Engineering and Scientific

Information Services
Opportunities in
Cross-Industry
Markets
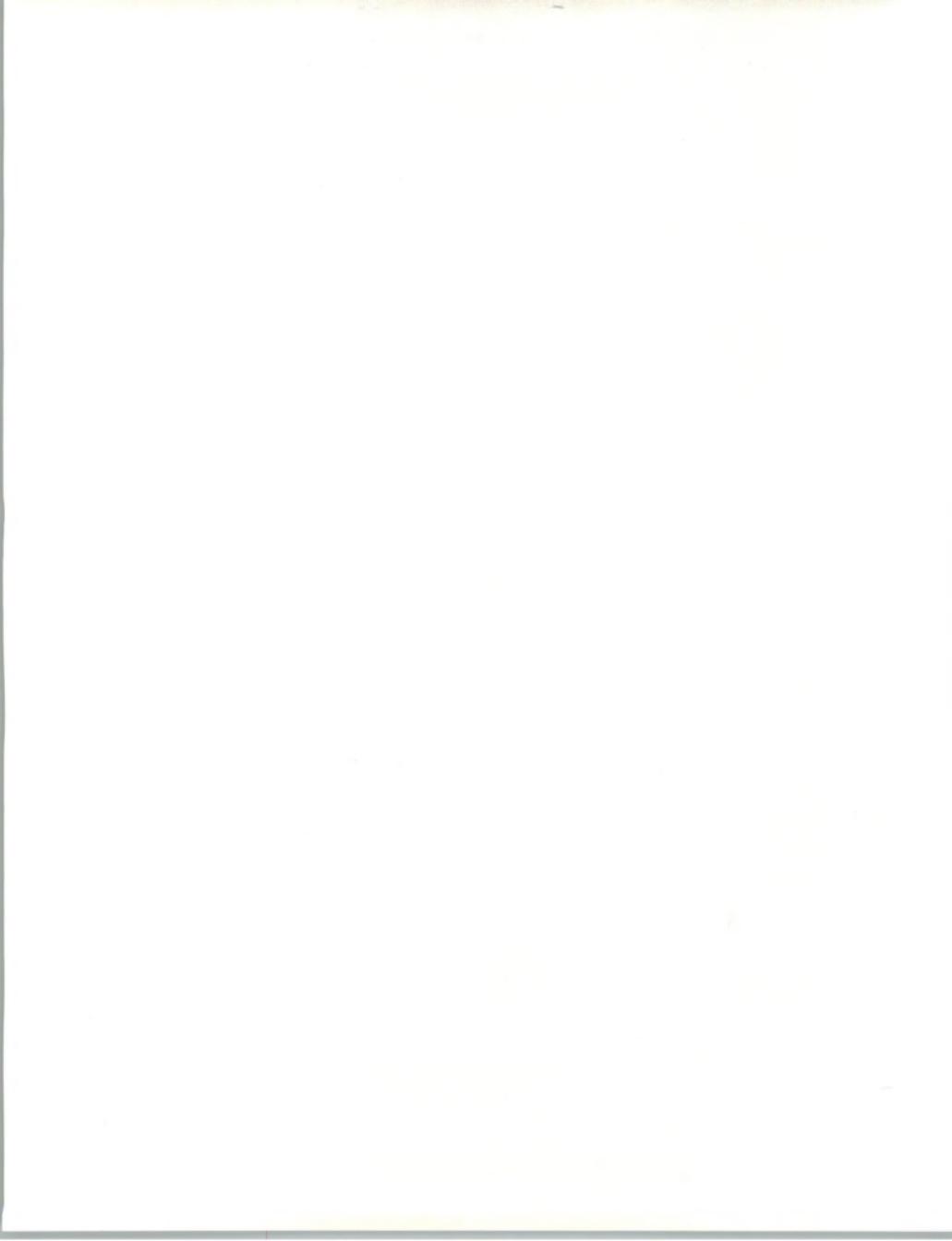
1992-1997

INPUT®

INFORMATION SERVICES OPPORTUNITIES IN CROSS-INDUSTRY MARKETS

1992-1997

EXCERPT

Engineering and Scientific

INPUT®

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Abstract

This document extracts Chapter VI, *Engineering and Scientific*, from INPUT's full report, *Information Services Opportunities in Cross-Industry Markets, 1992-1997*. The excerpt contains the *Introduction* (Chapter I) and *Engineering and Scientific* (Chapter VI) chapters from the full report, and also provides Appendix A, *Definition of Terms*, and the market-specific financials from Appendix B, *Forecast Data Base*.

The excerpt does *not* contain either the *Executive Overview* or *Conclusions and Recommendations* chapters from the full report, since these sections address all cross-industry market sectors at an overview level.

The extract is intended for readers who have an interest in a single cross-industry market sector. If data and analysis of other cross-industry market sectors is required, it can be obtained by purchasing the full report, *Information Services Opportunities in Cross-Industry Markets, 1992-1997*.

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I

Introduction

A
Purpose and Organization

This report is part of a series of market analysis reports written each year by INPUT on industry and cross-industry sectors of the U.S. information services industry. This report analyzes the cross-industry sectors of the U.S. information services industry.

1. Purpose

The objectives of this report are to:

- Forecast user expenditures during the next five years on information services for each of the seven cross-industry sectors

- Identify and discuss user department directions as they relate to each of the seven cross-industry sectors

- Identify technological issues and trends that are driving the use of information services for the cross-industry sectors

- Discuss the competitive environment and profile leading vendors in each of the cross-industry sectors

- Summarize findings through comparing and contrasting the cross-industry sectors

The report provides readers with insights and information that will help them:

- Review the forces shaping their markets

- Develop internal corporate financial projections

- Identify new markets and product and services opportunities

- Assess the competitive trends

- Determine potential market directions

- Assist in prioritizing investments

2. Organization

This report is organized as follows:

- Chapter II is an overview of the cross-industry sectors of the information services market.

- Chapters III through IX are individual discussions of each of the seven cross-industry sectors. Within each chapter there are five sections.

  - Section 1, *Definitions*, introduces and defines each of the cross-industry sectors.

  - Section 2, *Information Services Markets*, presents the information services market forecasts by delivery mode and submode for each of the seven cross-industry sectors.

  - Section 3, *User Department Directions*, discusses and analyzes interviews with end-user organizations representing the seven cross-industry sectors.

  - Section 4, *Trends/Technology Ratings of Importance*, provides vendor and user respondent ratings of the relative importance of eight technologies.

  - Section 5, *Vendors and Competitive Environment*, discusses the competitive environment for information services within each of the cross-industry sectors and profiles leading and emerging vendors.

- Chapter X summarizes the conclusions of Chapters III through IX.

- Appendix A—*Definition of Terms*—provides definitions and descriptions of market structures and terms used throughout INPUT's reports.

- Appendix B—*Forecast Data Base*—provides a detailed forecast by delivery mode for each cross-industry sector. It also contains a reconciliation to the previous year's cross-industry sector reports.

B

Scope and Methodology

This report addresses the U.S. information services industry in seven cross-industry sectors. It includes only user expenditures that are noncaptive (generally available to vendors). Many large organizations have portions of their information services requirements satisfied by internal divisions. The resulting expenditure is not available for competitive bid by the general vendor community and is not included in INPUT's projections.

1. Cross-Industry Sector Definitions

INPUT defines cross-industry information services as packaged functional application solutions that are used by multiple industry sectors. In other words, these application solutions are not verticalized. For example, accounting, and planning and analysis are functions that are similar enough across all industries to be considered markets in their own right for nonverticalized application solutions.

The seven cross-industry sectors identified by INPUT are:

- Accounting
- Human Resources
- Education and Training
- Engineering and Scientific
- Office Systems
- Planning and Analysis
- Sales and Marketing

2. Delivery Mode Definitions

Cross-industry information services are delivered via applications software products, turnkey systems and transaction processing services. Management support information services such as systems operations, systems integration and professional services, information delivery services and systems software are excluded from cross-industry consideration.

For a more complete discussion of INPUT's information services industry structure and market sector definitions, please refer to the separate volume, INPUT's *Definition of Terms* found in the volume I binder of the 1992 Market Analysis Program reports.

3. Methodology

Data was collected and analyzed from in-depth telephone interviews with 37 vendors and 18 user departments representing all cross-industry sectors. In addition, INPUT's library was used as an information resource, as were the results of previous INPUT reports on key aspects of the information services industry.

C
Forecast Assumptions

In developing the five-year forecasts, INPUT has incorporated current economic assumptions regarding the outlook for the U.S. economy as a whole.

- The GNP and GNP deflator growth rates used in INPUT's market projections are from the CONSENSUS forecast of the Blue Chip Economic Indicators of Sedona, Arizona. The Blue Chip CONSENSUS forecast is derived from a panel of economists representing leading financial, industrial, and research firms across the U.S. and has a 13-year track record of balanced and accurate projections.

- The economic situation is showing signs of improvement and its impact on the information services market will be more favorable in 1992 and beyond than it was in 1991.

1. Economic Overview

The year 1991 was one in which the recession was expected to end, the recovery to start, and the ambiguities of an uncertain economy to gradually disappear. The end of the Middle East crisis brought a brief euphoria, as American troops, victorious in Iraq, returned home to hopes that the end of the conflict would "jump-start" the economy. Some encouraging signs were seen, but by year-end 1991, the U.S. economy was still sluggish, with no clear signs of a near-term sustainable recovery.

Phrases such as "all the necessary pieces to initiate and sustain a recovery are in place" have been common in the media, but as late as May 1992, the hoped-for sustainable upturn in the economy is just starting to be seen. Few disagree that a return to economic growth will happen, but opinions vary widely as to when a steady, sustainable turnaround will be solidly assured, how quickly the economy will rebound, and what the new growth rates will be for the country, the various industries and the financial resources that fuel the economy.

At present, economists are expecting an inflation-adjusted gross domestic product (GDP) to increase 2.8% from the fourth quarter of 1991 to the fourth quarter of 1992, and about the same increase in 1993. This will be the best economic performance in four years, but it is only half the average pace recorded in the initial years of previous recoveries.

2. Economic Impact

Official or unofficial, recession in the U.S. finally ended a decade of largely uninterrupted economic growth.

Economic growth is significant because the economy, as well as the overall size of the information services industry, is a significant factor in the user expenditure level for information services and software products. For example:

- The inflation rate of the past few years has been much more modest than in the mid-1980s and, as noted above, is expected to continue at modest levels. Because INPUT's forecasts and market sizes are in current dollars, lower inflation means lower growth.

- Real economic growth had been modest over the few years prior to the economic slowdown. As a result, deferred and canceled expansion plans in all industry sectors have slowed the expansion of information services expenditures. A 2.8% increase per year in the GDP for 1992 and 1993 is not likely to change this condition.

- The trend toward shifting information processing to smaller computers lowers the software products investment, based on current pricing practices. Thus, the quantities of software products sold increase, but revenue levels grow at a more modest rate.

The net economic influence on the cross-industry sectors for information services is that the slowdown in growth and constraints on budgets seen over the last two years will not appreciably change over the next two years.

Businesses that use cross-industry information services will still be dealing with their own market, product and organizational uncertainties, and although such an environment offers many opportunities for the use of new products and technologies, users are expected to continue their tendency toward cautious change and growth, and strong expense controls.

D
Related Reports

Related reports of possible interest to the reader include:

1. U.S. Markets

- *U.S. Application Solutions Market, 1991-1996*

- *U.S. Processing Services Market, 1991-1996*

- *U.S. Industry Sector Markets, 1991-1996* (15 reports on all major industry sectors, e.g., insurance)

2. European Markets

- *The Western European Market Forecast for Computer Software and Services, 1991-1996*

- *Trends in Processing Services—Western Europe, 1991-1996*

VI
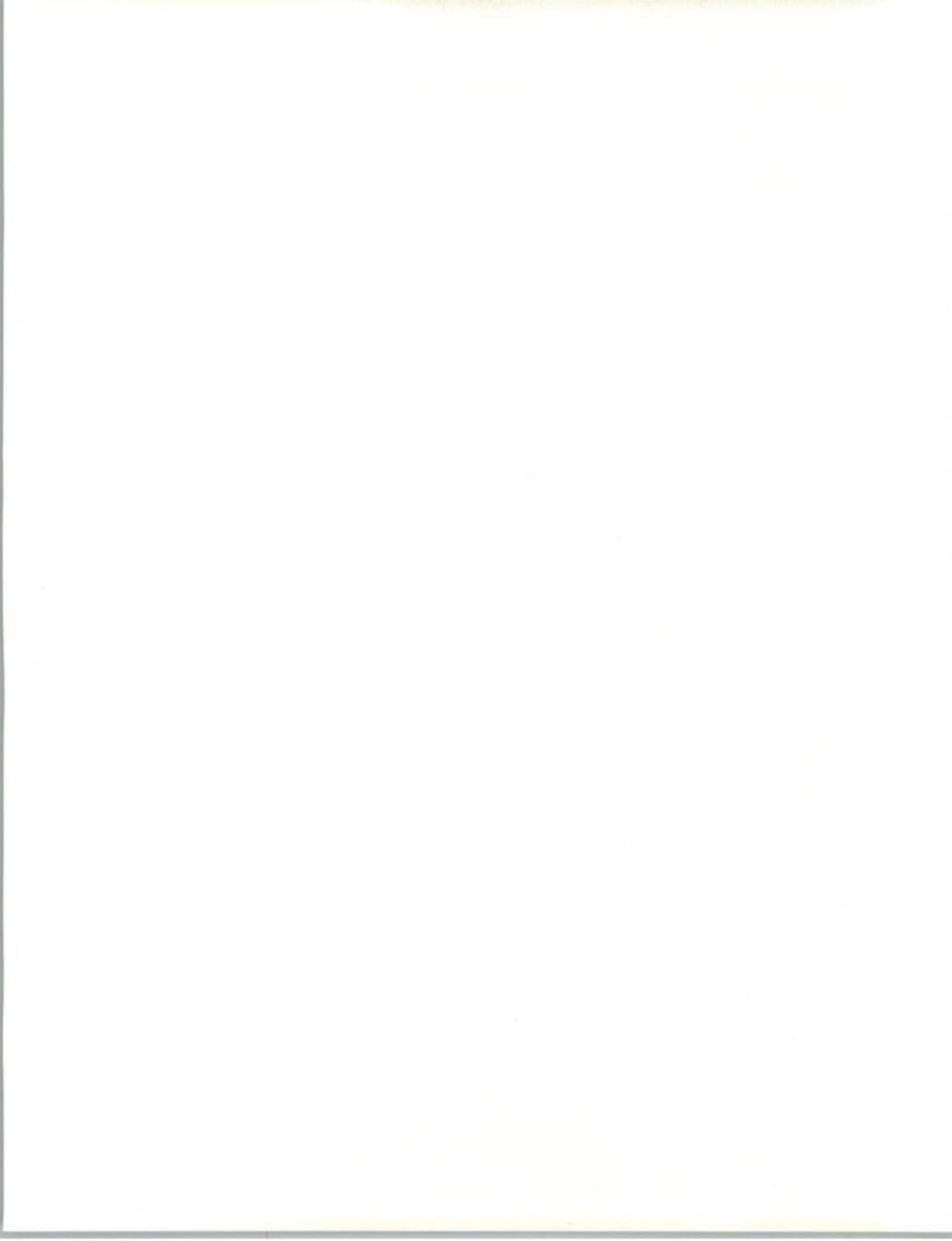
Engineering and Scientific

A
Definitions

The engineering and scientific cross-industry sector encompasses the following applications:

- Computer-aided design and engineering (CAD and CAE)
- Structural analysis
- Statistics/mathematics/operations research
- Geographic information systems/mapping

Computer-aided manufacturing (CAM) or CAD that is integrated with CAM is excluded from this report, as it is specific to the manufacturing industries. CAD or CAE that is dedicated to integrated circuit design is also excluded because it is specific to the engineering industry.

Structural analysis or finite element analysis helps engineers analyze the structural integrity and thermal inadequacies of components. A relatively new and developing market is electromagnetic field analysis, which analyzes the interaction between electronic fields. Examples of applications are:

- Aerospace—fuselage and wing internal load analysis
- Automotive—bumper impact analysis
- Defense—guidance system vibration
- Industrial machinery and mechanical design—gearbox and transfer case stress analysis

Statistical and mathematical analysis applications include all forms of survey analysis for market research and product testing, personnel evaluation, decision support, health care analysis and computer performance evaluation, and operations research. Specific examples include reviewing/analyzing data from accident reports; evaluating air traffic controller information; census data collection; and monitoring of student performance, class selection and education testing.

Geographic information systems (GISs) and desktop mapping are finding a broad range of applications. GISs and mapping software capture, manage, analyze and display geographic information. Traditional uses include environmental monitoring, site planning and natural resource management. Utility and transportation firms are using GISs for facilities planning and management tasks, and government agencies are using GISs to manage public resources. Commercial applications include demographic market analysis to help, for example, retailers decide where to locate new stores; tax assessment; and routing of emergency vehicles.

The area of desktop mapping is a recent development, brought about not only by the proliferation of computer power at the desktop, but also by the increasing availability of geographic data bases and the ability to add street maps.

B
Information Services Markets

INPUT's forecast of engineering and scientific cross-industry sector information services is presented in Exhibit VI-1.

EXHIBIT VI-1

Engineering and Scientific Cross-Industry Sector Information Services Market, 1992-1997

User Expenditures ($ Billions)

1992: 1.0
1997: 1.7
CAGR 11%
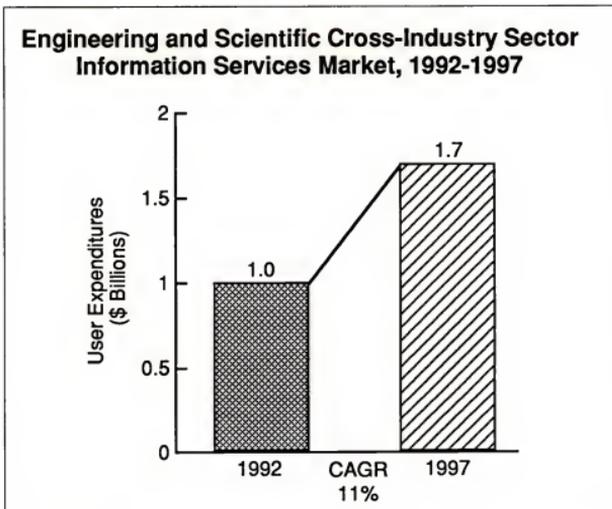
Although the engineering and scientific cross-industry sector is one of the smallest market sectors for information services as a whole, it nonetheless spends a larger dollar amount on applications software products than many of the industry-specific sectors, including process manufacturing, transportation, retail and wholesale distribution, and the federal government.

Most of the expenditures and expenditure growth for the engineering and scientific cross-industry sector will continue to come from applications software products (Exhibit VI-2), primarily products that run on workstations and personal computers.

EXHIBIT VI-2

Engineering and Scientific Cross-Industry Sector Information Services Market by Delivery Mode 1992-1997

CAGR (Percent)

Delivery Mode	1992	1997	CAGR (Percent)
Applications Software	740	1,450	14
Processing Services	130	100	-5
Turnkey Systems	130	170	5

☒ 1992
☑ 1997

User Expenditures ($ Millions)
0   500   1000   1500
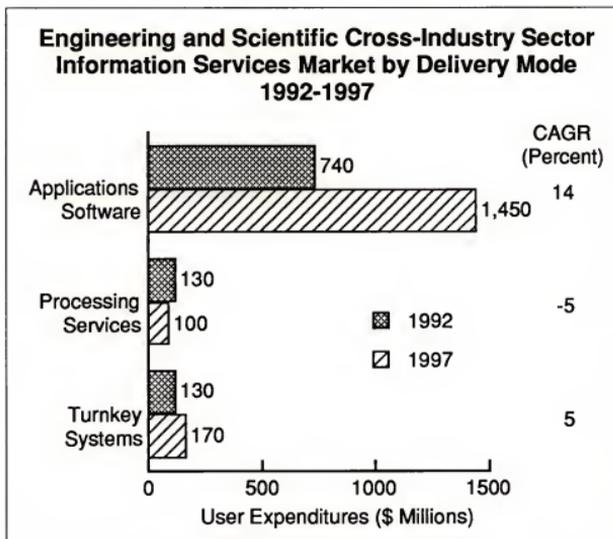
1. Applications Software Products

INPUT's applications software products forecast considers the following factors:

Economy—Given INPUT's discussions with users (see Section C of this chapter), scientific and engineering departments may be experiencing budget constraints more severe than INPUT expected one year ago. Universities and research organizations have been especially hard hit by the economy. An uncertain economy is a short-term growth inhibitor.
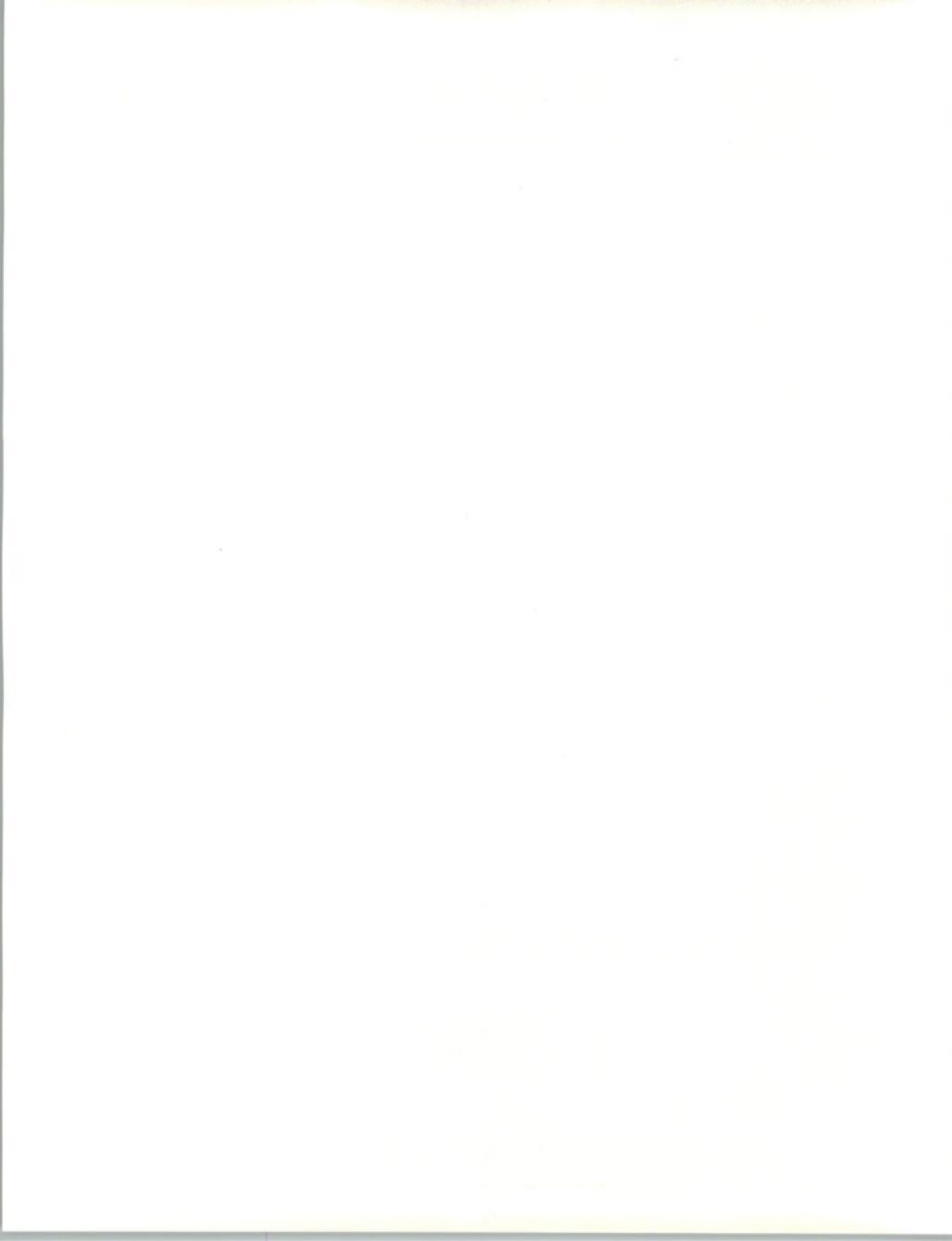
Pricing issue—Up until the mid-1980s practically all engineering and scientific software resided on mainframes and minicomputers. Now growth has clearly shifted to lower priced workstation- and PC-based products.

Although this shift has opened up new markets and new pockets of users—and will be well received by departments with constrained budgets—it also implies lower revenue per unit sold. An issue is which will have a greater impact on the forecasts: more unit sales or lower prices. INPUT believes lower prices will have a greater impact and therefore lower expenditures in the short term, but that higher unit sales may make up for the lower prices over the long term.

Networking issue—Users appear to be at the beginning or in the middle of a steep network implementation and learning curve. Yet data and applications sharing, for which networking is essential, is a key need. Therefore, users' networking sophistication (and the technology itself) will have to evolve more before they will begin to purchase large quantities of new engineering and scientific applications software products. Thus INPUT believes that the networking issue is a short-term growth inhibitor.

Need for industry-specific functionality—One way the need for specificity and customization is being addressed for this cross-industry sector is through more sales of scientific and engineering software through the VAR channel. VARs are predominantly specialized by industry, which detracts from expenditures on cross-industry engineering and scientific applications software products. INPUT believes this is a long- as well as a short-term growth inhibitor.

Potential new markets—CAD, structural analysis tools, and mapping products have been, until the last several years, the sole domain of engineers and scientists. Now, however, because of lower platform costs, a potentially broader market exists for these products.

- Smaller companies and a greater variety of companies are buying CAD. For example, consumer products companies that want to maximize their product designs are beginning to use low-cost CAD.

- General purpose, lower priced statistical software products are used when, for example, a need exists for more sophisticated analysis, greater data capacity or more specialized graph types than a spreadsheet can provide.

- Vendors are introducing desktop mapping software with GIS-like layering features created specifically for business applications. For example, desktop mapping is used as a tool for identifying target markets and determining market penetration and potential.

In order to penetrate these new markets, vendors need to create new types of marketing strategies. These new products are not likely to be at the top of a company's most wanted applications software products list.

Given the above factors, INPUT has lowered its compound annual growth rate (CAGR) for the applications software products delivery mode compared to last year's forecast (INPUT's 1991-1996 forecast was 16% CAGR). INPUT's primary reasons for lowering the forecast are:

• The combined challenges of lower price and the "network bottleneck"

• Vendors will have to develop more new marketing strategies directed at new customers in order to expand their markets.

Exhibit VI-3 shows INPUT's forecast of applications software products delivery by platform size.

EXHIBIT VI-3

Engineering and Scientific Cross-Industry Sector Applications Software Products Market by Platform Size, 1992-1997

Platform	1992	1997	CAGR (Percent)
Mainframe	160	230	8
Minicomputer	270	430	10
Workstation/PC	300	610	15

User Expenditures ($ Millions)
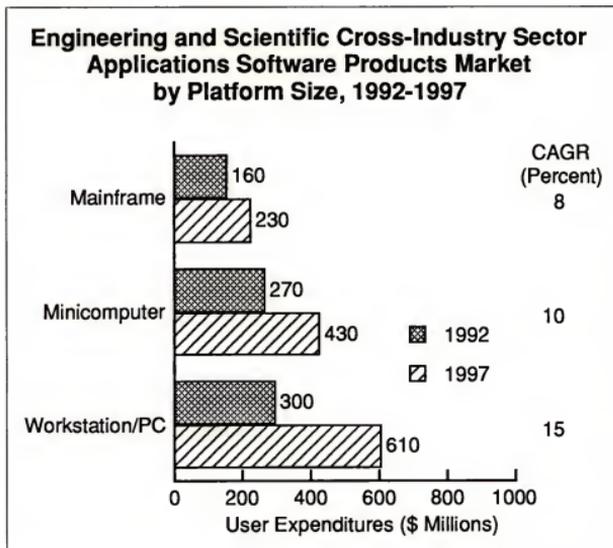
Exhibit VI-3 reflects the following:

- Engineering and scientific sector applications software products have historically been mainframe based. Over 50% of GIS expenditure is still for mainframe-based products, which have traditionally served cartographic, earth resources and other scientific areas. Large government and commercial enterprises use GISs on mainframes and will continue to license upgrades.

- Workstation- and PC-based CAD now accounts for an estimated two-thirds of CAD expenditures. Growth in statistics software has shifted to the PC level due to the emergence of 386- and 486-based machines. Windows will promote growth in the statistical software market; Windows-based products will be forthcoming in 1992.

- The area of desktop mapping is a recent development, brought about not only by the proliferation of computer power at the desktop but also by the increasing availability of geographic data bases and the ability to add street maps.

- The market for structural analysis applications software products at the workstation and PC level is still small, but product availability is increasing.

2. Turnkey Systems

Turnkey systems in this cross-industry sector are predominantly CAD; mapping turnkey solutions are also available.

Engineering and Scientific Cross-Industry Sector Turnkey Systems Market, 1992-1997

Exhibit VI-4 reflects the following:

• Growth over the five-year period for cross-industry turnkey systems vendors and VARs is limited due to the market's requirements for industry-specific functionality. Thus, sales will be through industry-specific VARs rather than cross-industry VARs.

• The original CAD vendors addressing this cross-industry sector were turnkey vendors, providing what were, at the time, specialized engineering workstations and applications software solutions. Now, however, turnkey vendors are pressured into developing increasingly portabl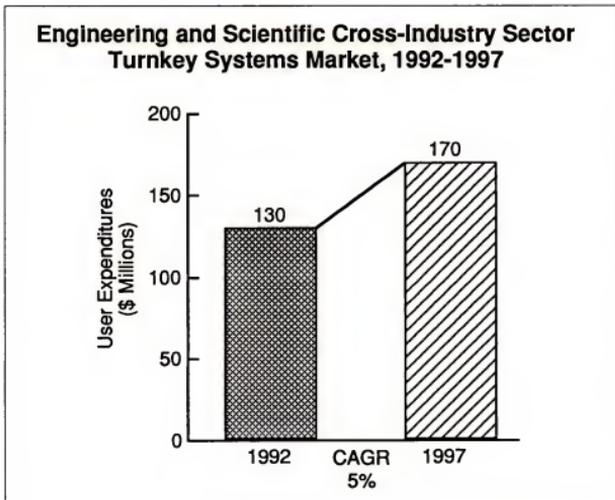e software and not tying their products to a single platform. As CAD software and data base technology has grown in importance compared to hardware technology, many of the original CAD turnkey vendors have been forced to exit this market entirely or become software and service vendors only.

• Limited growth is still available to CAD turnkey systems vendors and VARs as some products are sold to increasingly smaller companies. Opportunities arise for VARs to add technology such as output tools, other cross-industry applications software packages that tie into CAD, special streaming devices, and network software as a bundled solution.

• Desktop mapping vendors are expanding their VAR channels in efforts to expand their markets. However, they are seeking industry-specific VARs such as those that service the retail, medical, and insurance markets.

• As hardware becomes lower cost and more standard, turnkey systems vendors will be forced to add value in other ways such as through additional new technologies, more professional services, and customization. Continued expenditure on turnkey systems is dependent on this additional value being made available.

3. Processing Services

Users of processing services are universities and research organizations, and industrial companies that do not have the computer power in-house to run sophisticated engineering and scientific applications. SPSS-X is available as a batch-oriented system for data analysis that appeals strongly to academic researchers, particularly in the social sciences.

Exhibit VI-5 presents INPUT's processing services forecast. This processing services forecast reflects negative growth. INPUT has lowered the forecast for the second year in a row for the engineering and scientific cross-industry sector.

EXHIBIT VI-5

Engineering and Scientific Cross-Industry Sector Processing Services Market, 1992-1997
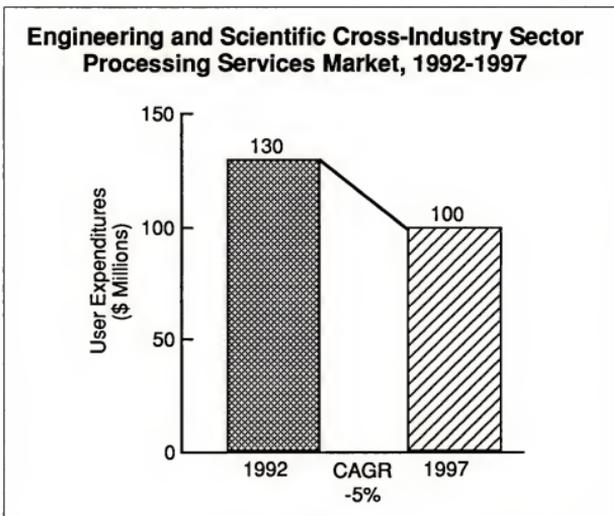
- The need for engineering and scientific processing services—albeit a small need—may be curtailed as some funding of large research projects is put on hold.

- Although INPUT does not expect mainframe pricing to decline measurably, price/performance ratios continue to improve for minicomputers and especially workstations/personal computers; statistical packages that were previously available only for large computers can now run effectively on the desktop. This phenomenon will limit growth of expenditures on engineering and scientific processing services to research organizations and companies with large ongoing sophisticated computing needs or companies that need a temporary solution to their computing needs.

C

User Department Directions

INPUT interviewed a group manager of a computer-aided engineering department of a large aerospace motor manufacturer, a railroad mapping department manager, and a geological scientist.

- In all three examples, information technology budget constraints prevail. The interviewees are being pressured to use what they already have more effectively rather than purchase new equipment and software. Price is a key factor in any purchase decision.

    The CAE department manager indicated that his company is placing more short-term emphasis on orderly production processes rather than on new development areas that use CAE.

- Offloading applications software products from a centralized computer is under way at the railroad mapping department. This department has made the transition from using mainframes with terminals for all of its work, to using minicomputers primarily as data storage devices, and is now replacing its minicomputers with networked workstations and PCs. All applications software will be downsized to workstations and personal computers.

- On the other hand, in the aerospace manufacturer's CAE department, reliance on the mainframe for data access is well entrenched. This department is moving rapidly to a centralized on-line product management system for handling drawings, documentation and structural and thermal analytical models.

- The members of the CAE department want to get more utility out of their work by using less paper, minimizing redundancy and electronically extracting and sharing data among themselves as well as with other departments. Therefore networking issues, workstation support and the management of information across multiple platforms are their biggest IS issues.

The following needs were expressed:

- The CAE department wants to be able to more effectively reduce large volumes of technical data into understandable, succinct presentations for nontechnical audiences.

- The railroad mapping department is customizing its purchased software product. Systems that relate specifically to railroad industry procedures do not exist. This company indicated that systems need to be powerful, yet generic enough to be easily customizable.

- Applications integration is a key concern, as engineers typically use half a dozen pieces of software—e.g., spreadsheet, plotting package, geometric model—for a single project. A geologist expressed the opinion that scientists in his organization are spending too much time dealing with hardware and software incompatibilities and making pieces of software work together.

- The geologist also indicated that easier-to-use facilities that don't take a lot of specialized input to get fairly detailed results are needed.

• The CAE department indicated that pricing structures need to be more flexible. Site licensing and the freedom to move applications software products from one platform to another and from one facility to another without any pricing changes is desirable. Software as a fixed cost is a problem in an environment in which staff reductions are occurring.

To summarize, better tools are needed for extraction and presentation of large amounts of data. Products that more easily allow for the sharing of data are needed as well. These expressed needs imply that networking technology is fundamental to this cross-industry sector. INPUT believes that these interviews indicate a shift away from the need for more analysis features towards emphasis on information sharing, information management, and graphics for presentation. In order for these needs to be met, not only must the products be available, but also network implementation and integration must be well under way within the engineering and scientific community.

D

Trends/Technology Ratings of Importance

Respondents within all cross-industry sectors, vendors and users, were asked to rate various trends and technologies on a scale of one to five, where one is unimportant or of little impact and five is very important or of significant impact.

The technologies listed in Exhibit VI-6 were selected because INPUT believes they will receive the most attention from vendors and users over the next five years. In addition, INPUT believes their impacts on vendors and users will be profound. Users who deploy these technologies will be re-engineering their business functions. And vendors will need to change not only their products, but also the ways in which they price, sell and support them.

Exhibit VI-6 shows the composite ratings of the engineering and scientific sector compared to the ratings of all cross-industry sectors combined.

As is true with all cross-industry sectors, networking is ranked as the most important and imaging is ranked as the least important. However, not surprisingly, the engineering and scientific sector is more technology driven than all cross-industry sectors combined; all technologies and trends are rated substantially higher except imaging, which is rated lower in importance. INPUT believes that imaging is rated relatively lower than the cross-industry rating combined because engineering and scientific information content needs to be manipulated rather than viewed as a page.

EXHIBIT VI-6

Engineering and Scientific Cross-Industry Sector Respondents' Indication of Relative Importance of Trends and Technologies

Trend/Technology	Engineering and Scientific Sector	All Cross-Industry Sectors
Networking	4.8	4.1
Applications Integration	4.5	4
GUIs	4.5	3.9
Client/Server	4.2	3.4
Data Base Technology	4.2	3.3
Downsizing	3.8	3.1
Open Systems/UNIX	4.7	3
Imaging	2.3	2.7

Rating: 0 (Unimportant) — 5 (Very Important)

▦ Engineering and Scientific Sector
▨ All Cross-Industry Sectors
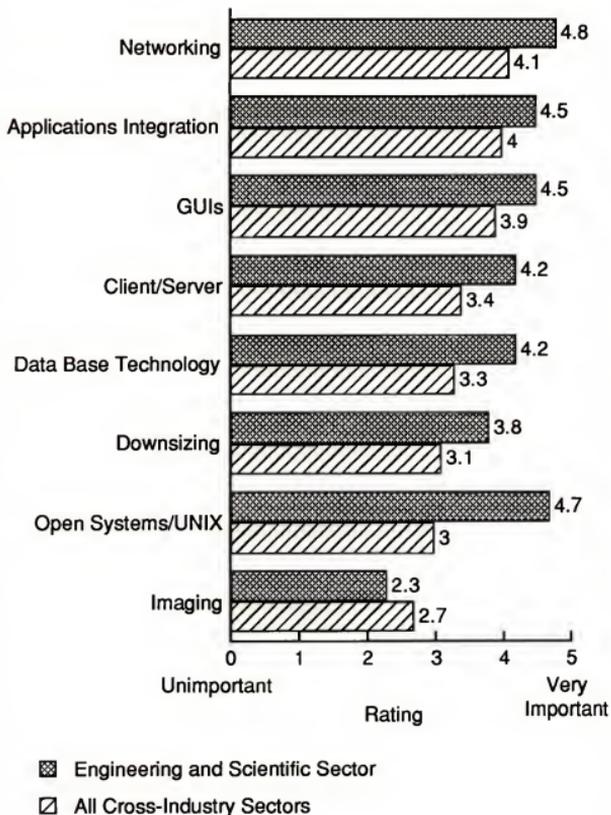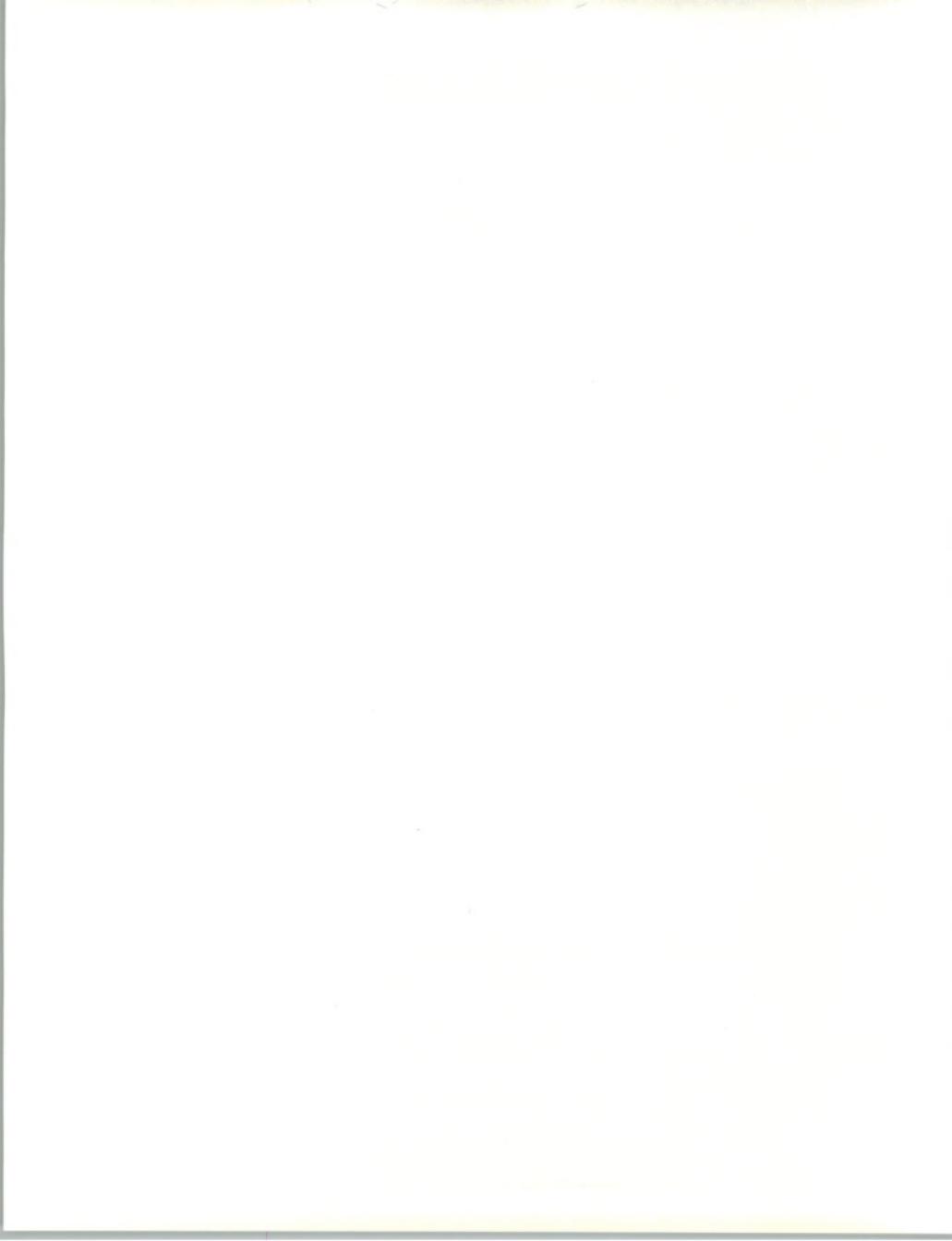
INPUT believes the high ratings given to networking, applications integration, applications integration, GUIs and data base technology, as well as client/server architecture, confirm the emphasis within this sector on sharing data. Further, the need to share data precedes all other considerations when applications software products purchase decisions are made.

Also, not surprisingly, this cross-industry sector rates open systems and UNIX substantially higher than all cross-industry sectors combined. This rating reflects the fact that UNIX not only has advanced networking capabilities but also that it had its origins in the scientific and engineering community.

Respondents for all cross-industry sectors were also asked to rank the technologies and trends in terms of importance five years from now. All technologies for all cross-industry sectors increase in importance over the five-year period.

The 1997 ratings for the engineering and scientific sector are consistent with the ratings of all cross-industry sectors combined, with one exception: GUIs are rated considerably lower (3.3 compared to 4.5) in 1997. INPUT believes this indicates that GUIs will have already been implemented in large part within the engineering and scientific sector, so their impact will be somewhat lessened by 1997.

As is true with all cross-industry sectors, within the engineering and scientific sector vendor rankings are generally higher than user rankings. For the engineering and scientific sector, agreement exists between users and vendors on the importance of UNIX and applications integration.

Obviously UNIX is well entrenched, and INPUT thinks this sector will be less inclined to experiment with new operating systems such as Windows NT. INPUT believes that, although additional features are nice, vendors must emphasize integration and networking. They will have to pursue a multiplatform strategy and enhance their products with more customization capabilities.

E

Vendors and Competitive Environment

1. Vendor Characteristics and Trends

Vendor trends include the following:

- Vendors continue to add features, new functionality and ease of use to their products. A new firm, Parametric Technology, has gained recognition through adding sophisticated parametric design techniques to its CAD product, ProEngineer.

- Due to continued market need for industry-specific functionality, vendors are more aggressively pursuing industry-specific VARs as a distribution channel.

- As reflected in the forecasts of Section B, strong movement to PC and workstation platforms continues. As reflected in the vendor profiles below, there are also many examples of vendors' pursuing multiplatform strategies.

- At the high end of the product spectrum, as new products are introduced and as users become more familiar with networking, vendors must begin to prepare for a migration of their customer base to new ways of doing business and using new products to their fullest potential. This will be a challenge even for the largest of companies in this cross-industry sector.

- At the low end of the product spectrum, vendors are challenged to create demand for their products. New ways of marketing, increased advertising budgets and product ease of use will become increasingly important.

2. Leading and Emerging Vendors

Computer-aided design and engineering—Over 100 companies participate in the CAD market; however, few participate in the scientific and engineering cross-industry sector due to the continuing trend toward industry-specific functionality and customization. Of the vendors that do participate in automated cross-industry design and drafting, a continuing shakeout and redefinition is under way.

The strong competitors of several years ago—Calma, Versacad, Computervision, and Gerber Systems—have significantly lessened their presence in or exited the market. Most of the companies lessening their presence are turnkey providers who based their software products on a certain hardware architecture. When the era of the workstation arrived, they were wed to the then old hardware and unbundled/transitioned awkwardly.

Because IC and systems design is outside the scope of this report, companies such as Cadence Design Systems, Dazix, Mentor Graphics and Valid Logic, all of which sell the vast majority of their products to engineering companies, are excluded from this discussion.

Although consolidation in the CAD market has slowed, it is still occurring, and vendor "rearranging" is taking place:

- EDS acquired McDonnell Douglas Systems Integration Co. after a bid to buy just the company's CAD/CAM software line was rejected. Its Unigraphics CAD software is one of two preferred CAD systems in use at EDS' General Motors Corp. parent. In addition to Unigraphics, McDonnell Douglas markets GISs, records management software and CAE products.

- CADAM, owned by IBM, will operate as a division of Dassault Systems. IBM is acquiring an equity position in Dassault.

Structural analysis—At least 100 companies offer structural analysis programs, the vast majority of which have niche products for primarily niche markets; a very small part of their business is cross-industry.

Statistics/mathematics/operations research—Vendors providing statistical and mathematical analysis application solutions have for the most part added modular capabilities and broadened their product lines; now statistical analysis is supported as one of many operations. Several hundred statistical applications software products exist for the PC, but only about half a dozen of the companies that make them have revenues over $5 million. Many of these companies will go as quickly as they come.

A critical question that remains is whether companies offering statistical packages only will be able to survive in a market looking for more integration of tools. Today the specialized company must sell directly to the sophisticated, larger user company that is willing to perform the tool integration task itself. The specialized company can also sell its tools via OEM agreements to the broad-line vendor that, in turn, provides the integration task.

In addition to National Science Foundation (NSF) Supercomputer Centers, dozens of regional remote supercomputing centers exist with time available to outside users. Many license applications packages for structural design, simulation and analysis. Processing services firms such as Litton Computer Services, Computer Sciences, Control Data and GE Information Services may offer timesharing services in statistical applications; however, statistical processing services are a small and diminishing portion of their overall business.

GIS/Mapping —The leading GIS vendors have a mainframe orientation. A handful of vendors have desktop mapping product offerings; more are expected to enter this market.

Today's leading cross-industry engineering and scientific vendors are listed in Exhibit VI-7. With the exception of Intergraph, they are software-only vendors whose products run on industry standard platforms. Although no new entrants in the CAD arena are expected, vendors will continue to enter statistics, structural analysis and mapping.

A

Definition of Terms

A
Introduction

INPUT's *Definition of Terms* provides the framework for all of INPUT's
market analyses and forecasts of the information services industry. It is
used for all U.S. programs. The structure defined in Exhibit A-1 is also
used in Europe and for the worldwide forecast.

One of the strengths of INPUT's market analysis services is the consis-
tency of the underlying market sizing and forecast data. Each year INPUT
reviews its industry structure and makes changes if they are required.
When changes are made they are carefully documented and the new
definitions and forecasts reconciled to the prior definitions and forecasts.
INPUT clients have the benefit of being able to track market forecast data
from year to year against a proven and consistent foundation of defini-
tions.

For 1992 INPUT has added one delivery mode and defined three new
submodes to its Information Services Industry Structure:

- *Equipment Services* has been added as the ninth delivery mode. INPUT
  has forecasted the equipment maintenance, support and related services
  market through its Customer Services Programs for a number or years.
  Starting in 1992, the equipment services portion of the customer services
  market will be included in the total information services industry as
  defined by INPUT. Other portions of this market (such as software
  support) are already included.

- Two new submodes have been defined in the *Systems Operations* deliv-
  ery mode - *desktop services* and *network management*. They are defined
  on pages 5 and 6.

- A fourth submode has been defined within the Professional Services
  delivery mode—*applications management*. This change reflects a shift
  in the way some software development and maintenance services are
  purchased. A complete definition is provided on page 6.
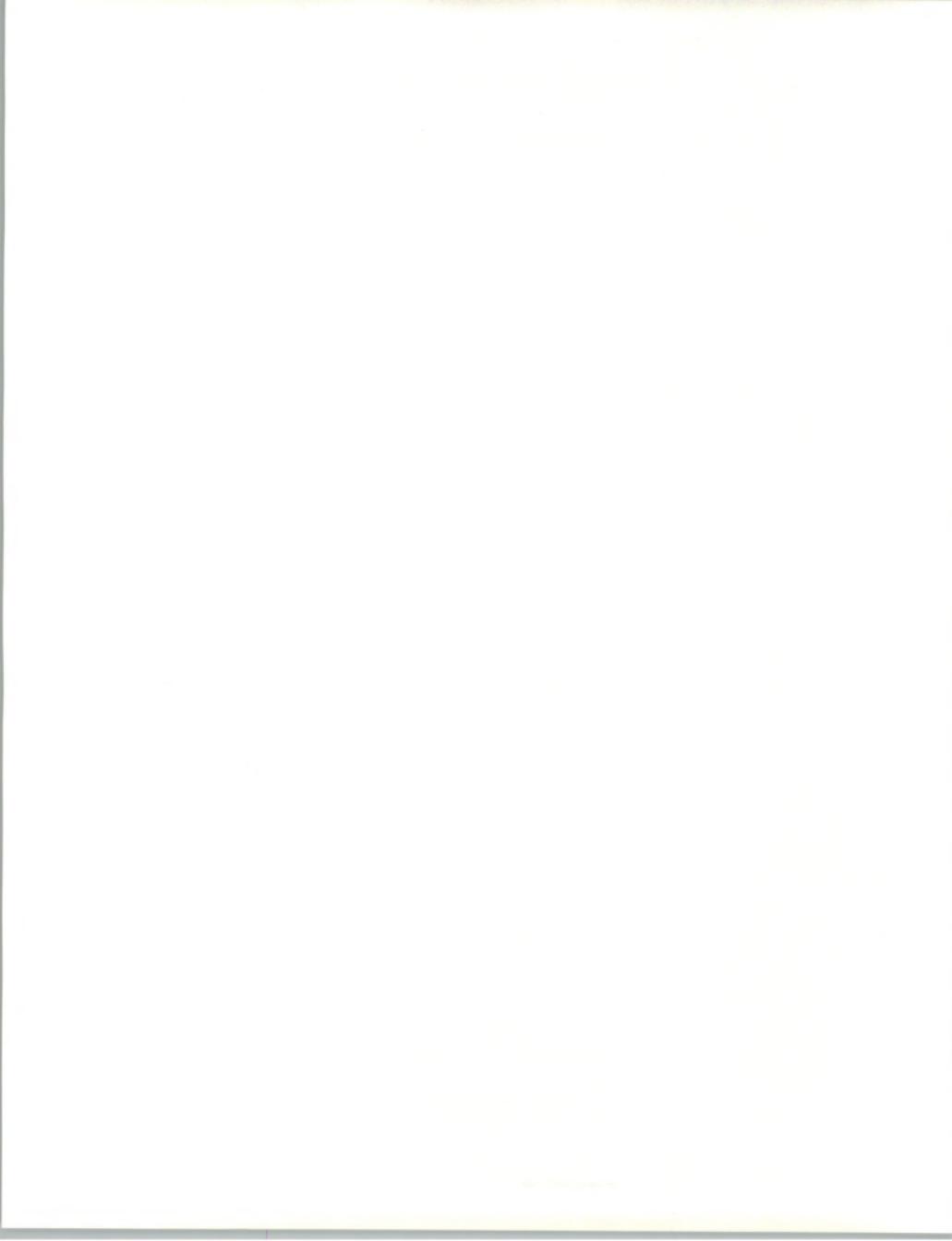
A series of definitions for computer equipment have also been added.

Changes from the 1991 INPUT *Definition of Terms* are indicated with a ☆.

B

Overall Definitions and Analytical Framework

1. Information Services

Information Services are computer/telecommunications-related products and services that are oriented toward the development or use of information systems. Information services typically involve one or more of the following:

- Use of vendor-provided computer processing services to develop or run applications or provide services such as disaster recovery or data entry (called *Processing Services*)

- A combination of computer equipment, packaged software and associated support services which will meet an application systems need (called *Turnkey Systems*)

- Packaged software products, including systems software or applications software products (called *Software Products*)

- People services that support users in developing and operating their own information systems (called *Professional Services*)

- The combination of products (software and equipment) and services where the vendor assumes total responsibility for the development of a custom integrated solution to an information systems need (called *Systems Integration*)

- Services that provide operation and management of all or a significant part of a user's information systems functions under a long-term contract (called *Systems Operations*)

- Services that support the delivery of information in electronic form—typically network-oriented services such as value-added networks, electronic mail and document interchange (called *Network Applications*)

- Services that support the access and use of public and proprietary information such as on-line data bases and news services (called *Electronic Information Services*)

- Services that support the operation of computer and digital communication equipment (called *Equipment Services*)

In general, the market for information services does not involve providing equipment to users. The exception is where the equipment is part of an overall service offering such as a turnkey system, a systems operations contract, or a systems integration project.

The information services market also excludes pure data transport services (i.e., data or voice communications circuits). However, where information transport is associated with a network-based service (e.g., electronic data interchange services), or cannot be feasibly separated from other bundled services (e.g., some systems operations contracts), the transport costs are included as part of the services market.

The analytical framework of the information services industry consists of the following interacting factors: overall and industry-specific business environment (trends, events and issues); technology environment; user information system requirements; size and structure of information services markets; vendors and their products, services and revenues; distribution channels; and competitive issues.

2. Market Forecasts/User Expenditures

All information services market forecasts are estimates of *User Expenditures* for information services. When questions arise about the proper place to count these expenditures, INPUT addresses them from the user's viewpoint: expenditures are categorized according to what users perceive they are buying.

By focusing on user expenditures, INPUT avoids two problems which are related to the distribution channels for various categories of services:

- Double counting, which can occur by estimating total vendor revenues when there is significant reselling within the industry (e.g., software sales to turnkey vendors for repackaging and resale to end users)

- Missed counting, which can occur when sales to end users go through indirect channels such as mail order retailers

Captive Information Services User Expenditures are expenditures for products and services provided by a vendor that is part of the same parent corporation as the user. These expenditures are not included in INPUT forecasts.

Non-captive Information Services User Expenditures are expenditures that go to vendors that have a different parent corporation than the user. It is these expenditures which constitute the information services market analyzed by INPUT and that are included in INPUT forecasts.

3. Delivery Modes

Delivery Modes are defined as specific products and services that satisfy a given user need. While *Market Sectors* specify *who* the buyer is, *Delivery Modes* specify *what* the user is buying.

Of the nine delivery modes defined by INPUT, six are considered primary products or services:

- *Processing Services*
- *Network Services*
- *Professional Services*
- *Applications Software Products*
- *Systems Software Products*
- *Equipment Services*

The remaining three delivery modes represent combinations of these products and services, combined with equipment, management and/or other services:

- *Turnkey Systems*
- *Systems Operations*
- *Systems Integration*

Section C describes the delivery modes and their structure in more detail.

4. Market Sectors

Market Sectors or markets are groupings or categories of the buyers of information services. There are three types of user markets:

- *Vertical Industry* markets, such as Banking, Transportation, Utilities, etc. These are called "industry-specific" markets.

- *Functional Application* markets, such as Human Resources, Accounting, etc. These are called "cross-industry" markets.

- *Other* markets, which are neither industry- nor application-specific, such as the market for systems software products and much of the on-line data base market.

Specific market sectors used by INPUT are defined in Section E, below.

5. Trading Communities

Information technology is playing a major role in re-engineering, not just companies but the value chain or *Trading Communities* in which these companies operate. This re-engineering is resulting in electronic commerce emerging where interorganizational electronic systems facilitate the business processes of the trading community.
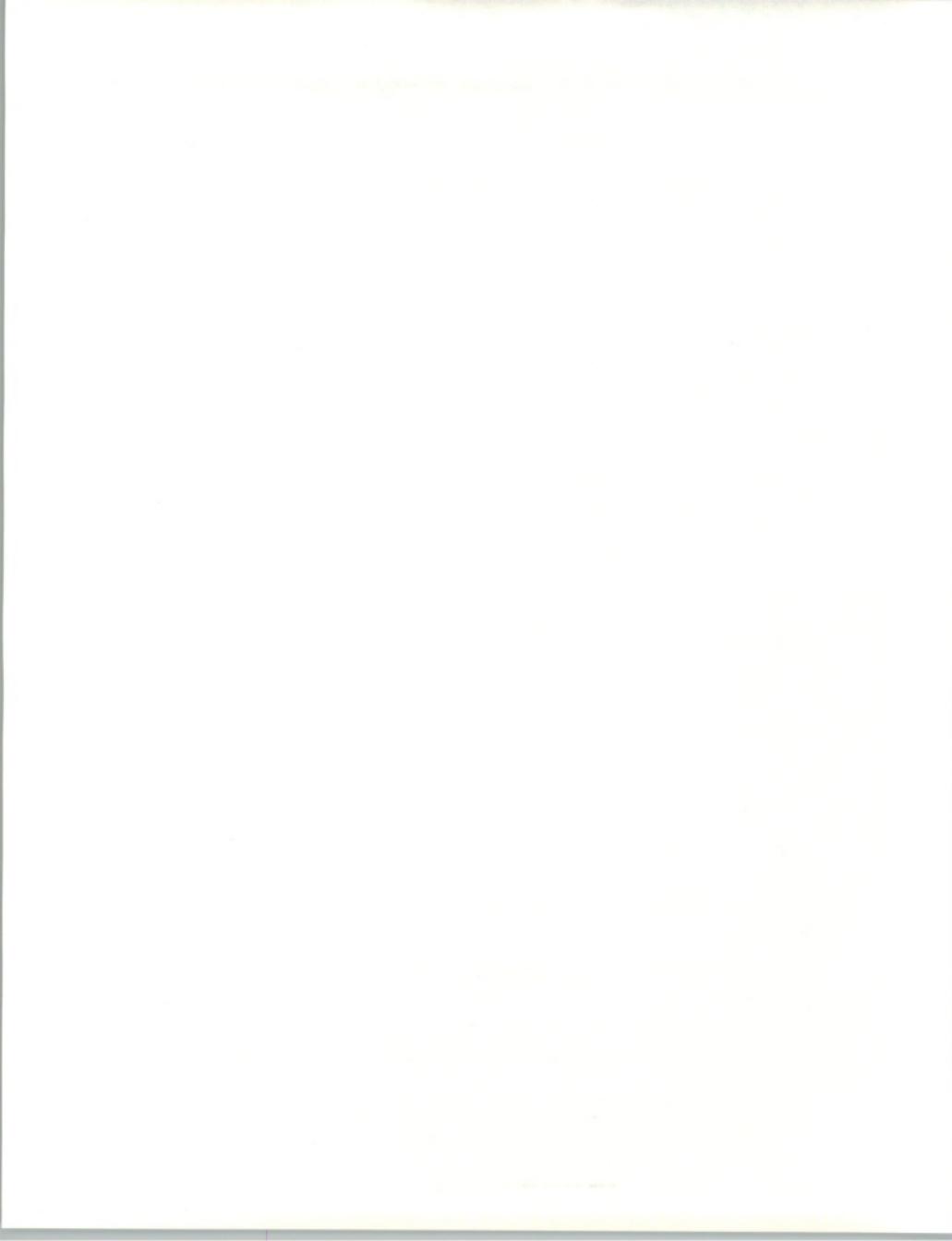
- A trading community is the group or organizations—commercial and non-commercial—involved in producing a good or services.

- Electronic commerce and trading communities are addressed in INPUT's EDI and Electronic Commerce Program.
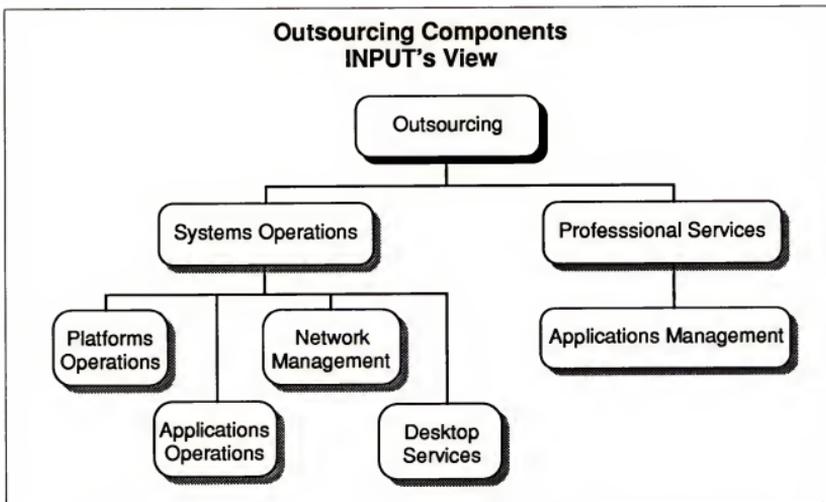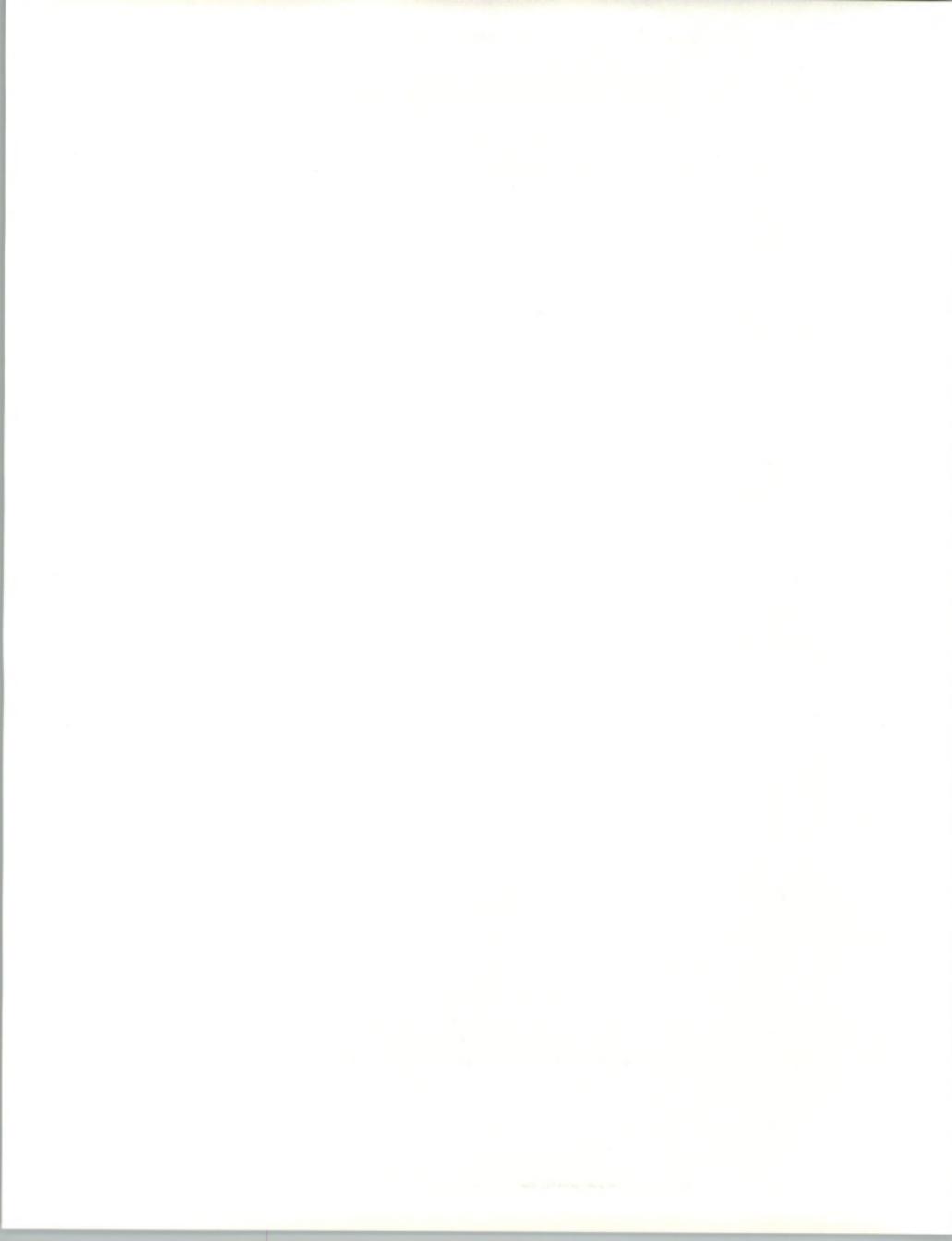
6. Outsourcing

Over the past few years a major change has occurred in the way clients are buying some information services. The shift has been labeled *outsourcing*.

INPUT views outsourcing as a change in the form of the client/vendor relationship. Under an outsourcing relationship, all or a major portion of the information systems function is contracted to a vendor in a long-term relationship. The vendor is responsible for the performance of the function.

INPUT considers the following submodes to be outsourcing-type relationships and in aggregate to represent the outsourcing market. See Exhibit A-1. Complete definitions are provided in Section C of this document. INPUT provides these forecasts as part of the corresponding delivery modes.

EXHIBIT A-1

**Outsourcing Components
INPUT's View**

```
                        Outsourcing
                            |
            ┌───────────────┴───────────────┐
    Systems Operations              Professsional Services
            |                               |
  ┌─────────┼─────────┐          Applications Management
Platforms       Network
Operations     Management
  │               │
Applications    Desktop
Operations      Services
```

- *Platform Systems Operations* - The vendor is responsible for managing and operating the client's computer systems.

- *Applications System Operations* - The vendor is responsible for developing and/or maintaining a client's applications as well as operating the computer systems.

☆*Network Management* - The vendor assumes full responsibility for operating and managing the client's data communications systems. This may also include the voice communications of the client.

☆*Applications Management/Maintenance* - The professional services vendor has full responsibility for developing and/or maintaining some or all of the applications systems that a client uses to support business operations. The services are provided on a long-term contractual basis.

☆*Desktop Services* - The vendor assumes responsibility for the deployment, maintenance, and connectivity between the personal computers and/or intelligent workstations in the client organization. The services may also include performing the help-desk function. The services are provided on a long-term contractual basis.

C
Delivery Modes and Submodes

Exhibit A-2 provides the overall structure of the information services industry as defined and used by INPUT. This section of *Definition of Terms* provides definitions for each of the delivery modes and their sub-modes or components.

1. Software Products

INPUT divides the software products market into two delivery modes: systems software and applications software.

The two delivery modes have many similarities. Both involve purchases of software packages for in-house computer systems. Included are both lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement or maintain the package at the user's sites. Vendor-provided training or support in operation and use of the package, if part of the software pricing, is also included here.

Expenditures for work performed by organizations other than the package vendor are counted in the professional services delivery mode. Fees for work related to education, consulting, and/or custom modification of software products are also counted as professional services, provided such fees are charged separately from the price of the software product itself.
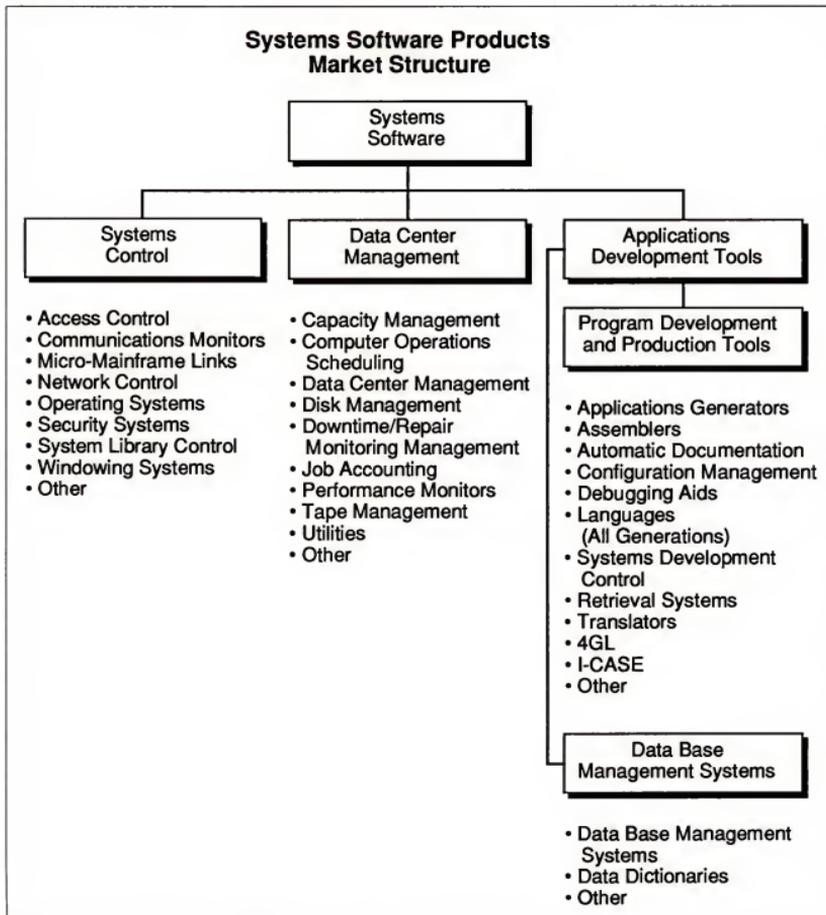
Information Services Industry Structure—1992

Systems Software Products	Applications Software Products	Turnkey Systems	Equipment Services	Professional Services	Systems Integration	Systems Operations	Processing Services	Network Services
−Mainframe	−Mainframe	−Equipment	−Equipment Maintenance	−Consulting	−Equipment	−Platform Operations	−Transaction	−Electronic Information Services
−Minicomputer	−Minicomputer	−Software Products	−Environmental Services	−Education & Training	−Software Products	−Applications Operations	−Utility	−Network Applications
−Workstation/ PC	−Workstation/ PC	−Professional Services		−Software Development/ Maintenance	−Professional Services	−Desktop Services	−Other	
				−Application Management/ Maintenance	−Other	−Network Management		

Source: INPUT

a. Systems Software Products

Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. INPUT divides systems software products into three submodes. See Exhibit A-3.

EXHIBIT A-3

Systems Software Products Market Structure

Systems Software

Systems Control
- Access Control
- Communications Monitors
- Micro-Mainframe Links
- Network Control
- Operating Systems
- Security Systems
- System Library Control
- Windowing Systems
- Other

Data Center Management
- Capacity Management
- Computer Operations Scheduling
- Data Center Management
- Disk Management
- Downtime/Repair Monitoring Management
- Job Accounting
- Performance Monitors
- Tape Management
- Utilities
- Other

Applications Development Tools

Program Development and Production Tools
- Applications Generators
- Assemblers
- Automatic Documentation
- Configuration Management
- Debugging Aids
- Languages (All Generations)
- Systems Development Control
- Retrieval Systems
- Translators
- 4GL
- I-CASE
- Other

Data Base Management Systems
- Data Base Management Systems
- Data Dictionaries
- Other

- *Systems Control Products* - Software programs that manage computer system resources and control the execution of programs. These products include operating systems, emulators, network control, library control, windowing, access control, and spoolers.

- *Operations Management Tools* - Software programs used by operations personnel to manage the computer system and/or network resources and personnel more effectively. Included are performance measurement, job accounting, computer operation scheduling, disk management utilities, and capacity management.

- *Applications Development Tools* - Software programs used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Included are traditional programming languages, 4GLs, data dictionaries, data base management systems, report writers, project control systems, CASE systems and other development productivity aids.

INPUT also forecasts the systems software products delivery mode by platform level: mainframe, minicomputer and workstation/PC.

b. Applications Software Products

Applications software products enable a user or group of users to support an operational or administrative process within an organization. Examples include accounts payable, order entry, project management and office systems. INPUT categorizes applications software products into two groups of market sectors. (See Exhibit A-4.)

- *Industry Applications Software Products* - Software products that perform functions related to fulfilling business or organizational needs unique to a specific industry (vertical) market and sold to that market only. Examples include demand deposit accounting, MRPII, medical record keeping, automobile dealer parts inventory, etc.

- *Cross-Industry Applications Software Products* - Software products that perform a specific function that is applicable to a wide range of industry sectors. Examples include payroll and human resource systems, accounting systems, word processing and graphics systems, spreadsheets, etc.

INPUT also forecasts the applications software products delivery mode by platform level: mainframe, minicomputer and workstation/PC.

EXHIBIT A-4

Application Products and Turnkey Systems

```
                    ┌──────────────────┐   ┌──────────────┐
                    │   Applications   │   │   Turnkey    │
                    │ Software Products│   │   Systems    │
                    └──────────────────┘   └──────────────┘
```

Cross-Industry

Office Systems	Accounting	Human Resources	Education & Training
• Integrated Office Systems • Word Processing • Desktop Publishing • Image Systems • Electronic Publishing	• General Ledger • Accounts Payable • Accounts Receivable • Billing/Invoicing • Costing • Fixed Assets • International Accounting • Purchasing • Taxation	• Human Resources Management • Payroll • Benefits	• Computer-Based Training • Authoring Languages

Planning & Analysis	Engineering & Scientific	Sales and Marketing
• Executive Information Systems • Financial Modeling and Planning • Spreadsheets • Project Management	• Computer-Aided Design and Engineering • Structural Analysis • Statistics/Mathematics/Operations Research • Mapping	• Marketing Management • Sales Analysis

Industry-Specific

- Discrete Manufacturing
- Process Manufacturing
- Transportation Services
- Utilities
- Telecommunications
- Retail Distribution
- Wholesale Distribution
- Banking and Finance
- Insurance
- Health Services
- Education
- Business and Technical Services
- Federal Government
- State and Local Government
- Miscellaneous Industries

2. Turnkey Systems

A turnkey system is an integration of equipment (CPU, peripherals, etc.), systems software, and packaged applications software into a single product developed to meet a specific set of user requirements. Value added by the turnkey system vendor is primarily in the software and professional services provided. INPUT categorizes turnkey systems into two groups of market sectors as it does for applications software products. (See Exhibit A-4.)

Most CAD/CAM systems and many small business systems are turnkey systems. Turnkey systems utilize standard computers and do not include specialized hardware such as word processors, cash registers, process control systems, or embedded computer systems for military applications.

Computer manufacturers (e.g., IBM or DEC) that combine software with their own general-purpose hardware are not classified by INPUT as turnkey vendors. Their software revenues are included in the appropriate software category.

Most turnkey systems are sold through channels known as value-added resellers.

- *Value-Added Reseller (VAR):* A VAR adds value to computer hardware and/or software and then resells it to an end user. The major value added is usually applications software for a vertical or cross-industry market, but also includes many of the other components of a turnkey systems solution, such as professional services, software support, and applications upgrades.

Turnkey systems have three components:

- Equipment - computer hardware supplied as part of the turnkey system

- Software products - prepackaged systems and applications software products

- Professional services - services to install or customize the system or train the user, provided as part of the turnkey system sale

Exhibit A-5 contrasts turnkey systems with systems integration. Turnkey systems are based on available software products that a vendor may modify to a modest degree.

EXHIBIT A-5

The Customization Spectrum

Systems Integration	Custom Turnkey	Turnkey
Degree of Customization		

100%   50%   25%   0%

3. Processing Services

This delivery mode includes three submodes: transaction processing, utility processing, and "other" processing services. See Exhibit A-6.

EXHIBIT A-6

Processing Services Market Structure

Processing Services

— Transaction Processing

— Uitlity Processing

— Other Processing Services
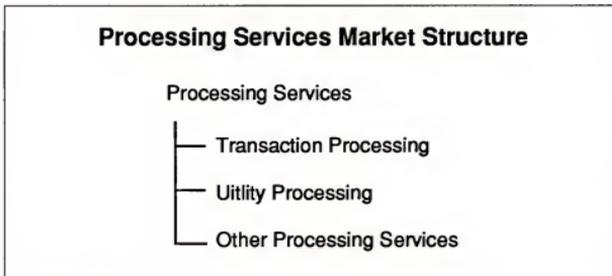
- *Transaction Processing* - Client uses vendor-provided information systems—including hardware, software and/or data networks—at the vendor site or customer site to process specific applications and update client data bases. The application software is typically provided by the vendor.

- *Utility Processing* - Vendor provides basic software tools (language compilers, assemblers, DBMSs, graphics packages, mathematical models, scientific library routines, etc.), enabling clients to develop and/or operate their own programs or process data on the vendor's system.

- *Other Processing Services* - Vendor provides service—usually at the vendor site—such as scanning and other data entry services, laser printing, computer output microfilm (COM), CD preparation and other data output services, backup and disaster recovery, etc.

4. Systems Operations

Systems operations as a delivery mode was introduced in the 1990 Market Analysis and Systems Operations programs. Previously called Facilities Management, this delivery mode was created by taking the Systems Operations submode out of both Processing Services and Professional Services. For 1992 the submodes have been defined as follows.

Systems operations involves the operation and management of all or a significant part of the client's information systems functions under a long-term contract. These services can be provided in either of two distinct submodes where the difference is whether the support of applications, as well as data center operations, is included.

- *Platform systems operations* - The vendor manages and operates the computer systems, to perform the client's business functions, without taking responsibility for the client's application systems.

- *Applications systems operations* - The vendor manages and operates the computer systems to perform the client's business functions, and is also responsible for maintaining, or developing and maintaining, the client's application systems.

☆*Network Management* - The vendor assumes responsibility for operating and managing the client's data communications systems. This may also include the voice communications of the client. A network management outsourcing contract may include only the management services or the full costs of the communications services and equipment plus the management services.

☆*Desktop Services* - The vendor assumes responsibility for the deployment, maintenance, and connectivity among the personal computers and/or workstations in the client organization. The services may also include performing the help-desk function. Equipment as well as services can be part of a desktop services outsourcing contract.

Note: This type of client service can also be provided through traditional professional services where the contractual criteria of outsourcing are not present.

Systems operations vendors now provide a wide variety of services in support of existing information systems. The vendor can plan, control, provide, operate, maintain and manage any or all components of the client's information systems environment (equipment, networks, applications systems), either at the client's site or the vendor's site.

Note: In the federal government market, systems operation services are also defined by equipment ownership with the terms "COCO" (Contractor-Owned, Contractor-Operated), and "GOCO" (Government-Owned, Contractor-Operated).

5. Systems Integration (SI)

Systems integration is a vendor service that provides a complete solution to an information system, networking or automation development requirement through the custom selection and implementation of a variety of information system products and services. A systems integrator is responsible for the overall management of a systems integration contract and is the single point of contact and responsibility to the buyer for the delivery of the specified system function, on schedule and at the contracted price. (Refer to Exhibit A-7.)

The components of a systems integration project are the following:

- *Equipment* - information processing and communications equipment required to build the systems solution. This component may include custom as well as off-the-shelf equipment to meet the unique needs of the project. The systems integration equipment category excludes turnkey systems by definition.

- *Software products* - prepackaged applications and systems software products.

- *Professional services* - the value-added component that adapts the equipment and develops, assembles, or modifies the software and hardware to meet the system's requirements. It includes all of the professional services activities required to develop, implement, and if included in the contract, operate an information system, including consulting, program/project management, design and integration, software development, education and training, documentation, and systems operations and maintenance.

- *Other services* - most systems integration contracts include other services and product expenditures that are not classified elsewhere. This category includes miscellaneous items such as engineering services, automation equipment, computer supplies, business support services and supplies, and other items required for a smooth development effort.

EXHIBIT A-7

Products/Services in Systems Integration Projects

Equipment
- Information systems
- Communications

Software Products
- Systems software
- Applications software

Professional Services
- Consulting
  - Feasibility and trade-off studies
  - Selection of equipment, network and software
- Program/project management
- Design/integration
  - Systems design
  - Installation of equipment, network, and software
  - Demonstration and testing
- Software development
  - Modification of software packages
  - Modification of existing software
  - Custom development of software
- Education/training and documentation
- Systems operations/maintenance

Other Miscellaneous Products/Services
- Site preparation
- Data processing supplies
- Processing/network services
- Data/voice communication services

6. Professional Services

This category includes four submodes: consulting, education and training, software development, and applications management. Exhibit A-8 provides additional detail.

- *Consulting:* Services include management consulting (related to information systems), information systems re-engineering, information systems consulting, feasibility analysis and cost-effectiveness studies, and project management assistance. Services may be related to any aspect of the information system, including equipment, software, networks and systems operations.

- *Education and Training:* Services that provide training and education or the development of training materials related to information systems and services for the information systems professional and the user, including computer-aided instruction, computer-based education, and vendor instruction of user personnel in operations, design, programming, and documentation. Education and training provided by school systems are not included. General education and training products are included as a cross-industry market sector.

- *Software Development:* Services include user requirements definition, systems design, contract programming, documentation, and implementation of software performed on a custom basis. Conversion and maintenance services are also included.

☆*Applications Management:* The vendor has full responsibility for maintaining and upgrading some or all of the application systems that a client uses to support business operations and may develop and implement new application systems for the client.

An applications management contract differs from traditional software development in the form of the client/vendor relationship. Under traditional software development services the relationship is project based. Under applications management it is time and function based.

These services may be provided in combination or separately from platform systems operations.

EXHIBIT A-8

Professional Services Market Structure

Professional Services

Applications Management**

- Applications Maintenance
- Application Development
- Application Support

Software Development/ Maintenance

- User Requirements Definition
- Systems Design
- System Conversion
- Data Base Design
- Programming
- Testing
- System Modification
- Documentation/ Technical Writing
- Network Development
- Other

Consulting*

- Installation Planning
- Network Planning and Design
- Information Systems Audit
- IS Planning
- IS Security/Audit
- System Evaluation
- IS Personnel Planning
- Systems Analysis
- IS Policies and Procedures Development
- Project Management
- Other

Education & Training*

- Computer Operations Training
- IS Management Training
- Analyst/ Programmer Training
- Systems Use Training
- Video Instruction
- Other

*Related to computer systems, topics, or issues

**Vendor assumes full responsibility on contracted longer term basis

7. Network Services

Network services are a variety of telecommunications-based functions and operations. Network service includes two submodes, as shown in Exhibit A-9.

EXHIBIT A-9

Network Services Market Structure

Network Services

Network Applications Services	Electronic Information Services
— Value-Added Networks (VANs) 　- Packet Switching 　- Store and Forward — Electronic Data Interchange (EDI) — Electronic Information Interchange 　- Electronic Mail 　- Bulletin Boards	— On-Line Data Bases — On-Line News (text) Services — Other
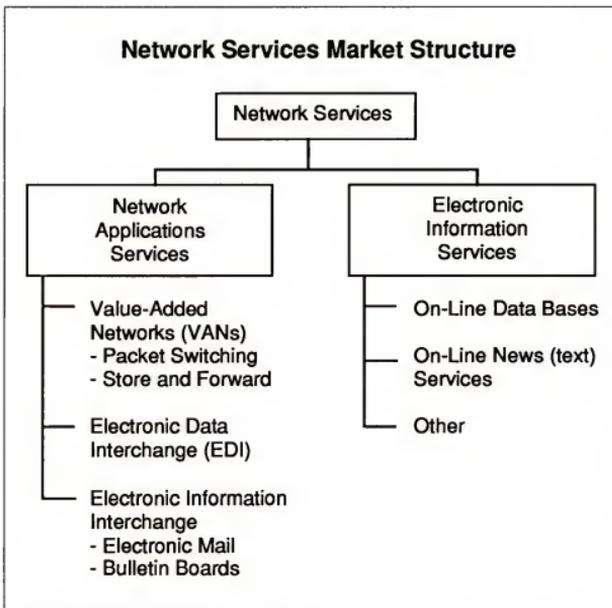
a. Electronic Information Services

Electronic information services are data bases that provide specific information via terminal- or computer-based inquiry, including items such as stock prices, legal precedents, economic indicators, periodical literature, medical diagnosis, airline schedules, automobile valuations, etc. The terminals used may be computers themselves, such as communications servers or personal computers.

Users inquire into and extract information from the data bases. They may load extracted data into their own computer systems; the vendor does not provide data processing or manipulation capability as part of the electronic information service and users cannot update the vendor's data bases. However, the vendor may offer other services (network applications or processing services) that do offer processing or manipulation capability.

The two kinds of electronic information services are:

- *On-line Data Bases* - Structured, primarily numerical data on economic and demographic trends, financial instruments, companies, products, materials, etc.

- Unstructured, primarily textual information on people, companies, events, etc. These are often news services.

While electronic information services have traditionally been delivered via networks, there is a growing trend toward the use of CD ROM optical disks to support or supplant on-line services, and these optical disk-based systems are included in the definition of this delivery mode.

b. Network Applications

Value-Added Network Services (VAN Services) - VAN services are enhanced transport services which involve adding such functions as automatic error detection and correction, protocol conversion, and store-and-forward message switching to the provision of basic network circuits.

While VAN services were originally provided only by specialized VAN carriers (Tymnet, Telenet, etc.), today these services are also offered by traditional common carriers (AT&T, Sprint, etc.). Meanwhile, the VAN carriers have also branched into the traditional common carriers' markets and are offering unenhanced basic network circuits as well.

Electronic Data Interchange (EDI) - Application-to-application electronic exchange of business data between trade partners or facilitators using a telecommunications network.

Electronic Information Interchange- The transmission of messages across an electronic network managed by a services vendor, including electronic mail, voice mail, voice messaging, and access to Telex, TWX, and other messaging services. This also includes bulletin board services.

8. Equipment Services

☆The equipment services delivery mode includes two submodes. Both deal with the support and maintenance of computer equipment.

☆*Equipment Maintenance* - Services provided to repair, diagnose problems and provide preventive maintenance both on-site and off-site for computer equipment. The costs of parts, media and other supplies are excluded. These services are typically provided on a contract basis.

☆*Environmental Services* - Composed of equipment and data center related special services such as cabling, air conditioning and power supply, equipment relocation and similar services.

D
Computer Equipment

☆These definitions have been included to provide the basis for market segmentation in the software products markets.

☆*Computer Equipment* - 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. Unless otherwise noted in an INPUT forecast, computer equipment is only included where it is part of the purchase of services or software products (e.g., turnkey systems and systems integration).

☆*Peripherals* - Includes all input, output, communications, and storage devices (other than main memory) that can be channel connected to a 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 modem, 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

☆*Computer Systems* - Includes all processors from personal computers to supercomputers. Computer systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices and processors or CPUs not provided as part of an integrated (turnkey) system.

☆*Personal computers* - Smaller computers using 8-, 16-, or 32-bit computer technology. Generally designed to sit on a desktop and are portable for individual use. Price generally less than $5,000.

☆*Workstations* - High-performance, desktop, single-user computers often employing Reduced Instruction Set Computing (RISC). Workstations provide integrated, high-speed, local network-based services such as data base access, file storage and back-up, remote communications, and peripheral support. These products usually cost from $5,000 to $15,000.

☆*Minicomputer or midsize computers* - Minicomputers are generally priced from $15,000 to $350,000. Many of the emerging client/server computers are in this category.

☆*Mainframe or large computers* - Traditional mainframe and supercomputers costing more than $350,000.

E

Sector Definitions

1. Industry Sector Definitions

INPUT structures the information services market into industry sectors such as process manufacturing, insurance, transportation, etc. The definitions of these sectors are based on the 1987 revision of the Standard Industrial Classification (SIC) code system. The specific industries (and their SIC codes) included under these industry sectors are detailed in Exhibit A-10.

INPUT includes all delivery modes except systems software products and equipment services in industry market sectors. See Exhibit A-9 and section E-3 (Delivery Mode Reporting by Sector).

Note: SIC code 88 is Personal Households. INPUT does not currently analyze or forecast information services in this market sector.

EXHIBIT A-10

Industry Sector Definitions

Industry Sector	SIC Code	Description
Discrete Manufacturing	23xx	Apparel and other finished products
	25xx	Furniture and fixtures
	27xx	Printing, publishing and allied industries
	31xx	Leather and leather products
	34xx	Fabricated metal products, except machinery and transportation equipment
	35xx	Industrial and commercial machinery and computer equipment
	36xx	Electronic and other electrical equipment and components, except computer equipment
	37xx	Transportation equipment
	38xx	Instruments; photo/med/optical goods; watches/clocks
	39xx	Miscellaneous manufacturing industry
Process Manufacturing	10xx	Metal mining
	12xx	Coal mining
	13xx	Oil and gas extraction
	14xx	Mining/quarrying nonmetalic minerals
	20xx	Food and kindred products
	21xx	Tobacco products
	22xx	Textile mill products
	24xx	Lumber and wood products, except furniture
	26xx	Paper and allied products
	28xx	Chemicals and allied products
	29xx	Petroleum refining and related industries
	30xx	Rubber and miscellaneous plastic products
	32xx	Stone, clay, glass and concrete products
	33xx	Primary metal industries
Transportation Services	40xx	Railroad transport
	41xx	Public transit/transport
	42xx	Motor freight transport/warehousing
	43xx	U.S. Postal Service
	44xx	Water transportation
	45xx	Air transportation (including airline reservation services in 4512)
	46xx	Pipelines, except natural gas
	47xx	Transportation services (including 472x, arrangement of passenger transportation)

EXHIBIT A-10 (CONT.)

Industry Sector Definitions

Industry Sector	SIC Code	Description
Telecommunications	48xx	Communications
Utilities	49xx	Electric, gas and sanitary services
Retail Distribution	52xx 53xx 54xx 55xx 56xx 57xx 58xx 59xx	Building materials General merchandise stores Food stores Automotive dealers, gas stations Apparel and accessory stores Home furniture, furnishings and accessory stores Eating and drinking places Miscellaneous retail
Wholesale Distribution	50xx 51xx	Wholesale trade - durable goods Wholesale trade - nondurable goods
Banking and Finance	60xx 61xx 62xx 67xx	Depositary institutions Nondepository institutions Security and commodity brokers, dealers, exchanges and services Holding and other investment offices
Insurance	63xx 64xx	Insurance carriers Insurance agents, brokers and services
Health Services	80xx	Health services
Education	82xx	Educational services

EXHIBIT A-10 (CONT.)

Industry Sector Definitions

Industry Sector	SIC Code	Description
Business Services	65xx	Real estate
	70xx	Hotels, rooming houses, camps, and other lodging places
	72xx	Personal services
	73xx	Business services (except hotel reservation services in 7389)
	7389x	Hotel reservation services
	75xx	Automotive repair, services and parking
	76xx	Miscellaneous repair services
	78xx	Motion pictures
	79xx	Amusement and recreation services
	81xx	Legal services
	83xx	Social services
	84xx	Museums, art galleries, and botanical/zoological gardens
	86xx	Membership organizations
	87xx	Engineering, accounting, research, management, and related services
	89xx	Miscellaneous services
Federal Government	9xxx	
State and Local Government	9xxx	
Miscellaneous Industries	01xx	Agricultural production - crops
	02xx	Agricultural production - livestock/animals
	07xx	Agricultural services
	08xx	Forestry
	09xx	Fishing, hunting and trapping
	15xx	Building construction - general contractors, operative builders
	16xx	Heavy construction - contractors
	17xx	Construction - special trade contractors

2. Cross-Industry Sector Definitions

INPUT has identified seven cross-industry market sectors. These sectors or markets involve multi-industry applications such as human resource systems, accounting systems, etc.

• In order to be included in an industry sector, the service or product delivered must be specific to that sector only. If a service or product is used in more than one industry sector, it is counted as cross-industry.

• INPUT only includes the turnkey systems, applications software products, and transaction processing services in the cross-industry sectors.

The seven cross-industry markets are:

Accounting - consists of applications software products and information services that serve such functions as:

- General ledger
- Financial management
- Accounts payable
- Accounts receivable
- Billing/invoicing
- Fixed assets
- International accounting
- Purchasing
- Taxation
- Financial consolidation

• Excluded are accounting products and services directed to a specific industry, such as tax processing services for CPAs and accountants within the business services industry sector.

Human Resources - consists of application solutions purchased by multiple industry sectors to serve the functions of human resources management and payroll. Examples of specific applications within these two major functions are:

- Employee relations
- Benefits administration
- Government compliance
- Manpower planning
- Compensation administration
- Applicant tracking
- Position control
- Payroll processing

Education and Training - consists of education and training for information systems professionals and users of information systems delivered as a software product, turnkey system or through processing services. The market for computer-based training tools for the training of any employee on any subject is also included.

Office Systems consists of the following:

- Integrated office systems (IOS)
- Word processing
- Desktop publishing
- Electronic publishing
- Image systems

• IOSs—such as IBM's OfficeVision, HP's NewWave Office and DEC's All-In-1—typically include the following core functions, all of which are accessed from the same desktop: electronic mail, decision support systems, time management and filing systems.

• Office systems graphics include presentation graphics (which represent the bulk of office systems graphics), paint and line art, page description languages, and electronic form programs.

• The fundamental difference between electronic publishing and desktop publishing (within the office systems sector) is that electronic publishing encompasses a method of document management and control from a single point—regardless of how many authors/locations work on a document—whereas desktop publishing is a personal productivity tool and is generally a lower end product residing on a personal computer.

• Electronic or computer publishing systems that are sold strictly and specifically to commercial publishers, printers, and typesetters are excluded from cross-industry consideration and are included in the discrete manufacturing industry.

Engineering and Scientific encompasses the following applications:

- Computer-aided design and engineering (CAD and CAE)
- Structural analysis
- Statistics/mathematics/operations research
- Mapping/GIS

• Computer-aided manufacturing (CAM) or CAD that is integrated with CAM is excluded from the cross-industry sector as it is specific to the manufacturing industries. CAD or CAE that is dedicated to integrated circuit design is also excluded because it is specific to the semiconductor industry.

Planning and Analysis consists of software products and information services in four application areas:

- Executive Information Systems (EIS)
- Financial modeling or planning systems
- Spreadsheets
- Project management

Sales and Marketing encompasses marketing management and sales analysis application solutions.

• Sales and marketing includes:

- Sales analysis
- Marketing management
- Demographic market planning models

3. Delivery Mode Reporting by Sector

This section describes how the delivery mode forecasts relate to the market sector forecasts. Exhibit A-11 summarizes the relationships.

• *Processing services* - The transaction processing services submode is forecasted for each industry and cross-industry market sector. The utility and other processing services submodes are forecasted in total market in the general market sector.

• *Turnkey systems* - Turnkey systems is forecasted for the 15 industry and 7 cross-industry sectors. Each component of turnkey systems is forecasted in each sector.

• *Applications software products* - The applications software products delivery mode is forecasted for the 15 industry and 7 cross-industry sectors. In addition, each forecast is broken down by platform level: mainframe, minicomputer and workstation/PC.

• *Systems operations* - Each of the systems operations submodes is forecasted for each of the 15 industry sectors.

• *Systems integration* - Systems integration and each of the components of systems integration are forecasted for each of the 15 industry sectors.

• *Professional services* - Professional services and each of the submodes is forecasted for each of the 15 industry sectors.

EXHIBIT A-11

Delivery Mode versus Market Sector
Forecast Content

Delivery Mode	Submode	Market Sectors		
		Industry Sectors	Cross-Industry Sectors	General
Processing Services	Transaction	X	X	
	Utility			X
	Other			X
Turnkey Systems		X	X	
Applications Software Products		X	X	
Systems Operations	Platform	X		
	Applications	X		
Systems Integration		X		
Professional Services		X		
Network Services	Network Applications	X		
	Electronic Information Services	X		X
Systems Software Products				X
Equipment Services				X

- *Network services* - The network applications submode of network services forecasted for each of the 15 industry sectors.

  Industry and cross-industry electronic information services are forecast in relevant market sectors. The remainder of electronic information services is forecasted in total for the general market sector.

- *Systems software products* - Systems software products and its submodes are forecasted in total for the general market sector. Each submode forecast is broken down by platform level: mainframe, mini-computer and workstation/PC.
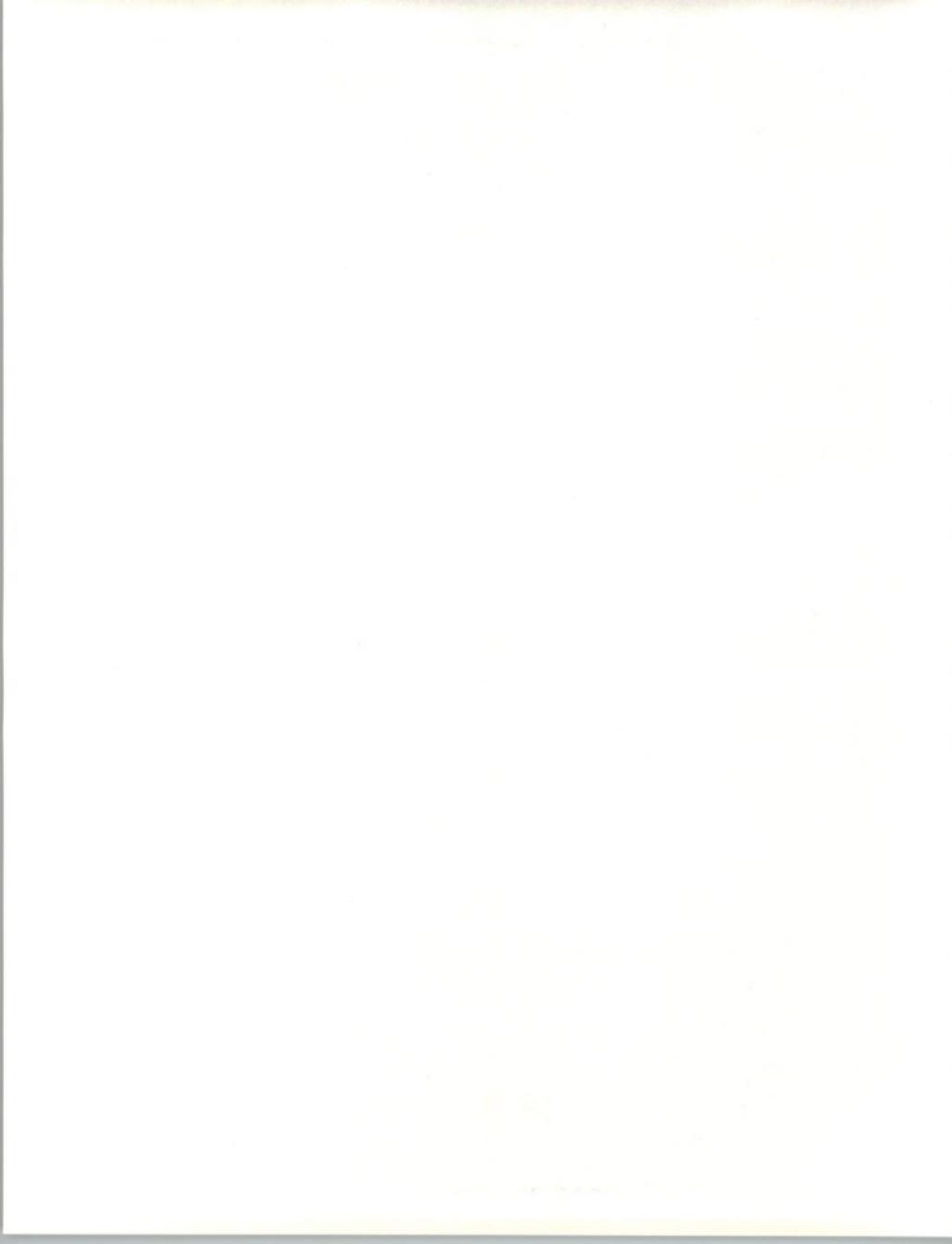
• *Equipment services* - Equipment services and its submodes are
forecasted in total in the general market sectors.

F
Vendor Revenue and User Expenditure Conversion

The size of the information services market may be viewed from two
perspectives: vendor (producer) revenues and user expenditures. INPUT
defines and forecasts the information services market in terms of user
expenditures. User expenditures reflect the markup in producer sales
when a product such as software is delivered through indirect distribution
channels (such as original equipment manufacturers (OEMs), retailers and
distributors). The focus on user expenditure also eliminates the double
counting of revenues that would occur if sales were tabulated for both
producer (e.g., Lotus) and distributor (e.g., ComputerLand).

For most delivery modes, vendor revenues and user expenditures are fairly
close. However, there are some areas of significant difference. Many
microcomputer software products, for example, are marketed through
distribution channels. To capture the valued added through these distribu-
tion channels, adjustment factors are used to convert estimated informa-
tion services vendor revenues to user expenditures.

For some delivery modes, including software products, systems integra-
tion and turnkey systems, there is a significant volume of intra-industry
sales. For example, systems integrators purchase software and subcontract
the services of other professional services vendors. Turnkey vendors
incorporate purchased software into the systems they sell to users.

To account for such intra-industry transactions, INPUT uses conversion
ratios to derive the estimate of end-user expenditures.

Exhibit A-12 summarizes the net effect of the various ratios used by
INPUT to convert vendor revenues to user expenditure (market size)
figures for each delivery mode.

EXHIBIT A-12

Vendor Revenue to
User Expenditure Conversion

Delivery Mode	Vendor Revenue Multiplier
Applications Software Products	1.18
Systems Software Products	1.10
Systems Operations	0.95
Systems Integration	0.95
Professional Services	0.99
Network Services	0.99
Processing Services	0.99
Turnkey Systems	0.95
Equipment Services	0.99

B

Forecast Data Base

INPUT has lowered the processing services forecast for the engineering and scientific sector for the second year in a row. More affordable hardware platforms cause user organizations to continue to bring applications in-house; also, INPUT expects large research projects to continue to be curtailed over the short term due to the uncertainty of the economy.

EXHIBIT B-1

Engineering and Scientific Cross-Industry Sector
User Expenditure Forecast by Delivery Mode, 1991-1997

Delivery Modes	1991 ($ M)	Growth 90-91 (%)	1992 ($ M)	1993 ($ M)	1994 ($ M)	1995 ($ M)	1996 ($ M)	1997 ($ M)	CAGR 92-97 (%)
Sector Total	902	11	999	1,106	1,227	1,365	1,527	1,710	11
Processing Services	128	2	130	130	125	120	110	100	-5
- Transaction Processing	128	2	130	130	125	120	110	100	-5
Turnkey Systems	123	5	129	136	142	150	157	165	5
Applications Software Products	651	14	740	840	960	1,095	1,260	1,445	14
- Mainframe	146	8	158	170	185	200	215	230	8
- Minicomputer	241	10	265	290	320	350	390	425	10
- Workstation/PC	264	15	304	350	400	460	530	610	15

EXHIBIT B-2

Engineering and Scientific Cross-Industry Sector
1992 MAP Data Base Reconciliation by Delivery Mode

Delivery Modes	1991 Market				1996 Market				91-96 CAGR per data 91 rpt (%)	91-96 CAGR per data 92 rpt (%)
	1991 Report (Fcst) ($ M)	1992 Report (Actual) ($ M)	Variance from 1991 Report ($ M)	(%)	1991 Report (Fcst) ($ M)	1992 Report (Fcst) ($ M)	Variance from 1991 Report ($ M)	(%)		
Sector Total	902	902	0	0	1,648	1,527	-121	-7	13	12
Processing Services	128	128	0	0	131	110	-21	-16	1	0
- Transaction Processing	128	128	0	0	131	110	-21	-16	1	0
Turnkey Systems	123	123	0	0	173	157	-16	-9	7	5
Applications Software Products	651	651	0	0	1,344	1,260	-84	-6	16	14
- Mainframe	146	146	0	0	214	215	1	0	8	8
- Minicomputer	241	241	0	0	415	390	-25	-6	11	10
- Workstation/PC	264	264	0	0	714	530	-184	-26	22	20

About INPUT

INPUT is a worldwide consulting and market research firm uniquely focused on the information technology services and software markets. Executives in many technically advanced companies in North America, Europe, and Japan rely on INPUT for data, objective analysis, and insightful opinions to support their business plans, market assessments, and technology directions. By leveraging INPUT's considerable knowledge and expertise, clients make informed decisions more quickly, and benefit by saving on the cost of internal research.

Since 1974, INPUT has compiled the most extensive research base available on the worldwide information services market and its key segments, providing detailed market forecasts, vertical industry sector analysis and forecasts and analysis of vendor strategies and products. INPUT delivers specific expertise in the fast changing areas of outsourcing, systems integration, EDI/electronic commerce, software development/CASE, and on the impact of downsizing.

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