmitted over a communications system, used in multiplexing applications to increase network capacity.

- *Coaxial Cable* - A cable used in HF (high-frequency) and VHF (very high frequency), single-frequency, or carrier-based systems; requires frequent reamplification (repeaters) to carry the signal any distance.

- *Microwave* - UHF (ultra-high-frequency) multichannel, point-to-point, repeated radio transmission, also capable of wide frequency channels.

- *Optical Fiber* - Local signal distribution systems employed in limited areas, using light-transmitting glass fibers and TDM for multichannel applications.

- *Communications Satellites* - Synchronous earth-orbiting systems that provide point-to-point, two-way service over significant distances without intermediate amplification (repeaters), but requiring suitable groundstation facilities for up- and down-link operation.

- *Cellular Radio* - Network of fixed, low-powered two-way radios that are linked by a computer system to track mobile phone/data set units. Each radio serves a small area called a cell. The computer switches service connections to the mobile unit from cell to cell.

E

Other Considerations

When questions arise about the proper place to count certain user expenditures, INPUT addresses them from the user viewpoint. Expenditures are then categorized according to what users perceive they are buying.

The standard industrial classification (SIC) codes are used to define the economic activity contained in generic sectors such as process manufacturing, insurance, or transportation.

The specific industries (and their SIC codes) included under these generic industry sectors are detailed in the exhibit.

EXHIBIT A-1

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Discrete Manufacturing	23	Apparel
	25	Furniture
	27	Printing
	31	Leather
	34	Metal
	35	Machinery
	36	Electronics
	37	Transportation
	38	Scientific and Control Instruments
	39	Miscellaneous
Process Manufacturing	10	Metal Mining
	11	Anthracite Mining
	12	Coal Mining
	13	Oil and Gas Extraction
	14	Mining/Quarrying of Non-Metallic Minerals, except Fuels
	20	Food Products
	21	Tobacco
	22	Textile Products
	24	Lumber and Wood Products
	26	Paper Products
	28	Chemicals
	29	Petroleum
	30	Rubber and Plastics
	32	Stone, Glass, Clay
	33	Primary Metals
Transportation	40	Railroads
	41	Local Transit
	42	Motor Freight
	43	U.S. Postal Service
	44	Water Transportation
	45	Air
	46	Pipelines
	47	Transportation Services

EXHIBIT A-1a

INDUSTRY SECTOR DEFINITIONS (Cont.)

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Utilities	49	Electric, Gas, and Sanitary
Telecommunications	48	Communications
Wholesale Distribution	50	Durable Goods
	51	Nondurable Goods
Retail Distribution	52	Building Materials, Hardware
	53	General Merchandise
	54	Food
	55	Automotive and Gas Stations
	56	Apparel
	57	Furniture
	58	Eating and Drinking
	59	Miscellaneous Retail
Banking and Finance	60	Banks
	61	Credit Agencies
	62	Security and Commodity Brokers
	67	Holding and Investment Offices
Insurance	63	Insurance (Life, Health, Etc.)
	64	Insurance Agents
Medical	80	Health Services
Education	82	Educational Services

EXHIBIT A-1b

INDUSTRY SECTOR DEFINITIONS (Cont.)

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Services	72	Personal Services
	73	Business Services (Excluding Information Services Companies Themselves)
	89	Miscellaneous Services
	66	Combinations of Real Estate, Insurance, Loans, Law Offices
	81	Legal Services
	76	Miscellaneous Repair
Federal Government	N/A	As Appropriate
State and Local Government	N/A	As Appropriate
Other Industries	01-09	Agriculture, Forestry, and Fishing
	15-17	Construction
	70	Hotels, Rooming Houses, Camps, and Other Lodging Places
	75	Automotive Repair, Services, and Garages
	78	Motion Pictures
	79	Amusement and Recreation Services, Except Motion Pictures
	83	Social Services
	84	Museums, Art Galleries, Botanical and Zoological Gardens
	86	Membership Organizations

B

Appendix: Market Database Forecast 1986-1992

EXHIBIT B-1

TURNKEY SYSTEMS USER EXPENDITURE FORECAST BY MARKET SEGMENT, 1986-1992

SEGMENTATION	1986 ($M)	1986-1987 Growth	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (%)
Industry-Specific									
Discrete Manufacturing	1,662	12	1,861	2,066	2,272	2,499	2,749	2,997	10
Process Manufacturing	334	10	367	404	445	490	538	591	10
Transportation	134	12	150	168	188	211	236	264	12
Utilities	27	15	31	35	40	46	51	57	13
Telecommunications	218	14	249	283	323	368	420	479	14
Distribution	523	15	601	685	774	865	962	1,059	12
Banking and Finance	668	11	741	823	914	1,014	1,126	1,249	11
Insurance	179	14	204	233	263	295	327	360	12
Medical	560	13	633	707	787	866	944	1,019	10
Education	96	11	107	117	124	130	138	143	6
Services	366	13	414	460	505	551	595	637	9
Federal Government	342	13	388	430	473	512	555	590	9
State & Local Government	102	15	117	135	155	178	205	236	15
Other Industry-Specific	112	17	131	151	170	189	206	221	11
Subtotal	5,323	13	5,994	6,697	7,433	8,214	9,052	9,902	11
Cross Industry									
Planning and Analysis	266	7	284	299	321	342	353	370	5
Accounting	394	5	414	433	459	485	495	514	4
Human Resources	217	8	235	251	267	280	291	300	5
Engineering/Scientific	322	10	354	380	418	451	479	508	7
Education/Training	137	9	149	157	168	177	183	189	5
Other Cross-Industry	1,140	6	1,208	1,268	1,332	1,398	1,468	1,542	5
Subtotal	2,476	7	2,644	2,788	2,965	3,133	3,269	3,423	5
Grand Total	7,799	11	8,638	9,485	10,398	11,347	12,321	13,325	9