FEDERAL SYSTEMS INTEGRATION MARKET

1991 - 1996

INPUT

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Federal Information Systems and Services Program (FISSP)

Federal Systems Integration Market, 1991-1996

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Abstract

INPUT estimates that the federal government market for systems integration contract opportunities will increase from $3.2 billion in 1991 to $6.6 billion by 1996, at a compound annual growth rate of 16%.

This update of the 1990 systems integration report presents the results of research and analyses of various operational aspects and strategies of the integration market. The many changes in this update include the following:

- An updated forecast of the systems integration market, including current and out-year funding
- A revised list of awards and opportunities
- An update of the competitive trends and the market shares of major systems integration vendors
- An examination of the current issues affecting federal government systems integration vendors

This report contains 190 pages, including 45 exhibits.

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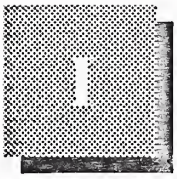


Introduction

The Federal Systems Integration Market, 1991-1996 is a revision of an earlier report issued in December 1990. It has been revised in response to continuing client interest in this changing market. The 1991 update identifies market issues and trends that affect vendors and systems integration contractors entering the market through FY 1996. Current contractor guidance and insight into the latest agency requirements and perceptions are offered to help vendors plan their strategies to compete for federal systems integration contracts during the 1991-1996 period.

This report on systems integration activities focuses on the federal government, and was prepared as part of INPUT's Federal Information Systems and Services Program (FISSP). Reports issued through this program are designed to help INPUT's U.S. industrial clients plan how to satisfy future federal government needs for computer-based information systems and services. The report's findings are based on research and analyses of several sources, including the following:

- INPUT's Procurement Analysis Reports (PARs)
- OMB/GSA/NIST Five-Year Information Technology Plans for 1991-1996
- Interviews with prime contractors of existing systems contracts
- Federal agency FY 1992 Information Technology Budgets
- GSA's April 1991 report, entitled *Alternatives to Grand Design Systems Modernization*
- ADAPSO's June 1991 report, entitled *Observations on Successful Federal Systems Integration Programs: An ADAPSO Survey of Industry and Federal Agency Program Managers*

A

Scope

The period covered in the report is GFY 1991-GFY 1996. At the writing of this report, GFY 1992 has just begun.

Agency and vendor interviews were not conducted for this revision. Agency and vendor information was obtained from surveys conducted during the first quarter of GFY 1991. This information was previously presented in INPUT's 1990-1995 version of this report.

For the purposes of the 1991 study, INPUT defined *systems integration* to encompass the following categories of vendor products and services (see Appendix F for detailed explanations of each category):

- Equipment
- Software products
- Professional services
- Design
- Integration
- Software development
- Education/training
- Documentation
- Systems operations (facilities management of client-owned systems)
- Other products/services

B

Methodology

For the INPUT Procurement Analysis Reports, the OMB/GSA/NIST Five-Year Plan was reviewed for programs to be initiated during the GFY 1991 - GFY 1996 period. INPUT also researched agency long-range plans for major systems replacements and new system initiations (new starts) for the same time period.

C

Report Organization

This report consists of five additional chapters:

- Chapter II is an executive overview describing the major points and findings in the report.

- Chapter III provides the market analysis and forecast, and describes the major market issues and trends affecting the industry.

- Chapter IV summarizes federal agencies' requirements of systems integration contractors and includes case study examples of systems integration projects.

- Chapter V presents the vendors' perspectives on the federal systems integration market, and short company profiles on this market segment's players.

- Chapter VI provides a sample of business opportunities, presented by programs and initiatives in the federal market, that anticipate seeking the services of a systems integrator contractor.

Several appendixes are also provided:

- Interview profiles
- Definitions
- Glossary of Federal Acronyms
- Policies, Regulations, and Standards
- Related INPUT Reports
- Questionnaires

A description of INPUT and its programs and services follows the appendixes.

II

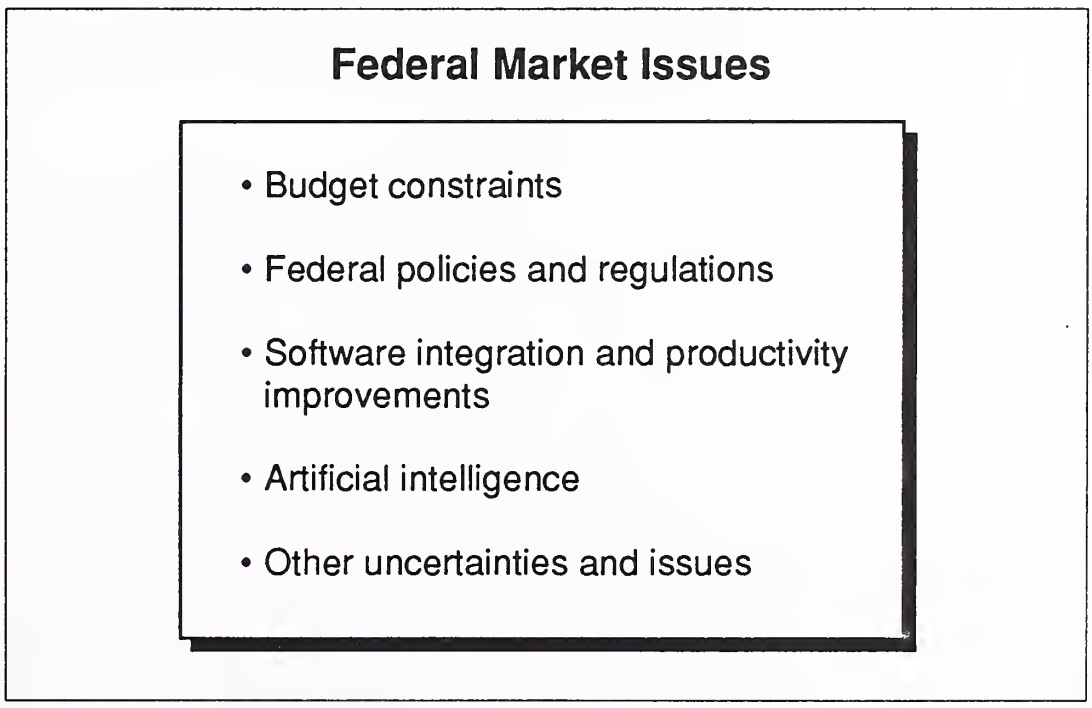
Executive Overview

A

Federal Market Issues

Systems integration procurements are both fueled and delayed by budget constraints. The constraints tend to enhance prospects for vendor services, as opposed to the government providing services through its own in-house resources. However, budget constraints also often delay SI initiatives. Federal market issues are shown in Exhibit II-1.

EXHIBIT II-1



Federal policies and regulations play an important role in the systems integration market. The Competition in Contracting Act (CICA), the Paperwork Reduction Act, and the Procurement Integrity Act, in their existence and their demise, have all influenced large systems integration procurements.

Software integration and productivity improvements impact the federal systems integration market. As new hardware technologies are put into place, the next generation of software must accommodate change and communications between incompatible equipment. Agencies are increasingly required to merge large applications into a single, transparent software system that fits their end users' needs.

Artificial intelligence is a market segment in which vendors are focusing on introduction of new technology to the government. In meeting federal systems integration needs, vendors must often include AI features as part of their offerings. The DoD is taking the lead in developing artificial intelligence programs.

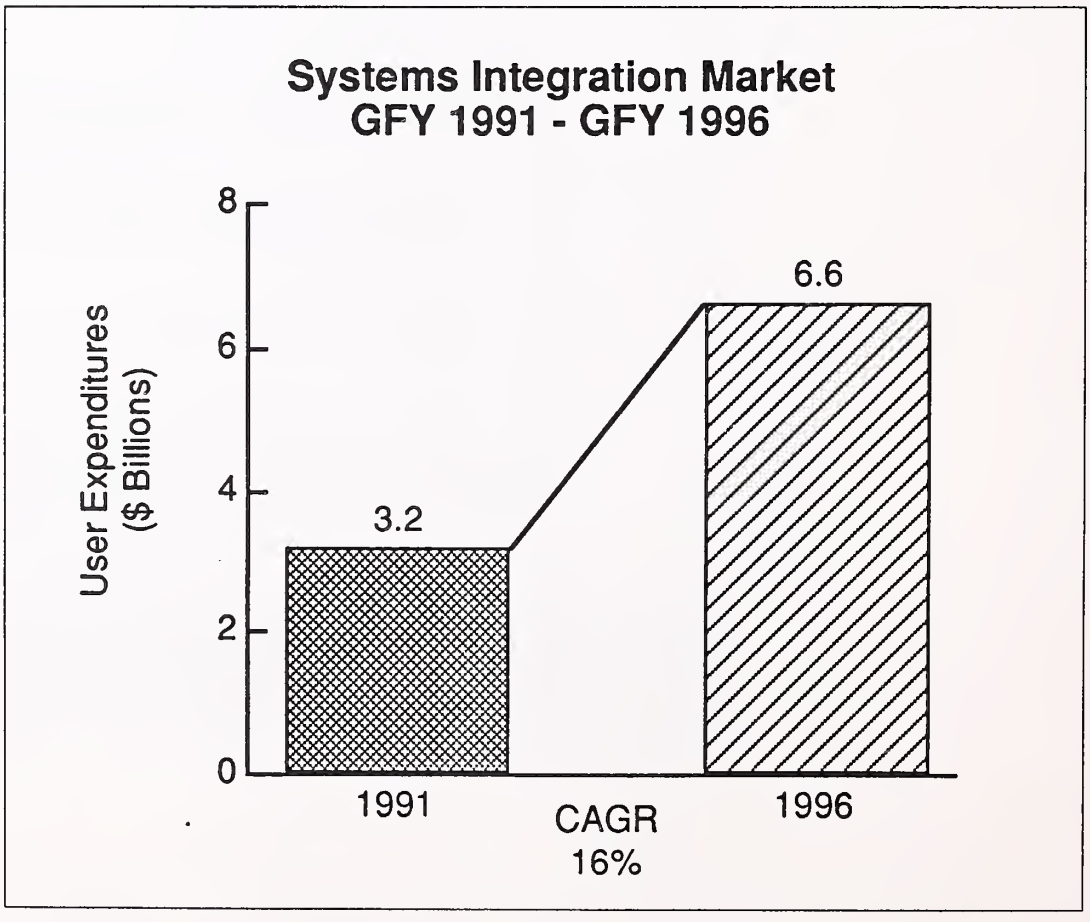
Other uncertainties and issues include the controversy over "grand design" and whether past SI programs were successful.

B

Market Forecast

As shown in Exhibit II-2, INPUT expects the federal systems integration market to grow from $3.2 billion in GFY 1991 to $6.6 billion in GFY 1996, at a CAGR of 16%. This growth rate is increased from last year's. CIM and renewed efforts toward office automation account for the increase in growth.

EXHIBIT II-2



Federal systems integration projects will shift in emphasis from hardware to software and services. Growth in software products is largely determined by OMB pressure, software certification trends, and packaged software availability, all of which are expected to increase. The increasing availability of custom software tools will drive the growth in software products. The growing shortage of federal technical professionals is fueling the need for additional contractor consulting support.

Computer and communications equipment will show lower growth than the other systems integration delivery modes. Federal agencies intend to put more software on each hardware system. This will give them greater functionality from their capital investment.

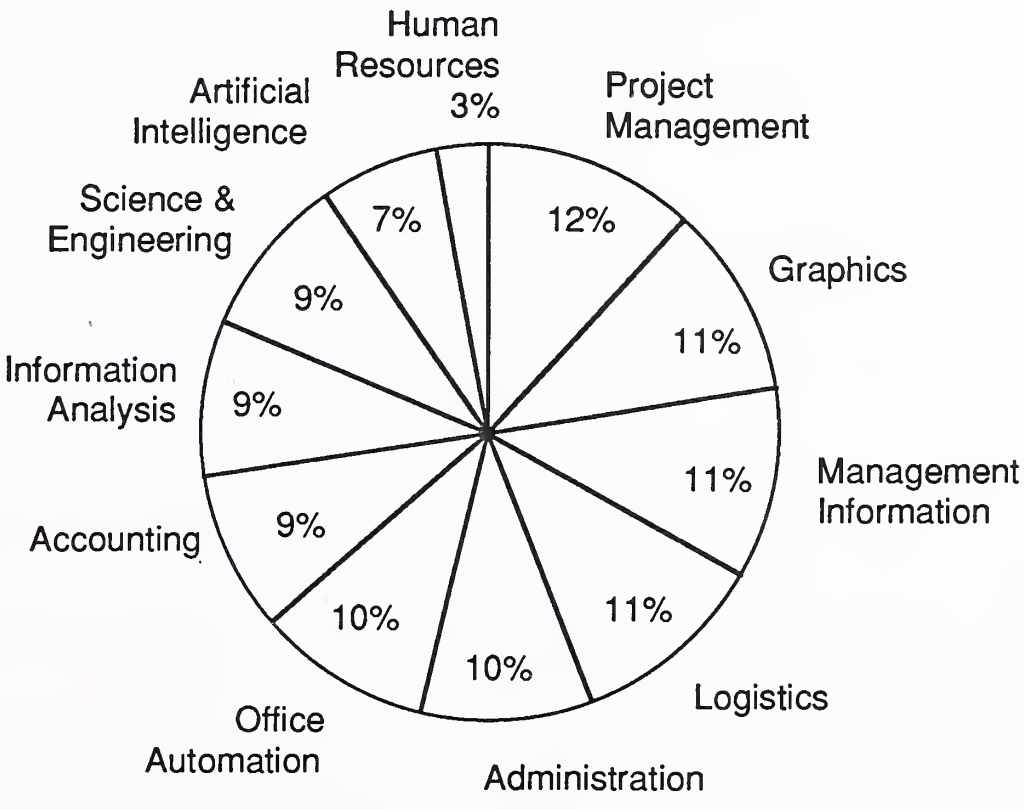
C

Primary Applications

INPUT asked agency personnel about applications involved in their SI projects. Exhibit II-3 summarizes the results.

EXHIBIT II-3

Federal Systems Integration Market by Type of Application



Note: Figures do not add up to 100% due to rounding.
Source: INPUT agency survey

The applications forecast represents federal agencies' estimates of which applications will require systems integration support services. Some respondents noted that additional applications will be added later in their SI programs by either contract or in-house staff without specifying the applications. INPUT expects more mission-oriented applications in the near future, as staffing constraints force agencies into contracting out more mission support. In SI replacement programs, not all of the resident applications to be converted to the new machine are specified.

D

Competitive Forces

Competitors vary in size, growth, and rates with the projected value of the SI project, applications, sponsoring agency, and end user of the system. INPUT lists the top federal SI vendors in order of reported expenditures, in Exhibit II-4. It should be noted that vendors report their revenues in different ways, and some projects may be viewed as systems integration by one firm and not by another.

EXHIBIT II-4

Top Five SI Vendors in the Federal ADP Market—CY 1990

Rank	Vendor
1	IBM Corporation
2	Electronic Data Systems (EDS)
3	Science Applications International Corporation (SAIC)
4	Martin Marietta
5	Computer Sciences Corporation (CSC)

Note: Ranked in order of reported federal SI revenue for CY 1990.

Many of these same firms are also leaders in the commercial systems integration market. There are many up-and-coming systems integration firms that did not make this list. Although many of them have higher growth rates or higher overall revenues than the listed systems integrators, their revenues from federal systems integration activities do not yet equal those of the vendors listed in Exhibit II-4.

There is an increasing trend for vendors to serve a wider range of federal agencies. Further, many SI vendors that had not previously targeted the commercial SI market are now doing so. They wish to broaden their business base so as to hedge their bets on the federal SI market and also leverage their federal experience.

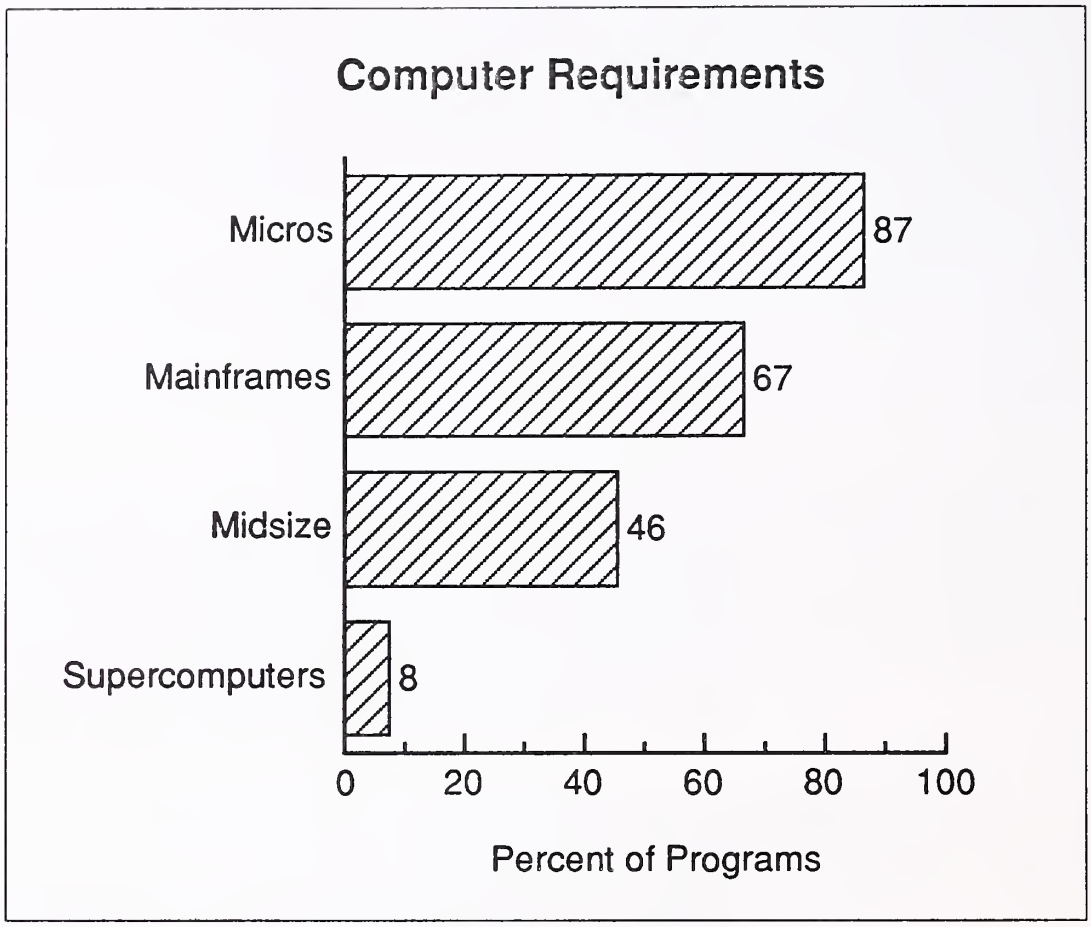
Vendors are attracted to the federal SI market by its growth potential and related benefits. Most vendors will try to win major SI contracts, but many others will work toward competitive niche jobs. However, for most of these vendors SI is only one component of their federal strategy. Unfortunately, most vendors refer to themselves as systems integrators, even when use of the term does not mean they could serve as prime contractors.

E

Agency Requirements

Computer equipment requirements are only partially identified in systems integration programs. There is a continuing strong need for mainframe computers (by more than two-thirds of the programs being reported on); nearly half of the programs reported on include requirements for midsize computers, and about seven-eighths of the programs include requirements for microcomputers (see Exhibit II-5). As one would expect, complex SI projects frequently utilize a combination of equipment types to solve a variety of user requirements. The number of microprocessors, consisting of PCs and specialized workstations, applies only to planned major systems. The number of microprocessors to be acquired for a range of smaller applications may be considerably higher, by as much as one or two orders of magnitude.

EXHIBIT II-5



F

Recommendations

There are several key strategic elements to be considered in entering the federal SI market. They are summarized in Exhibit II-6. Containing the risk element and consciously managing each project to reduce the possibility of failure are essential parts of continued participation in the market and the future of SI procurements in general. The vendor's reputation plays a key role in the proposal evaluation process.

EXHIBIT II-6

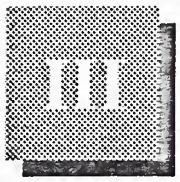
Critical Success Factors in SI Projects

- Risk containment and skillful management
- Vendor reputation
- Comprehension of procurement rules
- Technical ability
- Teaming partnership
- Need to focus efforts

The SI vendor must completely understand the federal systems acquisition process. Systems design, programming, and project management talent are other important components of the vendor's strategy.

Teaming partnerships are important because systems integration projects often have requirements that no single vendor can satisfy. A systems integrator must have partners that best complement the services and products that it can provide.

Finally, the SI market will become increasingly competitive in the next five years. Vendors now must choose the services, agencies, and skills that will be the focus of their SI efforts. Vendors have to identify the skills they want to develop, their potential teaming partners, and agencies to target.



Market Analysis and Forecast

A
Overview

INPUT has previously reported that the federal systems integration market was becoming more active, competitive, and controversial. This is still true. In terms of activity, many additional agencies have now begun to define their requirements in SI terms. In terms of competition, practically all major federal vendors now claim past or present SI experience, or future capability. In terms of controversy, there is an issue now being discussed that goes to the heart of the SI concept.

GSA has published several documents emphasizing the disadvantages and problems associated with the "grand design" method of systems integration and modernization. GSA defines the "grand design" approach as broad agency-wide plans to provide comprehensive information technology support (hardware, software, communications, and data) to all administrative functions. During the last decade, many federal agencies have developed large-scale systems modernization programs using the "grand design" approach.

In February 1988, GSA published a "grand design" study, entitled *Critical Success Factors for System Modernization*, which reviewed 18 large system modernization efforts and determined various common characteristics of successful programs. This study was followed by another report in September 1988, called *An Evaluation of the Grand Design Approach to Developing Computer-based Applications Systems*. This document examined the problems of the "grand design" approach and suggested ways of increasing its success rate. Some obstacles identified by the report include:

- Funding uncertainty during the planning phase
- Heightened vendor protest activity
- Unrealistic schedules during the planning phase
- Staffing problems throughout the project
- GAO audits

In April 1991, GSA released its most recent report on large systems integration programs, entitled *Alternatives to Grand Design for System Modernization*. It gives a detailed evaluation of four alternative strategies and describes under which conditions each strategy is most effective. All of the strategies emphasize a modular or downsized approach to system implementation, rather than a "grand design." This latest document was prepared by American Management Systems, Inc. (AMS), in conjunction with the GSA's Office of Federal Information Resources Management. Its recommendations will be discussed in further detail later in this chapter.

In June 1991, the Association of Data Processing Service Organizations (ADAPSO) published a report, *Observations on Successful Federal Systems Integration Programs*.

The ADAPSO survey sought to identify large federal systems integration projects, factors critical for their success, and criteria by which program managers evaluate success. Contrary to the opinion of GSA executives, ADAPSO members believe that the track record of systems integration projects is very positive. The ADAPSO survey examines eleven different systems integration programs valued at $40 million or above and awarded in the mid- to late-1980s.

According to the program managers for these programs, the following factors are most critical to program success:

- High-level commitment and support within the agency
- User involvement in the design and implementation process
- Contractual flexibility to accommodate change

The GSA and ADAPSO reports will be compared and contrasted later in Section D of this chapter.

Key government agencies— OMB, GSA, GAO, and NIST—have initiated acquisition reforms intended to accelerate the acquisition rate and improve the management of information resources (ADP and telecommunications) while fostering wider competition. The recent adoption of GOSIP and POSIX as FIPS will promote the acquisition of OSI-compliant products that foster interoperability, connectivity, and upgradability of federal systems.

B

Market Forecast

The federal systems integration market will grow from $3.2 billion in GFY 1991 to $6.6 billion in GFY 1996, at a CAGR of 16% (Exhibit III-1). The overall market growth rate increased from that projected last year (16% this year versus 14% reported last year).

EXHIBIT III-1

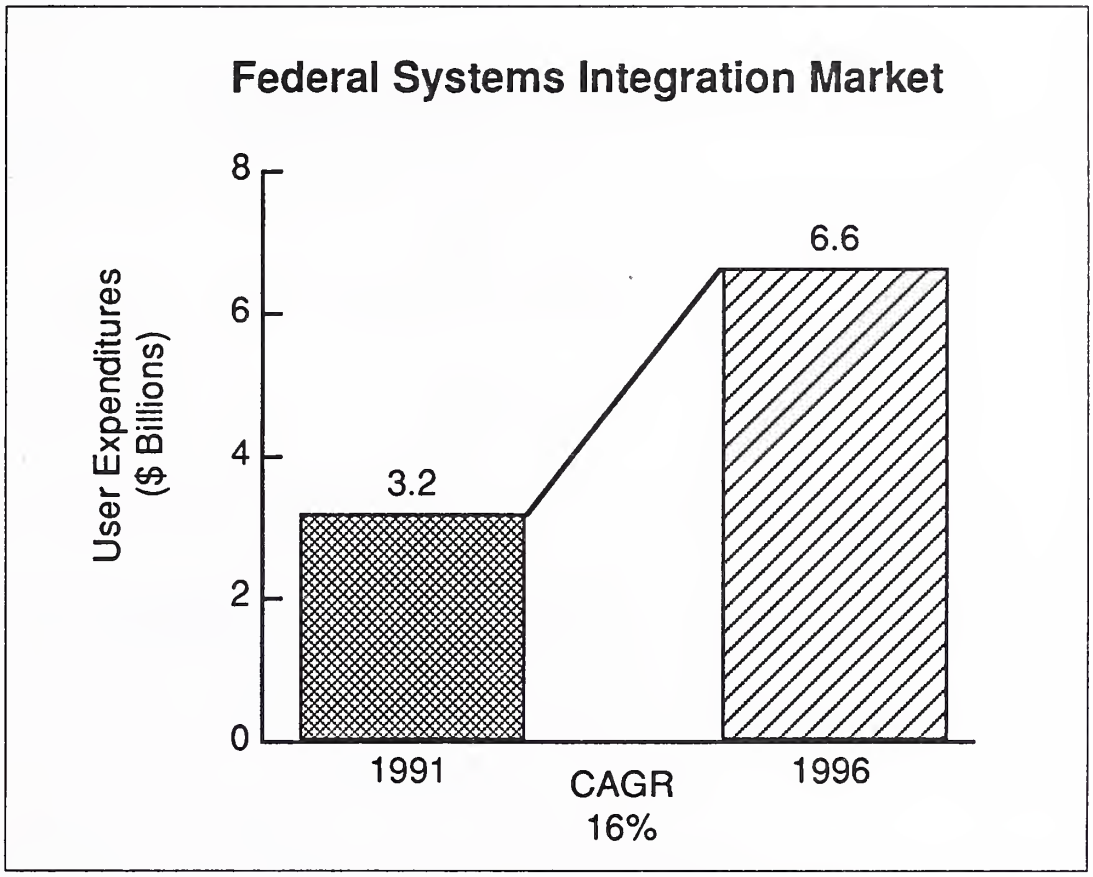
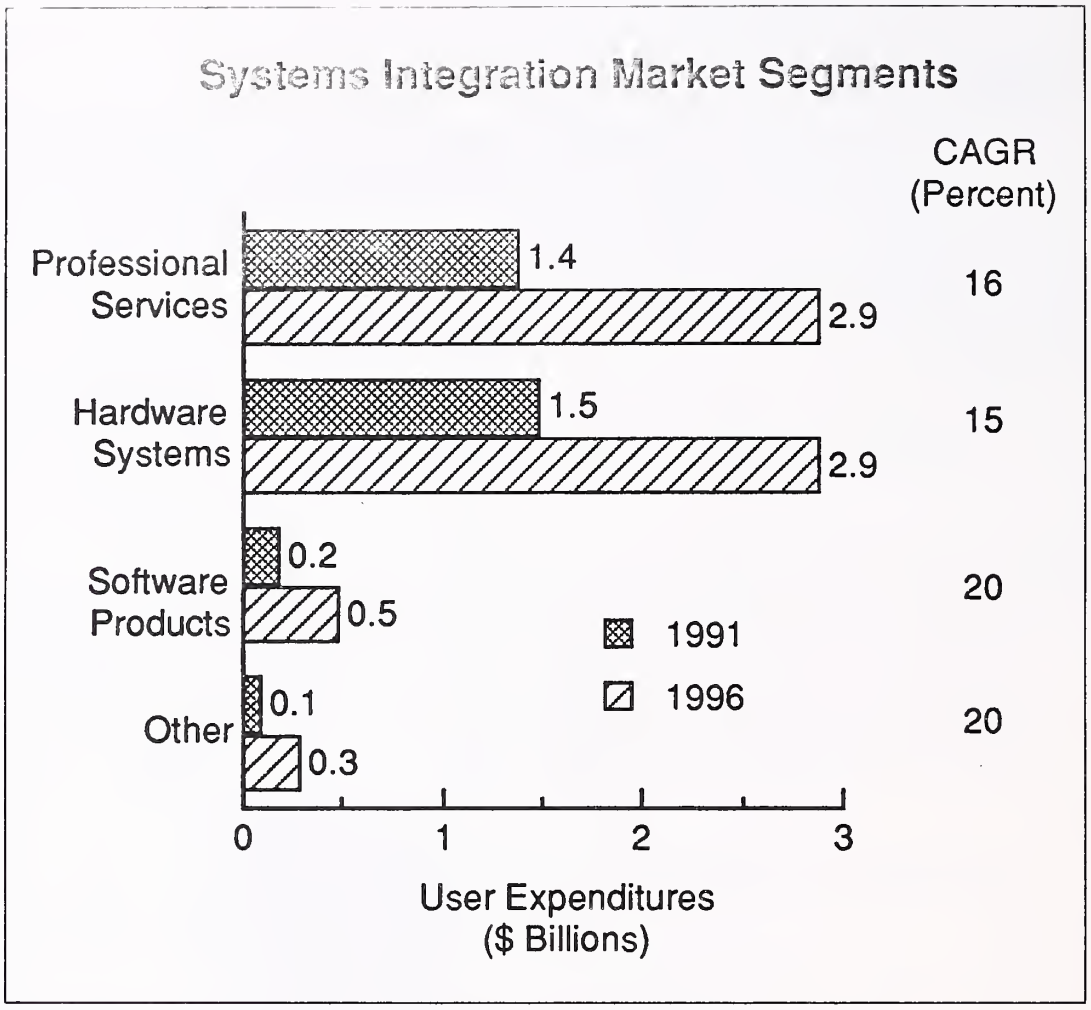


Exhibit III-2 divides the market into four components: professional services, hardware systems, software products, and other. The growth rates of market segment forecasts also differ somewhat from last year's forecast: the growth rate for the hardware portion of SI has increased from 12% to 15% over the past year, reflecting increased hardware acquisitions among many agencies.

EXHIBIT III-2



Professional services are forecast to increase at 16% annually (up from 15% reported last year). Acquisition of software products will increase at 20% annually (up from 18% reported last year). Other products and services will increase at 20% annually (up from 15% reported last year), reflecting greater spending for SI support services. The following discussion provides some analysis in support of these numbers.

1. Delivery Mode Forecast

As stated above, INPUT divides systems integration activities into four subdelivery modes:

- Professional services
- Software products
- Equipment systems
- Other

This approach permits a more comprehensive comparison between the modes and with the commercial market. As illustrated in Exhibits III-1 and III-2, the various modes will grow at different rates. This difference reflects the expected shift of emphasis from hardware (15% annual growth) to software (20% annual growth) and services (16% annual growth) in systems integration projects over the next five years. Although hardware will grow more quickly in the next two years, this growth rate will slow during the mid-1990s.

The professional services portion of the systems integration market is expected to grow from $1.4 billion in GFY 1991 to $2.9 billion in GFY 1996, at an CAGR of 16%. This does not include all of the federal professional services market—only that portion devoted to systems integration. The SI-related professional services include the following categories:

- Program management
- Consulting
- Design
- Integration
- Education and training
- Documentation
- Systems operations (facilities management of client-owned systems)

In general, the federal professional services market continues to grow, but the systems integration portion is expected to grow faster. Further, INPUT has noted a growing trend to include systems operations as a part of systems integration contracts. The growing shortage of federal technical professionals is fueling the need for additional contractor consulting support.

Many agency IT budgets for FY 1991-1996 have increased dramatically in the operations and maintenance line of the OMB Circular A-11 section 43A exhibit.

Growth in software products is largely determined by OMB pressure, software certification trends, and packaged software availability, all of which are expected to increase. In response to growing demands for functionality by agency customers, INPUT expects more packaged software to be installed per system. The increasing availability of custom software tools (sometimes referred to as analysts' workbench and programmers' workbench) will drive the growth in software products.

Software products consist of standard software packages, with little or no modification, that can be used effectively in a variety of situations. In addition to being more reliable and having a larger user base to report errors, software products are also more cost effective because of dramatically lower unit costs (for the same reason) when compared to custom software development.

The software products portion of the systems integration market should grow from $200 million in FY 1991 to $500 million in FY 1996, at a CAGR of 20%. The factors cited above account for most of the growth in this segment. In particular, the greater availability and functionality of packages to meet agency needs will support this growth.

After professional services, computer and communications equipment continue to account for the next largest share of the federal systems integration market. However, hardware's 15% CAGR will lag behind all the other components, and is comparable in part, to the lower overall growth rate (8%) of the overall federal equipment market, as reported in several other INPUT federal market reports. The growth rate also illustrates the declining unit costs of equipment, as expressed in price per throughput or capacity to do work. Finally, as previously discussed, the lower rate indicates agency intentions to realize greater functionality from equipment investment, largely by putting more software on each hardware system.

Even though the hardware segment of the SI market has the lowest CAGR, the growth rate has risen from 12% in last year's forecast to 15% in this forecast. This increase in the growth rate can be explained by improved price/performance ratios and increased efforts to replace outdated equipment. The Defense Department, despite overall funding constraints, will increase capital investment sharply as it brings more long-range systems on-line.

The "other" service mode includes outlays for site preparation, installation, test equipment and tools, processing services and networks for tests and simulations, and test and acceptance activities. This subdelivery mode of the federal SI market will grow from $130 million in FY 1991 to $320 million in FY 1996 at a CAGR of 20%. This growth rate reflects the increased spending for the types of support services. The government is using profit and not-for-profit contractors to assist in the test and acceptance process.

2. Agency Forecast

Civilian SI spending forecast for FY 1991 exceeds that of Defense by one billion dollars, as shown in Exhibits III-3 and III-5. Also, the civilian SI spending forecast for FY 1996 exceeds that of Defense by almost one-and-a-half billion dollars. This reflects current and expected budget constraints in the Defense Department. INPUT expects these constraints to continue throughout the forecast period. Most major SI initiatives, however, are not being cancelled, although some may be deferred or stretched out. As shown in Exhibits III-3 and III-5, the civilian market will grow slower than the defense market over the next five years. It also starts from a somewhat higher base. Most growth will occur in the middle years, as latent demand increases, and then the growing impact of budget cuts will begin to be felt.

EXHIBIT III-3

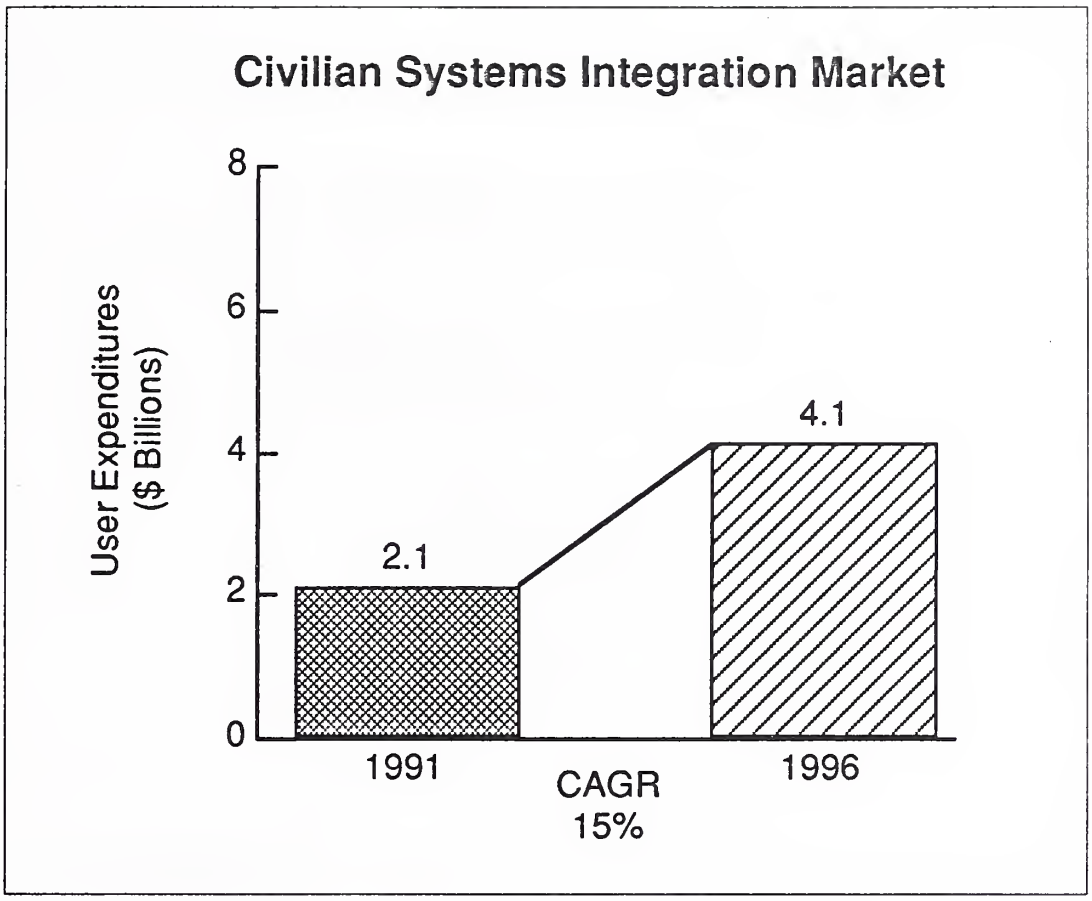


Exhibit III-4 shows the forecast for individual civilian systems integration market segments and their compound annual growth rates (CAGRs). Included in the civilian systems integration market are programs such as FBI's NCIC 2000 and PTO's Automated Trademark System.

The FBI's National Crime Information Center (NCIC) 2000 procurement is estimated to be worth over $100 million in its lifetime. This program provides for the acquisition of personnel, software, maintenance, equipment, and support services. The winning contractor will design, develop, build, install and temporarily support the National Crime Information Center. At this writing, both parts of the NCIC 2000 RFP have been released and bids are due December 23, 1991.

The Patent and Trademark Office is placing a high priority on the development of an Automated Trademark System (ATS), which will simplify trademark operations by integrating all existing automated trademark systems. According to the Department of Commerce's FY 1992 A-11 submission to OMB, the total value of the Trademark Automation Program is $45.5 million from FY 1991 to FY 1996. The RFP for this procurement is expected to be released in January 1992.

EXHIBIT III-4

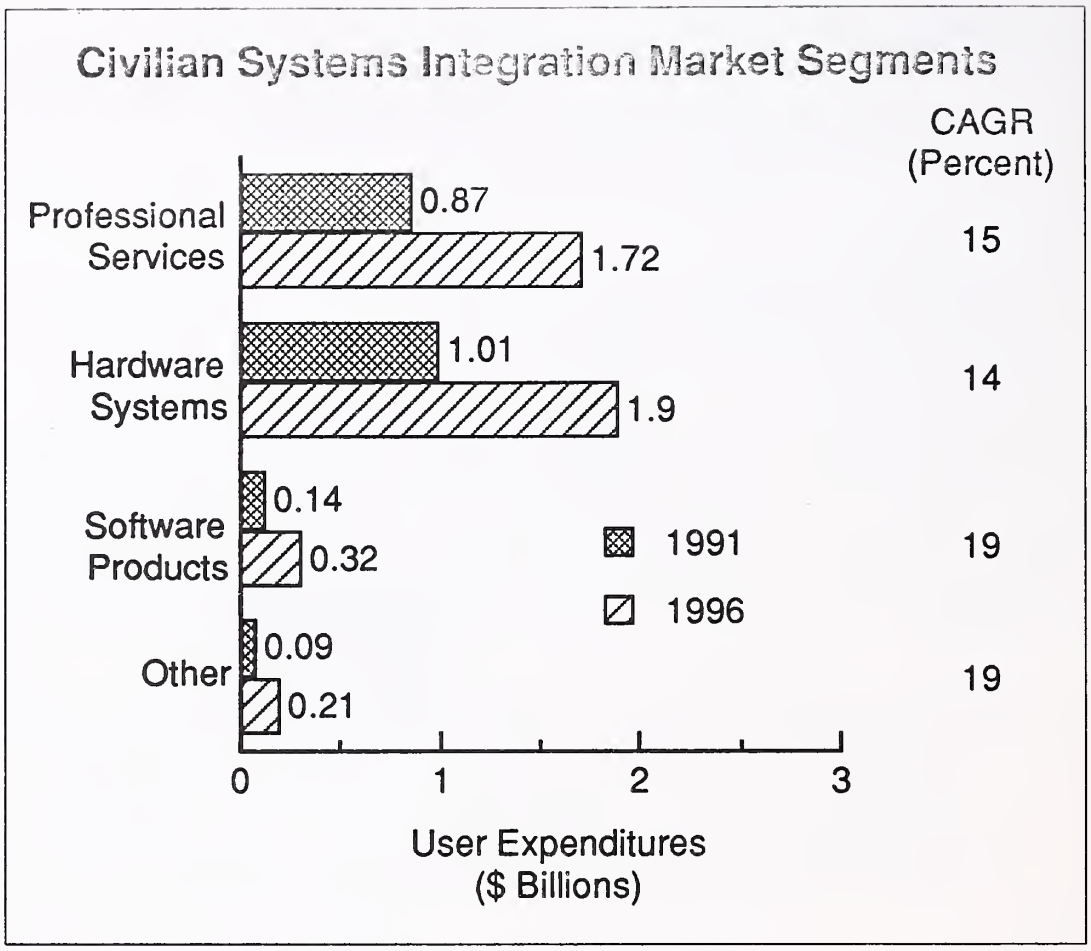
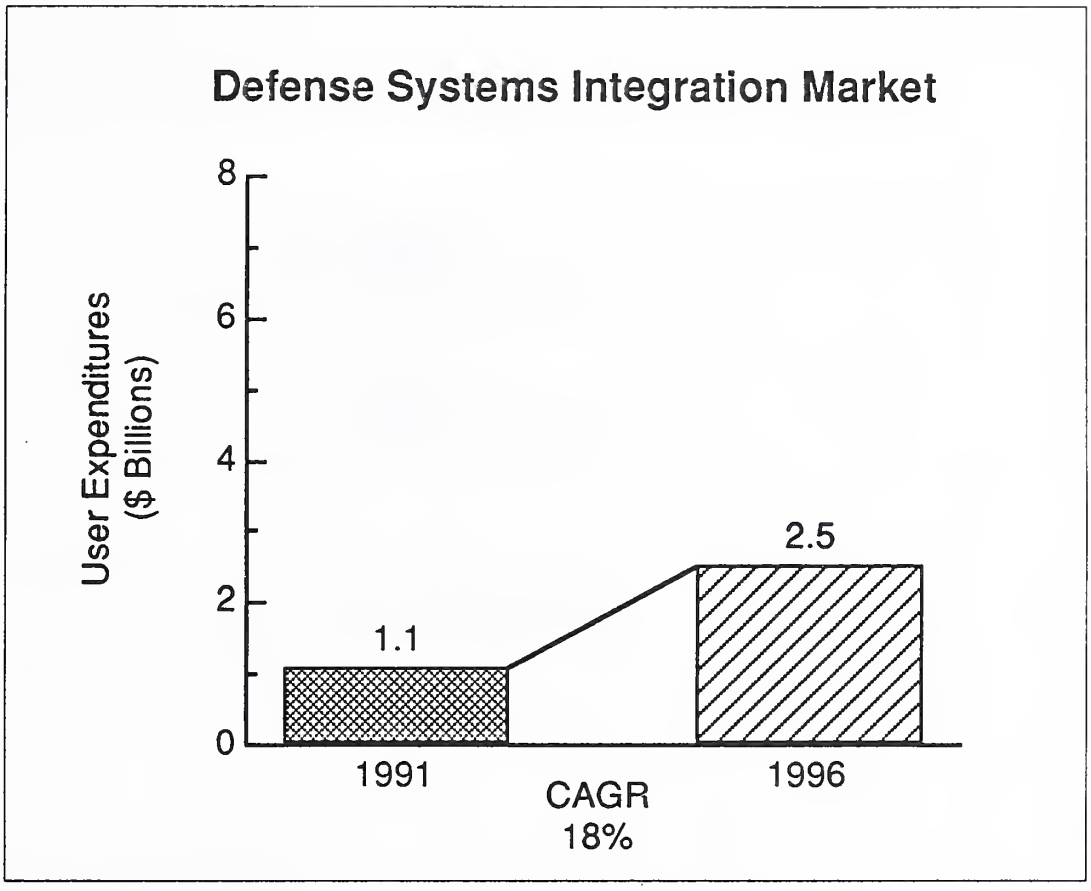


Exhibit III-5 shows INPUT's forecast for the entire defense agency systems integration market.

Exhibit III-6 depicts the individual systems integration market segments and their compound annual growth rates (CAGRs) for the defense agencies. Examples of defense agency systems integration programs include the Corporate Information management (CIM) program, the Army's Sustaining Baseline Information Services (SBIS), and the Air Force's Special Operations Forces Planning and Rehearsal System (SOF-PARS).

The CIM initiative serves to strategically analyze and plan a course for ADP system acquisitions throughout the Department of Defense. CIM is an effort to streamline procurements in DoD, prevent excessive duplication of ADP systems acquisitions, and ensure open system architecture. Some CIM-related procurements include Army CALS, Navy EDMICS, and FTS 2000.

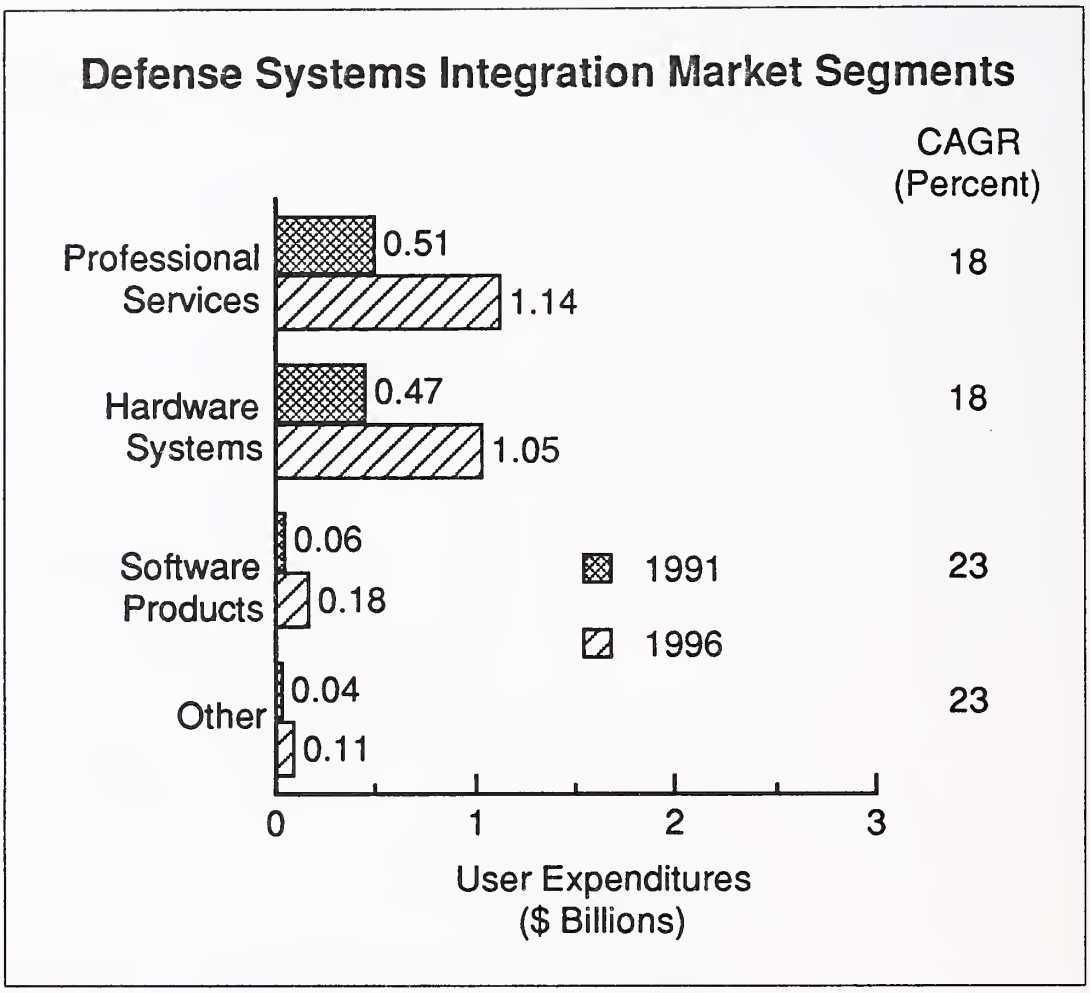
EXHIBIT III-5



The Army's SBIS Program provides for an enhanced system to replace the Army's current baseline configuration. The program will facilitate the transfer of the Army's information processing system to an open system environment. At this writing, the final SBIS RFP has not been released. However, the Contracting Office expects to release the RFP before January 1, 1992.

The SOF-PARS Program will consist of hardware and software components that provide mission planning. The completed system will serve the Air Force, Army and Navy. At this writing, the RFP for SOF-PARS, Phase II, is scheduled to be released in December 1991.

EXHIBIT III-6



The agency integration market forecasts are based on a combination of long-range IRM plans, projection of previous Information Technology Budgets, programs described in the agency OMB A-11 Section 43 A & B budget requests, and interviews with policy officials and ADP center managers. Only programs specifically identified by agencies in their planning documents and funding request submissions are included. Generally, this includes programs with a life-cycle cost greater than $1 million. Exhibit III-7 shows a breakout of active programs for custom systems integration. Individual programs are identified in Chapter VI. The Chapter VI list is somewhat shorter, since it includes only programs in which time remains for new vendor participation.

Exhibit III-7 shows total program funding for FY 1991-1996. It should be remembered that not all SI efforts involve major expenditures. In fact, some efforts can be quite modest, providing small vendors with the experience needed to take on larger tasks. However, the numbers cited in Exhibit III-7 refer mainly to the larger projects.

EXHIBIT III-7

SI Active Programs by Agency, FY 1991

Agency	Number of Programs	Total Funding ($M)
Defense		
Air Force	9	1,063
Army	9	2,900
Navy	5	329
Marine Corps	2	24
Defense Department	10	2,203
Subtotal	35	6,519
Civil		
Agriculture	2	124
Commerce	6	1,030
EPA	1	0*
H&HS	2	808
Interior	3	562
Justice	2	110
NASA	4	723
State	2	200
Transportation	3	1,093
Treasury	8	13,789
U.S. Courts	2	233
Veterans Affairs	2	220
Subtotal	37	18,892
Total	72	25,411

*No Funding Available

Source: INPUT Procurement Analysis Reports

It should be noted that the funding totals can be misleading, since projected funding for some programs is not available. Please refer to Chapter VI for more detailed information.

No estimate is available for the cost or funding of planned conversions of applications from other information processing resources to new in-house systems. The current resources include remote computing services, systems operations, and government data centers outside the agency. The level of monthly costs for running the application is not provided.

The representative agency SI program budgets reflect a combination of part of their IRM systems upgrade and replacement budgets and most of their new systems acquisition budgets. This list includes opportunities, as well as procurements undergoing source selection and recently-awarded systems integration contracts. Some opportunities included in this list are the U.S. Forest Service's Project 615, the Army's Sustaining Baseline Information System (SBIS) procurement, and the FBI's NCIC 2000 procurement. The overall forecast does anticipate the approval and funding of these programs. This year, most acquisitions consist of either expansions/upgrades of current systems or new starts.

The proportion of agency programs designated as upgrades, replacements, and new systems is discussed further in Chapter IV.

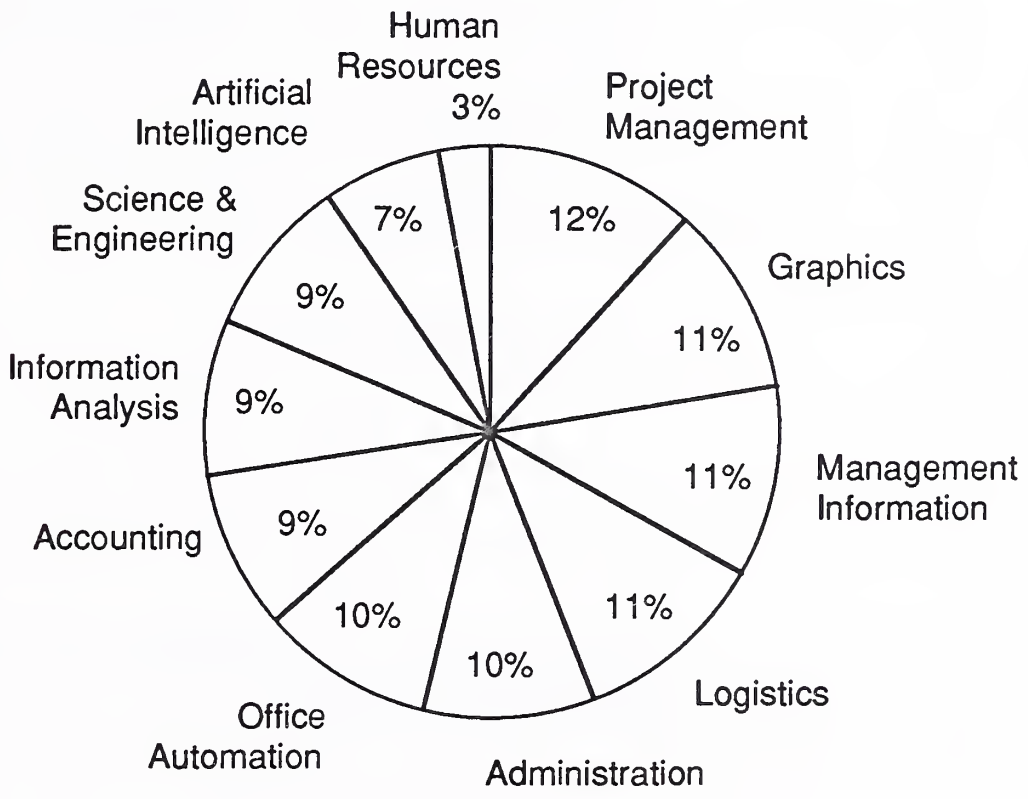
3. Applications Forecast

In an earlier INPUT survey, defense and civil agencies identified information resource applications by a wide variety of titles. Each of the military departments and defense agencies provided different codes and/or acronyms for such common commercial applications as personnel, payroll, distribution, and accounting.

Applications have been converted to INPUT's terms, as defined in Appendix B, with variations on applications for particular functions grouped with the basic application. This normalization process facilitates analysis of the data. The reader should note that some of the listed applications suggest office automation. They actually represent, however, a growing movement of substantive computational applications down to local (largely microcomputer-based) equipment under the control of the end user. Exhibit III-8 lists the key applications for systems integration initiatives, as identified by the agencies. Exhibit III-8 was compiled from past INPUT agency surveys. More specific information on current SI opportunities is provided in Chapter VI.

EXHIBIT III-8

Federal Systems Integration Market by Type of Application



Primary and secondary applications categorized.
Note: Figures do not add up to 100% due to rounding.
Source: INPUT agency survey

The applications forecast is not intended to be an accurate prediction; rather, it represents federal agencies' estimates of which applications will require systems integration support services. A number of SI programs note that additional applications will be added later in the program by either contract or in-house staff without specifying the application. In SI replacement programs, not all of the resident applications to be converted to the new machine are specified. Chapter IV provides more information on the identified operating systems and applications.

Exhibit III-8 shows that in the INPUT SI applications survey, artificial intelligence achieved only a 7% rating from the survey sample. INPUT expected this to grow from past forecasts (8%). However, it is clear that increasingly severe budgetary constraints require federal agencies to cut back their activities in application areas that cannot clearly be shown to provide a timely payback.

C
Competition

Competitors vary in size, growth, and rates with the projected value of the SI project, applications, sponsoring agency, and end user of the system. Brief profiles of the top ten federal SI vendors are provided in Chapter V.

Potential competitors for each category of systems acquisition are identified by service category. Some vendors compete in several categories because they offer products and/or services to a number of commercial and government sectors, including:

- Specialized integrated systems
- Midsize/microcomputer-based systems
- Midsize/microcomputer network-distributed data systems
- Large CPU-based systems with or without distribution networks
- Supercomputer systems that are frequently the host of several mainframes that may support distributed midsize computer and microcomputer terminals

1. Top Ten Systems Integrators

The INPUT list of the top ten SI vendors in FY 1990 is based on federal SI revenue in CY 1990, earlier INPUT Procurement Analysis Reports of SI activities, and cumulative reports from CBD notices and other sources on contracting activity.

In Exhibit III-9, INPUT lists the top ten federal SI vendors in order of reported expenditures. It should be noted that vendors report their revenues in different ways, and some projects may be viewed as systems integration by one firm and not by another. However, the list in Exhibit III-9 represents a reasonable estimate of relative market positions.

Brief profiles of each of these firms can be found in Section V of this report. Many of these same firms are also leaders in the commercial systems integration market. IBM, EDS, Unisys, and Control Data Corporation are also included in the top ten list for commercial systems integration.

EXHIBIT III-9

Top Ten Vendors in the Federal ADP Market CY 1990

Rank	Vendor
1	IBM Corporation
2	Electronic Data Systems (EDS)
3	Science Applications International Corporation (SAIC)
4	Martin Marietta
5	Computer Sciences Corporation (CSC)
6	Unisys
7	Boeing Computer Service (BCS)
8	PRC (Division of Black & Decker)
9	Grumman Data Systems (GDS)
10	Control Data Corporation (CDC)

Note: Ranked in order of reported federal SI revenue for CY 1990

There are many up-and-coming systems integration firms which did not make this list. Although many of them have higher growth rates or higher overall revenues than the listed systems integrators, their revenues from federal systems integration activities do not yet equal those of the vendors in the exhibit.

2. Professional Services Vendors

The larger professional services vendors are usually prime contractors or system engineers/integrators in the federal SI market. Other professional services companies have smaller, more limited offerings to the federal SI market or are involved through separate contracts with the contracting agency. These include accounting firms and management service firms.

The field of accounting firms and management service firms in the SI market has been narrowed due to an unprecedented number of mergers among these firms. Deloitte, Haskins and Sells merged with Touche Ross to form Deloitte Touche. Ernst and Whinney merged with Arthur Young to create Ernst and Young. Other firms in this field include Arthur Andersen (Andersen Consulting), Coopers and Lybrand, KPMG Peat Marwick, Booz, Allen & Hamilton, American Management Systems, and Bolt, Beranek, and Newman. These firms specialize in financial, budget, accounting, and management services applications.

3. Equipment Vendors

The major midsize- and large-CPU vendors are also contenders for contracts for SI programs because most offer upward-compatible CPUs for systems being replaced and newer systems with enhanced capabilities. These vendors include Amdahl, AT&T, CDC, Cray, DEC, DG, Gould, Harris, Hitachi Data Systems, HP, HFSI (now owned by Groupe Bull), IBM, NAS, NCR (now owned by AT&T), NEC America, Prime, Rolm, Stratus, Tandem, Tektronix, Unisys, Vion, Wang, and Zenith (also owned by Groupe Bull).

4. Foreign Competition

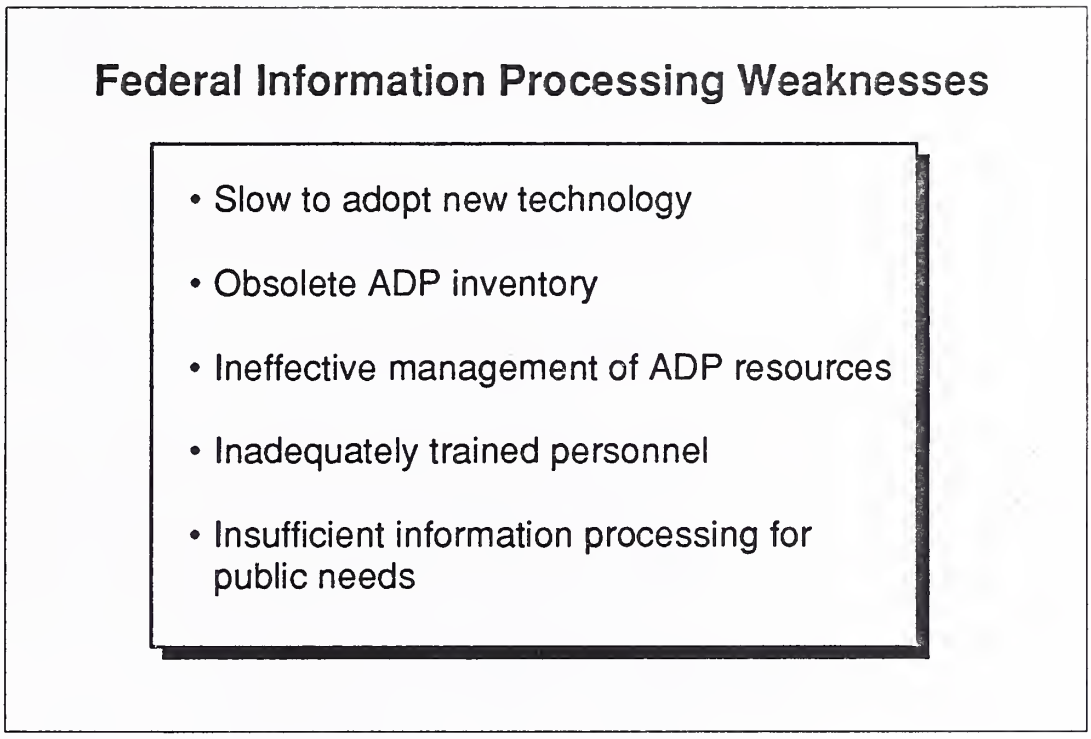
The prospect of hardware systems competition from the Far East and Western Europe for nonsensitive administration, management, and office automation projects is not expected to become a major factor until trade relations improve. The popularity of the "Made in America" campaign, coupled with the government's desire to remove trade barriers to reduce the trade imbalance, places restrictions on the amount or type of business foreign competitors can currently secure. One solution for foreign firms has been to buy American firms in order to break into the business. Two examples of this are Hitachi's 80% ownership of National Advanced Systems, and Groupe Bull/Honeywell's recent purchase of Zenith Federal Systems.

D

Federal Market Issues

During the two most recent administrations, presidential task forces investigated the problems and technological status of the federal government's information processing resources. Findings are shown in Exhibit III-10.

EXHIBIT III-10



Agencies find it difficult to adopt new technology in systems integration efforts, due mainly to the length of program life cycles. Technology is changing daily and systems integration projects may take years from the requirements stage to the implementation stage. One way to remedy the problem of evolving technology is to institute engineering change clauses in contracts. These clauses allow contractors to take advantage of new technology in existing contracts.

Systems obsolescence is also an information processing weakness caused by ever-evolving technology, the slow, complex procurement process, and old equipment inventory. In many cases, by the time a system is installed and running, a new technology has been developed that will accomplish the same tasks more efficiently. Also, much of the federal government's current equipment inventory is old and outdated. The average age of federal computer equipment ranges from 8 to 10 years.

Ineffective management of ADP resources also adds to the government's information processing problems. Each agency manages ADP resources differently. Some agencies use a central IRM function. This IRM function may be involved in system planning or it may only oversee procurement. Some agencies allow individual operating units to plan and develop their own systems. These different approaches to system planning and procurement can lead to inefficient resource management for the agency as a whole.

These findings, along with some fundamental changes in GSA's information systems (IS) management policies, led to gradual changes in IS procurements. These changes support the need for integrated solutions.

Systems integration procurements are both fueled and delayed by budget constraints. The constraints tend to enhance prospects for vendor services, as opposed to the government providing services through its own in-house resources. Agencies' requirements for large integrated systems may also be changed if GSA revises its rules on granting DPAs (Delegations of Procurement Authority) to force adherence to a more modular approach.

Deficit control measures, such as the Gramm-Rudman-Hollings (GRH) Act, are forcing agencies to cancel programs that do not satisfy stringent productivity improvement requirements. Other programs that do not meet urgent or emergency mission requirements are delayed or stretched out over time. At this writing, all agency FY 1992 budgets have been approved by Congress. Despite the GRH Act, budget deficits continue to grow every year.

Systems acquisitions in the second half of the 1980s addressed needed improvements in management, administration, human resources, and logistics functions that had not been moved to newer data processing resources in more than a decade. These have been manifested in the focus of systems integration procurements.

1. Federal Policies and Regulations

Agencies and vendors face difficulties in complying with the sheer number of federal policies and regulations while trying to fulfill information processing requirements.

GSA intended for the FIRMR to streamline the information resources acquisition process. GSA recently completed a rewrite of the FIRMRs to reflect significant legal and regulatory changes, as well as to expedite procurements. Other regulations and policy initiatives that are changing the acquisition procedures include:

- The Competition in Contracting Act (CICA) of 1985 provided expanded legal powers for ADP protest action via the GSA Board of Contract Appeals (GSBCA) and GAO; increased the opportunity to employ negotiated contracts; and established seven more restrictive categories of exceptions that permit sole-source awards. Agencies view the CICA as allowing vendors to complicate and lengthen the acquisition process. The Act's provisions make it easier for vendors to protest procurement activities and bring temporary halts to procurement schedules. Virtually every major procurement has been protested, quoting violations of the CICA.

- The Paperwork Reduction Reauthorization Act of 1986 expired without replacement legislation. It failed to pass the Senate in October 1990. The Paperwork Reduction Reauthorization Act expanded the power of the GSBCA, but also retained the Warner Amendment, which provides the DoD with mission-critical ADP procurement exemptions to Brooks Act coverage, except for application of general-purpose ADPE in noncritical functions, such as testing, recalibration, and programmer workbenches.

- At this writing, there are two bills pending that would affect federal information technology. The Federal Information Resources Management Act, also called the Glenn Bill, is competing against the Paperwork Reduction Act, also called the Nunn Bill. OMB's Office of Information and Regulatory Affairs (OIRA) participated in the writing of the Paperwork Reduction Act and is supporting this bill. If the Federal Information Resources Management Act passes, it will open OMB's information resources practices up to some scrutiny. Both bills are widely debated and a decision is not expected in the near future. Both bills would reauthorize OIRA. Currently, OIRA is operating without authorization.

Several other issues have arisen that are now being studied. These include software rights, data rights, and second-sourcing of some systems. INPUT expects these issues to continue to create problems on some hardware procurements, including systems integration.

As is well known in the vendor community, the CICA has not achieved the expected improvement of competitive opportunities while providing more equitable resolution of protests. The results have been anything but equitable. Most successful protests result from one or more of the following defects:

- Failure to follow stated evaluation plans
- Procurement process inconsistencies
- Improper documentation
- Defective pricing
- Inconsistent information dissemination

GSA's limited procurement review of the past few years has eliminated much of the expert examination of procurement actions. Many vendors now believe that more review is needed. Some have even indicated that, in certain circumstances, losing can be more profitable than winning. Within the past year, the pendulum has shifted back to heavier agency oversight by GSA. In fact, some programs have been singled out for especially comprehensive review, in much the same way that some tax returns are heavily audited. GSA is committed to increasing oversight without unduly delaying agency procurements.

The Procurement Integrity Act also had some negative effects on federal procurements. The Act, which went into effect on July 16, 1989, was written to ensure that no bias has infringed upon the procurement process. It required procurement officials to certify that they have complied with the law and that all members of their contracting team also complied with its provisions. The law carried penalties for government contracting officials and for vendors, including fines and imprisonment.

However, in December, 1989, President Bush signed The Ethics in Government Act, popularly referred to as the Congressional Pay Raise. This law suspended the Procurement Integrity Act for one year. The Procurement Integrity Act went back into effect on December 1, 1990. The law caused some discontent and confusion among industry and federal agencies. Industry representatives claim they are aware of the general intent of the law, but they are uncertain what full obedience will involve. Agency officials complain that the law is unclear and that it adds cumbersome paperwork.

2. Budgetary Constraints

Future-year funding of current acquisition programs and approval of funding for the next budget year are always in doubt in the federal government market. The authorization of an agency budget and the requested information sources by the agency oversight committee do not assure the agency or vendors that funds will be provided in the out-years. Appropriation Acts for the agencies approve the TOA (Total Obligational Authority) for certain large systems, but not the fiscal year or years in which the funds will be available (called outlays).

Continuing economic and political sensitivity to the large national budget deficit is beginning to adversely affect a number of acquisitions in the less-than-critical defense and civil technology sectors. Major IRM systems already approved are likely to continue in preference to unapproved programs. Furthermore, ongoing production, through operational support contracts, must continue. (However, see Exhibit IV-1, where a greater need for new-start efforts rather than replacements or upgrades/expansions is evident for Defense agencies.)

INPUT expects budget difficulties to continue to constrain the federal information systems market, particularly on the defense side. However, if the procurement process is simplified to reduce the protest volume, acquisitions should begin to increase. Many view information systems as key to productivity increases. Therefore, budget constraints sometimes lead to increased opportunities in the information systems market.

3. Software Integration and Productivity Improvements

Software is the interface medium between machines, applications, and end users. Agencies need strategies and vendor support to implement these integrations. Agency respondents in previous studies noted a growing need for portable software that is readily adaptable to a changing hardware environment. As new hardware technologies are put in place, the next generation of software must accommodate change and communications between incompatible equipment.

Similarly, agencies are increasingly required to merge large applications into a single, transparent software system that fits their end users' needs, rather than the government end users adapting their needs to the capabilities of the software.

To modernize software and effect productivity improvement, agency ADP organizations are seeking greater use of:

- Software engineering technologies, including more efficient software management methods, software development methodologies, and data dictionaries

- Higher-level development tools, including program generators and fourth-generation languages

- Better analytic tools for all sizes of machines—microcomputers, midsize computers, and mainframes—that will provide programmers with development aids such as automatic documentation, cross-referencing, etc. Many SI programs include requirements for these technologies.

One approach—data administration—provides techniques and software tools to arrange large amounts of data. By organizing, indexing, and cross-referencing data according to the business requirements of the organization, agencies are better equipped to plan procedures for the comprehensive development of future systems. Specifications from the American National Standards Institute (ANSI) are now being reviewed by agencies and vendors. Although a standard data dictionary software specification is some years away, vendors—especially of data base management systems (DBMSs)—need to be cognizant of the pending impact of this trend.

Fourth-generation languages (4GLs) are being employed by agencies to increase productivity in software development and maintenance. Currently, 4GLs are used primarily for end-user computing and reports, along with some decision support. Other applications for 4GLs are being designed and will eventually ease the burden on agency staff; government computer resources experts are concerned with the demand on computing capability of 4GLs and will look for 5GLs with improved efficiencies. Many information systems procurements include requirements for 4GL

experience. Advanced hardware designs, including Reduced Instruction Set Computing (RISC), will make (traditional) inefficient 4GLs more feasible. As a result of steadily declining hardware costs and increasingly powerful and fast computers, software inefficiency will matter less than it used to.

4. Artificial Intelligence

Artificial intelligence is a market segment in which vendors are focusing on introduction of new technology to the government, primarily in the areas of software development efforts and decision support. Currently, expert systems (which are a popular subset of the family of AI capabilities) are being developed by agencies as standalone end-user production systems to automate knowledge-based processing. In meeting federal systems integration needs, vendors must often include AI features as part of their offerings.

The DoD is taking the lead in developing artificial intelligence programs. AI is providing useful training for analysts, and applications are being employed in tactical situations and support functions. Civil agencies are also developing and operating expert systems for large-scale information processing. In a previous report, INPUT reported that decision support systems represent the most common government application of AI. However, AI is also being used in the development of micro security products.

Industry considers the current AI opportunities to be in product-oriented services for prototyping systems for federal agencies. As in other software areas, the government is looking to industry for solutions, not just products. Therefore, in response to this trend, AI vendors are expected to migrate beyond standalone systems to new products that integrate approaches and solutions. AI is expected to aid in developing closer links to the main flow of an agency's information processing.

Many small AI vendors are focusing their marketing efforts on SI directors and are providing products to facilitate information storage and retrieval, data communication, and other typical management functions. Current federal prototyping efforts are demonstrating AI feasibility in those SI functions as well as other decision support areas. Areas in which federal workers must interview the public seem especially promising for AI. In a previous report, INPUT found that many federal AI applications were being applied to specialized midsize computer systems.

5. Uncertainties and Issues

Federal agencies, in their attempts to consolidate disparate IRM systems, are bundling their requirements for information systems into massive contracts. These large projects are causing big problems in the time it takes to implement them, the cost of the system, and the overestimation of the systems' capabilities. Another problem with large-scale projects is the lack of agency staff and managers with the necessary experience, skills, and management authority.

Over the past year there has been rethinking on the issue of "grand design" systems integration projects. In 1988, GSA wrote a report entitled "An Evaluation of the 'Grand-Design' Approach to Developing Computer-Based Applications Systems." The report outlined ten issue areas that have the most effect on grand designs, as shown in Exhibit III-11. The report cites several criticisms of the grand-design approach.

GSA believes the "grand design" approach is not easily tailored to many agencies. According to GSA, it demands a high level of cooperation among organizational units, tough priority setting, swift decision making, and mobilization of a large percentage of an agency's top talent.

In April 1991, GSA released a report entitled *Alternatives to Grand Design for System Modernization,* which was developed in conjunction with American Management Systems, Inc. (AMS).

The objective of GSA's study is to provide a risk-based approach to the evaluation and selection of system modernization strategies that constitute alternatives to "grand design." Specific goals are:

- To define alternative strategies which are more modest in scope than "grand design"
- To identify risk factors to consider when selecting a strategy
- To identify a decision logic for selection of a strategy

EXHIBIT III-11

Ten Issue Areas with Most Effect on Grand Designs

- Coordination problems within the agency during the planning phase
- Procurement problems during the procurement phase
- Lack of acquisition skills during the planning and procurement phases
- Placing the program high enough in the organization in the planning phase
- Uncertain funding during the planning phase
- Audits by GAO during the planning and procurement phases
- Problems with contractors during procurement
- Staffing problems during planning, procurement and operations
- Problems with procurement regulations during the procurement phase
- Unrealistic time schedules during the planning phase

Source: Table 2 in Draft Report: An Evaluation of the "Grand Design" Approach to Developing Computer-Based Applications Systems, GSA, Information Resources Management Service, July 1988

GSA hopes this report will deter agencies from using the "grand design" approach. The report offers four alternative strategies to sytems modernization other than the "grand design" method. These strategies are listed in Exhibit III-12.

EXHIBIT III-12

Alternative Strategies to "Grand Design"

- Bounded grand design strategy
- Comprehensive information technology utility strategy
- Functional/technical integration of program-specific plans
- Incremental investment strategy

Source: *Alternatives to Grand Design for System Modernization*, GSA, Information Resources Management Service, April 1991

GSA states in this report that a minimum condition for a successful systems modernization program is selecting a strategy that is tailored to an agency's programmatic, organizational, budgetary, technical and political environment. GSA examined 29 public and private sector systems modernization programs started in the 1980s. GSA developed the four alternative strategies by analyzing the successes and failures of these 29 programs. All of the strategies listed utilize the downsizing philosophy advocated by GSA.

The report discusses each of the four strategies in great detail. It also describes the most appropriate strategy for certain situations.

The Bounded Grand Design Strategy focuses on implementing a comprehensive technical solution bounded to an agency's highest priorities and reducing risk to manageable levels. This strategy is most likely to be successful when the existing organizational structure supports large-scale, agencywide information technology programs and there is sufficient talent within the agency to plan and execute such a complex program.

The Comprehensive Information Technology Utility Strategy involves establishing a central IRM organization to enforce agencywide standards and methodologies, and requiring functional units to develop and implement their own modernization programs. This strategy seems to work best when there is a well-balanced relationship between a central IRM organization and programmable units, and when the agency's mission places high value on communication and processing capabilities.

Functional/Technical Integration of Program-Specific Plans requires each functional unit to formulate its own modernization plan. A central IRM organization then weaves the plans together and supplies a limited number of common services. This strategy is typically preferred when programmatic and functional units are large, organizationally influential, and have a strong preference for directing their own modernization activities.

The Incremental Investment Strategy focuses on deriving the highest return from relatively limited resources that may be invested in information technology within a short planning horizon. This strategy works well when planning and execution risk is high, significant returns from long-term investments may never be achieved, or there are severe funding limitations.

Great controversy has developed because of GSA's report and a report released by ADAPSO in June 1991. ADAPSO's report appears to contradict GSA's unfavorable opinion of the "grand design" method of system modernization.

The report, entitled *Observations on Successful Federal Systems Integration Programs,* was developed by ADAPSO to identify large federal systems integration projects, the factors critical to their success, and the criteria by which program managers evaluate program success.

Exhibit III-13 lists the agencies and programs examined by ADAPSO for its report.

ADAPSO surveyed program managers from eleven federal systems integration efforts. ADAPSO concluded that, for the most part, these eleven programs are successful (improvements to mission capability have been or will be realized that outweigh the costs). ADAPSO also found that program managers rely on user satisfaction to determine the success of their efforts. The report also identifies the factors most critical to program success. These factors are listed in Exhibit III-14.

ADAPSO's report presents the compiled responses to a number of questions regarding current SI programs. The report addresses the following issues:

- Contribution to agency mission
- Capabilities intended but not realized
- Major obstacles (pre-solicitation hurdles, procurement hurdles, implementation hurdles)

EXHIBIT III-13

Programs Examined by ADAPSO

Agency	Program	Systems Integrator	Award Year	Value ($M)
Agriculture	AMPS	EDS	1985	443
Air Force	SC&D	CSC	1988	135
Air Force	HSRP	Grumman	1988	92
Air Force	AFEMS	Martin Marietta	1989	77
Army	FIS	Boeing	1987	2
Army	80X	EDS	1987	343
Army/COE	CEAP	CDC	1989	365
NASA	LIMS	EDS	1987	42
Navy	EDMICS	PRC	1989	150
SEC	EDGAR	BDM	1989	52
Treasury	CDN	CSC	1985	106

Source: *Observations on Successful Federal Systems Integration Programs*, ADAPSO's Federal Information Systems Committee, June 1991

EXHIBIT III-14

Factors Critical to SI Program Success

- High-level agency commitment
- User involvement in design and implementation
- Contractual flexibility to accommodate change

Source: *Observations on Successful Federal Systems Integration Programs*, ADAPSO's Federal Information Systems Integration Committee, June 1991

- Retrospective views
- Achievement of success (definition of success, critical success factors)
- Assessment of program success

INPUT believes the differing views of GSA and ADAPSO may be explained. In fact, they may not be as drastically different as they initially appear. Factors that may contribute to the differences in the reports include the following:

- Different programs analyzed
- Different report objectives
- Different types of information presented
- Different definitions of terms

Both reports examined federal systems integration programs, but only the Security and Exchange Commission's program, called EDGAR, was addressed in both reports. There were no other matches between programs in the two reports. Each report analyzed entirely different programs.

Secondly, the objectives of both reports are different. GSA's report was developed in order to compose alternative strategies to the "grand design" method, and ADAPSO's report was written to examine factors important to program success and to define program success. Because the writers of each report had different goals in mind, they viewed the SI programs differently. GSA already had a negative opinion toward "grand design" before it began compiling this report. GSA's report does not describe in detail why it considers specific SI programs unsuccessful, whereas ADAPSO's report presents individual program managers' opinions of their SI projects.

In conjunction with differing objectives, the reports offer unlike types of information. GSA's report is a guide to choosing a strategy for systems modernization given certain circumstances. ADAPSO's report lists the answers and opinions of SI program managers on what went right and what went wrong with their programs.

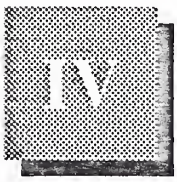
Lastly, definitions of terms such as *success*, *systems modernization*, *systems integration,* and *grand design* are questionable. GSA and ADAPSO may define program success differently. GSA never identifies its definition of success. Also, can system modernization and system integration be used interchangeably? Are all of the programs presented in the ADAPSO report "grand design" programs? With these questions left unanswered, the claim that GSA's and ADAPSO's reports are completely contradictory would be unjustifiable.

Aside from the "grand design" issue, some systems integration vendors are in favor of a modular approach. This group of vendors believes that the modular approach is the only logical way to achieve the goal of developing a major system. These vendors would like to make a fundamental change in the way the government buys their systems. According to these vendors, procurements should be competed on a functional basis rather than on detailed specifications. The contract would then be awarded on the efficiency of the vendor's concept. This concept is along the lines of how commercial systems integration projects are done. The vendors would also rather develop these systems under something other than a fixed-price contract.

A variety of agencies are participating in GSA's "Go for 12" program, with varying results. Each agency will work with GSA in one of three pilot projects designed to model and test different aspects of the acquisition process. The three aspects of the program are the elimination of unnecessary bottlenecks in the acquisition process, the potential for parallel review of acquisitions, and the provision for special training in ADP andtelecommunications acquisitions. The results and recommendations will be used to develop new procedures for use throughout the government. Until now, however, very few federal initiatives have achieved the schedule objectives.

Probably the most vital solution to these issues is communication between the vendors and government. However, communication is impaired by protests under the Competition in Contracting Act and by the Procurement Integrity Act. Both laws hamper communication; thus, optimization of the procurement process is an unattainable goal.

Since part of the problem with large SI projects is lack of expertise of federal managers, GSA has initiated the Trail Boss program. Under this program, senior IRM officials at civilian agencies are responsible for overseeing the contracting process of major acquisitions from beginning to end. The designees are given specialized training courses and aided in obtaining requisite authority and support from upper agency management to see a project through successfully. Vendors complain that the courses do not teach enough and that there are not enough Trail Boss trainees. The agencies oppose Trail Boss partially because of its focus on the individual rather than the agency.



Agency Requirements

A
Overview

Opportunities in the federal SI market appear in a number of agencies. Exhibit IV-1 presents the distribution of integration initiatives identified by agency and type of effort.

INPUT identified 72 active systems integration programs within the federal sector. The number of programs identified should not be interpreted as all-inclusive, but as representative of agency trends for SI projects over the next five years.

Expansion programs represent 33% of the SI market. More than half of these expansions are identified as requirements originating with the civilian agencies. This is an 8% decrease from the 1990 report (41%).

Replacement programs represent 25% of the current active systems integration programs. This percentage represents an increase from the 1990 version of this report (18%).

The number of new SI programs is higher than in the 1990 version of this report. The new starts identified in this report represent a slightly larger percentage (42%) of the federal SI market than was identified in last year's report (41%).

The small changes in percentages can be explained by the change in the stated goal of a project. During the development of an SI project, its definition and requirements can change before the RFP is released.

The total number of identified SI projects has increased somewhat from the 1990 version of this report; also, the number of projects within specific agencies has shifted. This is the result of the fulfillment and execution of some projects, and the development of new projects by other agencies.

EXHIBIT IV-1

Active SI Programs by Agency, GFY 1991

Agency	Upgrade/ Expansion	Replace-ment	New Starts	Total
Defense				
Air Force	4	1	4	9
Army	3	2	4	9
Navy	1	1	3	5
Marine Corps	1	0	1	2
Defense Dept.	2	2	6	10
Subtotal	11	6	18	35
Civil				
Agriculture	1	0	1	2
Commerce	1	2	3	6
EPA	0	1	0	1
H&HS	1	1	0	2
Interior	1	1	1	3
Justice	1	0	1	2
NASA	3	1	0	4
State	0	1	1	2
Transportation	1	1	1	3
Treasury	2	3	3	8
U.S. Courts	0	1	1	2
Veterans Affairs	2	0	0	2
Subtotal	13	12	12	37
Total	24	18	30	72

Source: INPUT Procurement Analysis Reports

B
Hardware Systems

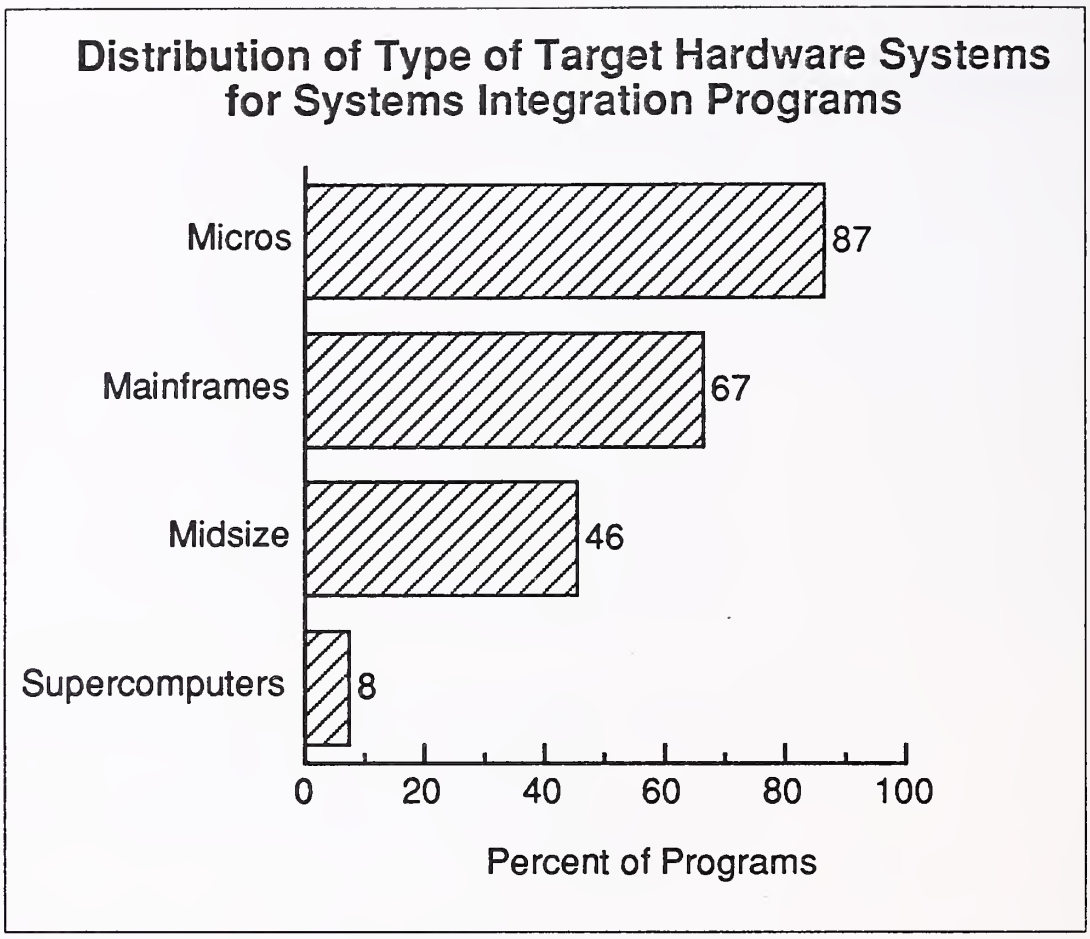
Information systems hardware requirements are only partially identified in systems integration programs. Under A-109 guidelines, hardware systems are only functionally described but not specified until the selection of the final contractor. However, few agencies are even considering the conduct of A-109-type procurements. New system acquisitions below the A-109 thresholds are not usually permitted to specify particular brands. Rather, computer systems will be selected competitively after completion of system architecture design. Furthermore, in a number of defense administrative, accounting, and human resource applications, one vendor may supply computers to several systems with bulk purchase discounts under a requirements-type contract. Two examples of A-109 procurements are the Army Reserve Component Automation System (RCAS) and the National Weather Service Advanced Weather Information Processing System for the 1990s (AWIPS-90).

At this writing, Computer Sciences Corporation is protesting the Army's award of RCAS to Boeing Computer Services. In January 1991, PRC and Computer Sciences Corporation submitted proposals for AWIPS. At this writing, proposals are still under evaluation. An award is expected in February 1992.

As illustrated in Exhibit IV-2, there is a continuing strong need for mainframe computers in systems integration projects (by more than two-thirds the programs being reported on); nearly half the programs reported on include requirements for midsize computers and about seven-eighths of the programs include requirements for microcomputers. As one would expect, complex SI projects frequently utilize a combination of equipment types to solve a variety of user requirements. The number of microprocessors, consisting of PCs and specialized workstations, applies only to planned major systems. The number of microprocessors to be acquired for a range of smaller applications may be considerably higher, by as much as one or two orders of magnitude.

In the commercial SI market, companies with systems integration projects for the most part have a low level of detail in their specifications. As a rule, less time is spent on functionality issues as opposed to performance. This is dissimilar to the federal government market, which is restrained by regulation to functional descriptions of its hardware requirements. Not only is this intended to safeguard against monopoly of the federal market by any hardware vendor, but it allows systems integration firms to propose more creative solutions. In the absence of a specification for a particular piece of hardware, the systems integrator in both federal and commercial markets can propose a system that provides the most effective solution.

EXHIBIT IV-2



Hardware manufacturers have become contractors in the commercial systems integration market in areas where they can apply new technologies, expand markets for those technologies, and leverage existing and new product lines. In effect, they are focused on utilizing their typically limited professional services resources to maximize the return on their core business products. This is true in most cases for federal market vendors as well. Most hardware firms prefer to apply their own core business products, but cannot avoid the use of hardware from other manufacturers. This policy may limit their ability to respond to all systems integration opportunities.

C

System Applications

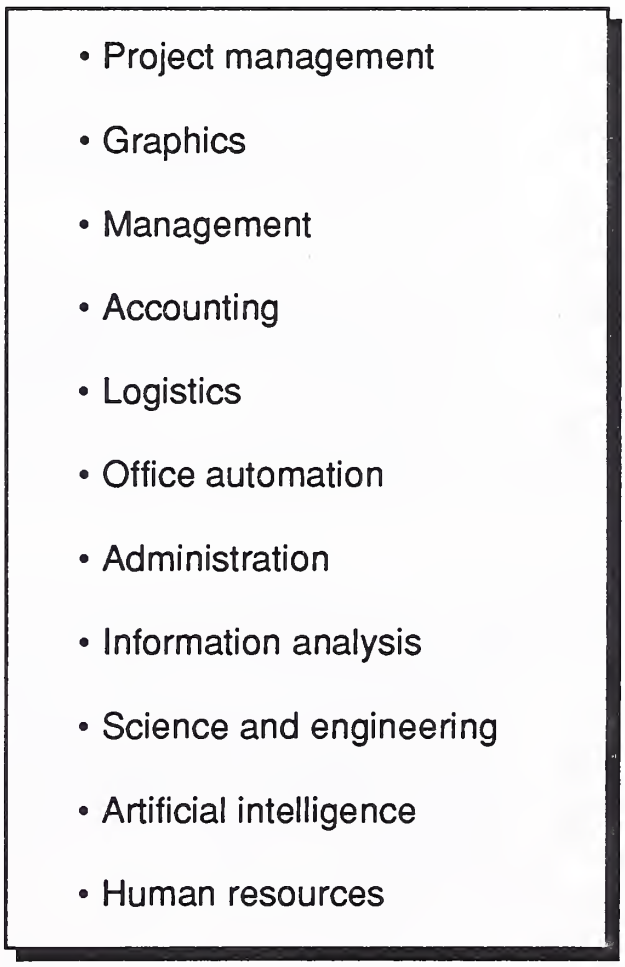
The reference documents and the interviews for systems integration programs consulted for this report identified a wide variety of applications. Since this information indicates the current opportunities, they are included here as well. The applications discussed (see Exhibit IV-3) should be considered representative of systems integration requirements only. A number of the applications may sound like variations on office automation. They represent, however, the impact of two (apparently contradictory) trends:

- The aggregation of corporate data to a level that encompasses all interested users within the span of a single organizational manager
- The separation of unique processing activities down to the end user's offices

Thus, end users throughout a large organization are able to make use of the same data wherever it is revelant to their activities. However, by exercising control over local processing capabilities, each user is able to process it in ways that are uniquely useful to his or her operating function.

EXHIBIT IV-3

Systems Integration Project Applications



Note: Presented in decreasing order of numbers of responses.

Project management is the most frequently mentioned application of systems integration projects. Federal agencies, both defense and civil, want to be able to coordinate and manage large (and visible) projects more effectively and efficiently.

On the Defense Department side of system applications, logistics and distribution systems are the most prevalent projects. Next come graphics and project management, followed by office automation, artificial intelligence and management.

On the civil agency side of system applications, project management and accounting are the most prevalent projects. Respondents also mentioned administrative applications, scientific/engineering applications, management, graphics, and office automation.

The commercial systems integration market differs from the federal SI market in that it is less granular. Federal agencies tend to acquire systems that are specific to that agency, whereas most firms acquire systems that may be applicable throughout their vertical industry.

As another difference, office systems programs are often larger and more extensive in the federal sector. Federal agencies have a greater need to update and integrate multiple levels and types of equipment. Many federal office projects include networks to interconnect widely dispersed offices and branches.

The federal agencies are also replacing more finance and administrative systems than in the commercial sector. In response to the Administration's Reform 88 program, a single federal financial system is required to be implemented by 1992. Major replacements are scheduled for defense and civil agency payroll systems and operations systems. Most of these replacements will be conducted in an SI environment.

D

Case Studies of Systems Integration Contracts

In this section, case studies of systems integration projects that were awarded at least one year ago are presented. The data was collected from prime contractor project managers. The case studies illustrate how contractors attempt to manage complex systems needs by providing equipment, software, professional services, and operations and maintenance functions.

FEDERAL SYSTEMS INTEGRATION PROJECT CASE STUDY

Program Name: **Repair Facilities Automation**

Department: **Department of Defense**

Branch: **Contractor requested that the client not be specifically identified.**

Mission Problem/ Function:

Automate the repair facilities on the shop floors at Department of Defense Centers. It will help control the repair function while decreasing the cost of repairs.

Major Tasks Performed

- Designed new methods and procedures
- Designed an automated system
- Provided hardware and software

Contract Information

Type	Amount	Duration
Fixed price	$113 million	12 years (including maintenance)

Schedule

RFP Release	Bid Due	Award	Completion
8/86	11/86	6/87	1993

Contractor(s)

	Company	Function
Prime Contractor	GDS	Design/Integration/Management
Subcontractor	IBM	Hardware Platforms
Subcontractor	Cincom	DBMS and Applied Software
Subcontractor	Ernst & Young	Applications Software peripherals

Project Components

Equipment: $35 million

Software Products: $10 million

- Systems software
  IBM MVS; Cincom Supra
- Applications software
  Manufacturers Requirements Planning II (Cincom), modified by Cincom and GDS

Professional Services: $50 million

	P=Prime Contractor S=Subcontractor O=Other
Design/Integration	P
Project Management	P
Education/Training	S

Software Development:

Manufacturers Requirements Planning II
Financial Reporting
Interfacing Software

Operations and Maintenance: $15 million

The prime contractor provides maintenance management, and the subcontractors provide specific maintenance functions.

Other Products and Information Services: $3M

Product Content Software

Project Status

The initial operating capability has been installed at the first site. The initial operating capability is currently being installed at other sites. This represents Phase I of four phases. The client is very satisfied with the vendor's progress, and the project is going very well.

GDS expects to have a fully operational system at one site by mid-1991. It then plans to migrate the fully operational system to other sites by mid-1992. Unique applications for all sites are being developed simultaneously.

FEDERAL SYSTEMS INTEGRATION PROJECT CASE STUDY

Program Name: **Engineering Research and Technical Support**

Department: **Transportation**

Branch: **National Highway Traffic Safety Administration**

Mission Problem/ Function: Integration of hardware, software, office automation, and networking for greater efficiency and cost savings.

Major Tasks Performed

- Design and support an integrated computer center
- Design and support an agencywide Ethernet network
- Design and support an agencywide management information system
- Provide agencywide office automation support

Contract Information

Type	Amount	Duration
Cost plus fixed fee	$20 million	5 years

Schedule

RFP Release	Bid Due	Award	Completion
N/A	N/A	8/1/86	7/31/91

Contractor(s)

	Company	Function
Prime Contractor	Automated Sciences Group	Consulting Services, Design/Integration, Project Management, Education/Training
Subcontractor	ISSI	Programming Support
Subcontractor	UVA	Engineering Analysis
Subcontractor	Kelley Associates	Special Study
Subcontractor	Canfield-Cook	Report Writing, Analysis
Subcontractor	Metro Media	Software Development

Project Components

Equipment: $3 million

Agency Supplied: Wang VS/100 (6); IBM-compatible PCs (65); VAX Cluster; AT&T 3B2 Cluster; HP 9000/840

Software Products: $2 million

- Systems Software
  VMS, UNIX, DOS
- Applications Software
  FORTRAN, C, Ingres, Oracle, Informix, dBase

Professional Services: $15 million

	P=Prime Contractor S=Subcontractor O=Other
Consulting Services	P
Design/Integration	P,S
Project Management	P
Education/Training	P,S,O

Software Development:

Off-the-shelf applications were supplied by the prime contractor. Custom-developed software was developed by the prime contractor, ISSI, and Metro Media.

Operations and Maintenance: $7.5 million

The prime contractor provides operations and maintenance support.

Project Status

The contract is in its last option year. The contract has evolved into a task order contract although it was not one originally. The client is extremely happy with the progress.

FEDERAL SYSTEMS INTEGRATION PROJECT CASE STUDY

Program Name: Cargo Movement Operations System (CMOS)

Department: Department of Defense

Branch: U.S. Air Force

Mission Problem/ Function:

The Air Force tracks and moves cargo throughout the world. The cargo's condition and status as it moves through transportation channels is basically a manual process today. The Cargo Movement Operations System (CMOS) will provide automated support to the cargo movement environment and allow for more efficient handling and tracking, thus allowing for the movement of increased volumes of cargo.

Major Tasks Performed

- Modified systems specifications
- Developing and implementing the entire system, including the integration of all hardware, software, and data communications.

Contract Information

Type	Amount	Duration
Firm Fixed Price	$11,958,369.95	3 years

Schedule

RFP Release	Bid Due	Award	Completion
NA	4/5/89	5/26/89	6/1/92

Contractor(s)

	Company	Function
Prime Contractor	ERC International	Project Management, Modification, Integration
Subcontractor	Wollongong Group	Data Communications
Subcontractor	CACI	Transportation Analysis

Project Components

Equipment: $300,000

Vendor Supplied: Sun 386i workstations
Agency Supplied: AT&T 3B2-600G, Zenith Z-248s

Software Products: $8,000 per site

- Systems Software
  UNIX System V/MS-DOS
- Applications Software
  DDN/FTP, DDN/GMTP, DDN/Telnet, DESQVIECO Windows, Prelude E-mail, Oracle RDBMS

Professional Services: $11 million

All services were provided by the prime contractor.

Software Development:

CMOS Increments I and II were custom developed by ERC International.

Operations and Maintenance: $2,080,000

ERC International provides operations and maintenance support.

Project Status

There are three increments. Increment I has cancelled System Design Review. Increment II has just begun System Requirements Analysis and Increment III has been initiated. $6.2 million was originally appropriated for this contract, but the scope of the project will in the future change from the original specifications. The project has been very successful to date.

FEDERAL SYSTEMS INTEGRATION PROJECT CASE STUDY

Program Name: **Inspector General Network (IGNET)**

Department: **Army**

Branch: **Inspector General**

Mission Problem/ Function:

Conversion from a manual data collection, processing, and storage operation to a fully automated system, to include worldwide data communications among 140 Army Inspector General offices.

Major Tasks Performed

- Design and develop hardware and software capabilities to meet specified requirements
- Work includes local and worldwide networking, encryption, training, maintenance, and system engineering support.

Contract Information

Type	Amount	Duration
Fixed Price	$15 million	8 years

Schedule

RFP Release	Bid Due	Award	Completion
4/83	8/83	3/84	3/92

Contractor(s)

	Company	Function
Prime Contractor Subcontractor	PRC Convergent Technologies	 Equipment and software data base

Project Components

Equipment: $5 million

Contractor supplied: Convergent Technologies PHD-010 (140), CP-001 (120), CP-002 (400), SRP (1); Racal-Milgo 1027 (140); AMT printer 2102 (160), Excel 500 (50); Centronics LP 885 (30)

Software Products: $600,000

- Systems software: CTOS/VM
- Applications software: Word Processing, mail, DBMS spreadsheet, graphics, cluster network, encryption, computer-based training.

Professional Services: $4 million

	P=Prime Contractor S=Subcontractor O=Other
Consulting Services	P
Design/Integration	P
Project Management	P
Education/Training	P

Software Development:

E-mail, DBMS, Printer Drivers/Spoolers were supplied off-the-shelf.

Encrypted data transmission software, DDN communications software, user statistics, and computer-based training were custom-developed by the prime contractor.

Operations and Maintenance: $6 million

The prime contractor provides operations and maintenance support.

Other Products and Services: $2 million

The prime contractor is providing installation, systems engineering support, and user support.

Project Status:

The client is extremely satisfied with delivery and performance on this contract. All 140 sites were installed as of October 1, 1989. Additional equipment is being installed as funding permits. Worldwide communications architecture is being redesigned to increase efficiencies and reduce overall communications costs.

Below is a list of SI contract awards. This contract data shows how different project requirements can affect contract type.

Systems Integration Programs

Dept.	Acronym	Program	Contractor	Year
Air Force	AFC2S	Air Force Command & Control System	GTE	89
	AFEMS	Equipment Maintenance System	Martin-Marietta	89
	AFWAM	WWMCCS ADP Modernization	Honeywell	89
	C2IPS	Command & Control Information Processing System	CSC	89
	DMMIS	Depot Maintenance Management Information System	Grumman	88
	HSRP	HQ Systems Replacement Program	Grumman	88
	SC&D	Stock Control & Distribution	CSC	87
	SWPS	Strategic War Planning System	General Dynamics	89
Army	ASIMS	Previously VIABL	EDS	81
	CEAP-1A	Corps of Engineers Automation Project	CDC	89
	CHCS	Composite Health Care System	SAIC	88
	FIS	FORSCOM Information System	Boeing	88
	TMIS	Technical Management Information System	CSC	87
Defense	DMSSCI	Defense Medical Systems Support Center Integration	EDS	90
DLA	DLSCDIDS	Defense Logistics Service Center/Defense Integrated Data System	Grumman	90
NASA	EADS	Engineering Analysis Data System—Marshall	Grumman	85

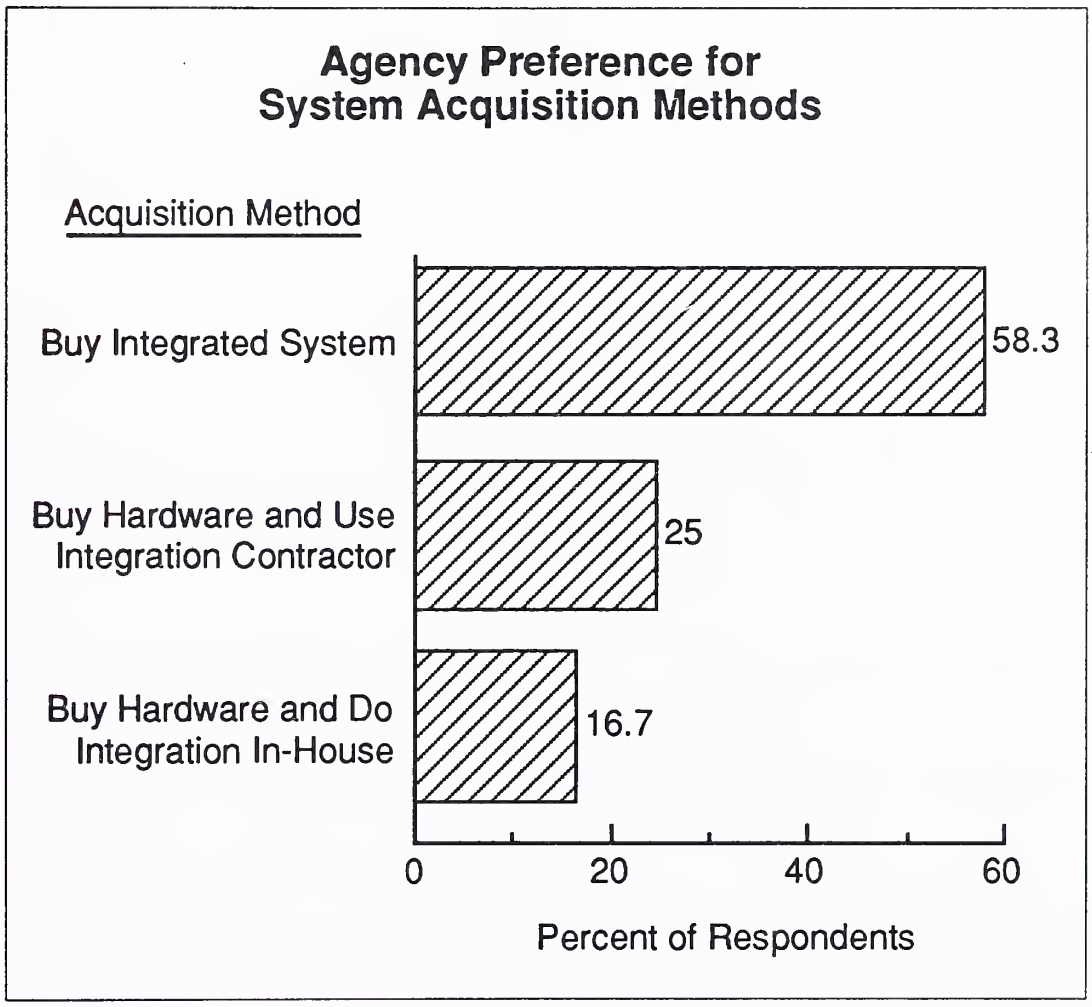
Dept.	Acronym	Program	Contractor	Year
Navy	EDMICS	Engineering Data Management Information Control System	Advanced Technology	89
	ICP	Inventory Control Points	EDS	84
	SPAR	Stock Points ADP Replacement	EDS	87
SEC	EDGAR	Electronic Data Gathering and Retrieval	BDM	89
Transp.	NAS-FAA	National Airspace System	IBM	88
Treasury	CDN	Consolidated Data Network	CSC	85
VA	IDCU	Integrated Data Communications Utility	SAIC	88
	IHIS-Chi	Integrated Hospital Information System—Chicago	SAIC	90
	IHIS-NY	Integrated Hospital Information System—Brooklyn	SAIC	90

E

Acquisition Plans and Preferences

Agencies interviewed in the study were asked to comment on their perceptions of how integration programs are now acquired and how they would prefer them to be acquired in the future. In the past few years, agencies have changed their acquisition preferences. In past surveys, INPUT discovered that agencies preferred separate acquisition of systems components and performance of integration in-house. Recently, more than one-half of the agencies interviewed preferred buying an integrated system, as shown in Exhibit IV-4.

EXHIBIT IV-4



The remainder of the respondents favored purchase of the hardware separately, along with the use of an integration contractor, over attempting to do systems integration in-house.

In the commercial sector, decisions concerning the use of internal or external resources were usually based on the scope, technical requirements, timeliness, risk factors, and corporate economics. In general, when an outside systems integration company was retained, it was mainly due to the buyer's lack of internal capability and/or resources. There were cases when a complete or partial capability existed within the buyer's organization, but due to other considerations, such as current workload or not wanting to increase the professional staff, a systems integration vendor was retained.

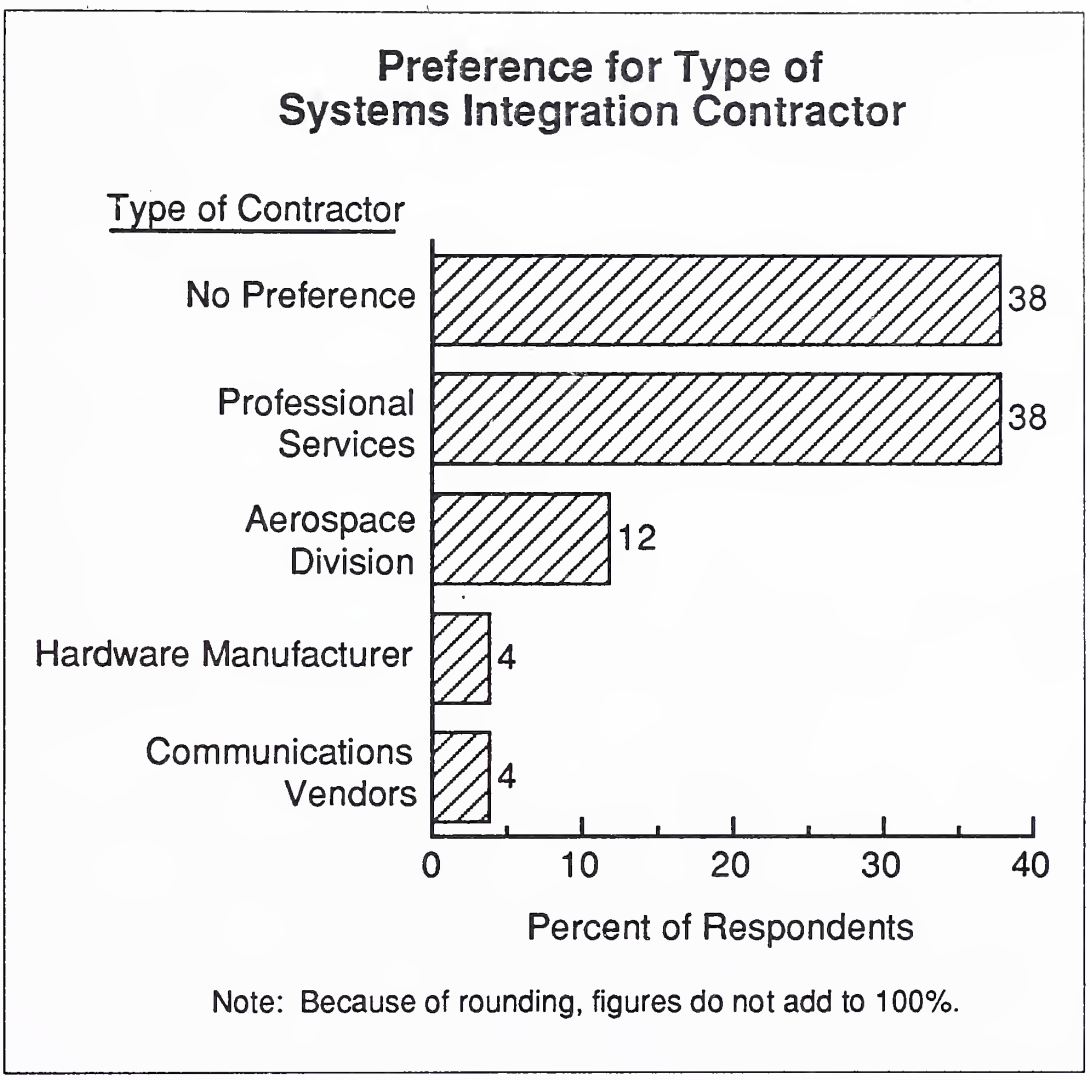
Agency representatives were also asked to describe the technology levels required to support their SI requirements. Only 8% of the agency programs included a requirement for supercomputers. (See Exhibit IV-2.) However, INPUT has found in other surveys that some agencies are considering using supercomputers for other than scientific applications, such as process control and econometric modeling. Supercomputers will likely continue to have relatively little impact on the federal systems integration market.

At this writing, considerable controversy exists over the necessity and success of large-scale systems integration projects. As discussed above, GSA continues to advocate "downsizing" or a "modular approach" to developing large-systems projects. Many agencies, as well as vendors, believe that single-point responsibility and liability are the only procurement avenues to pursue in establishing a multivendor environment. INPUT expects this debate to continue until a few highly visible successes or failures occur.

Agencies that expressed a preference were strongly in favor of using professional services vendors for SI acquisitions, as noted in Exhibit IV-5. This preference represents a significant shift from the results of INPUT's previous studies, and suggests a higher comfort level with this group of vendors.

Respondents in a number of agencies, including both program management respondents and contracting office respondents, interpreted this question in such a way that only a "no preference" response would meet the open competition requirements of current acquisition regulations. Of the remainder, a clear majority prefer professional services contractors for their systems integration efforts. Agencies with prior SI contract experience felt that the systems vendors made design choices that better supported the agencies' operational needs. Hardware manufacturers and communications vendors were preferred much less frequently than in previous surveys.

EXHIBIT IV-5



Bid selection criteria, while varying among agencies and even among specific projects within each agency, usually involved:

- Proposed technical solution—that is, the extent to which the proposed solution meets the requirements
- Cost, although this is considered a primary criterion by contracting personnel only when two or more vendors propose similar approaches or equipment
- Risk containment procedures, including adequacy of reporting schemes and progress reports
- The type of contract. As discussed earlier, the contract should be such that agencies have some assurances that cost and/or delivery schedules will not be overrun.

Results of federal agencies' ratings of six selection criteria for systems integration contract awards are shown in Exhibit IV-6.

EXHIBIT IV-6

Selection Criteria Significance for Systems Integration Contract Awards

Rank	Selection Criteria
1	Technical solution
2	Life cycle cost
3	Project management
4	Risk containment
5	Initial cost
6	Contract type

Note: Ranked based on averaging ratings by agency respondents.

Technical solution and life cycle cost were ranked numbers one and two in past years. In this survey, however, project management and contract type reversed positions, reflecting increased attention by federal agencies on the need for improved management of SI projects. Risk containment moved down in rank from past years—federal agencies are taking more responsibility for assessing risk in SI projects and are focusing more on life cycle costs (and attempting to prevent buy-ins) in accordance with directions from GAO and congressional oversight committees.

Although risk containment was reduced in relative importance from past survey responses, it remains an important consideration in SI services acquisitions. Large federal projects may be expected to exhibit some of the attributes of OMB Circular A-109 acquisitions even if they are not conducted within the purview of A-109 regulations. As a consequence, large projects are likely to include checkpoints in the implementation schedule at which the success of the current implementation phase is assessed prior to authorizing a contractor to start work on a succeeding phase.

The high ranking of life cycle cost is considered a reaction to the budgetary conflicts encountered on the way to project authorization and funding. Risk containment gains importance under CPFF-type contracts because the government assumes a higher proportion of the risk than it did under FP contracts.

Despite a frequently stated preference for basing awards on something other than cost, most contracts still seem to be decided that way. Whenever a major contract goes to other than the lowest bidder, the loser usually protests. Often, this leads an unhappy congressman to order a GAO investigation. Frequently, the time available for the GAO analysis may be too short or reflect an auditor's tendency to equate lowest overall cost to the best solution.

To avoid this development, many contracting officers engage in technical leveling, as discussed earlier in Chapter III. If the technical proposals can be brought into a competitive range, then the contracting officer can award to the lowest price bidder. This will enable him or her to avoid, in most cases, congressional investigations.

The relative ranking, by vendors, of agencies' systems integration contractor selection criteria appears in Chapter V.

The technical solution was identified as the primary criterion for selection by agencies in this and earlier reports. Life cycle cost was listed as the second most important criterion and previously was seldom used in actual contracting practice. In actual practice, however, initial cost was frequently the second most important selection criterion. Agency executives ranked risk containment lower than in past surveys, reflecting a growing concern over systems-life costs. There is no longer a trend for agencies to pay "lip service" to total life cycle costs as they face the reality of increasing budget limitations.

Vendors, however, ranked life cycle cost as the least important selection criterion in INPUT's study. They ranked contract type and initial cost as the most important selection criteria.

INPUT's research showed the bid process in the ccommercial systems integration marketplace to be quite different from the approach used within the federal government.

1. Participants

Of the commercial buyers polled, 80% determined beforehand which outside systems integration companies would be invited to bid on the project. Vendors were identified by talking to other companies involved in major projects, scanning literature and advertisements, and talking to vendors attending conferences and trade shows. The remaining 20% used an open bidding process and welcomed all outside systems integration companies interested in pursuing the business.

2. Bidder Conferences

Bidder conferences were held in 40% of the cases studied, whereas in the remaining 60%, scheduled individual meetings were held with the various vendors. As a result of these conferences or individual meetings, 20% of the companies modified or enhanced their original specifications.

In most cases when the bid was closed, the buyer invested considerable time in prescreening the various vendors' capabilities and expertise. The buyers did register concern regarding the lack of vendor information that outlined the various systems integration services and capabilities. Given the investment required by buyer and vendor in bidding a systems integration project, prudent management says to involve only vendors that at least appear to have adequate capabilities for the specific project.

Somewhat surprisingly, the research findings indicate there was no pattern in determining the chosen vendor. Instead, a combination of approaches was used and in some cases considerable thought was not given to this issue until the vendors bidding the project had submitted their proposals.

The most common approach was the overall evaluation of how the vendor proposal measured up to the buyer specification, but in addition there were numerous other criteria identified as having major significance in the selection process.

3. User Criteria

As listed in Exhibit IV-7, agencies ranked industry experience, applications knowledge and cost/performance criteria as the three most important issues in selecting a systems integration vendor. Alliances, widely reported in the press as being very important, were not ranked by respondents as important. However, this poor ranking could be due to the transparent nature of the alliances' participants from the viewpoint of the buyer organizations.

Other important buyer criteria included the financial health of the proposed vendor, the expertise and stability of the proposed project management team, a knowledgeable and professional technical staff and, finally, vendors' concern with providing the "best" solution, as opposed to promoting established products and capabilities.

EXHIBIT IV-7

Commercial Vendor Selection Criteria

Type	Frequency of Use (Percent)*
Industry Experience	86
Applications Knowledge	86
Cost/Performance	86
SI Experience	79
Project Management Skills	64
Support Skills	64
Service Orientation	50
On-Site Visits	43
References	43
Alliances	21

*Multiple responses permitted.

4. References

The two companies that registered the highest degree of satisfaction concerning the overall success of the project relied heavily upon references and on-site visits to similar installations. Many of the other companies interviewed also used references and on-site visits as a means of establishing vendor capability. When considering the general lack of industry information available, as reported by the buyers from a vendor and project viewpoint, on-site visits and reference checks became a critical means of validating a particular vendor's claims.

F

Trends

Agency representatives were asked by INPUT to rank technical factors that could improve the success of federal SI projects. The factors as ranked are listed in Exhibit IV-8.

EXHIBIT IV-8

Technical Factors for Successful Completion of Federal SI Projects

Rank	Technical Factor
1	Intersystem compatibility
2	Software standardization
3	Expanded networks
4	New technologies
5	Distributed processing
6	Increased microcomputer availability
7	Expert system/artificial intelligence

Ranked in decreasing order of impact.

In recognition of the growing federal need for very high-level applications that are common across several or many agencies, agencies rank intersystem compatibility and software standardization as the first and second most important factors. It should not be suprising that agencies ranked factors that affect their ability to perform their missions ahead of technical factors that influence how they perform their missions.

The adoption of GOSIP and POSIX as FIPS will stimulate agency needs to integrate new and existing systems.

Agencies were also asked to rank nontechnical factors that might affect successful completion of federal SI projects. The results are shown in Exhibit IV-9. In past years, respondents identified budgetary limitations as the largest single obstacle. Limitations in funding also contribute to the lack of available skilled staff within agencies and the agencies' difficulty in retaining them.

EXHIBIT IV-9

Nontechnical Factors for Successful Federal SI Projects

Rank	Nontechnical Factor
1	Availability of skilled staff
2	Internal agreement on requirements
3	Effort associated with acquisition
4	Budgetary limitations
5	Regulations imposed on agency
6	Increased congressional oversight
7	Industry consolidations/mergers

Ranked in decreasing order of impact.

In this survey, however, availability of skilled staff is the most important factor for success in federal SI projects. Next most important is management of the effort, as shown in the second and third ranked factors. In this survey, budgetary limitations and other factors were judged less important than staff and management.

Agency respondents were queried on their suggestions for how vendors might make their systems integration services more valuable to the federal government over the next five years. As should be expected, the replies varied due to the different types and levels of experience the respondents encountered with vendors. In descending order of frequency of mention, Exhibit IV-10 lists the principal suggestions made by the agencies.

EXHIBIT IV-10

Agency Suggestions for Improvements to Vendor Services

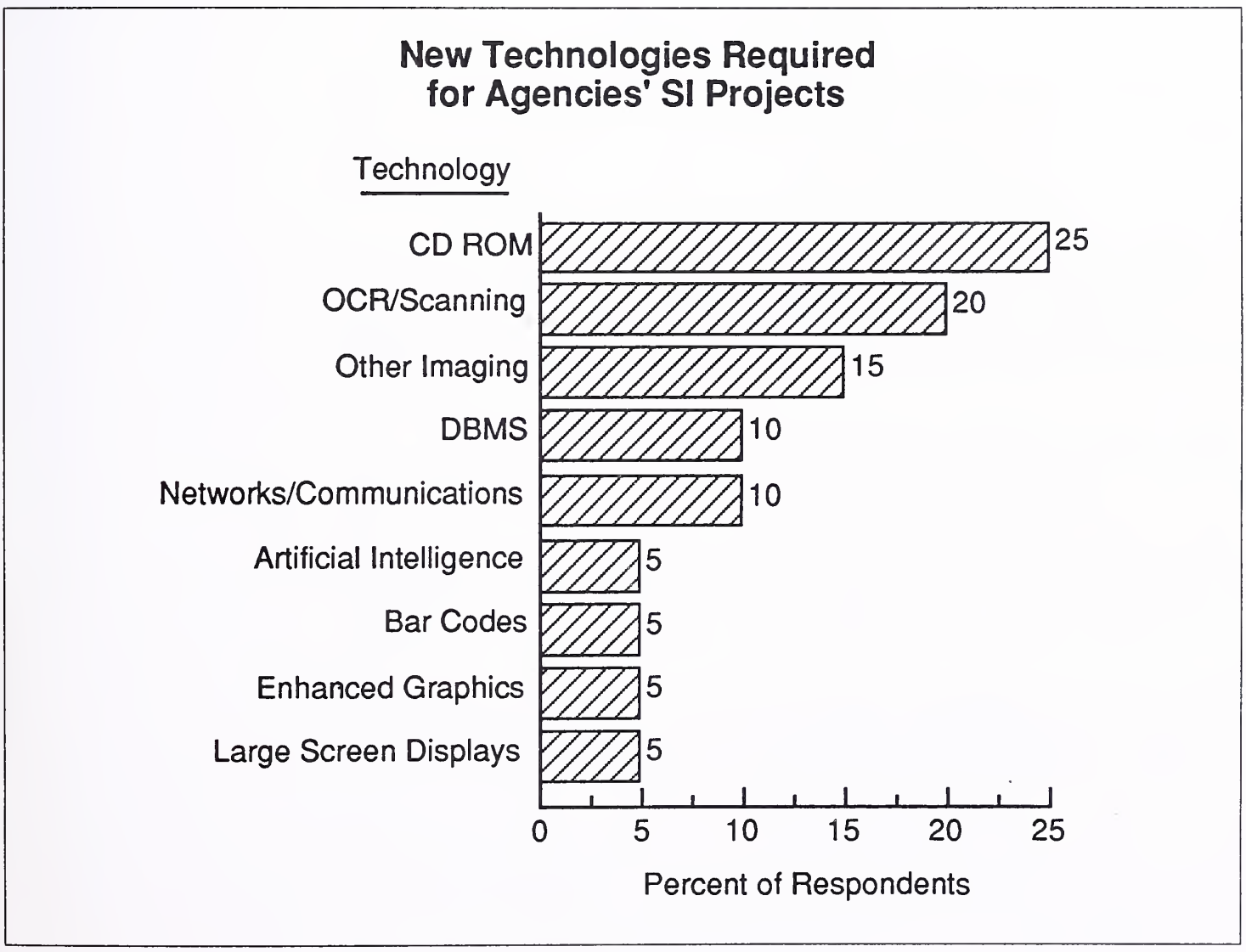
- Understand project issue/task/agencies' way of doing business
- Improve communication with agency
- Reduce system life cycle and maintenance costs
- Adopt government standards
- Use more-capable/experienced staff
- Deliver on time
- Improve program management
- Improve testing prior to software release
- Improve ease of transition to new system
- Know your own market and compatibility
- Remain flexible; agencies' budgets do change
- Improve use of automated tools

All suggestions reflect how extensively agencies rely on outside contractors. Respondents most frequently desire improved understanding of agencies' requirements and operating environment. Improved communication with the contracting agency, as well as reduced costs and increased adherence to federal information systems standards, were the next most frequently stated suggestions. Agencies seek the services of systems integrators primarily for their special professional skills. Agencies do not have the necessary technical expertise to design, implement, and coordinate the complex hardware and software systems that are demanded to fulfill governmentwide IRM needs. Contractors must continually be in

search of trained and experienced personnel to keep up with advancing technology. To be successful as a systems integrator, contractors must learn well the culture of an agency and anticipate hidden agendas. By supplying compatible software systems, contractors will take steps that will bring them closer to being able to ensure interoperability, connectivity, and upgradability between systems.

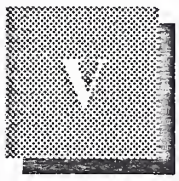
As a result of this survey, INPUT finds a growing need for, and plans to incorporate, new technologies in agencies' mission-essential application systems. As shown in Exhibit IV-11, agencies plan to incorporate CD ROM, OCR/scanning, and other imaging technologies into their systems.

EXHIBIT IV-11



Consistent with Exhibit IV-11, CD ROM is the one of the most attractive new technologies available; it offers both high-density mass storage of static data and low-cost publishing technology. For static data that must be centrally maintained, but distributed widely, a five-inch CD ROM disk holding 500-600 megabytes can be produced for less than two dollars (in large enough quantities) and mailed for one-ounce first class postage. No paper product can provide similar benefits for the same costs.

In general, INPUT's findings suggest significant, growing opportunities in the federal government. Agencies' SI services needs will increase as productivity pressures grow and agency resources become further constrained.



Systems Integration Vendors

A Overview

The federal systems integration market will continue to grow through 1996. Although there are some doubts about "grand design" systems integration projects, the government will still rely on SI to bring about solutions to its data processing and data sharing problems. Some vendors will take greater advantage of this market growth than other vendors.

There is an increasing trend for vendors to serve a wider range of federal agencies. Further, many SI vendors that had not previously targeted the commercial SI market are now doing so. They wish to broaden their business base to hedge their bets on the federal SI market, and also leverage their federal experience.

Vendors are attracted to the federal SI market by its growth potential and related benefits. Most vendors will try to win major SI contracts, but many others will work toward competitive niche jobs. However, for most of these vendors, SI is only one component of their federal strategy. Unfortunately, most vendors now refer to themselves as systems integrators, even when use of the term does not mean they could serve as prime contractors.

Federal SI vendors offer most of the products and services involved in SI bids as prime contractors and subcontract out others. The products and support services most frequently subcontracted to other vendors include:

- Hardware/equipment
- Software development
- Operation and maintenance services
- Education, training and documentation
- Network management and installation

B

Market Share

1. Top Systems Integrators

INPUT identified the ten leading SI vendors, based on government systems integration expenditures, and listed them in Exhibit V-1.

EXHIBIT V-1

Top Ten SI Vendors in the Federal ADP Market—CY 1990

- IBM
- Electronic Data Systems
- Science Applications International Corporation
- Martin Marietta
- Computer Sciences Corporation
- Unisys
- Boeing Computer Services
- PRC (Division of Black & Decker)
- Grumman Data Systems
- Control Data Corporation

These companies are under contract to meld different hardware, software, and services with standards and processes into large complex systems. Except for IBM, Unisys, and Control Data Corporation, none of the top SI contractors listed are hardware vendors. Complex systems often require multivendor solutions. Hardware manufacturers have traditionally ad-

hered to provision of their own proprietary systems solutions and offered to manage multivendor projects. However, most hardware vendors have changed their policy to allow multivendor solutions. IBM is an example of a hardware vendor that has effectively managed multivendor solutions.

2. Corporate Profiles of Top Federal Systems Integrators

The following are brief corporate profiles of the top ten SI contractors (ranked according to federal SI revenue):

a. IBM Corporation

IBM is the world's premier developer, manufacturer, and marketer of computer equipment. IBM's organization and management have always been focused on this fundamental purpose.

The executives who direct IBM have a strong heritage of either marketing or development of computer equipment. The current leaders include: Chairman John Akers, who has spent most of his IBM career in marketing; and President Jack Kuehler, who has spent much of his career in equipment development and manufacturing. Their bias has affected the corporation's interest in and commitment to the information services industry. Also, IBM has traditionally focused on leveraging equipment sales, not on service revenue from individual projects. However, in 1991 IBM reorganized to more effectively pursue the federal services business.

IBM's earliest activities in the systems integration market were performed by a group that is now called the Federal Sector Division. This organization was chartered more than thirty years ago by IBM's founder, Tom Watson, who made a commitment to the nation and its welfare and defense. Some examples of this division's early projects are:

- Project SAGE (Semi-Automatic Ground Environment)—a nationwide air defense system

- The current FAA Air Traffic Control System

More recently, IBM has also been involved in the new FAA Air Traffic Control System, the command and control system for the BSY-1 submarine, and the integration of the LAMPS anti-submarine helicopter.

Recognizing systems integration as an important distribution channel, the management of the (then) Federal Systems Division obtained corporate permission to first test its skills in the commercial SI market, and later to make a major commercial SI thrust. Renamed the Systems Integration Division (SID), and supplemented with commercial professional services talent, it aggressively pursued commercial opportunities during 1987 and 1988. SID was successful in most of these projects, but experienced some difficulties with its commercial marketing organization and customer set.

As a result of changes in the structure of world markets, more customers began to seek solutions rather than products. This offered new opportunities for SI, but with IBM's limited professional services resources and huge customer base it was apparent that internally-supplied SI would not satisfy all customer demands.

In 1988, IBM established the Applications Solutions Line of Business (ASLoB) to address the demand for solutions. Recognizing that the product organizations had always dominated the product direction setting, IBM management attempted to establish ASLoB as an equal partner with important input into the total product planning process. It located ASLoB in the U.S. Marketing and Services organization, and gave ASLoB responsibility for collecting and addressing worldwide solution requirements.

ASLoB evolved into five major vertical industry-focused divisions; in 1990 the function of the SID was absorbed into these divisions. Responsibility for federal SI efforts was placed in the Federal Sector division, as was all marketing to the federal government.

Recent awards to IBM include the following:

- IBM's largest federal SI project to date remains the $3.6 billion FAA Air Traffic Control system modernization.
- A $191 million contract in May 1991 with NASA's Johnson Space Center for operation ADP
- A $38.5 million contract with the Air Force in October 1991 for command and data processing

IBM has not been prominent as a prime contractor in SI competitions for the last two years; however, with its economic strength, its wide range of products, its technical capabilities and alliances with outside professional services firms, IBM can be expected to compete for SI (as for other) requirements whenever and wherever it has the required capabilities and internal resources. Further, IBM participates as a subcontractor on practically every major federal SI procurement

IBM's 1990 total SI revenue was approximately $1,280 million: its federal SI revenue was $800 million and its commercial SI revenue was $480 million.

b. Electronic Data Systems (EDS)

EDS was founded in 1962 by Ross Perot and in 1984 was acquired by General Motors. It has a strong set of capabilities and resources. Its operational data processing experience, including developing large and small data centers, makes it very successful in the efficient and cost-

effective use of technology. Its alliance with GM Hughes provides it with aerospace industry knowledge. Having GM as a backer provides EDS with huge financial resources to support bids on the largest opportunities. EDS has approximately 56,000 employees worldwide.

EDS is expanding its commercial manufacturing base beyond its parent company in several ways:

- EDS provided funding to ASK Computer Systems for ASK's acquisition of Ingres Corporation. This will give EDS access to ASK's manufacturing software and Ingres' data base and software development tools.

- EDS has acquired equity in several companies that increases its business base and its access to technology; included are the following companies: System One, Westwood, Thomas, and Infocel.

- EDS and Hitachi combined to acquire National Advanced Systems which was then renamed Hitachi Data Systems (HDS). EDS obtained a 20% equity in HDS.

Recent awards to EDS include the following:

- A $12.4 million contract in January 1990 with Agriculture's Stabilization and Conservation Service (SCS) to operate and maintain the Cotton Inventory Management System for SCS

- A $116.2 million contract in July 1990 with the Army to provide technical support services to Army ISSC

- A $715.9 million contract with the Army, also in July 1990, for small multiuser computers. EDS will supply microcomputers, peripherals, operating software, maintenance, training, engineering services, and LANs that operate in conformity with GOSIP. Under the contract, Army, Navy and DLA can acquire hardware, software, and services to satisfy requirements for different programs.

- A $10 million contract in November 1990 with the City of Los Angeles for an imaging fingerprint system

EDS' 1990 total revenue was $644 million: federal SI revenue was $430 million and commercial SI revenue was $214 million.

c. Science Applications International Corporation (SAIC)

SAIC was founded in 1969 by a group of research scientists. It is now an employee-owned and operated company of about 9,000 people. SAIC is known as a leader in technology and in research and development. SAIC's primary product is diversified research and engineering services.

SAIC is organized into eight operating sectors:

- The Advanced Technology & Analysis Sector
- The Aerospace & Defense Sector
- The Communications, Information, and Space Sector
- The Science & Engineering Sector
- The Space Energy & Environment Sector
- The Systems Technology and Integration Sector
- The Systems, Software, and Telecommunications Sector
- The Technology, Policy, and Operations Sector

Recent awards to SAIC include the following:

- A $500 million contract in May 1991 with the Army for Lightweight Computer Units (LCU)

- A $12 million contract in May 1991 with the Marine Corps for systems engineering and software support services

SAIC's 1990 total SI revenue was $470 million: its federal SI revenue was $400 million and its commercial SI revenue was $70 million.

d. Martin Marietta

The Martin Marietta Data Systems company was formed in 1970. The Data Systems company was part of the Martin Marietta Information Systems Group. The Martin Marietta Information Systems Group is now divided into seven distinct business areas:

- Information and Communications Systems designs, develops, produces, and operates systems that use advanced hardware and man/machine interface technologies for both defense and non-defense purposes.

- Simulation Systems designs, develops, and installs large-scale distributed simulation and modeling systems—for example, the National Test Bed, a nationwide state-of-the-art computer simulation system for test and evaluation of strategic defense concepts, architectures, battle management, and technology applications.

- Civil Information Systems designs, develops, and integrates multifunction administrative and operational large-scale systems for federal, state, local, and foreign governments. Also, three data centers provide electronic data interchange and remote computing services to government and industry.

- Air Traffic Systems designs, integrates, and implements civilian and military air traffic control systems; it also provides airport management services.

- Facilities Management & Professional Services provides customer-site facilities and program management, including systems development, installation, implementation, operations, and maintenance. It also provides technical professionals for specialized client requirements, on a task-order basis.

- Internal Information Systems provides applications systems, computer resources, and communications systems to the corporation and its operating companies.

Recent awards to Martin Marietta include:

- A $4.9 million contract in March 1989 with DOE, Western Area Power Administration to provide ADP support services

- A $35.9 million contract in September 1989 with National Agriculture Statistics Service to provide a nationwide teleprocessing network which ensures the security of sensitive data

- A $526 million contract in April 1991 with the Department of Housing and Urban Development for an ADP upgrade

Martin Marietta's 1990 total SI revenue was $376 million; federal SI revenue accounted for all of its SI revenue.

e. Computer Sciences Corporation (CSC)

CSC has been active in the federal systems integration arena for over 30 years and is a major software developer and systems integrator. CSC manufactures no equipment, but designs, develops, integrates, and operates systems for a broad range of government needs. CSC's federal SI revenue was $350 million in 1990. CSC is experiencing rapid growth in its commercial and international activities. CSC's total 1990 SI revenue was $441 million.

CSC provides services to the federal government primarily through its Systems Group; it is organized as five operating divisions:

- The System Sciences Division provides support to NASA and the FAA, as well as offering basic technology services.
- The Applied Technology Division offers facilities management, range operations and maintenance, and information sciences services.
- The Integrated Systems Division provides total turnkey systems engineering and software system support for major government systems.
- The Network Systems Division specializes in implementing wide-area data communications networks and remote data telemetry systems.
- The Special Projects Division provides broad-based systems engineering and technical assistance (SETA) services to clients with specific emphasis on communications and software support.

Recent awards include the following:

- A $65.7 million contract with NASA in early 1990 to provide engineering support services to the Wallops Island facility. CSC will support sounding rocket, balloon, and aeronautical programs, and launch range projects.
- A $48 million contract with GSA in August 1990 to provide system development and software support services for scientific and engineering applications in GSA's Pacific Zone
- A September 1990 contract, called System 90 and worth $48 million to $90 million, with the Treasury's Financial Management Service for professional services and telecommunications equipment to link the Financial Management Service headquarters and the seven Regional Financial Centers. (At this writing, Andersen Consulting has filed a belated protest in federal district court of the System 90 award; Andersen charges that CSC priced its proposal so low that it cannot possibly meet the requirements of the specification.)
- A September 1990 contract with EPA ($54 million, up to $347 million with additional options) for Technical and Operating Support Services (TOSS). CSC won TOSS away from Unisys.
- A $65.2 million contract with Army TRADOC in September 1990
- A $120 million contract with GSA in December 1990 for system development and software support services.
- A $180 million contract with the Air Force in June 1991 for Management Information System Technical Services (MISTS)

CSC, along with Boeing Computer Services, was also selected to participate in Phase One of the Army RCAS system. At this writing, CSC has protested the follow-on award to Boeing.

CSC has hundreds of contracts throughout the federal government. CSC expects continued growth in its federal government services market, having identified more than $14 billion in requirements that match its capabilities and are slated for award over the next three years.

f. Unisys

Unisys is the company formed by the combination of the Sperry Corporation and the Burroughs Corporation. The company manufactures and sells a wide range of systems, from high-performance mainframes to microcomputer-based systems. Unisys can exploit the varied capabilities offered by its two merger partners, especially from the former System Development Corporation (a subsidiary of the former Burroughs Corporation).

The year 1989 was very difficult for Unisys: it reported a loss of $639 million and cut more than 8,000 jobs, down to 78,000. Part of the loss resulted from a $231 million debt restructuring in October 1989. In July, 1990, however, Unisys still reported a $45.1 million loss in the year's first half after paying preferred stock dividends. In the autumn, 1990 bear market, Unisys' common stock price fell below $3 per share. Unisys posted a loss of $75.8 million in the third quarter of 1991.

In October 1991, Unisys Corporation announced a public stock offering for its Paramax, Inc. defense division because the firm could not find an acceptable buyer for the division. The company hopes to raise up to $832 million to help alleviate debt load, which stood at $3.8 billion at the end of the second quarter of 1991.

In October 1991, Unisys completed the sale of its Timplex business to Ascom Holding AG for $207 million in cash. According to CEO James Unruh, the sale of Timplex is part of a continuing Unisys program to sell non-strategic assets as the company moves to strengthen its balance sheet.

Unisys gains approximately 22% of its revenue from defense agency contracts. Much of this revenue, however, does not fall within the area of systems integration, since Unisys performs a great deal of work oriented toward weapons systems. Unisys' 1990 federal SI revenue was $343 million; its commercial SI revenue was $70 million.

Recent awards to Unisys include the following:

- A June 1990 contract with NASA ($20 million over five years) for business, administrative, and management information support services. Unisys will provide applications software development, software maintenance, end-user support, technical support, computer operations, and hardware maintenance.

- A $3.2 million contract with GSA in April 1991 for ADP equipment, software, supplies, and support equipment

Unisys has moved to open systems and is pursuing expertise in particular businesses, and providing specialized software. Unisys is committed to implementing an open UNIX and CASE/4GL environment.

In October 1991, Unisys introduced three new microcomputers, based on the Intel 80386 microprocessor, that feature integrated graphics, hard-disk controllers and built-in security.

Also in 1991, Unisys introduced its 2200/900 mainframe series. The mainframe series includes nine models priced from $8 million to $16 million.

g. Boeing Computer Services (BCS)

BCS is one operating division of seven in the Boeing Corporation fold. The Boeing Corporation was founded in Seattle in 1916 and is now a diversified aerospace company with 153,000 employees. BCS was founded in May 1970 and has 2,700 employees. Most of its workers provide dedicated support to the parent company. Its major role is to integrate large-scale complex information and telecommunications systems. It provides remote computing (including supercomputing), network services, distributed processing services, systems operation services, consulting services, education and training services, and packaged software products. BCS also provides other Boeing divisions with computing and telecommunications support. About 90% of the total noncaptive revenue for BCS is derived from the federal government.

BCS was a subcontractor to AT&T for Network A of FTS 2000. It provided management systems for the largest procurement in telecommunications history, and is the prime contractor on several government contracts, including the IRS Budget Preparation System, and the Inventory Control and Distribution System. BCS also has a contract with the U.S. Army Forces Command to design and install an automated management information system. One of BCS' largest federal contracts is the NASA Technical Management Information System (TMIS). Under this contract, it is providing systems integration services for the Space Station Freedom program. Boeing was awarded the Army RCAS follow-on contract, which is under protest by CSC at this writing.

Boeing Computer Services' total 1990 SI revenue was $200 million: its federal SI revenue $180 million and its commercial SI was $20 million.

h. Grumman Data Systems (GDS)

GDS specializes in providing SI services to a variety of civil and defense federal agencies. GDS has considerable experience in software and hardware engineering, computer graphics, networking, supercomputers, high-level systems architecture, and machine intelligence and correlation.

Grumman's information and other services segment includes the data systems operation, space station program support, and refurbishment and launch preparation of the space shuttle. It also includes service and maintenance of flight simulators and trainers and the support of Grumman aircraft.

Recent awards include:

- A $40.9 million contract in April 1990 with the Office of Naval Research to install a Class VII supercomputer at the Naval Oceanographic Office in Mississippi. This contract includes an option to install another Class VII supercomputer at the Fleet Numerical Oceanographic Center at Monterey, CA.

- A $41 million contract with NOAA in May 1990 for a large-scale computer system and support services

Grumman Data Systems' 1990 total SI revenue was $185 million: its federal SI revenue was $165 million and its commercial revenue was $20 million.

i. Planning Research Corporation (PRC/Black and Decker)

PRC was founded in 1954, and is headquartered in McLean, VA. It has nearly 8,000 employees and is a leading professional services company. PRC was acquired in December 1986 by Emhart for approximately $220 million. Emhart also acquired Advanced Technology, Inc. (ATI) one year later. In April 1989 Emhart allowed itself to be acquired by Black & Decker Corporation, which announced soon thereafter that it would attempt to sell off both PRC and ATI. Black and Decker decided to keep the two companies and merge them into one, which trades as PRC, Inc. The merger was final in January 1991.

PRC has three main operating groups:

- The Government Information Systems group is oriented toward designing and integrating systems for the U.S. government.

- The Business Information Systems group provides nationwide computer-based multiple listing services (MLS), computerized systems for group practice physicians, and computer-aided dispatch systems.

- The Systems Services group is focused on professional and technical services in support of the engineering and information systems requirements of government agencies.

PRC's total 1990 revenue reached $700 million. Approximately 73% of PRC's total 1990 revenue came from government contracts. PRC's 1990 total SI revenue was $239 million: federal SI revenue was $170 million and commercial SI revenue was $69 million.

j. Control Data Corporation

Control Data Corporation, founded in 1957 and headquartered in Minneapolis, Minnesota, is best known for its computer hardware but also provides hardware maintenance, systems integration and systems operations services, as well as operating systems software for business, scientific, and engineering applications to clients worldwide. Once known almost entirely for its hardware, now the company's computer-based services and systems integration businesses will account for over 60% of its revenues. In 1990, CDC continued to cut its losses by selling off several of its businesses and cutting staffing, but the losses have not yet ceased.

During the first half of 1990 CDC continued its divestiture through the sales of:

- U.S. and Canadian third-party hardware maintenance business in January 1990 to Bell Atlantic's Sorbus subsidiary

- CDC's remaining (industrial) training operation in March 1990 to a partnership headed by a Canada-based group of human resource and training companies (Drake International, Inc.) and CDC. CDC retained a minority interest in the company after this sale.

- CDC's Investment Management Information System (IMIS) product, customer base and related employees to Texas Instruments in June 1990

- CDC Data Services' Doane Information Services, a provider of software and services to the agriculture industry, to Doane Agricultural Services Company of Cherry Valley, Illinois in July 1990

- CDC completed the sale of its Printed Circuits Operation, with 128 employees, to Acsist Associates, Inc. in July 1990.

CDC's big SI win came during October 1989. The Army awarded its Corps of Engineers Automation Plan (CEAP) Phase I-A, worth approximately $365 million over up to 11 years, to CDC. CDC will provide an integrated worldwide network of CYBER computers.

Over 50% of the CEAP contract revenue will result from systems integration services provided by CDC's Computer Products division.

CDC's 1990 total SI revenue was $151 million: its federal SI revenue was $90 million and its commercial SI revenue was $61 million.

The following SI services vendors also participate in the federal SI market, although to a smaller degree (in alphabetical order):

k. American Management Systems (AMS), Incorporated

AMS, founded in 1970, provides professional services, application software, and marketing and micrographics services. Since 1982, AMS' marketing has focused primarily on larger financial services firms, federal government agencies, state and local governments, colleges and universities, energy industry clients, and telecommunications companies—as follows:

- Financial services institutions: AMS provides professional services and applications software products to money center banks, major regional banks, insurance companies, and other large financial services firms.

- Federal government agencies: AMS provides professional services, facilities management, and processing services to civilian and defense agencies.

- State and local governments, school districts, and universities: AMS provides applications software products and professional services to city, county, state, and provincial governments, local school districts, and colleges and universities.

- Energy industry clients: AMS provides software products and professional services to large energy companies and federal and state agencies.

- Telecommunications firms: AMS provides professional services and applications software products to telephone companies.

In accordance with its business strategy, AMS provides a combination of professional services, AMS productivity tools, and packaged proprietary applications software to clients in certain target markets. AMS also attempts to maintain long-term relationships with its clients.

Major awards to AMS include the following:

- A $21.5 million contract with EPA for task-order consulting and technical assistance
- An $11.5 million subcontract with IBM to install a billing system for Contel Corp.
- A $7.5 million contract with the Navy Submarine Monitoring, Maintenance and Support Office to upgrade networking applications

Eighty percent (80%) of AMS' employees are involved in SI activities. AMS' total 1990 SI revenue was $123 million: its federal SI revenue was $70 million and its commercial SI revenue was $53 million.

l. Andersen Consulting

Andersen Consulting is a separate member firm of The Arthur Andersen Worldwide Organization (The AAWO). Andersen Consulting provides strategic services, integration services (e.g., systems integration and systems management), and change management services. Andersen Consulting employs more than 18,000 professionals worldwide.

Andersen Consulting provides services in systems design and installation, systems integration, systems productivity consulting, information planning, strategic consulting, change management, and systems/network management (outsourcing). This company also offers applications software products that support manufacturing resource planning, control, and distribution control/warehouse management, and markets and supports the FOUNDATION™ computer-aided software engineering (CASE) software product.

Andersen Consulting's 1990 total SI revenue was $686 million: its federal SI revenue was $68 million and its commercial SI revenue was $618 million.

m. Digital Equipment Corporation (DEC)

Digital Equipment Corporation (DEC, or Digital) designs, manufactures, markets, and services general purpose midrange computers, intelligent workstations, terminals, related peripherals, systems software, and applications software for cross-industry and selected vertical markets.

Without question, DEC holds the leadership position in midrange systems. It has capitalized on its strengths in departmental and distributed computing, enabling it to expand beyond its traditional emphasis on scientific and technical computing to include the general office and administrative

applications. DEC operates in virtually all industry sectors; its primary industry markets are: telecommunications, education, federal government, aerospace, automobile manufacturing, banking and finance, health care, and process manufacturing.

As most other SI vendors have done, DEC has formed strategic alliances with British Telecom, Northern Telecom, Ericsson Telephone Company, Philips Telecommunications, and Siemens, which will strengthen its position in the communications component of the SI business.

Recent contract awards include the following:

- A $140 million contract in May 1991 with the Navy for network integration
- A $4.6 million contract in June 1991 with Delta Airlines for automating technical publishing operations

DEC's 1990 total revenue was $525 million: its federal SI revenue was $55 million and its commercial SI revenue was $470 million.

n. The Mitre Corporation

Mitre is a non-profit company that performs systems engineering, management consulting, and management engineering services. Mitre is often called on when an objective source is needed for a study, or for support services. Mitre does not usually participate in competitive procurements.

Mitre has contracts with numerous federal agencies, both civil and defense. Examples of Mitre contracts include:

- A November 1989 contract with DEA worth nearly $500,000 for technology infrastructure assessment and technology base enhancement services
- A December 1989 contract modification from GSA added $37.6 million to a contract of July 1989 for $3.4 million to provide telecommunications management support to FTS 2000
- A $750,000 contract with the IRS in June 1990 for integration support services for the Tax Systems Modernization

Mitre had more than $500 million in total revenue in 1989.

o. Oracle Complex Systems

In June, 1988, Oracle Corporation entered the systems integration business through the formation of a subsidiary, the Oracle Complex Systems Corporation (OCSC). OCSC provides systems integration services to government and commercial clients.

As a systems integrator, OCSC assumes full responsibility for the integration of hardware, software, networks, facilities, and services.

- OCSC is a leading provider of systems integration services in the area of image processing technology. OCSC has participated in one of the world's largest imaging projects and has customers in the federal, state, and commercial markets.

- OCSC specializes in providing Oracle-based information management solutions, combined with value-added knowledge and experience in distributed data bases and heterogeneous environments; building/ delivering fully-integrated image and compound data management systems; and providing high-performance systems using parallel processing and other emerging technologies.

OCSC's 1990 total SI revenue was $49 million: its federal revenue was $30 million and its commercial SI revenue was $19 million.

p. SHL Systemhouse

SHL Systemhouse, founded in 1974, provides systems integration, professional services, and systems operations services to commercial and government clients. The company also sells microcomputer hardware and software through ComputerLand.

In 1990, Systemhouse's majority shareholder, Kinburn Technology, fell into serious financial difficulties. Its assets, including its Sytemhouse stock, were seized by Kinburn's parent company, BCE, Inc., which took 25% of the company. The banks picked up the remaining 30%, and the remainder of the shares are publicly held. The Ottawa company was put up for sale in May 1990, but took itself off the market again in November after a total lack of response. Says Systemhouse's John Owens, the company will now remain in the hands of BCE and the banks until its share price improves.

Systemhouse uses a proprietary methodology (Systems Integration Life Cycle—SILC) to develop and implement all systems integration projects. SILC includes not only the software development life cycle, but also project management, strategic planning, facilities engineering, quality assurance, architecture definition, and capacity planning.

Systemhouse targets federal government and state and local government agencies; it also markets to the banking/financial, medical, insurance, manufacturing, telecommunications, retail, transportation, utilities, and distribution industries.

Recent SI awards to Systemhouse include the following:

- A contract in joint venture with Ameritech Information Systems for $25 million with the Metropolitan Emergency Communications Agency (MECA) of Marion County, Indiana. The two companies will handle system design, specification, hardware, software development and testing, vendor bid reviews and recommendations, training, and installation.

- A $16 million contract with the Los Angeles Fire Department for its Fire Command and Control System (FCCS II). This system will link IBM PS/2 workstations at 104 fire stations and Motorola KDT mobile terminals in over 400 trucks into a fault-tolerant system using token ring technology.

Systemhouse's 1990 total SI revenue was $120 million: its federal SI revenue was $70 million and its commercial SI revenue was $50 million.

q. Syscon

Syscon Corporation, founded in 1966, provides system development, systems integration, and other systems services. Syscon operated as a public corporation until December 1986, when it was acquired by Harnischfeger Industries for $92.1 million. Syscon now operates as a wholly owned subsidiary of Harnischfeger Industries. Syscon has 1,800 employees.

Syscon's major business lies in the development of complex systems for the Department of Defense. Syscon provides computer programs used by the military services in their training, logistics, business management, and mission-critical systems. Syscon uses Ada to develop software.

Syscon's 1990 total SI revenue was approximately $27 million: its federal SI revenue was approximately $25 million and its commercial SI approximately $2 million.

r. TRW

TRW provides high technology products and services to the space, defense, and automotive information systems markets. TRW employs about 73,000 people.

TRW has three operating sectors: Space and Defense, Automotive, and Information Systems. Space and Defense sector provides advanced technology products, services, and systems management capabilities focused on high-priority national programs. The Automotive sector develops components and systems such as passive restraint systems. The Information Systems sector includes consumer and commercial credit reporting, computer maintenance, real estate information services, and information systems engineering. The Information Systems sector covers the commercial markets for TRW.

TRW's new Systems Integration Group, formed by combining the former Federal Systems Group with two divisions of the Defense Systems Group, provides a wide range of services to the federal government. These services include systems engineering, systems integration, operational and maintenance support, command and control, and information processing.

The Systems Integration Group includes four operating divisions:

- The Systems Division performs systems engineering; it also develops and installs Navy command and control systems and information processing systems.

- The Command Support Division designs, develops, and integrates strategic and tactical command and control systems and security systems.

- The Systems Development Division (in Redondo Beach, CA) integrates and maintains high-technology space and mission support systems.

- The Systems Engineering and Development Division (also in Redondo Beach) designs, develops and integrates command and control systems, information management, battlefield automation, and surveillance and control systems for the Army and Air Force.

TRW has contracts will all three branches of the Defense Department and with several civilian agencies. TRW is known for its expertise in the areas of systems engineering and technical assistance (SETA) and special studies. During GFY 1990, TRW won several major contracts. In early 1990, TRW won a contract with the FAA to provide SETA services in support of the FAA's Advanced Automation Plan; the contract is valued at $138.9 million. In August 1991, TRW won a $3 million contract for system engineering and integration support for the Navy Undersea Surveillance Project Office.

TRW's total 1990 SI revenue was $106 million: its federal SI revenue was $35 million and its SI revenue was $71 million.

s. Other Contractors

Other contractors that are visible in both prime and subcontractor roles in the federal SI market include:

- Automated Sciences Group
- Battelle
- BDM
- Booz-Allen
- Centel
- Cincinnati Bell Information Systems
- CDSI
- Federal Computer Corporation
- Federal Data Corporation
- Ford Aerospace
- General Dynamics
- GTE
- Harris
- HFSI (a subsidiary of Groupe Bull)
- IBIS
- Intergraph
- ITC
- Litton Computer Services
- Lockheed
- McDonnell Douglas Systems Integration Company
- MCI Communications
- OAO Corporation
- SRA
- SRI International
- Storage Technology
- STX
- Sysorex
- Xerox

C

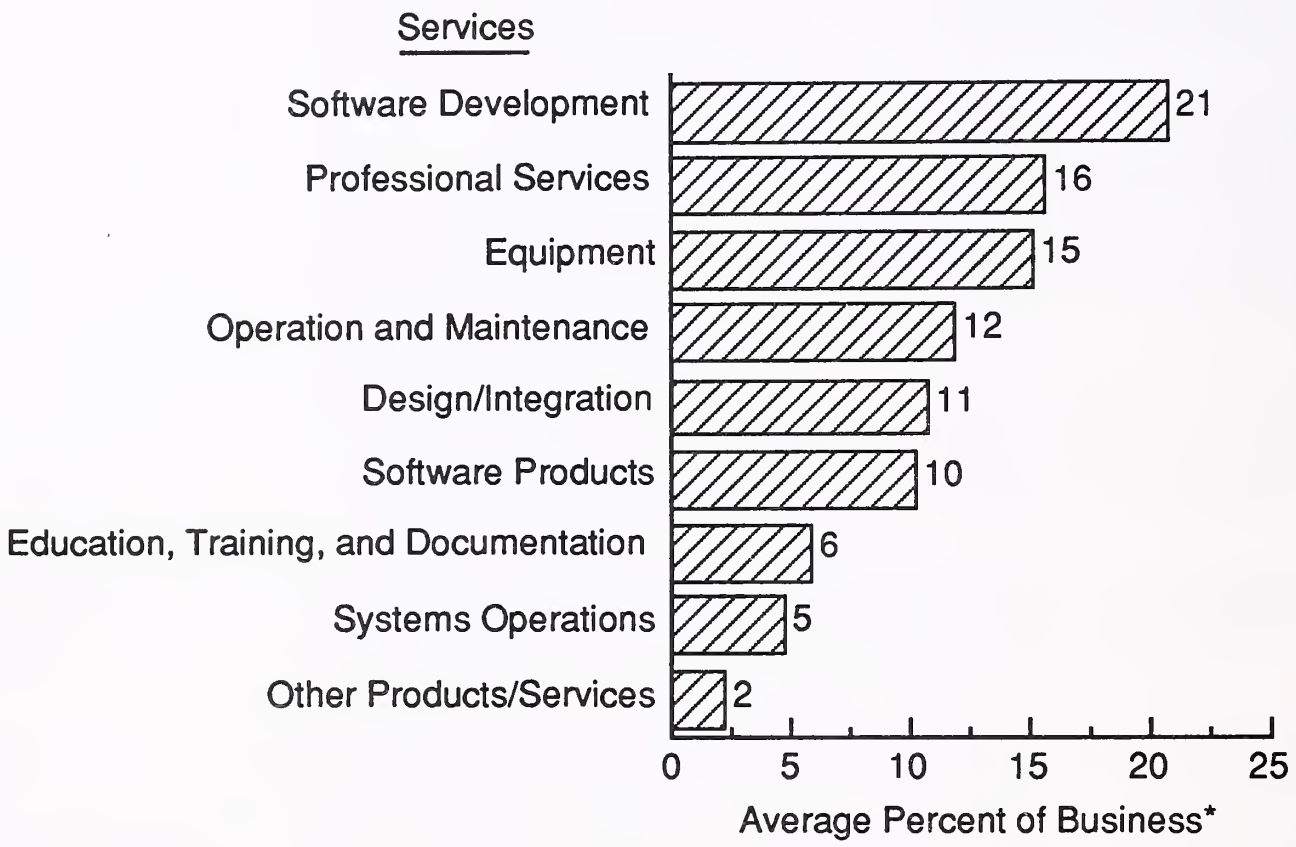
Characteristics of Vendor Respondents

1. The Systems Integration Market

INPUT asked vendor respondents to estimate the percent of their company's federal integration business by specific categories of products and services. The data reflecting their responses is presented in Exhibit V-2.

EXHIBIT V-2

Federal Systems Integration Business by Service Category



*Percentages do not add to 100% due to averaging.

Software development, (other) professional services and providing equipment account for one-half of the average SI vendor's revenues. In the past, providing equipment requirements accounted for more than one-third of revenues; it accounts for little more than 15% in this survey. While equipment is still a significant part of the SI business, nearly six-sevenths of the revenues now come from other sources.

It should be noted that respondents expressed difficulty in responding to this question, and to a similar question that asked them to select revenue ranges for each category of services and products offered. Also, vendors competing in this market generally do not track their SI revenues by product and service categories. Therefore, there is a large potential for error in the results.

Respondent vendors represented large corporations having average federal SI revenues in excess of $36 million. This figure represents only their federal SI revenues. The average percent of SI work contracted out, by dollar value, was approximately 20%, as shown in Exhibit V-3.

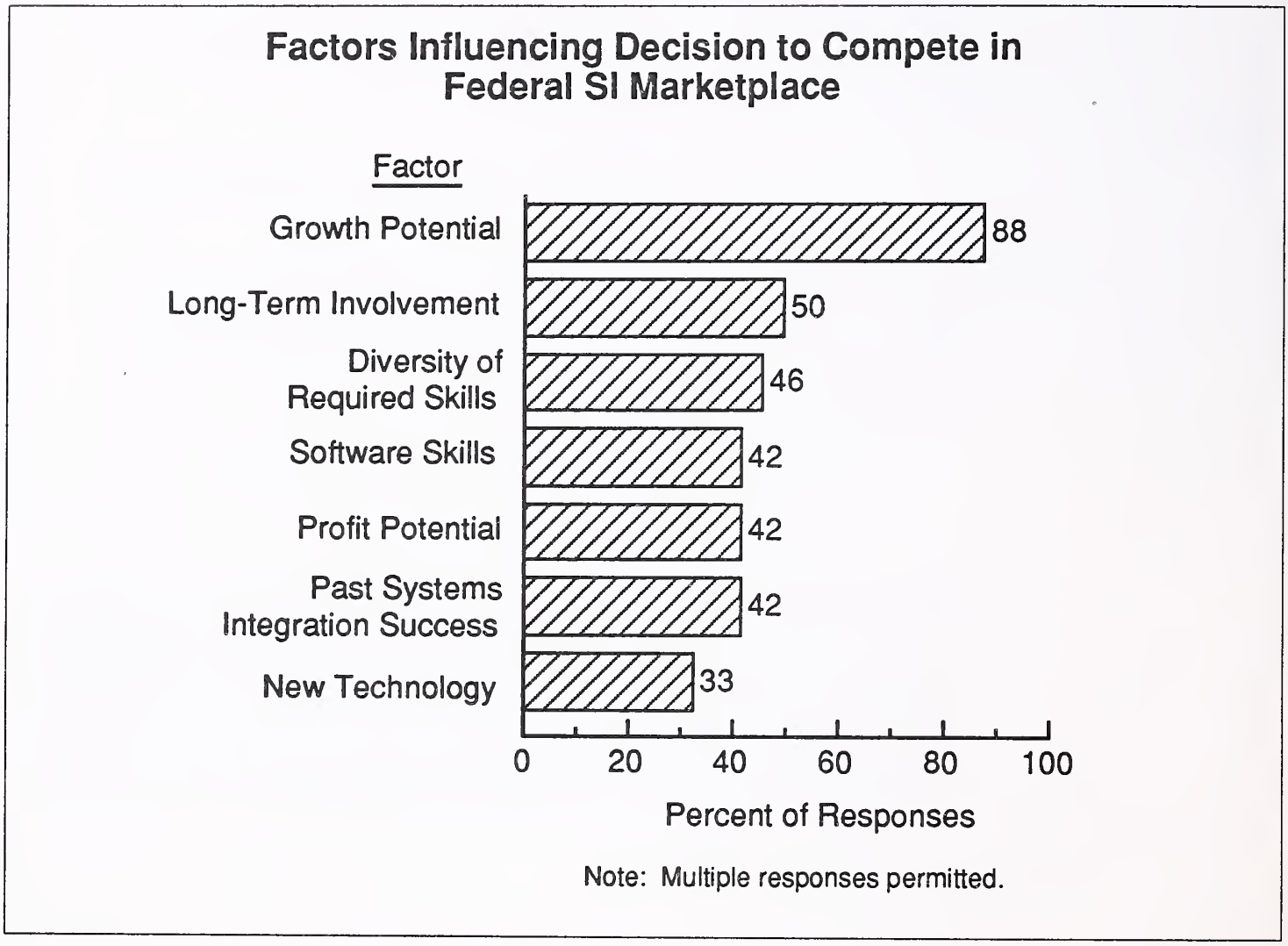
EXHIBIT V-3

Summary Corporate Data of SI Respondents

Average Federal SI Revenue ($ Millions)	Average Percent of Work Contracted Out
36.1	20

The majority of those interviewed cited anticipated growth of the federal SI market as the primary factor that influenced their company's decision to compete for SI opportunities, as shown in Exhibit V-4. In second place was the opportunity for long-term involvement in a project. Next, respondents cited the diversity of required skills. Three factors were fourth most frequently cited: past SI successes, availability of required software skills, and profit potential. New technology was the least frequently cited factor.

EXHIBIT V-4



2. Procurement Approaches

Vendors competing for federal systems integration market share employ one or more of several approaches to capturing new business opportunities. Respondents to this survey will utilize several different approaches to win SI contracts, but they did state they will primarily pursue competitive niche jobs and IDIQ contracts more than the other procurement approaches, as seen in Exhibit V-5.

Seeking competitive niche jobs will be the primary procurement approach pursued by vendors, followed by indefinite-delivery/indefinite-quantity (IDIQ) contracts, and only then pursuit of major SI opportunities. The sample of SI vendors appears to possess the technical resources, reputation, and procurement savvy to compete effectively in this highly competitive market. Most vendors cannot afford to focus solely on the SI market at the expense of other market opportunities. Rather, SI forms only one component of an overall federal-market-oriented product and service offering.

EXHIBIT V-5

Vendor Procurement Approaches to Federal Systems Integration

Procurement Approaches	Rank
Competitive Niche Jobs	1
IDIQ Contracts	2
Major SI Opportunities	3
Basic Ordering Agreements	4
Sole-Source Seed Jobs	5

In the commercial SI market, the procurement approach is strongly affected by the strategic planning process. Commercial market selection is usually fairly narrow, with one or two alternates to be followed if the primary vertical market does not produce contracts. Opportunities that do not fit within the limits of the tactical business plan or do not focus on the longer term strategic goals must be declined before any serious resource commitments take place.

Most vendors have focused on one or more vertical industry markets, where a successful implementation can be leveraged to other clients in the same industry or enhancements to the original contract. This reflects the importance of application experience. More recently, however, specialists in cross-industry (non-industry-specific) technologies have teamed with industry-specific vendors to improve prospects of awards.

3. Agency Opportunities

Systems integrators' views on future SI opportunities at federal agencies are presented in Exhibit V-6. More contractors foresee DoD opportunities decreasing than increasing. Fewer than 21% of the contractors predict their SI opportunities will remain the same among DoD agencies. All respondents who answered this question suggested that SI opportunities with the civil agencies would increase.

EXHIBIT V-6

Vendor Views of Agency SI Opportunities (Percent)

Agency Type	Increasing	Decreasing	Remaining the Same
DoD	29.2	50	20.8
Civil	100	0	0

The vendor views of civilian agency opportunities were extremely positive. All believed there will be an increase in SI projects during the GFY 1991-1996 period. (The civilian agencies lagged behind the DoD in ADP modernization during the early 1980s.) INPUT believes this shift in SI opportunities is due to civilian agencies finally catching up to their DoD counterparts in modernizing their operations. Technology advances such as image-based processing and publishing systems and office automation products are making it easier for agencies to automate many functions.

When asked to specify particular agencies that offered the most attractive SI opportunities for their companies, vendors always cited at least two agencies. Exhibit V-7 lists the agencies that received multiple mentions by respondents. Other agencies that were cited by vendors included:

U.S. Government Agencies:

- Department of Agriculture
- Department of Health and Human Services
- Social Security Administration
- Intelligence agencies
- Department of Housing and Urban Development
- Department of the Interior
- U.S. Senate

International Agencies:

- NATO

EXHIBIT V-7

Agencies Offering the Most Attractive SI Opportunities

Agency	Percent of Respondents
Treasury	46
Transportation	42
Defense	29
Army	25
Education	21
EPA	21
Air Force	17
GSA	13
NASA	13
Postal Service	13
State	13

Systems integration opportunities exist across a wide spectrum of federal agencies. Vendors in INPUT's sample do not expect to concentrate their activities in one or two agencies, but pursue contracts wherever SI opportunities are presented.

Also, federal SI contractors expect to see greater growth of their SI opportunities within the federal market (36%) than in the commercial market (29%). Since INPUT forecasts only 16% growth in the federal SI market from GFY 1991 to GFY 1996, this suggests that current SI services vendors have a healthy confidence in their ability to compete in the federal SI marketplace.

D

Vendor Perceptions of Federal Systems Integration

Commercial SI vendors were asked to rank the importance of several technologies in federal SI projects. Exhibit V-8 shows their rankings.

EXHIBIT V-8

Importance of Technologies to Federal SI Projects

Technology	Importance	Comments
Computer Security	Major	Seems to impede user access
Communications	Major	
Network Management	Major	Government is slow to appreciate need
LAN Integration	Major	
FTS 2000	Minor	

Vendors were asked to identify issues associated with bidding problems, pricing problems and delivery problems.

a. *Bidding problems*. The single most frequently mentioned issue associated with bidding problems is the high cost and time required for proposal preparation, followed by inadequate (vague or unrealistic) specifications. Likewise, unrealistic schedules (including the observation that the procurement cycle is too long for current technology cycles), and difficulty achieving a winning price/performance balance were issues with the SI vendors.

b. *Pricing problems*. The most frequently cited issue associated with pricing problems was the government's (apparently successful) attempt to obtain commodity pricing for custom projects. Coupled with this was the perception that the government inappropriately demands firm-fixed-price

contracts for ill-defined requirements. Also, vendors had problems with multi-year pricing—especially where they were bidding third-party supplies and services and have difficulty guaranteeing the third-party participants' out-year pricing.

c. *Delivery problems.* Vendors' problems with delivery dealt with relatively few areas. Problems cited were: deliveries from third-party OEMs are difficult to enforce; vendors being penalized by agencies' unrealistic (not related to foreseeable need) delivery schedules; and vendors are penalized by harsh evaluations against poorly-defined work definitions.

Much of the difficulty described in the preceding issues results from the government's need to reduce the costs associated with procurement of information technology (both goods and services). In practice, it is perceived as increasing the costs associated with bidding and, thus, with delivery of these goods and services.

E

Commercial versus Federal Systems Integration

1. Market Differences

The federal government has relied on systems integrators to develop, upgrade, or replace automatic data processing systems for over thirty years. Commercial systems integration, with some of its roots in federal SI, has both striking similarities and differences with government contracting (see Exhibit V-9).

The commercial sector customer is less likely to have the legal or technical background required for many projects, and when this knowledge is available, it is only available in pieces from numerous personnel within the client organization. In the federal government, on the other hand, the thrust has been the establishment of project offices that include both technical and legal representatives who speak for the sponsoring agency.

A key difference of vendor characteristics is the formality with which vendor reputation is evaluated as a part of the bid selection procedure in the federal marketplace. In most cases, a vendor's estimated versus actual performance on cost and schedule measures is recorded (the Defense Contract Audit Agency does this for defense agencies but makes the evaluations available to all agencies). Agencies use this historic information to specifically and formally weigh the vendor's past performance.

EXHIBIT V-9

Commercial versus Federal Systems Integration Characteristics

Characteristic	Commercial	Federal
Customers		
Requirements knowledge	Low	High
Technical knowledge	Variable	High
Interface	Multiple	Single
Vendors		
Vertical expertise	Preferred	Mandatory
Customer base	Leverageable	Reference
Business knowledge	Required	Optional
Reputation	Media-based	Historic
Business Conditions		
Lead generation	Field sales	CBD/budgets
Competitive bids	Optional	Required
Bid complexity	Variable	High
Expenditure commitment	Deferrable	Guaranteed
Risk exposure	High	Contained
Contract type	Fixed-price	Combination
Price restrictions	Competitive	Ceilings
Bonuses	Unlikely	Award/incentive
Penalties	Unlikely	Exception
Profit potential	High	Limited

In the commercial world, a federal track record of successful implementations may be desirable and leverageable. Customer business knowledge is a key requirement because the commercial customer looks to the vendor to offer a business solution. State and federal agencies are more specific about the desired solution, at least functionally, and less dependent on vendor business consulting/recommendations.

The business conditions associated with the two markets are widely divergent, with some definite advantages to the government market. The federal agencies advertise in the *Commerce Business Daily* about upcoming solicitations, and describe key programs in publicly available documentation. Commercially, the vendor is nearly totally dependent on the sales force for leads.

The requirement for competitive bids for expenditures over $100,000 in the federal sector has no counterpart in the commercial world. While competition may be a vehicle for the client to achieve the best solution at the best price, other factors (vendor reputation, comfort level with the vendor, etc.) do come into play. Further, the requirements for competition are such that agencies may not generally specify name brand products in the request for proposal (RFP). The federal process is more open and public, fostering a great deal of competition in which discounting or fixed-price bidding is frequent.

Competitive bidding in the federal sector makes for complexity that involves more time, effort, and money on the part of the vendors, with no assurance of award. Bidding expenses are recoverable, but stringently controlled.

The trade-off is that once the process starts in the federal sector, the expenditures are virtually guaranteed, or termination costs are paid to close the project down. In the commercial area, expenditure commitments may be deferred or withdrawn at the client's choosing with no recourse for the bidding vendors. Bill collecting also sometimes presents a problem in commercial contracts.

The risks to the contractor appear to be much greater in the commercial marketplace. The contracting rules in the federal arena lead to compliance with the "letter" of the specifications and some measure of risk-sharing with the client agency. The absence of these rules in the commercial marketplace creates an environment where the specifications are more at issue and, consequently, more subject to interpretation (and misinterpretation), creating the prospect of contract performance suits.

Unless the contract is fixed-price, federal regulations may specify price ceilings. Fair pricing regulations specify that profit can be no more than 15% and permit agencies to audit vendor records to verify these conditions. There are no corresponding rules in the commercial sector, where competition and demand determine the acceptable price range.

Vendor capabilities in the commercial sector are usually based on written proof, previous success testimony, or live test demonstrations simulating a critical function of the desired system. In the federal marketplace these capabilities are frequently required to be "proven" by scores under the "Weighted Guidelines," actual performance against standards (benchmarks) established for the project's system, or "compute-offs" against competitors.

Pricing strategies differ in that commercial jobs are frequently fixed-price without bonuses but with penalties. Government contracts are typically fixed-price and cost-plus for medium-sized jobs. Further, it is not unusual for the government to reward a contractor for a low-price bid (award fee) or provide incentives for beating cost or schedule estimates.

In-depth reviews of component performance are required by contracts of federal agencies as a means of verifying/validating a contractor's work. This practice will be found less frequently in the commercial arena.

The commercial/federal SI market distinctions revolve around the formality and regulatory backbone of the process. Some of these more formal practices of the federal and state government market are being adopted by the commercial market where exposure to new regulations makes the benefits obvious. Commercial clients will eventually adopt those practices that protect them.

2. Commercial and Federal Market Directions

In the current survey, SI services vendors were asked to project their revenue growth in the federal and commercial markets. There was some significant variation between individual vendors; the average and range of estimates are both shown in Exhibit V-10. It is interesting to note that vendors exhibit slightly higher confidence in the federal market.

EXHIBIT V-10

Respondents' Forecast of Revenue Growth

Sector	Percent		
	Low Estimate	High Estimate	Average
Commercial	0	80	29
Federal	2	100	36

F

Strategies for Success

There are several key strategic elements to be considered in entering the federal SI market. Containing the risk element and consciously managing each project to reduce the possibility of failure is an essential part of continued participation in the market and the future of SI procurements in general. The vendor's reputation plays a key role in the proposal evaluation process.

To be successful in the federal SI market, the vendor must acquire a comprehensive understanding of the federal information systems acquisition process. Systems design, programming, and project management talent are the second most important components of the vendor's strategy, the first being a ground-level understanding of the procurement rules. These qualities are needed to solve increasingly complex technical problems that require complex solutions.

SI offers federal vendors the opportunity to capture agency accounts. Because of the critical importance of these systems to the end user and because the duration of the contract will be multiyear, the vendor has an excellent opportunity to develop a unique customer relationship that can replace existing relationships.

Moreover, most, if not all, SI projects are functionally so complex that no single vendor usually can expect to satisfy the user's requirements alone. Agency requirements include: complex communications links, mixing older and advancing technology in networks and LANs, and converting older software into new. As a result, leases between vendors and agencies will be formed that will be difficult to compete against or break. It is therefore crucial for vendors to choose, early on, partnerships that serve their best long-term strategic interests.

To properly prepare for the federal SI competitive environment over the next five years and beyond, vendors now must choose the set of services, agencies, and skills that will be the focus of their SI efforts. Vendors can then identify the capabilities, products, and services that are needed to complement their own catalog and can begin selection of the ideal partner or partners that can not only provide the skills needed but enhance the vendor's image and therefore the likelihood of obtaining business.

1. Growing Demands and Staff Shortages

Demand from all agencies for additional support is ever increasing. Systems integration projects are seen as promoting efficiency in the civil agencies' administration systems and savings in the DoD.

- Agencies have a need for networks that tie inter- and intra-agency groups together, especially in large geographically dispersed organizations. They also need networks that tie government buyers and sellers together for the electronic exchange of data that ranges from orders to invoices, bills of lading to receipt-of-goods acknowledgments, and the like.

- The development of efficient and effective office information systems permits document exchange capabilities between various media (data, test, image), multiple layers of computing (personal, departmental, and agencywide), and various types of equipment from a multitude of vendors.

Many of the existing data processing systems lack the transaction speed and size to satisfy requirements. The aging of equipment in the face of increasing demands requires that obsolete systems be replaced on a timely and continuing basis. This concern becomes all the more urgent as technology advances and offers new capabilities. "Supersystems" have moved from the "desirable" to the "necessary" category. These systems integrate several applications bound to fourth-generation languages, agency data base management systems, data that ranges from the personal level to the agency level and beyond, and end-user tools that range to intelligent workstations requiring mainframe links.

Although many federal executives exhibit a desire to apply these technologies, few total solutions are available to link information systems to overall agency plans. And, to the chagrin of many organizations, the internal staff skills to handle the technical demands of these integration efforts are weak or unavailable.

This apparent lack of in-house skills has often been blamed on adherence to OMB Circular A-76 policies that have reduced in-house staffs. Loss of personnel at central design activities appears to be more related to the lack of growth opportunities in-house and the availability of better paying jobs

in the private sector. Hiring freezes dictated by budget cuts (including the GRH effects) have reduced agency capabilities to maintain existing systems. Where the systems are critical to mission fulfillment, development efforts continue with little regard for current budget impacts.

In most cases, demand for new and better systems has outstripped the ability of the internal staff to meet the requirements at all, let alone on time and within budget. The staff is simply too mired in day-to-day operations to meet new requirements. Even if staff time were available, the complex problems often require multivendor solutions that are outside the capabilities of the personnel. And internal development can be costly in terms of delays in other, less critical projects.

2. Pervasiveness of Information Systems

Agency management has shown an increasing desire to automate the very core of its mission activities. In the current constrained budget environment, agencies cannot wait for internally developed solutions in such areas as financial decision support, support to the public, and management reporting and logistics.

This pervasiveness has also brought forth a concern for the proper management of the agency's information systems assets (spurred by the Paperwork Reduction Act), including hardware, personnel, and data/information. Agencies have moved from a reactive to a proactive orientation. This new orientation requires the containment of costs and the leveraging of assets, the reduction of maintenance costs, and the prioritization of development efforts.

3. Demands for Productivity

Management has also focused on increasing productivity throughout the organization. Management organizations feel that part of the problem with the lack of growth in output that has followed significant investments in information systems is the technical-absorption bottleneck. The absence of a strong agency SI plan (despite A-130 requirements) has led to fragmented systems, and the proliferation of "solutions" has caused not only confusion among possible directions but more fragmented systems from packaged solutions that are not a good fit.

From the agencies' perspective, then, systems integration has several attractive characteristics, as shown in Exhibit V-11. First, SI offers an approach to meeting mission objectives rapidly. Second, the integrator assumes at least some of the risk of development. At once, this starts to relieve the clients of the worry that the system will be built at all and provides greater assurance that the project will be completed on time and within budget. After all, it is in the contractor's best interest to bring projects in on time or sooner. Bringing in a project ahead of schedule saves costs to the contractor. If the integrator fails for any reason, the

agency client is risking only the time and money to the point of failure and can point to a sole source for accountability. Also, where SI efforts are successful, fragmented and redundant systems can be eliminated, to be replaced by comprehensive, monolithic systems. SI contractors typically have experience in the areas of development for which they are contracted; this pays off in time (and, thus, dollar) savings during the implementation phase.

EXHIBIT V-11

Agencies' View: Attractive Characteristics of SI Approach

- Meets mission objectives rapidly
- Reduces risk of systems development
- Acquired project management functions
- Integrates complex, fragmented systems
- Saves costs over internally developed solutions
- Uses new technology to achieve optimum solution

The agency hopes to be relieved of the time-consuming and potentially confusing logistics of finding and controlling several contractors. It depends on outside contractors to fulfill project management functions.

The assumption is that the integrator has or will develop solid business and technical relationships with the vendors that will be involved in the solution, and that these relationships will smooth the interaction of multiple vendors. In the worst case, these vendor problems get passed on to the integrator, not the client.

In an SI effort it becomes the integrator's responsibility to integrate divergent and incompatible products. This arrangement usually requires a level of technical sophistication that the user organization does not possess. Office information systems, for example, require a strategic office systems

architecture that incorporates and interconnects multiple media, levels of computing, and functionality. These electronic offices require highly advanced communications and integration of data, information, and knowledge bases.

The agency also hopes to capitalize on the integrator's industry and applications experience in both the development and postimplementation phases. The project involves state-of-the-art and state-of-the-industry expertise that the vendor will bring to the effort.

The agency views the potential economies of scale offered by the integrator as a plus. If an integrator is working on multiple projects or has an established distribution channel for products from other vendors, it is likely that products/services are being acquired in such volume or with such regularity that the integrator will get a "price break" that will be passed on to the client.

A systems integration approach also solves the problem of unavailable in-house project management skills. INPUT studies consistently show that IRM management feels that project management skills and certain technical skills, especially systems design, are lacking in their agencies. Many, if not most, MIS departments have a mediocre record of completing major projects on budget and on time. SI solves this problem by transferring responsibility to a third party that can demonstrate these skills. Agencies assign the responsibility to do the work to outside parties without loss of authority, and the work gets done more effectively.

SI vendors were asked to rank the importance of the same SI contract selection criteria that were identified in Exhibit IV-6. Vendors' rankings are shown in Exhibit V-12.

Vendors found contract type to be the most important criterion. Technical solution, the agencies' first-ranked criterion, was rated very low by the vendors. Agencies looked to life cycle costs; vendors were more interested in the initial costs.

EXHIBIT V-12

SI Vendors' Rankings of Selection Criteria for SI Contract Awards

Rank	Selection Criteria
1	Contract type
2	Initial cost
3	Risk containment
4	Project management
5	Technical solution
6	Life cycle cost

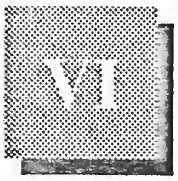
4. Vendors' Recommendations for Success

Vendors were asked to identify successful bidding strategies. At least one respondent suggested "pie-in-the-sky promises." Most frequently, however, the serious responses centered around cost control to bring down the bid price. The next most frequent responses suggested developing an expertise in a niche market and forming alliances with OEM suppliers and other niche experts. Other strategies addressed reliance on open architectures—avoiding any product bias, and minimum compliance with specifications (unless clearly requested otherwise, bid only what the government requires, not what you think it should need).

INPUT asked commercial SI vendors to rate the business prospects of small-to-midsize firms in performing federal SI projects. The responses ranged from "excellent" to "poor." In general, respondents suggested that:

- Small-to-midsize firms do best in a niche-expertise market.
- Small-to-midsize firms do best teamed with a large firm with overall expertise and economic resources to perform the entire project.
- Small-to-midsize firms are at a competitive disadvantage if they are not "8(a)" (disadvantaged minority) firms. Non-8(a) firms are squeezed between the protected-program firms and the larger businesses with their greater economic strength.

Thus, INPUT's vendor survey suggests that a small-to-midsize firm can succeed by choosing carefully the market area and the competitive environment (subcontractor or alliance with a vendor having complementary skills, or both) in which it will compete. Also, assuming that it has the required skills available, a small-to-midsize firm can compete by controlling its costs, especially labor costs.



Key Opportunities

This section describes specific opportunities in the federal information technology market. Two lists of programs are provided.

- Recent awards
- Future systems integration opportunities

Although neither opportunity list is all-inclusive, both include major programs that are typical of the federal market.

A

Present and Future Programs

New information technology programs that are larger than $1-2 million are listed in at least one of the following federal government documents:

- OMB/GSA Five-Year Plan, which is developed from agency budget requests submitted in compliance with OMB Circular A-11
- Agency long-range information resource plans developed to meet the reporting requirements of the Paperwork Reduction Reauthorization Act of 1986
- Agency annual operating budget requests submitted to congressional oversight and appropriations committees based on the OMB A-11 information
- *Commerce Business Daily* for specific opportunities for qualifications as a bidder, and invitations to submit a bid in response to an RFP or RFQ
- Five-Year Defense Plan, which is not publicly available, and the supporting documentation of the separate military departments and agencies
- Classified program documentation available only to qualified DoD contractors

Systems integration opportunities may not be specifically identified as such in these documents. Information technology planning documents usually identify mission requirements to be met by specific programs rather than methods for meeting those requirements. An agency decision to use a systems integration contractor may not be made until a program is well under way and an acquisition plan has been formulated. Over the last several years, however, agencies have shown an increasing tendency to use systems engineering and integration contractors for larger, more complex systems.

B

Recent Awards

Agency/Program	Contractor	Value ($000)
Air Force		
• Strategic War Planning System (SWPS)	General Dynamics	165,000
• Equipment Management System (AFEMS)	Martin Marietta	70,000
• Defense Emergency Authorization (DEARAS)	Maxim Technology	927
• Management Information System (MISTS)	CSC	180,000
Army		
• Small Multi-user Microcomputer Contract (SMC)	EDS	700,000
Navy		
• Large-scale Computer System	Grumman Data Systems	204,700
• FOSECS	Federal Computer Corporation	69,400
Marine Corps		
• Systems Engineering and Support	SAIC	11,989

Agency/Program	Contractor	Value ($000)
Defense		
• DLSC Modernization (DIDS)	Grumman Data Systems	60,700
• Defense Medical System	Contel	42,000
Agriculture		
• Integrated Financial Management (IFMIS)	Peat Marwick	10,600
Commerce		
• On-line Data Storage	Unisys	20,000
• Health and Human Services Project to Redesign (PRISM)	SAIC	7,600
Interior		
• Distributed Information System (DIS)	Data General	127,000
Justice		
• Minicomputer System Corp.	Digital Analysis	10,000
NASA		
• Training Systems Center	CAE-Link Corp.	517,000
ADP Support Services	Sterling Federal	6,000
Systems		
State		
• AFCAC 310	Pacific Corp.	
Capital, Inc.		
Storage Technology		
Federal Computer Corp.		
Federal Systems Group		

Agency/Program	Contractor	Value ($000)
Treasury		
• Integrated Collection System (ICS)	IBM	339,600
• System 90*	CSC	48,800
U.S. Courts		
• National Data Network	IBM	233,000
Veterans Affairs		
• Integrated Supply Management (ISMS)	Arthur Andersen & Company	

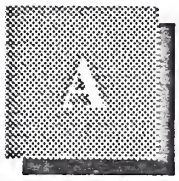
*Under protest by Andersen Consulting

C
Systems Integration Opportunities

Agency/Program	PAR Reference	FY91-FY96 Funding (Est. $000)
Air Force		
• Special Operations Forces (SOF-PARS)	V-01-105	
• Air Force CALS	V-01-108	45,000
• Continuous Engineering	V-01-134	103,000
• Optical Disk Imaging System	V-01-148	
• Information Systems Engineering (ISEPD)	V-01-149	500,000
Army		
• Army WWMCCS Information System (AWIS)	V-02-008	
• Acquisition Information Management (AIM)	V-02-039	

Agency/Program	PAR Reference	FY91-FY96 Funding (Est. $000)
• Sustaining Baseline Information System (SBIS)	V-02-043	500,000
• ADP System Services	V-02-061	48,000
• Combined Allied Defense Equipment (CADE)	V-02-064	46,000
Navy		
• Navy CALS	V-03-080	
• Navy WWMCCS (WAM)	V-03-083	56,000
Marine Corps		
• Systems Engineering and Support	V-03A-012	11,989
Defense		
• CALS	V-04E-004	
• Corporate Information Management (CIM)	V-04G-010	2,000,000
• National Emergency Telecom. System (NETS)	V-04G-003	
• Defense Information System (DISN)	V-04G-009	
• Defense Commissary Information System (DCIS)	V-04K-001	50,000
• Program Budget Accounting System (PBAS)	V-02-058	401
Agriculture		
• Project 615	VI-05-030	112,500
Commerce		
• Automated Patent System (APS)	VI-06-027	455,000
• Patent Application Management System (PAMS)	VI-06-036	5,000
• Mainframe Replacements	VI-06-037	
• Automated Trademark System (ATS)	VI-06-043	45,448

Agency/Program	PAR Reference	FY91-FY96 Funding (Est. $000)
Environmental Protection Agency		
• Environmental Monitoring (EMAP)	VIII-17-013	
Federal Communications Commission		
• Information System Modernization	VIII-34-001	19,500
Health and Human Services		
• IBM 370	VII-08-049	880,000
Interior		
• Technical Information Management System (TIMS)	VII-09-027	60,000
NASA		
• Engineering and Technical Services	VIII-15-103	95,000
Transportation		
• Mission Oriented Info. (MOISE)	VII-11-032	92,855
Treasury		
• Tax Systems Modernization (TSM)	VII-12-006	10,000,000
• Service Center Support System (SCSS)	VII-12-065	2,200,000
• Interagency Border Inspection System (IBIS)	VII-12-076	50,000
Veterans Affairs		
• Veterans Benefits Administration	VIII-16-011	220,000



Interview Profiles

A

Federal Agency Respondents Profile

1. Contact Summary

Contacts with agencies were made in December 1990 by telephone and through the mail. Interviews were conducted primarily at the department level with officials in the Office of Information Resources Management. These officials are responsible for office systems policy and planning.

The distribution of job classifications among individual agency respondents for the analysis was as follows:

	Policy	Buyers	Users	Total
Respondents	4	15	5	24

2. List of Agencies

Respondents interviewed in 1990 represented the agencies listed below, with the number in parentheses indicating the number of different contacts within the agency if more than one contact was made.

Department of Defense

- Air Force (2)
- Army (3)
- Navy (5)
- Marine Corps
- Defense Logistics Agency
- Defense Communications Agency (2)

Civil Agencies

- Department of Agriculture
- Department of Justice (2)
- National Aeronautics and Space Administration (4)

- Department of the Treasury (2)
- General Services Administration

B

Vendor Respondents Profile

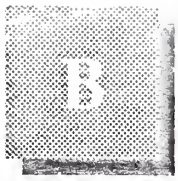
For the 1991 study, INPUT used surveys conducted in December 1990. A representative sample of vendors providing systems integration to the federal government were contacted. Job classifications among individual vendor respondents included marketing as well as administrative executives.

Contacts with vendor personnel were made by telephone and by mail.

C

Case Study Respondents Profile

Respondents who provided case study profiles on the systems integration project included prime contractor representatives.



Definitions

The definitions in this appendix include hardware, software, services, and telecommunications categories to accommodate the range of information systems and services programs described in this report.

Alternate service mode terminology employed by the federal government in its procurement process is defined along with INPUT's regular terms of reference, as shown in Exhibit B-1.

The federal government's unique, non-technical terminology, associated with applications, documentation, budgets, authorization, and the procurement/acquisition process, is included in Appendix C, Glossary of Federal Acronyms.

A

Overall Definitions and Analytical Framework

Information Services - 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:

- Processing of specific applications using vendor-provided systems (called *Processing Services*)
- A combination of hardware, packaged software and associated support services which will meet a specific application processing need (called *Turnkey Systems*)
- Packaged software (called *Software Products*)
- People services that support users in developing and operating their own information systems (called *Professional Services*)
- Bundled combinations of products and services where the vendor assumes responsibility for the development of a custom solution to an information system problem (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 associated with the delivery of information in electronic form—typically network-oriented services such as value-added networks, electronic mail and document interchange, on-line data bases, on-line news and data feeds, videotex, etc. (called *Network Services*)

In general, the market for information services does not involve providing equipment to users. The exception is where the equipment is bundled as 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., EDI or VAN 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.

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.

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 eight delivery modes defined by INPUT, five are considered primary products or services:

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

The remaining three delivery modes represent combinations of these products and services, bundled together with equipment, management and/or other services.

- Turnkey Systems
- Systems Operations
- Systems Integration

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

Outsourcing is defined as the contracting of information systems (IS) functions to outside vendors. Outsourcing should be viewed as the opposite of *insourcing*: anything that IS management has considered feasible to do internally (e.g., data center operations, applications development and maintenance, network management, training, etc.) is a potential candidate for outsourcing.

IS has always bought systems software, as it is infeasible for companies to develop it internally. However, all other delivery modes represent functions or products that IS management could choose to perform or develop in-house. Viewed this way, outsourcing is the result of a make-or-buy decision, and the outsourcing market covers any product or service where the vendor must compete against the client firm's own internal resources.

B

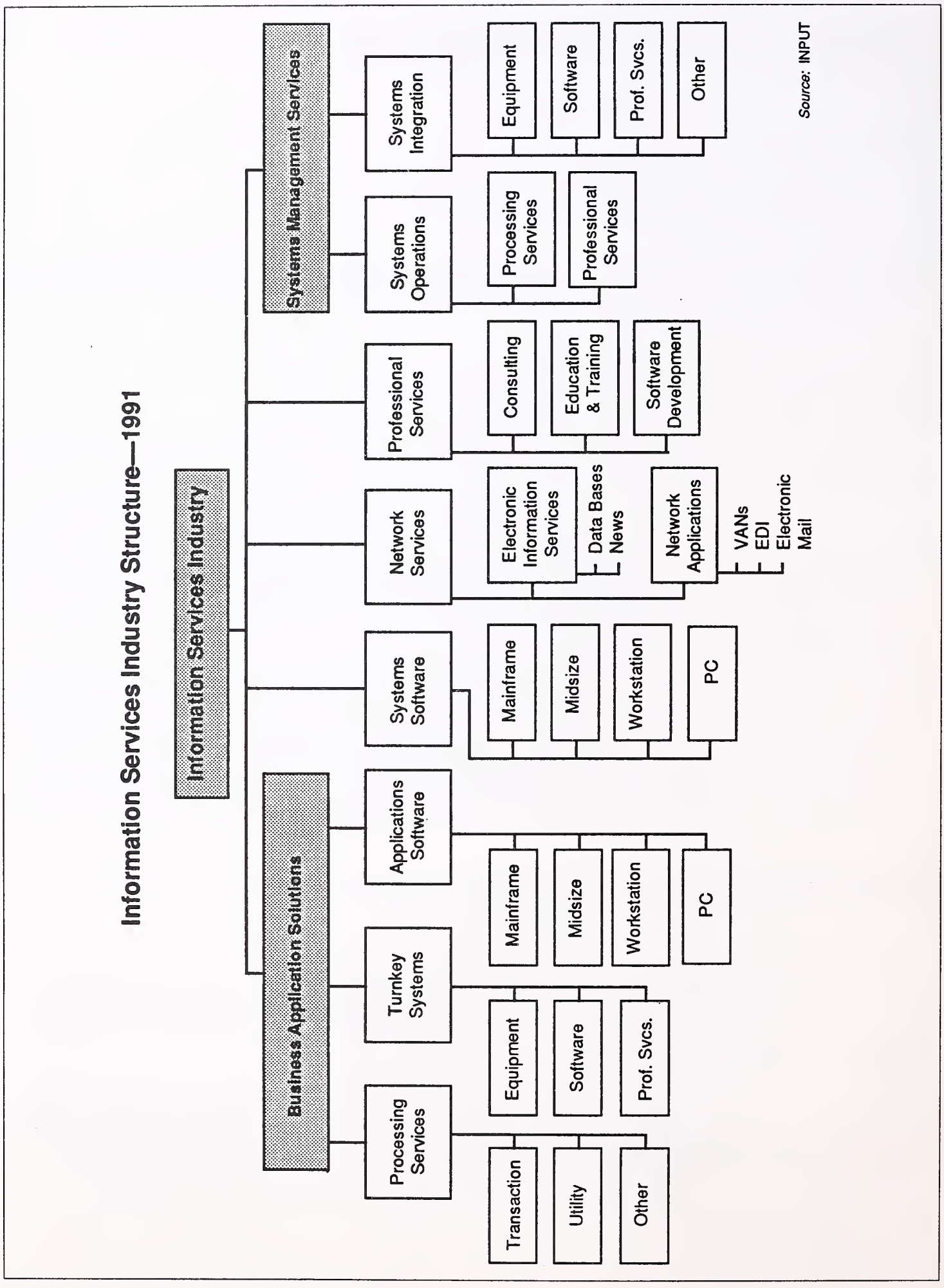
Industry Structure and Delivery Modes

1. Services Categories

Exhibit B-1 presents the structure of the information services industry. Several of the delivery modes can be grouped into higher-level *Service Categories,* based on the kind of problem the user needs to solve. These categories are:

- *Business Application Solutions (BAS)* - prepackaged or standard solutions to common business applications. These applications can be either industry-specific (e.g., mortgage loan processing for a bank), cross-industry (e.g., payroll processing), or generic (e.g., utility time

EXHIBIT B-1



sharing). In general, BAS services involve minimal customization by the vendor, and allow the user to handle a specific business application without having to develop or acquire a custom system or system resources. The following delivery modes are included under BAS:

- Processing Services
- Applications Software Products
- Turnkey Systems

- *Systems Management Services (SMS)* - services which assist users in developing systems or operating/managing the information systems function. Two key elements of SMS are the customization of the service to each individual user and/or project, and the potential for the vendor to assume significant responsibility for management of at least a portion of the user's information systems function. The following delivery modes are included under SMS:

  - Systems Operations
  - Systems Integration

Each of the remaining three delivery modes represent a separate service category:

- Professional Services
- Network Services
- System Software Products

Note: These service categories are a new concept introduced in 1990. They are purely an aggregation of lower-level delivery mode data. They do not change the underlying delivery modes or industry structure.

2. Software Products

There are many similarities between the applications and systems software delivery modes. Both involve user 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 site. Vendor-provided training or support in operation and user of the package, if bundled in the software pricing, is also included here.

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.

Software products have several subcategories, as indicated below and shown in Exhibit B-2.

- Systems Software Products

  Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. These products include:

  - *Systems Control Products* - Software programs that function during application program execution to manage computer system resources and control the execution of the application program. 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. Also included are system utilities (e.g., sorts) which are directly invoked by an applications program.

- Applications Software Products

  - *Industry-Specific Applications Software Products* - Software products that perform functions related to solving business or organizational needs unique to a specific vertical market and sold to that market only. Examples include demand deposit accounting, MRPII, medical recordkeeping, 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. Applications include payroll and human resource systems, accounting systems, word processing and graphics systems, spreadsheets, etc.

EXHIBIT B-2

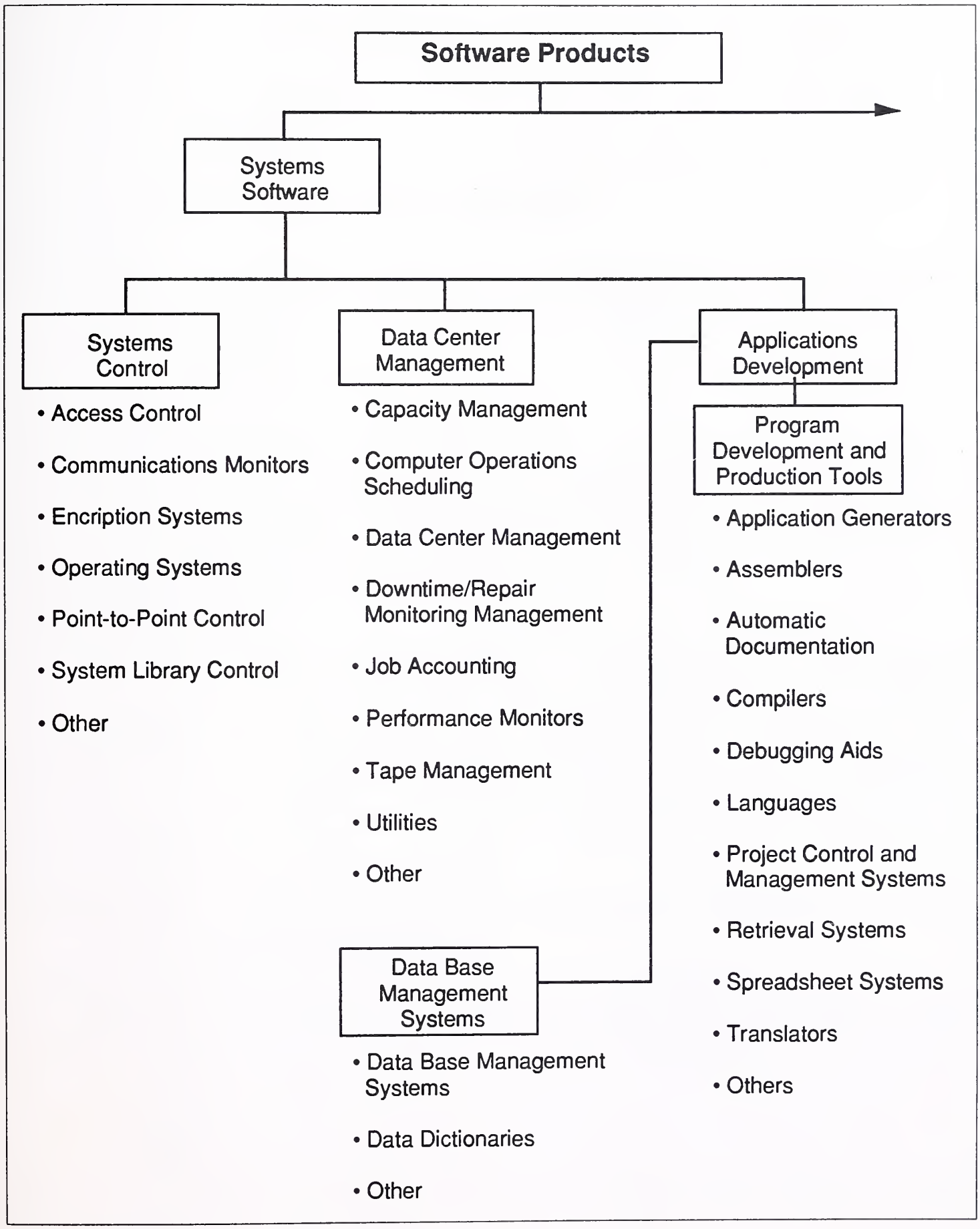
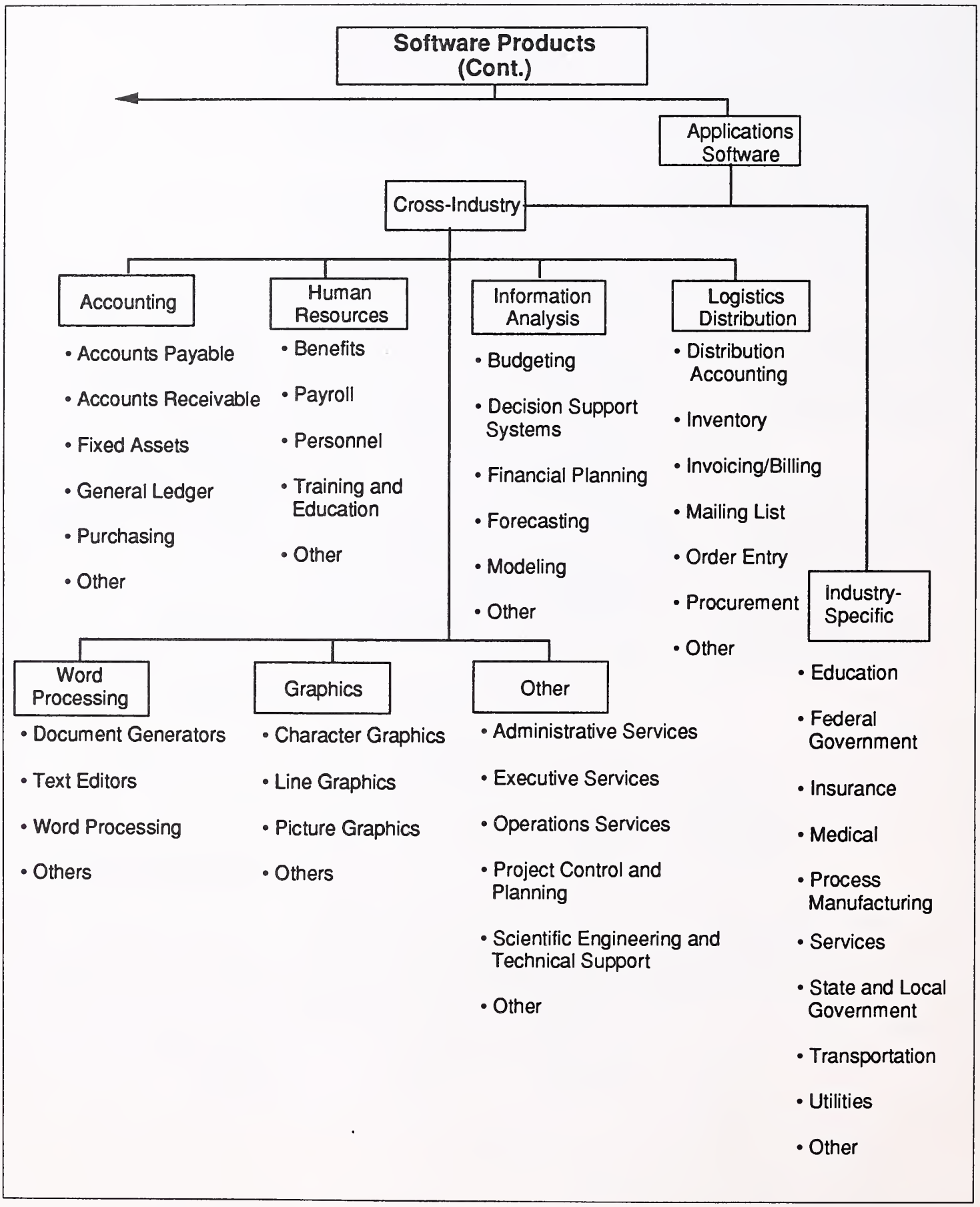


EXHIBIT B-2 (CONT.)



3. Turnkey Systems

A turnkey system is an integration of equipment (CPU, peripherals, etc.), systems software, and packaged or custom application software into a single system developed to meet a specific set of user requirements. Value added by the turnkey system vendor is primarily in the software and support services provided. Most CAD/CAM systems and many small business systems are turnkey systems. Turnkey systems utilize standard computer and do not include specialized hardware such as word processors, cash registers, process control systems, or embedded computer systems for military applications.

Hardware vendors 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 application 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.

Turnkey systems are divided into two categories:

- *Industry-Specific Systems* - systems that serve a specific function for a given industry sector, such as automobile dealer parts inventory, medical recordkeeping, or discrete manufacturing control systems.

- *Cross-Industry Systems* - 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.

4. Processing Services

This category includes transaction processing, utility processing, and other processing services.

- *Transaction Processing*: Client uses vendor-provided information systems—including hardware, software and/or data networks—at vendor site or customer site to process transactions and update client data bases. Transactions may be entered in one of four modes:

- *Interactive* - Characterized by the interaction of the users with the system for data entry, transaction processing, problem solving and report preparation: the user is on-line to the programs/files stored on the vendor's system.

- *Remote Batch* - Where the user transmits batches of transaction data to the vendor's system, allowing the vendor to schedule job execution according to overall client priorities and resource requirements.

- *Distributed Services* - Where users maintain portions of an application data base and enter or process some transaction data at their own site, while also being connected through communications networks to the vendor's central systems for processing other parts of the application.

- *Carry-in Batch* - where users physically deliver work to a processing services vendor.

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

- *Other Processing Services:* Vendor provides services—usually at 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.

5. Systems Operations

Systems operations involves the operation and management of all or a significant part of the user's information systems functions under a long-term contract. These services can be provided in either of two distinct submodes:

- *Professional Services:* The vendor provides personnel to operate client-supplied equipment. Prior to 1990, this was a submode of the Professional Services delivery mode.

- *Processing Services:* The vendor provides personnel, equipment and (optionally) facilities. Prior to 1990, this was a submode of the Processing Services delivery mode.

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 user's information systems (equipment, networks, systems and/or application software), either at the client's site or the vendor's site. Systems operations can also be referred to as "resource management" or "facilities management".

There are two general levels of systems operations:

- Platform/network operations - where the vendor operates the computer system and/or network without taking responsibility for the applications
- Application operations - where the vendor takes responsibility for the complete system, including equipment, associated telecommunications networks, and applications software.

Note: Systems Operations is a new delivery mode introduced in 1990.

6. Systems Integration (SI)

Systems integration is a business offering that provides a complete solution to an information system, networking or automation requirements 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.

To be included in the information services market, systems integration projects must involve some application processing component. In addition, the majority of cost must be associated with information systems products and/or services.

The systems integrator will perform, or manage others who perform, most or all of the following functions:

- Program management, including subcontractor management
- Needs analysis
- Specification development
- Conceptual and detailed systems design and architecture
- System component selection, modification, integration and customization

- Custom software design and development
- Custom hardware design and development
- Systems implementation, including testing, conversion and post-implementation evaluation and tuning
- Life cycle support, including
  - System documentation and user training
  - Systems operations during development
  - Systems maintenance
- Financing

7. Professional Services

This category includes consulting, education and training, and software development.

- *Consulting:* services include management consulting (related to information systems), information systems consulting, feasibility analysis and cost-effectiveness studies, and project management assistance. Services may be related to any aspect of information systems, including equipment, software, networks and systems operations.
- *Education and Training*: Products and services related to information systems and services for the professional end user, including computer-aided instruction, computer-based education, and vendor instruction of user personnel in operations, design, programming, and documentation.
- *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.

8. Network Services

Network services typically include a wide variety of network-based functions and operations. Their common thread is that most of these functions could not be performed without network involvement. Network services is divided into two major segments: Electronic Information Services, which involve selling information to the user, and Network Applications, which involve providing some form of enhanced transport service in support of a user's information processing needs.

- 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 typically inquire into and extract information from the data bases. Although users may load extracted data into their own computer systems, the electronic information vendor provides no data processing or manipulation capability and the users cannot update the vendor's data bases.

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.

- *News Services* - Unstructured, primarily textual information on people, companies, events, etc.

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.

- *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 (Tymet, 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.

INPUT's market definition covers VAN services only, but includes the VAN revenues of all types of carriers.

- *Electronic Data Interchange (EDI)* - Application-to-application exchange of standardized business documents between trade partners or facilitators. This exchange is commonly performed using VAN services. specialized translation software is typically employed to convert data from organizations' internal file formats to EDI interchange standards; this software may be provided as part of the VAN service, or may be resident on the organization's own computers.

- *Electronic Information Exchange (EIE)* - Also known as Electronic Mail (E-Mail), EIE involves the transmission of messages across an electronic network managed by a services vendor, including facsimile transmission (FAX), voice mail, voice messaging, and access to Telex, TWX, and other messaging services. This also includes bulletin board services.

- *Other Network Services* - This segment contains videotex and pure network management services. Videotex is actually more a delivery mode than an application. Its prime focus is on the individual as a consumer or in business. These services provide interactive access to data bases and offer the inquirer the capability to send as well as receive information for such purposes as home shopping, home banking, travel reservations, and more.

Network management services included here must involve the vendor's network and network management systems as well as people. People-only services, or services that involve the management of networks as part of the broader task of managing a user's information processing functions are included in Systems Operations.

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 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

Terminals - Three types of terminals are described below:

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

  - 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-, 16-, or 32-bit computer on a chip in various forms including:

  - Integrated circuit package

  - Plug-in boards with increased memory and peripheral circuits

  - Console including keyboard and interfacing connectors

  - Personal computer with at least one external storage device directly addressable by the CPU

  - An embedded computer which may take a number of shapes or configurations

- *Workstations* - High-performance, desktop, single-user computers employing (mostly) 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. Typical workstation products are provided by Apollo (now a unit of Hewlett-Packard), Sun, Altos, DEC (the MicroVAX) and IBM. These products usually cost more than $15,000. However, at this writing many companies have recently announced sizable price cuts.

- *Midsize Systems* - Describe superminicomputers and the more traditional business minicomputers. Due to steadily improving design and technology, the latter have outgrown traditional definitions (which defined small systems as providing 32-bit to 64-bit word lengths at prices ranging from $15,000 to $350,000). Increasingly, minicomputers and workstations meet the 32-bit definition, and may go beneath the $15,000 lower price limit. Typical midrange systems include IBM System/3X, 43XX, AS/400, and 937X product lines, DEC PDP and VAX families (excluding MicroVAX families), and competitive products from a wide range of vendors, including HP, Data General, Wang, AT&T, Prime Concurrent, Gould, Unisys, NCR, Bull, Harris, Tandem, Stratus, and many others.

- *Large Computer* - Presently centered on storage controllers, but likely to become bus-oriented and to consist of multiple processors or parallel processor. Intended for structured mathematical and signal processing and typically used with general purpose, Von Neumann-type processors for system control. This term usually refers to traditional mainframes and supercomputers.

- *Supercomputer* - High-powered processors with numerical processing throughput that is significantly greater than the fastest general purpose computers, with capacities in the 100-500 million floating point operations per second (MFLOPS) range. Newer supercomputers, with burst modes over 500 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-four gigabyte class, are labeled Class V to Class VII in agency long-range plans. 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

  - *Supercomputer* - Is also applied to micro, mini, and large mainframe computers with performance substantially higher than attainable by Von Neumann architectures.

- *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. These systems may vary in capacity from microcomputers to parallel processor computer systems.

D

General Definitions

Analog - Signal or transmission type with continuous waveform representation.

ASCII - American National Standard Code for Information Interchange—Eight-bit code with seven data bits and one parity bit.

Asynchronous - Communications operation (such as transmission) without continuous timing signals. Synchronization is accomplished by appending signal elements to the data.

Bandwidth - Range of transmission frequencies that can be carried on a communications path; used as a measure of capacity.

Baud - Number of signal events (discrete conditions) per second. Typically used to measure modem or terminal transmission speed.

Byte - Usually equivalent to the storage required for one alphanumeric character (i.e., one letter or number).

CBX - Computerized Branch Exchange—A PABX based on a computer system, implying programmability and usually voice and data capabilities.

Central Processing Unit (CPU) - The arithmetic and control portion of a computer; i.e., the circuits controlling the interpretation and execution of computer instructions.

Centrex - Central office telephone services that permit local circuit switching without installation of customer premises equipment. Could be described as shared PBX service.

Circuit Switching - A process that, usually on demand, connects two or more network stations, and permits exclusive circuit use until the connection is released; typical of the voice telephone network, where a circuit is established between the caller and the called party.

CO - Central Office—Local telco site for one or more exchanges.

CODEC - Coder/decoder—Equivalent to modem for digital devices.

Constant Dollars - Growth forecasts in constant dollars make no allowance for inflation or recession. Dollar value based on the year of the forecast unless otherwise indicated.

Computer System - The combination of computing resources required to perform the designed functions. May include one or more CPUs, machine room peripherals, storage systems, and/or applications software.

CPE - Customer Premises Equipment—DCE or DTE located at a customer site rather than at a carrier site such as the local telephone company CO. May include switchboards, PBX, data terminals, and telephone answering devices.

CSMA/CD - Carrier Sense Multiple Access/Collision Detect—Contention protocol used in local-area networks, typically with a multipoint configuration.

Current Dollars - Estimates or values expressed in current-year dollars which, for forecasts, would include an allowance for inflation.

Data Encryption Standard (DES) - Fifty-six-bit key, one-way encryption algorithm adopted by NIST in 1977, implemented through hardware ("S-boxes") or software. Designed by IBM with NSA guidance.

Datagram - A self-contained packet of information that does not depend on the contents of preceding or following packets and has a finite length.

DCA - IBM's Document Content Architecture—Protocols for specifying document (text) format which are consistent across a variety of hardware and software systems within IBM's DISOSS.

DCE - Data Circuit-terminating Equipment—Interface hardware that couples DTE to a transmission circuit or channel by providing functions to establish, maintain, and terminate a connection, including signal conversion and coding.

DDCMP - Digital Data Communications Message Protocol—Data link protocol used in Digital Equipment Company's DECNET.

DECNET - Digital Equipment Company's network architecture.

Dedicated Circuit - A permanently established network connection between two or more stations; contrast with switched circuit.

DEMS - Digital Electronic Message Service—Nationwide common carrier digital networks which provide high-speed, end-to-end, two-way transmission of digitally encoded information using the 10.6 GHz band.

DIA - IBM's Document Interchange Architecture—Protocols for transfer of documents (text) between different hardware and software systems within IBM's DISOSS.

Digital - Signal or transmission type using discontinuous, discrete quantities to represent data.

DISOSS - IBM's DIStributed Office Support System—Office automation environment, based on DCA and DIA, which permits document (text) transfer between different hardware and software systems without requiring subsequent format or content revision.

Distributed Data Processing - The development of programmable intelligence in order to perform a data processing function where it can be accomplished most effectively through computers and terminals arranged in a telecommunications network adapted to the user's needs.

DTE - Data Terminal Equipment—Hardware which is a data source, link, or both, such as video display terminals that convert user information into data transmission, and reconvert data signals into user information.

EBCDIC - Extended Binary Coded Decimal Interchange Code—Eight-bit code typically used in IBM mainframe environments.

EFT - Electronic funds transfer.

Encryption - Electric, code-based conversion of transmitted data to provide security and/or privacy of data between authorized access points.

End User - One who is using a product or service to accomplish his or her own functions. The end user may buy a system from the hardware supplier(s) and do his or her own programming, interfacing, and installation. Alternately, the end user may buy a turnkey system from a systems house or hardware integrator, or may buy a service from an in-house department or external vendor.

Engineering Change Notice (ECN) - Product improvements after production.

Engineering Change Order (ECO) - The follow-up to ECNs, including parts and a bill of materials to effect the change in the hardware.

Equipment Operators - Individuals operating computer control consoles and/or peripheral equipment (BLS definition).

Erasable Disk - A type of disk that allows users to erase data previously written. Erasable disks used for applications where data may need to be updated periodically.

Ethernet - Local-area network developed by Xerox PARC using baseband signaling, CSMA/CD protocol, and coaxial cable to achieve a 10 mbps data rate.

Facsimile - Transmission and reception of graphic data, usually fixed images of documents, through scanning and conversion of a picture signal.

FDM - Frequency Division Multiplexing—A multiplexing method that permits multiple access by assigning different frequencies of the available bandwidth to different channels.

FEP - Front-End Processor—Communications concentrator such as the IBM 3725 or COMTEN 3690 used to interface communications lines to host computers.

Field Engineer (FE) - Field engineer, customer engineer, serviceperson, and maintenance person are used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

Full-Duplex - Bi-directional communications, with simultaneous, two-way transmission.

General Purpose Computer System - A computer designed to handle a wide variety of problems. Includes machine room peripherals, systems software, and small business systems.

Half-Duplex - Bi-directional communications, but only in one direction at a time.

Hardware Integrator - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. The hardware integrator also may develop control system software in addition to installing the entire system at the end-user site.

HDLC - High-level Data Link Control.

Hertz- Number of signal oscillations (cycles) per second, abbreviated Hz.

IBM Token Ring - IBM's local-area network using baseband signalling and operating at 4 mbps on twisted-pair copper wire. Actually a combination of star and ring topologies—IEEE 802.5-compatible.

IDN - Integrated Digital Network—Digital switching and transmission; part of the evolution to ISDN.

Independent Suppliers - Suppliers of machine room peripherals, though usually not suppliers of general purpose computer systems.

Information Processing - Data processing as a whole, including use of business and scientific computers.

Installed Base - Cumulative number or value (cost when new) of computers in use.

Interconnection - Physical linkage between devices on a network.

Interoperability - The capability to operate with other devices on a network. Different from interconnection, which merely guarantees a physical network interface.

ISDN - Integrated Services Digital Network—Completely digital, integrated voice and nonvoice public network service. Not clearly defined through any existing standards, although FCC and other federal agencies are developing CCITT recommendations.

Keypunch Operators - Individuals operating keypunch machines (similar to electric typewriters) to transcribe data from source materials onto punch cards.

Lease Line - Permanent connection between two network stations. Also known as dedicated or non-switched line.

Machine Repairers - Individuals who install and periodically service computer systems.

Machine Room Peripherals - Peripheral equipment generally located close to the central processing unit.

Mainframe - The central processing unit (CPU or units in a parallel processor) of a computer that interprets and executes computer (software) instructions of 32 bits or more.

MAP - Manufacturing Automation Protocol—Seven-layer communications standard for factory environments promoted by General Motors/ EDS. Adopts IEEE 802.2 and IEEE 802.4 standards plus OSI protocols for other layers of the architecture.

Mean Time to Repair - The mean of elapsed times from the arrival of the field engineer on the user's site to the time when the device is repaired and returned to user service.

Mean Time to Respond - The mean of elapsed times from the user call for services and the arrival of the field engineer on the user's site.

Message - A communication intended to be read by a person. The quality of the received document need not be high, only readable. Graphic materials are not included.

MMFS - Manufacturing Messaging Format Standard—Application-level protocol included within MAP.

Modem - A device that encodes information into electronically transmittable form (MOdulator) and restores it to original analog form (DEModulator).

NCP - Network Control Program—Software used in IBM 3705/3725 FEPs for control of SNA networks.

Node - Connection point of three or more independent transmission points which may provide switching or data collection.

Off-Line - Pertaining to equipment or devices that can function without direct control of the central processing unit.

On-Line - Pertaining to equipment or devices under direct control of the central processing unit.

Optical Disk - Storage device that uses laser technology to record data. Optical disks provide high storage capacity, but cannot be overwritten.

OSI - ISO reference model for Open Systems Interconnection—Seven-layer architecture for application, presentation, session, transport, network, data link, and physical services and equipment.

OSI Application Layer - Layer 7, providing end-user applications services for data processing.

OSI Data Link Layer - Layer 2, providing transmission protocols, including frame management, link flow control, and link initiation/release.

OSI Network Layer - Layer 3, providing call establishment and clearing control through the network nodes.

OSI Physical Layer - Layer 1, providing the mechanical, electrical, functional, and procedural characteristics to establish, maintain, and release physical connections to the network.

OSI Presentation Layer - Layer 6, providing data formats and information such as data translation, data encoding/decoding, and command translation.

OSI Session Layer - Layer 5, establishes, maintains, and terminates logical connections for the transfer of data between processes.

OSI Transport Layer - Layer 4, providing end-to-end terminal control signals such as acknowledgments.

Overseas - Not within the geographical limits of the continental United States, Alaska, Hawaii, and U.S. possessions.

PABX - Private Automated Branch Exchange—Hardware that provides automatic (electro-mechanical or electronic) local circuit switching on a customer's premises.

PAD - Packet Assembler-Disassembler—A device that enables DTE not equipped for packet switching operation to operate on a packet switched network.

PBX - Private Branch Exchange—Hardware that provides local circuit switching on the customer premise.

PCM - Pulse-Code Modulation—Modulation involving conversion of a waveform from analog to digital form through coding.

PDN - Public Data Network—A network established and operated by a recognized private operating agency, a telecommunications administration, or other agency for the specific purpose of providing data transmission services to the public.

Peripherals - Any unit of input/output equipment in a computer system, exclusive of the central processing unit.

PPM - Pulse Position Modulation.

Private Network - A network established and operated for one user or user organization.

Programmers - Persons mainly involved in designing, writing, and testing computer software programs

Protocols - The rules for communication system operation that must be followed if communication is to be effected. Protocols may govern portions of a network or service. In digital networks, protocols are digitally encoded as instructions to computerized equipment.

Public Network - A network established and operated for more than one user with shared access, usually available on a subscription basis. See related international definition of PDN.

Read-Only - A type of disk that is prerecorded and can be used for retrieving data. A read-only disk cannot be overwritten. A read-only system will retrieve and display stored data, but the system cannot alter the stored data.

Read/Write - A type of disk that can be read and written upon. A read/write system will read and display stored data and alter data already recorded.

Scientific Computer System - A computer system designed to process structured mathematics (such as Fast Fourier Transforms), and complex, highly redundant information (such as seismic data, sonar data, and radar), with large, on-line memories and very high-capacity output.

SDLC - Synchronous Data Link Control—IBM's data link control for SNA. Supports a subset of HDLC modes.

SDN - Software-Defined Network.

Security - Physical, electrical, and computer (digital) coding procedures to protect the contents of computer files and data transmission from inadvertent or unauthorized disclosure to meet the requirements of the Privacy Act and national classified information regulations

Service Delivery Point - The location of the physical interface between a network and customer/user equipment

Simplex - Unidirectional communications.

Smart Box - A device for adapting existing DTE to new network standards such as OSI. Includes PADs and protocol convertors, for example.

SNA - Systems Network Architecture—Seven-layer communications architecture designed by IBM. Layers correspond roughly but not exactly to OSI model.

Software - Computer programs

Supplies - Includes materials associated with the use of operations of computer systems, such as printer paper, keypunch card, disk packs, and tapes.

Switched Circuit - Temporary connection between two network stations established through dial-up procedures.

Synchronous - Communications operation with separate, continuous clocking at both sending and receiving stations.

Systems Analyst - Individual who analyzes problems to be converted to a programmable form for application to computer systems.

Systems House - Vendor that acquires, assembles, and integrates hardware and software into a total system to satisfy the data processing requirements of an end user. The vendor also may develop systems software products for license to end users. The systems house vendor does not manufacture mainframes.

Systems Integrator - Systems house vendor that develops systems interface electronics, applications software, and controllers for the CPU, peripherals, and ancillary subsystems which may have been provided by a contractor or the government (GFE). This vendor may either supervise or perform the installation and testing of the completed system.

T1 - Bell System designation for 1.544 mbps carrier capable of handling 24 PCM voice channels.

TDM - Time Division Multiplexing—A multiplexing method that interleaves multiple transmissions on a single circuit by assigning a different time slot to each channel.

Token Passing - Local-area network protocol which allows a station to transmit only when it has the "token," an empty slot on the carrier.

TOP - Technical Office Protocol—Protocol developed by Boeing Computer Services to support administrative and office operations as complementary functions to factory automation implemented under MAP.

Turnkey System - System composed of hardware and software integrated into a total system designed to fulfill completely the processing requirements of a single application.

Twisted-Pair Cable - Communications cabling consisting of pairs of single-strand metallic electrical conductors, such as copper wires, typically used in building telephone wiring and some LANs.

Verification and Validation - Process for examining and testing applications and special systems software to verify that it operates on the target CPU and performs all of the functions specified by the user.

Voice-Grade - Circuit or signal in the 300-3300 Hz bandwidth typical of the public telephone system, nominally a 4 Khz user.

VTAM - Virtual Telecommunications Access Method—Host-resident communications software for SNA networks.

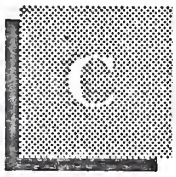
WORM - Write-Once, Read-Many—A type of disk that can be created one time. Once written on, the disk can only be read—otherwise data will be destroyed.

Write-Once - A type of disk that can be created one time. Once written on, the disk can only be read. It cannot be rewritten.

E

Other Considerations

When questions arise as to the proper place to count certain user expenditures, INPUT addresses the questions from the user viewpoint. Expenditures are then categorized according to the users' perception of the purchase.



Glossary of Acronyms

The federal government's procurement language uses a combination of acronyms, phrases, and words that is complicated by different agency definitions and interpretations. The government also uses terms of accounting, business, economics, engineering, and law with new applications and technology.

Acronyms and contract terms that INPUT encountered most often in program documentation and interviews for this report are included here, but this glossary should not be considered all-inclusive. Federal procurement regulations (DAR, FPR, FAR, FIRMR, FPMR) and contract terms listed in RFIs, RFPs, and RFQs provide applicable terms and definitions.

Federal agency acronyms have been included to the extent they are employed in this report.

A

Federal Acronyms

AAS	Automatic Addressing System.
AATMS	Advanced Air Traffic Management System.
ACO	Administrative Contracting Offices (DCAS).
ACS	Advanced Communications Satellite (formerly NASA 30/20 GHz Satellite Program).
ACT-1	Advanced Computer Techniques (Air Force).
Ada	DoD High-Order Language.
ADA	Airborne Data Acquisition.
ADL	Authorized Data List.
ADS	Automatic Digital Switches (DCS).
AFA	Air Force Association.
AFCEA	Armed Forces Communications Electronics Association.
AGE	Aerospace Ground Equipment.
AIP	Array Information Processing.

AIS	Automated Information System.
AMPE	Automated Message Processing Equipment.
AMPS	Automated Message Processing System.
AMSL	Acquisition Management Systems List.
ANG	Army National Guard
AP(P)	Advance Procurement Plan.
Appropriation	Congressionally approved funding for authorized programs and activities of the Executive Branch.
APR	Agency Procurement Request.
ARPANET	DARPA network of scientific computers.
ASP	Aggregated Switch Procurement.
ATLAS	Abbreviated Test Language for All Systems (for ATE-Automated Test Equipment).
Authorization	In the legislative process programs, staffing, and other routine activities must be approved by Oversight Committees before the Appropriations Committee will approve the money from the budget.
AUSA	Association of the U.S. Army.
AUTODIN	AUTOmatic DIgital Network of the Defense Communications System.
AUTOSEVOCOM	AUTOmatic SEcure VOice COMmunications Network.
AUTOVON	AUTOmatic VOice Network of the Defense Communications System.
BA	Basic Agreement.
BAFO	Best And Final Offer.
Base level	Procurement, purchasing, and contracting at the military installation level.
BCA	Board of Contract Appeals.
Benchmark	Method of evaluating ability of a candidate computer system to meet user requirements.
Bid protest	Objection (in writing, before or after contract award) to some aspect of a solicitation by a valid bidder.
BML	Bidders Mailing List - qualified vendor information filed annually with federal agencies to automatically receive RFPs and RFQs in areas of claimed competence.
BOA	Basic Ordering Agreement.
B&P	Bid and Proposal - vendor activities in response to government solicitation/specific overhead allowance.
BPA	Blanked Purchase Agreement.
Budget	Federal Budget, proposed by the President and subject to Congressional review.
C^2	Command and Control.
C^3	Command, Control, and Communications.
C^4	Command, Control, Communications, and Computers.
C^3I	Command, Control, Communications, and Intelligence.
CAB	Contract Adjustment Board or Contract Appeals Board.
CADE	Computer-Aided Design and Engineering.
CADS	Computer-Assisted Display Systems.
CAIS	Computer-Assisted Instruction System.
CALS	Computer-Aided Automated Logistic System.
CAPS	Command Automation Procurement Systems.

CAS	Contract Administration Services or Cost Accounting Standards.
CASB	Cost Accounting Standards Board.
CASP	Computer-Assisted Search Planning.
CBD	Commerce Business Daily - U.S. Department of Commerce publication listing government contract opportunities and awards.
CBO	Congressional Budget Office.
CCEP	Commercial Comsec Endorsement Program.
CCDR	Contractor Cost Data Reporting.
CCN	Contract Change Notice.
CCPDS	Command Center Processing and Display Systems.
CCPO	Central Civilian Personnel Office.
CCTC	Command and Control Technical Center (JCS).
CDR	Critical Design Review.
CDRL	Contractor Data Requirement List.
CFE	Contractor-Furnished Equipment.
CFR	Code of Federal Regulations.
CICA	Competition in Contracting Act.
CIG	Computerized Interactive Graphics.
CIR	Cost Information Reports.
CM	Configuration Management.
CMI	Computer-Managed Instruction.
CNI	Communications, Navigation, and Identification.
CO	Contracting Office, Contract Offices, or Change Order.
COC	Certificate of Competency (administered by the Small Business Administration).
COCO	Contractor-Owned, Contractor-Operated.
CODSIA	Council of Defense and Space Industry Associations.
COMSTAT	Communications Satellite Corporation.
CONUS	CONtinental United States.
COP	Capability Objective Package.
COTR	Contracting Officer's Technical Representative.
CP	Communications Processor.
CPAF	Cost-Plus-Award-Fee Contract.
CPFF	Cost-Plus-Fixed-Fee Contract.
CPIF	Cost-Plus-Incentive-Fee Contract.
CPR	Cost Performance Reports.
CPSR	Contractor Procurement System Review.
CR	Cost Reimbursement (Cost Plus Contract).
CSA	Combat or Computer Systems Architecture.
C/SCSC	Cost/Schedule Control System Criteria (also called "C-Spec").
CWAS	Contractor Weighted Average Share in Cost Risk.
DAL	Data Accession List.
DAR	Defense Acquisition Regulations.
DARPA	Defense Advanced Research Projects Agency.
DAS	Data Acquisition System.
DBHS	Data Base Handling System.
DCA	Defense Communications Agency.

DCAA	Defense Contract Audit Agency.
DCAS	Defense Contract Administration Services.
DCASR	DCAS Region.
DCC	Digital Control Computer.
DCP	Development Concept Paper (DoD).
DCS	Defense Communications System.
DCTN	Defense Commercial Telecommunications Network.
DDA	Dynamic Demand Assessment (Delta Modulation).
DDC	Defense Documentation Center.
DDL	Digital Data Link - A segment of a communications network used for data transmission in digital form.
DDN	Defense Data Network.
DDS	Dynamic Diagnostics System.
DECCO	DEfense Commercial Communications Office.
DECEO	DEfense Communications Engineering Office.
D&F	Determination and Findings - required documentation for approval of a negotiated procurement.
DIA	Defense Intelligence Agency.
DIF	Document Interchange Format, Navy-sponsored word processing standard.
DHHS	Department of Health and Human Services.
DIDS	Defense Integrated Data Systems.
DISC	Defense Industrial Supply Center.
DLA	Defense Logistics Agency.
DMA	Defense Mapping Agency.
DNA	Defense Nuclear Agency.
DO	Delivery Order.
DOA	Department of Agriculture (also USDA).
DOC	Department of Commerce.
DOE	Department of Energy.
DOI	Department of Interior.
DOJ	Department of Justice.
DOS	Department of State.
DOT	Department of Transportation.
DPA	Delegation of Procurement Authority (granted by GSA under FPRs).
DPC	Defense Procurement Circular.
DQ	Definite Quantity Contract.
DQ/PL	Definite Quantity Price List Contract.
DR	Deficiency Report.
DSCS	Defense Satellite Communication System.
DSN	Defense Switched Network.
DSP	Defense Support Program (WWMCCS).
DSS	Defense Supply Service.
DTC	Design-To-Cost.
ECP	Engineering Change Proposal.
ED	Department of Education.
EEO	Equal Employment Opportunity.
8(a) Set-Aside	Agency awards direct to Small Business Administration for direct placement with a socially/economically disadvantaged company.

EMC	Electro-Magnetic Compatibility.
EMCS	Energy Monitoring and Control System.
EO	Executive Order - Order issued by the President.
EOQ	Economic Ordering Quantity.
EPA	Economic Price Adjustment.
EPA	Environmental Protection Agency.
EPMR	Estimated Peak Monthly Requirement.
EPS	Emergency Procurement Service (GSA) or Emergency Power System.
EUC	End User Computing, especially in DoD.
FA	Formal Advertising.
FAC	Facility Contract.
FAR	Federal Acquisition Regulations.
FCA	Functional Configuration Audit.
FCC	Federal Communications Commission.
FCDC	Federal Contract Data Center.
FCRC	Federal Contract Research Center.
FDPC	Federal Data Processing Center.
FEDSIM	Federal (Computer) Simulation Center (GSA).
FEMA	Federal Emergency Management Agency.
FFP	Firm Fixed-Price Contract (also Lump Sum Contract).
FIPS	NBS Federal Information Processing Standard.
FIPS PUBS	FIPS Publications.
FIRMR	Federal Information Resource Management Regulations.
FMS	Foreign Military Sales.
FOC	Final Operating Capability.
FOIA	Freedom of Information Act.
FP	Fixed-Price Contract.
FP-L/H	Fixed-Price - Labor/Hour Contract.
FP-LOE	Fixed-Price - Level-Of-Effort Contract.
FPMR	Federal Property Management Regulations.
FPR	Federal Procurement Regulations.
FSC	Federal Supply Classification.
FSG	Federal Supply Group.
FSN	Federal Supply Number.
FSS	Federal Supply Schedule or Federal Supply Service (GSA).
FSTS	Federal Secure Telecommunications System.
FT Fund	A revolving fund, designated as the Federal Telecommunications Fund, used by GSA to pay for GSA-provided common-user services, specifically including the current FTS and proposed FTS 2000 services.
FTSP	Federal Telecommunications Standards Program administered by NCS; Standards are published by GSA.
FTS	Federal Telecommunications System.
FTS 2000	Proposed replacement for the Federal Telecommunications System.
FY	Fiscal Year.
FYDP	Five-Year Defense Plan.
GAO	General Accounting Office.
GFE	Government-Furnished Equipment.

GFM	Government-Furnished Material.
GFY	Government Fiscal Year (October to September).
GIDEP	Government-Industry Data Exchange Program.
GOCO	Government Owned - Contractor Operated.
GOGO	Government Owned - Government Operated.
GOSIP	Government Open Systems Interconnection Profile.
GPO	Government Printing Office.
GPS	Global Positioning System.
GRH	Gramm-Rudman-Hollings Act (1985), also called Gramm-Rudman Deficit Control.
GS	General Schedule.
GSA	General Services Administration.
GSBCA	General Services Administration Board of Contract Appeals.
HCFA	Health Care Financing Administration.
HHS	(Department of) Health and Human Services.
HPA	Head of Procuring Activity.
HSDP	High-Speed Data Processors.
HUD	(Department of) Housing and Urban Development.
ICA	Independent Cost Analysis.
ICAM	Integrated Computer-Aided Manufacturing.
ICE	Independent Cost Estimate.
ICP	Inventory Control Point.
ICST	Institute for Computer Sciences and Technology, National Bureau of Standards, Department of Commerce.
IDAMS	Image Display And Manipulation System.
IDEP	Interservice Data Exchange Program.
IDN	Integrated Data Network.
IFB	Invitation For Bids.
IOC	Initial Operating Capability.
IOI	Internal Operating Instructions.
IPS	Integrated Procurement System.
IQ	Indefinite Quantity Contract.
IR&D	Independent Research & Development.
IRM	Information Resources Management.
IXS	Information Exchange System.
JFMIP	Joint Financial Management Improvement Program.
JOCIT	Jovial Compiler Implementation Tool.
JSIPS	Joint Systems Integration Planning Staff.
JSOP	Joint Strategic Objectives Plan.
JSOR	Joint Service Operational Requirement.
JUMPS	Joint Uniform Military Pay System.
LC	Letter Contract.
LCC	Life Cycle Costing.
LCMP	Life Cycle Management Procedures (DD7920.1).

LCMS	Life Cycle Management System.
L-H	Labor-Hour Contract.
LOI	Letter of Interest.
LRPE	Long-Range Procurement Estimate.
LRIRP	Long-Range Information Resource Plan.
MAISRC	Major Automated Information Systems Review Council (DoD).
MANTECH	MANufacturing TECHnology.
MAPS	Multiple Address Processing System.
MAP/TOP	Manufacturing Automation Protocol/Technical and Office Protocol.
MASC	Multiple Award Schedule Contract.
MDA	Multiplexed Data Accumulator.
MENS	Mission Element Need Statement or Mission Essential Need Statement (see DD-5000.1 Major Systems Acquisition).
MILSCAP	Military Standard Contract Administration Procedures.
MIL SPEC	Military Specification.
MIL STD	Military Standard.
MIPR	Military Interdepartmental Purchase Request.
MOD	Modification.
MOL	Maximum Ordering Limit (Federal Supply Service).
MPC	Military Procurement Code.
MYP	Multi-Year Procurement.
NARDIC	Navy Research and Development Information Center.
NASA	National Aeronautics and Space Administration.
NBS	National Bureau of Standards.
NCMA	National Contract Management Association.
NCS	National Communications System; responsible for setting U.S. Government standards administered by GSA; also holds primary responsibility for emergency communications planning.
NICRAD	Navy-Industry Cooperative Research and Development.
NIP	Notice of Intent to Purchase.
NMCS	National Military Command System.
NSA	National Security Agency.
NSEP	National Security and Emergency Preparedness.
NSF	National Science Foundation.
NSIA	National Security Industrial Association.
NTIA	National Telecommunications and Information Administration of the Department of Commerce; replaced the Office of Telecommunications Policy in 1970 as planner and coordinator for government communications programs; primarily responsible for radio.
NTIS	National Technical Information Service.
Obligation	"Earmarking" of specific funding for a contract from committed agency funds.
OCS	Office of Contract Settlement.
OFCC	Office of Federal Contract Compliance.
Off-Site	Services to be provided near but not in government facilities.
OFMP	Office of Federal Management Policy (GSA).

OFPP	Office of Federal Procurement Policy.
OIRM	Office of Information Resources Management.
O&M	Operations & Maintenance.
OMB	Office of Management and Budget.
O,M&R	Operations, Maintenance, and Readiness.
On-Site	Services to be performed on a government installation or in a specified building.
OPM	Office of Procurement Management (GSA) or Office of Personnel Management.
Options	Sole-source additions to the base contract for services or goods to be exercised at the government's discretion.
OSHA	Occupational Safety and Health Act.
OSI	Open System Interconnect.
OSP	Offshore Procurement.
OTA	Office of Technology Assessment (Congress).
Out-Year	Proposed funding for fiscal years beyond the Budget Year (next fiscal year).
P-I	FY Defense Production Budget.
P3I	Pre-Planned Product Improvement (program in DoD).
PAR	Procurement Authorization Request or Procurement Action Report.
PAS	Pre-Award Survey.
PASS	Procurement Automated Source System.
PCO	Procurement Contracting Officer.
PDA	Principal Development Agency.
PDM	Program Decision Memorandum.
PDR	Preliminary Design Review.
PIR	Procurement Information Reporting.
PME	Performance Monitoring Equipment.
PMP	Purchase Management Plan.
PO	Purchase Order or Program Office.
POM	Program Objective Memorandum.
POSIX	Portable Open System Interconnection Exchange.
POTS	Purchase of Telephone Systems.
PPBS	Planning, Programming, Budgeting System.
PR	Purchase Request or Procurement Requisition.
PRA	Paperwork Reduction Act.
PS	Performance Specification - alternative to a Statement of Work, when work to be performed can be clearly specified.
QA	Quality Assurance.
QAO	Quality Assurance Office.
QMCS	Quality Monitoring and Control System (DoD software).
QMR	Qualitative Material Requirement (Army).
QPL	Qualified Products List.
QRC	Quick Reaction Capability.
QRI	Quick Reaction Inquiry.
R-I	FY Defense RDT&E Budget.
RAM	Reliability, Availability, and Maintainability.
RC	Requirements Contract.

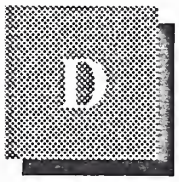
R&D	Research and Development.
RDA	Research, Development, and Acquisition.
RDD	Required Delivery Date.
RD&E	Research, Development, and Engineering.
RDF	Rapid Deployment Force.
RDT&E	Research, Development, Test, and Engineering.
RFI	Request For Information.
RFP	Request For Proposal.
RFQ	Request For Quotation.
RFTP	Request For Technical Proposals (Two-Step).
ROC	Required Operational Capability.
ROI	Return On Investment.
RTAS	Real Time Analysis System.
RTDS	Real Time Display System.
SA	Supplemental Agreement.
SBA	Small Business Administration.
SB Set-Aside	Small Business Set-Aside contract opportunities with bidders limited to certified small businesses.
SCA	Service Contract Act (1964 as amended).
SCN	Specification Change Notice.
SDN	Secure Data Network.
SEC	Securities and Exchange Commission.
SE&I	Systems Engineering and Integration.
SETA	Systems Engineering/Technical Assistance.
SETS	Systems Engineering/Technical Support.
SIBAC	Simplified Intragovernmental Billing and Collection System.
SIMP	Systems Integration Master Plan.
SIOP	Single Integrated Operations Plan.
SNAP	Shipboard Nontactical ADP Program.
Sole Source	Contract award without competition.
Solicitation	Invitation to submit a bid.
SOR	Specific Operational Requirement.
SOW	Statement of Work.
SSA	Source Selection Authority (DoD).
SSAC	Source Selection Advisory Council.
SSEB	Source Selection Evaluation Board.
SSO	Source Selection Official (NASA).
STINFO	Scientific and Technical INFOrmation Program - Air Force/NASA.
STU	Secure Telephone Unit.
SWO	Stop-Work Order.
Synopsis	Brief Description of contract opportunity in CBD after D&F and before release of solicitation.
TA/AS	Technical Assistance/Analysis Services.
TCP/IP	Transmission Control Protocol/Internet Protocol.

TEMPEST	Studies, inspections, and tests of unintentional electromagnetic radiation from computer, communication, command, and control equipment that may cause unauthorized disclosure of information; usually applied to DoD and security agency testing programs.
TILO	Technical and Industrial Liason Office—Qualified Requirement Information Program - Army.
TM	Time and Materials contract.
TOA	Total Obligational Authority (Defense).
TOD	Technical Objective Document.
TR	Temporary Regulation (added to FPR, FAR).
TRACE	Total Risk Assessing Cost Estimate.
TRCO	Technical Representative of the Contracting Offices.
TREAS	Department of Treasury.
TRP	Technical Resources Plan.
TSP	GSA's Teleprocessing Services Program.
TVA	Tennessee Valley Authority.
UCAS	Uniform Cost Accounting System.
USA	U.S. Army.
USAF	U.S. Air Force.
USCG	U.S. Coast Guard.
USMC	U.S. Marine Corps.
USN	U.S. Navy.
U.S.C.	United States Code.
USPS	United States Postal Service.
USRRB	United States Railroad Retirement Board.
VA	Veterans Affairs Department.
VE	Value Engineering.
VHSIC	Very High Speed Integrated Circuits.
VIABLE	Vertical Installation Automation BaseLine (Army).
VICI	Voice Input Code Identifier.
WBS	Work Breakdown Structure.
WGM	Weighted Guidelines Method.
WIN	WWMCCS Intercomputer Network.
WITS	Washington Interagency Telecommunications System.
WIS	WWMCCS Information Systems.
WS	Work Statement - Offerer's description of the work to be done (proposal or contract).
WWMCCS	World-Wide Military Command and Control System.

B

General and Industry Acronyms

ADAPSO	Association of Data Processing Service Organization, now the Computer Software and Services Industry Association.
ADP	Automatic Data Processing.
ADPE	Automatic Data Processing Equipment.
ANSI	American National Standards Institute.
BOC	BELL Operating Company.
CAD	Computer-Aided Design.
CAM	Computer-Aided Manufacturing.
CBEMA	Computer and Business Equipment Manufacturers Association.
CCIA	Computers and Communications Industry Association.
CCITT	Comite Consultaif Internationale de Telegraphique et Telephonique; Committee of the International Telecommunication Union.
COBOL	COmmon Business-Oriented Language.
COS	Corporation for Open Systems.
CPU	Central Processor Unit.
DMBS	Data Base Management System.
DRAM	Dynamic Random Access Memory.
EIA	Electronic Industries Association.
EPROM	Erasible Programmable Read-Only-Memory.
IEEE	Institute of Electrical and Electronics Engineers.
ISDN	Integrated Services Digital Networks.
ISO	International Organization for Standardization; voluntary international standards organization and member of CCITT.
ITU	International Telecommunication Union.
LSI	Large-Scale Integration.
MFJ	Modified Final Judgement.
PROM	Programmable Read-Only Memory.
RBOC	Regional Bell Operating Company.
UNIX	AT&T Proprietary Operating System.
UPS	Uninterruptable Power Source.
VAR	Value Added Retailer.
VLSI	Very Large Scale Integration.
WORM	Write-Once-Read-Many-Times.



Policies, Regulations, and Standards

A

OMB Circulars

A-11	Preparation and Submission of Budget Estimates.
A-49	Use of Management and Operating Contracts.
A-71	Responsibilities for the Administration and Management of Automatic Data Processing Activities.
A-109	Major Systems Acquisitions.
A-120	Guidelines for the Use of Consulting Services.
A-121	Cost Accounting, Cost Recovery, and Integrated Sharing of Data Processing Facilities.
A-123	Internal Control Systems.
A-127	Financial Management Systems.
A-130	Management of Federal Information Resources.
A-131	Value Engineering.

B

GSA Publications

The FIRMR as published by GSA is the primary regulation for use by federal agencies in the management, acquisition, and use of both ADP and telecommunications information resources.

C

DoD Directives

DD-5000.1	Major System Acquisitions.
DD-5000.2	Major System Acquisition Process.
DD-5000.11	DoD Data Elements and Data Codes Standardization Program.
DD-5000.31	Interim List of DoD-Approved, High-Order Languages.
DD-5000.35	Defense Acquisition Regulatory Systems.
DD-5200.1	DoD Information Security Program.
DD-5200.28	Security Requirements for Automatic Data Processing (ADP) Systems.

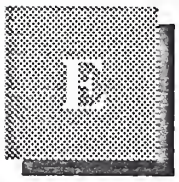
DD-5200.28-M	Manual of Techniques and Procedures for Implementing, Deactivating, Testing, and Evaluating Secure Resource Sharing ADP Systems.
DD-7920.2	Major Automated Information Systems Approval Process.
DD-7935	Automated Data Systems (ADS) Documentation.

D

Standards

ADCCP	Advanced Data Communications Control Procedures; ANSI Standard X3.66 of 1979; also NIST FIPS 71.
CCITT G.711	International PCM standard.
CCITT T.0	International standard for classification of facsimile apparatus for document transmission over telephone-type circuits.
DEA-1	Proposed ISO standard for data encryption based on the NIST DES.
EIA RS-170	Monochrome video standard.
EIA RS-170A	Color video standard.
EIA RS-464	EIA PBX standards.
EIA RS-465	Standard for Group III facsimile.
EIA RS-466	Facsimile standard; procedures for document transmission in the General Switched Telephone Network.
EIA RS-232-C	EIA DCE to DTE interface standard using a 25-Pin connector; similar to CCITT V-24.
EIA RS-449	New EIA standard DTE to DCE interface which re places RS-232-C.
FED-STD 1000	Proposed Federal Standard for adoption of the full OSI reference model.
FED-STD 1026	Federal Data Encryption Standard (DES) adopted in 1983; also FIPS 46.
FED-STD 1041	Equivalent to FIPS 100.
FED-STD 1061	Group II Facsimile Standard (1981).
FED-STD 1062	Federal standard for Group III facsimile; equivalent to EIA RS-465.
FED-STD 1063	Federal facsimile standard; equivalent to EIA RS-466.
FED-STDs 1005, 1005A-1008	Federal Standards for DCE Coding and Modulation.
FIPS 46	NIST Data Encryption Standard (DES).
FIPS 81	DES Modes of Operation.

FIPS 100	NIST Standard for packet-switched networks; subset of 1980 CCITT X.25.
FIPS 107	NIST Standard for local-area networks, similar to IEEE 802.2 and 802.3.
FIPS 146	Government Open Systems Interconnection (OSI) Profile (GOSIP).
FIPS 151	NIST POSIX (Portable Operating System Interface for UNIX) standard.
IEEE 802.2	OSI-Compatible IEEE standard for data-link control in local-area networks.
IEEE 802.3	Local-area network standard similar to Ethernet.
IEEE 802.4	OSI-compatible standard for token bus local-area networks.
IEEE 802.5	Local-area networks standard for token ring networks.
IEEE P1003.1	POSIX standard, similar to FIPS 151.
MIL-STD-188-114C	Physical interface protocol similar to RS-232 and RS-449.
MIL-STD-1777	IP-Internet Protocol.
MIL-STD-1778	TCP - Transmission Control Protocol.
MIL-STD-1780	File Transfer Protocol.
MIL-STD-1781	Simple Mail Transfer Protocol (electronic mail).
MIL-STD-1782	TELNET - virtual terminal protocol.
MIL-STD-1815A	Ada Programming Language Standard.
SVID	UNIX System Interface Definition.
X12	ANSI standard for Electronic Data Interchange
X.21	CCITT standard for interface between DTE and DCE for synchronous operation on public data networks.
X.25	CCITT standard for interface between DTE and DCE for terminals operating in the packet mode on public data networks.
X.75	CCITT standard for links that interface different packet networks.
X.400	ISO application-level standard for the electronic transfer of messages (electronic mail).



Related INPUT Reports

A

Annual Market Analyses

- *U.S. Information Services Vertical Markets*
- *U.S. Information Services Cross-Industry Markets*
- *Procurement Analysis Reports, GFY 1991-GFY 1996*

B

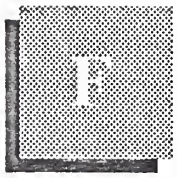
Industry Surveys

- *U.S. Information Services Industry*
- *Directory of Leading U.S. Information Services Vendors*

C

Market Reports

- *Federal Microcomputer Market, 1989-1994*
- *Defense Logistics Agency Information Services Market*
- *Federal Computer Security Market*
- *Federal Professional Services Market*
- *Federal Processing Services and Operational Support Markets*
- *Federal Software Products and Related Services Market*
- *Federal Computer Equipment Market, 1991-1996*
- *Federal Systems Integration Market, 1990-1995*



Questionnaires

A Definitions

For this survey, we have defined Systems Integration as the following vendor-supplied products and services:

- Equipment
  - Information Systems
  - Communications

- Software Products
  - Systems Software
  - Applications Software

- Professional Services (during Contract)
  - Consulting
    - Feasibility and Trade-off Studies
    - Selection of Hardware, Networks, and Software
  - Project Management

- Design/Integration
  - Systems Design
  - Installation of Hardware, Networks, and Software
  - Demonstration of Testing

- Software Development
  - Modification of Software Packages
  - Modification of Existing Software
  - Custom Development of Software

- Education/Training and Documentation

- Operation and Maintenance (during Contract)
  - Equipment/Network Maintenance

- Software Maintenance
- Education and Training
- Network Management

• Systems Operations (during Contract)
- Replaces Facilities Management
- 'Ownership' with Customer
- Not-Shared Operations
- Transient Possibility

• Other Products/Services
- Data Processing Supplies
- Processing/Network Services
- Data/Voice Communication Services
- Engineering Services
- Other

B
Questionnaires

1. Federal Systems Integration Market

Industry Questionnaire

1. Does your company now provide, or plan to provide systems integration services to the federal government? **(check one)**

   Yes ❑
   No ❑ **(end)**

2a. What types of systems integration services does your company currently provide, and plan to provide to the federal market through FY 1995? **(check all that apply—refer to definition page)**

	Current	Planned
Software Development	❑	❑
Equipment	❑	❑
Software Products	❑	❑
Design/Integration	❑	❑
Professional Services	❑	❑
Education/Training and Documentation	❑	❑
Operation and Maintenance	❑	❑
Systems Operations	❑	❑
Other Products/Services	❑	❑

2b. As a system integrator, what functions does your company normally subcontract to other vendors? **(please be specific)**

_____

3. Approximately what percent of your company's federal systems integration business for FY 1989 was in each of the following categories? **(remember your responses should add to 100%)**

SI Category	Indicate Percent
Software Development	_____%
Equipment	_____%
Software Products	_____%

SI Category	Indicate Percent
Design/Integration	_____%
Professional Services	_____%
Education/Training and Documentation	_____%
Operation and Maintenance	_____%
Systems Operations	_____%
Other Products/Services	_____%

4. Which of the following reasons have influenced your company's decision to compete in the federal systems integration market for products or services? **(check all that apply)**

Growth Potential	❑
Past Systems Integration Success	❑
New Technology	❑
Profit Potential	❑
Software Skill	❑
Possess Diversity of Required Skills	❑
Long-Term Involvement	❑
Other **(specifiy)**: _____	❑

5. Which range best describes your company's total 1989 revenues (all divisions, all markets)? **(check one only)**

Less than $100 million	
$1 million - $25 million	❑
$26 million - $50 million	❑
$51 million - $75 million	❑
$76 million - $100 million	❑
Greater than $100 million	
$101 million - $250 million	❑
$251 million - $500 million	❑
$501 million - $1 billion	❑
Greater than $1 billion	❑

6a. Approximately how many employees are in your entire company? **(enter number)** _____

6b. How many employees are in your company's federal market division **(enter number)** _____

7a. In your opinion, do you believe the commercial systems integration market will increase, decrease, or remain the same through FY 1995? **(check one)**

Increase	❑	by what percent? _____%
Decrease	❑	by what percent? _____%
Remain the same	❑	

7b. Why?

_____

_____

8. Indicate which range best describes your company's 1989 revenues from each segment of the federal systems integration market listed below? **(for each category check one revenue range)**

	Market Segment Category								
	Software Development	Equipment	Software	Design/ Integration Products	Prof. Svcs.	Ed./ Training/ Doc.	Ops. & Mnt. Svcs.	Systems Operations	Other Products/
Revenue Range									
LESS THAN $100 MILLION									
$ 1 million - $ 25 million	❑	❑	❑	❑	❑	❑	❑	❑	❑
$ 26 million - $ 50 million	❑	❑	❑	❑	❑	❑	❑	❑	❑
$ 51 million - $ 75 million	❑	❑	❑	❑	❑	❑	❑	❑	❑
$ 76 million - $100 million	❑	❑	❑	❑	❑	❑	❑	❑	❑
GREATER THAN $100 MILLION									
$101 million - $250 million	❑	❑	❑	❑	❑	❑	❑	❑	❑
$251 million - $500 million	❑	❑	❑	❑	❑	❑	❑	❑	❑
$501 million - $ 1 billion	❑	❑	❑	❑	❑	❑	❑	❑	❑
Greater than $1 billion	❑	❑	❑	❑	❑	❑	❑	❑	❑

9a. Does your company forecast that its federal systems integration revenues will increase, decrease or remain the same through FY 1995? **(check one)**

Increase ❑ by what percent? _____%
Decrease ❑ by what percent? _____%
Remain the same ❑

9b. Why?

_____

10. Which procurement approaches will your company pursue in the federal systems integration market? **(check all that apply)**

- Sole-source seed jobs ❑
- Competitive niche jobs ❑
- IQID Requirements Contracts ❑
- Basic Ordering Agreements ❑
- Major SI opportunities ❑
- Other **(specify)**: _____ ❑

11a. Indicate below how your company views systems integration oportunities by agency type: **(check one for each agency)**

Agency Type	Opportunities Increasing	Decreasing	Remaining the Same
DoD	_____	_____	_____
Civil	_____	_____	_____

11b. Please name the specific agencies that provide the most attractive systems integration opportunities for your company.

_____

_____

_____

12. In your opinion, what differences exist between the federal and commercial systems integration markets?

_____

_____

_____

13. How important do you believe each of the following factors should be in controlling vendor selection for systems integration contracts by federal agenceis? Use a 1-5 scale to rate each factor; 5 = of crucial importance, and 1 = of no importance at all. **(read each factor, circle one response)**

Factor	Rating				
Technical Solution	1	2	3	4	5
Contract Type	1	2	3	4	5
Risk Containment Procedures	1	2	3	4	5
Initial Cost	1	2	3	4	5
Life Cycle	1	2	3	4	5
Other (specify):_____	1	2	3	4	5

14. Does your company perceive that any of the following factors will impact the federal systems integration market positively or negatively and why?

		IMPACT (check one)	
		Positive	Negative
a.	Budget Constraints? How/why? _____	❑	❑
b.	Democratic Administration? How/why? _____	❑	❑
c.	Republican Administration? How/why? _____	❑	❑
d.	New Technology? How/why? _____	❑	❑

DEADLINE FOR COMPLETED QUESTIONNAIRES IS _____

2. Federal Systems Integration Case Study

Prime Contractor Questionnaire

Program Name: _____

Department: _____

Branch/Office: _____

Agency: _____

Address: _____

_____

_____

Agency/Project Manager: _____

****

Prime Contractor Name: _____

Address: _____

_____

Contractor Interviewee: _____

Title: _____

Phone: _____

1. Please describe the mission problem/function that this systems integration contract was to solve/ fulfill? (**Example:** Agency was running a manual inventory system to ship 2.5M parts per year. The depot center was approximately 60,000 square feet. The agency forecasted growth in this requirement and automation was the only way to keep up with demand.)

   (specify mission): _____

   _____

2. What major tasks did your company perform as a systems integrator that were critical to the program's success? Please be specific. (Example: Designed a new depot center; designed and implemented a new computer system; designed and implemented a monorail system to transport parts within the depot; altered existing depot center to accommodate planned depot.)

   (specify tasks performed): _____

   _____

   _____

3. Please **specify** the following summary contract and schedule information:

a. Contract type: _____
b. Contract value: $ _____
c. Contract duration: _____
d. RFP release date: _____
e. Bid due date: _____
f. Contract award date: _____
g. Project completion date: _____

4. For this systems integration contract, **provide** the names of the subcontractors and functions they were responsible for:

Contractor	Company	Function
Subcontractor	_____	_____
Subcontractor	_____	_____
Subcontractor	_____	_____
Outside Consultant	_____	_____

For Questions 5 through 11, please describe the following project components of this systems integration contract in each category where applicable:

Equipment

	(Check One) Agency Supplied	Contractor Supplied
5a. Equipment: **(specify hardware make(s), model number(s), quantity)**		
_____	❑	❑
_____	❑	❑
_____	❑	❑

5b. **Enter** total $ value of IT equipment: $_____

Software

6a. **Specify** systems software type(s): _____

6b. **Specify** application software type(s): _____

_____

6c. **Enter** total $ value of applications software: $_____

Professional Services

7a. **Estimate** the total value of the professional services portion of this contract:

$_____

7b. For each professional service listed, indicate contractor responsibility. **(circle: P for Prime Contractor; S for Subcontractor; O for Other)**

	Circle One		
Consulting Services	P	S	O
Design/Integration	P	S	O
Project Management	P	S	O
Education/Training	P	S	O

Applications

8. **Specify which applications** were developed or modified for this project and **by which contractor(s)** for each software category.

a. Off-the-shelf: _____

b. Custom developed: _____

Operations and Maintenance

9a. **Estimate** the total value of the operations and maintenance portion of this contract:

$_____ **(enter value)**

9b. **Circle** which contractor had responsibility for operations and maintenance: **(circle: P for Prime Contractor; S for Subcontractor; O for Other)**

(circle one) P S O

Other Products and Information Services

10a. What was the $ value of other ADP products and information services in this contract?

$ _____ **(enter value)**

10b. **Specify** products and information services:

_____

Other Noninformation Services

11a. What was the $ value of other noninformation services in this contract? $ _____ **(enter value)**

11b. **Specify** noninformation services:

_____

12. How would you rate your company's overall success in satisfying the user requirements of this systems integration contract so far? **(use a 1-5 scale: where 5 = extremely successful and 1 = not successful at all)**

(circle one) 1 2 3 4 5

Additional comments: _____

_____

13. What funding was originally appropriated for this contract?

(specify amount) $ _____

14a. Did the scope of this project change from the contract award date? **(check one)**

Yes ❑
No ❑

14b. If Yes, how was this issue resolved with the federal agency?

Please explain: _____

_____

15. Please **detail** the current status of this systems integration contract:

_____

_____

PLEASE RETURN THIS QUESTIONNAIRE BY _____

3. Federal Systems Integration Case Study

Agency Questionnaire

Program Name: _____

Department: _____

Branch/Office: _____

Agency: _____

Address: _____

_____

_____

Program/Project Manager: _____

Phone: _____

Interviewee/Title: _____

1. Please describe the mission problem/function that this systems integration contract was to solve/ fulfill? (**Example:** Agency was running a manual inventory system to ship 2.5M parts per year. The depot center was approximately 60,000 square feet. The agency forecasted growth in this requirement and automation was the only way to keep up with demand.)

   (specify mission): _____

   _____

   _____

2. What major tasks did your vendor perform as a systems integrator that were critical to the program's success? Please be specific. (**Example:** Designed a new depot center; designed and implemented a new computer system; designed and implemented a monorail system to transport parts within the depot; altered existing depot center to accommodate planned depot.)

   (specify tasks performed): _____

   _____

   _____

3. Please **specify** the following summary contract and schedule information:

   a. Contract Type: _____
   b. Contract Value: $ _____
   c. Contract Duration: _____
   d. RFP release date: _____
   e. Bid due date: _____
   f. Contract award date: _____
   g. Project completion date: _____

4. For this systems integration contract, **provide** the names of the contractors and functions they were responsible for:

Contractor	Company	Function
Prime Contractor	_____	_____
Subcontractor	_____	_____
Subcontractor	_____	_____
Outside Consultant	_____	_____

For Questions 5 through 11, please describe the following project components of this systems integration contract in each category where applicable:

Equipment

	Check One	
	Agency Supplied	Contractor Supplied
5a. Equipment: **(specify hardware make(s), model number(s), quantity)**		
_____	_____	_____
_____	_____	_____
_____	_____	_____

5b. Enter total $ value of IT equipment: $ _____

Software

6a. **Specify** systems software type(s): _____

6b. **Specify** applications software type(s): _____

_____

6c. **Enter** total $ value of applications software: $_____

Professional Services

7a. **Estimate** the total value of the professional services portion of this contract:

$ _____

7b. For each professional service listed, indicate contractor responsibility. **(circle: P for Prime Contractor; S for Subcontractor; O for Other)**

	Circle One		
Consulting Services	P	S	O
Design/Integration	P	S	O
Project Management	P	S	O
Education/Training	P	S	O

Applications

8. **Specify which applications** were developed or modified for this project and **by which contractor(s)** for each software category.

a. Off-the-shelf: _____

_____

b. Custom developed: _____

_____

Operations and Maintenance

9a. **Estimate** the total value of the operations and maintenance portion of this contract:

$_____ **(enter value)**

9b. **Circle** which contractor had responsibility for operations and maintenance: **(circle: P for Prime Contractor; S for Subcontractor; O for Other)**

(circle one) P S O

Other Products and Information Services

10a. What was the $ value of other ADP products and information services in this contract?

$ _____ **(enter value)**

10b. **Specify** products and information services:

_____

Other Noninformation Services

11a. What was the $ value of other noninformation services in this contract?

$ _____ **(enter value)**

11b. **Specify** noninformation services:

_____

12. How would you rate your agency's overall satisfaction with the results of this systems integration contract? **(use a 1-5 scale: 5 = extremely satisfied; and 1 = not satisfied at all)**

(circle one) 1 2 3 4 5

Additional comments: _____

_____

_____

13. What funding was originally appropriated for this contract? **(specify amount)**

$ _____

14a. Did the scope of this project change from the contract award date? **(check one)**

Yes ❑
No ❑

14b. If **Yes**, how was this issue resolved with the contractor? **Please explain:**

_____

_____

_____

15. Please **detail** the current status of this sytems integration contract:

_____

_____

_____

PLEASE RETURN THIS QUESTIONNAIRE BY_____

About INPUT

Company Profile

INPUT provides planning information, analysis, and recommendations to managers and executives in the information services industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Continuous-information advisory services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services (software products, processing and network services, systems management, and systems/software maintenance and support).

Many of INPUT's professional staff have more than 20 years' experience in their areas of specialization. Most have held management positions in large organizations, enabling them to supply practical solutions to complex business problems.

Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

Staff Credentials

INPUT's staff have been selected for their broad background in a variety of functions, including planning, marketing, operations, and information processing. Many of INPUT's professional staff have held executive positions in some of the world's leading organizations, both as vendors and users of information services, in areas such as the following:

- Processing Services
- Professional Services
- Turnkey Systems
- Applications Software
- Field (customer) Service
- Banking and Finance
- Insurance
- Process Manufacturing
- Telecommunications
- Federal Government

Educational backgrounds include both technical and business specializations, and many INPUT staff hold advanced degrees.

U.S. and European Advisory Services

INPUT offers the following advisory services on an annual subscription basis.

1. Market Analysis Program—U.S.
The Market Analysis Program provides up-to-date U.S. information services market analyses, five-year forecasts, trend analyses, vertical/cross-industry market reports, an on-site presentation, hotline inquiry service, and sound recommendations for action. It covers software products, turnkey systems, processing and network services, and professional services markets. It is designed to satisfy the planning and marketing requirements of current and potential information services vendors.

2. Market Analysis Program—Europe
This program is designed to help vendors of software and services with their market planning. It examines the issues in the marketplace, from both a user and a vendor viewpoint. It provides detailed five-year market forecasts to help plan for future growth.

3. Vendor Analysis Program—U.S.
A comprehensive reference service covering more than 400 U.S. information services vendor organizations, VAP is often used for competitive analysis and prescreening of acquisition and joint-venture candidates. Profiles on leading vendors are updated regularly, and hotline inquiry service is provided.

4. Vendor Analysis Program—Europe
This is an invaluable service for gaining competitive information and for seeking targets for partnerships or acquisitions. The service provides profiles on some 450 European software and services vendors. A hotline enquiry service provides details on companies not covered by the profiles.

5. Electronic Data Interchange Program
Focusing on what is fast becoming a major computer/communications market opportunity, this program keeps you well informed. Through monthly newsletters, timely news flashes, comprehensive studies, and telephone inquiry privileges, you will be informed and stay informed about the events and issues impacting this burgeoning market.

6. Network Services Program—Europe
Network services is a fast-growing area of the software and services industry. This program is essential to vendors of EDI, electronic information services, and network products and services, keeping clients informed of the latest developments in the European marketplace.

7. Systems Integration Program—U.S.
Focus is on the fast-moving world of systems integration and the provision of complex information systems requiring vendor management and installation of multiple products and services. The program includes an annual market analysis of the U.S. systems integration market, SI vendor profiles and updates, topical market analysis reports, and an annual SI seminar.

8. Systems Operations Program—U.S.
This program focuses on the exciting resurgence of the market for outsourcing systems operations. It includes an annual market analysis report of the systems operations market, SO vendor profiles and updates, topical market analysis reports, and an annual SO seminar.

9. Systems Management Program—Europe
Systems integration and systems operations (facilities management) are key growth areas for the decade. This program examines these two areas and analyzes current market trends, user needs, and vendor offerings.

10. Federal Information Systems and Services Program
This program presents highly specific information on U.S. federal government procurement practices, identifies information services vendor opportunities, and provides guidance from INPUT's experienced Washington professionals to help clients maximize sales effectiveness in the federal government marketplace.

11. State Information Systems and Services Program (proposed)
This program presents extensive information on state government spending, procurement policies, identifies key contacts, opportunities, and provides guidance from INPUT's experienced professionals to help clients maximize sales opportunities in the state government marketplace.

12. Information Systems Program
ISP is designed for executives of large information systems organizations and provides crucial information for planning, procurement, and management decision making. This program is widely used by both user and vendor organizations.

13. Customer Service Program—International
This program provides customer service organization management with data and analyses needed for marketing, technical, financial, and organizational planning. The program pinpoints user perceptions of service received, presents vendor-by-vendor service comparisons, and analyzes and forecasts service markets for large systems, minicomputers, personal computer systems, and third-party maintenance. A monthly newsletter helps clients keep informed of the latest developments in the market.

14. Customer Service Program—Europe
Customer service is an expanding area. Companies are now expanding from hardware service to more software-related maintenance and professional services. This program helps vendors penetrate these new areas and provides guidelines for future market strategy. A monthly newsletter helps clients keep abreast of the latest developments in the market.

15. Worldwide Information Services Market Forecasts
In 1989 INPUT initiated this research study, which provides an international forecast for the information services market.

Customized Advisory Services

In addition to standard continuous-information programs, INPUT will work with you to develop and provide a customized advisory service that meets your unique requirements.

Acquisition Services

INPUT also offers acquisition services that are tailor-made for your requirements. INPUT's years of experience and data base of company information about information systems and services companies have helped many companies in their acquisition processes.

An Effective Combination

INPUT'S Executive Advisory Services are built on an effective combination of research-based studies, client meetings, informative conferences, and continuous client support. Each service is designed to deliver the information you need in the form most useful to you, the client. Executive Advisory Services are composed of *varied combinations of the following products and services:*

Research-Based Studies
Following a proven research methodology, INPUT conducts major research studies throughout each program year. Each year INPUT selects issues of concern to management. Topical reports are prepared and delivered throughout the calendar year.

Information Service Industry Reports
INPUT's Executive Advisory Services address specific issues, competitive environments, and user expenditures relative to:

- Software Products
- Processing Services
- Network Services
- Systems Integration
- Systems Operations
- Professional Services
- Turnkey Systems
- Small-Systems Service
- Third-Party Maintenance
- Large-Systems Service

Industry-Specific Market Reports

Detailed analyses of market trends, forces driving the markets, problems, opportunities, and user expenditures are available for the following sectors:

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

Cross-Industry Market Report

A separate analysis covers the following cross-industry application areas:

- Accounting
- Education and Training
- Engineering and Scientific
- Human Resources
- Office Systems
- Planning and Analysis
- Other Cross-Industry Sectors

Hotline: Client Inquiry Services

Inquiries are answered quickly and completely through use of INPUT's Client Hotline. Clients may call any INPUT office (San Francisco, New York, Washington D.C., London, or Paris) during business hours or they may call a voicemail service to place questions after hours. This effective Hotline service is the cornerstone of every INPUT Executive Advisory Service.

The Information Center

One of the largest and most complete collections of information services industry data, the Information Center houses literally thousands of up-to-date files on vendors, industry markets, applications, current/emerging technologies, and more. Clients have complete access to the Information Center. In addition to the information contained in its files, the center maintains an 18-month inventory of over 130 major trade publications, vendor consultant manuals, economic data, government publications, and a variety of important industry documents.

Access to INPUT Professional Staff

Direct access to INPUT's staff, many of whom have more than 20 years of experience in the information industry, provides you with continuous research and planning support. When you buy INPUT, you buy experience and knowledge.

Client Conference

You can attend INPUT's Client Conference. This event addresses the status and future of the information services industry, the competitive environment, important industry trends potentially affecting your business, the impact of new technology and new service offerings, and more.

You will attend with top executives from many of the industry's leading, fastest-growing, and most successful vendor companies—and with top Information Systems (IS) managers from some of the world's most sophisticated user organizations.

On-Site Presentation by INPUT Executives

Many of INPUT's programs offer an informative presentation at your site. Covering the year's research, this session is scheduled at the convenience of the client.

Proprietary Research Service

INPUT conducts proprietary research that meets the unique requirements of an individual client. INPUT's custom research is effectively used:

For Business Planning

Planning for new products, planning for business startups, planning for expansion of an existing business or product line—each plan requires reliable information and analysis to support major decisions. INPUT's dedicated efforts and custom research expertise in business planning ensure comprehensive identification and analysis of the many factors affecting the final decision.

For Acquisition Planning

Successful acquisition and divestiture of information services companies requires reliable information. Through constant contact with information services vendor organizations and continuous tracking of company size, growth, financials, and management "chemistry," INPUT can provide the valuable insight and analysis you need to select the most suitable candidates.

For the Total Acquisition Process

INPUT has the credentials, the data base of company information, and—most importantly—the contacts to assist you with total acquisition and/or partnering relationship processes:

- Due Diligence
- Schedules and Introduction
- Criteria & Definitions
- Retainer and Fee-Based
- Active Search

For Competitive Analysis
Knowing marketing and sales tactics, product capabilities, strategic objectives, competitive postures, and strengths and weaknesses of your competition is as critical as knowing your own. The career experience of INPUT's professionals—coupled with INPUT's collection and maintenance of current financial, strategic, tactical, and operational information about more than 400 active companies—uniquely qualifies INPUT to provide the best competitive information available today.

For Market and Product Analysis
Developing new products and entering new markets involves considerable investment and risk. INPUT regularly conducts research for clients to identify product requirements, market dynamics, and market growth.

More About INPUT...

- More than 5,000 organizations, worldwide, have charted business directions based on INPUT's research and analysis.
- Many clients invest more than $50,000 each year to receive INPUT's recommendations and planning information.
- INPUT regularly conducts proprietary research for some of the largest companies in the world.
- INPUT has developed and maintains one of the most complete information industry libraries in the world (access is granted to all INPUT clients).
- INPUT clients control an estimated 70% of the total information industry market.
- INPUT analyses and forecasts are founded upon years of practical experience, knowledge of historical industry performance, continuous tracking of day-to-day industry events, knowledge of user and vendor plans, and business savvy.
- INPUT analysts accurately predicted the growth of the information services market—at a time when most research organizations deemed it a transient market. INPUT predicted the growth of the microcomputer market in 1980 and accurately forecasted its slowdown in 1984.

For More Information . . .
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