FEDERAL SOFTWARE AND RELATED SERVICES MARKET 1986-1991

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Federal Information Systems and Services Program (FISSP)

Federal Software and Related Services Market, 1986-1991

FEDERAL SOFTWARE AND RELATED SERVICES MARKET, 1986-1991

ABSTRACT

INPUT expects the federal government market demand for software and related services to increase from $1.5 billion in fiscal 1986 to $2.8 billion in fiscal 1991. The market will experience sustained growth at an average rate of 14% through the period.

The federal software and related services market consists of two distinct, but interrelated, segments: off-the-shelf software packages and their maintenance, and professional services activities required to develop custom software. During this period, software products will exhibit more rapid growth, but the custom software development will account for the majority of federal expenditures in this category.

This report discusses agency buying trends, technical issues influencing the market, and major software initiatives in both defense and civilian agencies. Specific examples of opportunities for vendors are identified by agency.

This report contains 190 pages, including 48 exhibits.

FEDERAL SOFTWARE AND RELATED SERVICES MARKET, 1986-1991

CONTENTS

EXHIBITS

I INTRODUCTION

- This report on Software and Related Services in the federal government was prepared as part of the Federal Information Systems and Services Program (FISSP).

- INPUT first researched, analyzed, and reported on the federal software market in a 1984 report, Federal Government Professional Services Market, 1985-1990, and updated the software and related services segment of that report in 1985.

- Federal Software and Related Services Market, 1986-1991 is a new report, focused specifically on software products and software development. The report builds on the previous INPUT market analyses, with extensive revisions to reflect government fiscal year 1987 agency budgets, opportunities for vendors, and recent vendor financial data.

A. SCOPE

- This report covers software and related services programs listed in the OMB/GSA/NBS Five-Year Plan for government fiscal years 1986-1991, related federal agency long-range Automated Data Processing (ADP) plans, and federal agency government fiscal years 1986 and 1987 Information Technology Budgets.

- Although the period of interest is government fiscal years 1986-1991, the years outside this window are discussed as necessary to provide a complete picture of the development of agency software strategies.

- For the purpose of this study, INPUT defines the software and related services market to include the following products and services:

  - Software products, also known as software packages.

    - Exhibit B-2 provides a detailed schematic of the types of products and relationships between products covered in this report.

    - Revenues from purchase, lease, or rental, and maintenance are counted as software products revenues.

  - Software development, sometimes called contract programming or programming and analysis, a subset of professional srvices.

B. METHODOLOGY

- This report is based on research and anlysis of information from several sources.

  - INPUT's Procurement Analysis Reports (PAR).

  - Previous INPUT research conducted from 1981 through 1986.

  - Discussions with INPUT's FISSP clients.

  - Interviews with federal agency officials.

- Interviews with leading federal software vendors.

- The OMB/GSA/NBS Five-Year Plan analysis for the INPUT Procurement Analysis Reports was reviewed for software programs to be initiated during the period of interest.

- The available agency Long-Range ADP Plans for government fiscal years 1985-1990 and government fiscal years 1986-1991 were researched to identify plans for major software initiatives.

- Vendor GSA Schedule software sales data were obtained and analyzed.

- Questionniares (Appendix F) were developed for interviews of both federal agency officials and software vendor executives (see Appendix A for respondent profiles).

C. REPORT ORGANIZATION

- This report has been organized into six major sections.

  - Chapter I - Introduction.

  - Chapter II - Executive Overview.

  - Chapter III - Market Analysis and Forecast.

  - Chapter IV - Agency Requirements and Trends.

  - Chapter V - Competitive Trends.

  - Chapter VI - Key Opportunities.

- Several appendices are provided to aid in report use.
  - Appendix A - Interview Profiles.
  - Appendix B - Definitions.
  - Appendix C - Glossary of Acronyms.
  - Appendix D - Policies, Regulations, and Standards.
  - Appendix E - Related INPUT Reports.
  - Appendix F - Questionnaires.

II EXECUTIVE OVERVIEW

- This Executive Overview is designed in a presentation format to help the reader review key research findings and recommendations quickly. It also provides an executive presentation, complete with script and visual aids, to facilitate group communications.

- Key points of the entire report are summarized in Exhibits II-1 through II-8. The left-hand page facing each exhibit contains the script that explains the content of the exhibit.

A. FEDERAL SOFTWARE AND RELATED SERVICES MARKET SEGMENTS

- This market forecast and analysis focuses on several specific types of information technology products and services commercially acquired by the federal government:

  - Software products, sometimes called softwre packages, which includes off-the-shelf packages and their maintenance.

  - Software development, also called programming and analysis, including the modification of packages and new custom development.

- The software products market segment includes both systems and applications software. The forecast for this segment includes expenditures based on purchase, lease, or rental of software products.

- The software development market segment is a subset of the professional services market. This segment includes services such as programming, code conversion, and maintenance of custom-developed systems and applications software.

FEDERAL SOFTWARE AND RELATED SERVICES MARKET STRUCTURE

MEANS OF ACQUISITION • TYPE OF ACQUISITION	TYPE OF SOFTWARE	
	APPLICATIONS	SYSTEMS
Software Products Packages		
• Purchase	X	X
• Lease/Rental	X	X
Maintenance		
• Purchase	X	X
Professional Services		
• Modify Package Purchase	X	X
• Custom Development Purchase	X	X

B. MARKET FORECAST

- INPUT estimates that the federal government software and related services market will increase from $1.5 billion in FY 1986 to $2.8 billion in FY 1991 with an average annual growth rate (AAGR) of 14%.

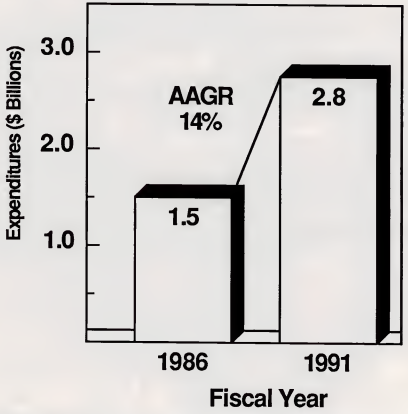
- This estimate reflects an overall AAGR lower than previously forecasted/

  - The depressed growth rate is attributable primarily to slower growth in the software development segment of the market (AAGR = 11%). The expanding functionality of off-the-shelf products coupled with a diminishing perception of unique agency requirements is fueling a "buy not build" strategy.

  - The software products segment exhibits stronger growth (AAGR = 17%) throughout the forecast period, but not strong enough to offset the slowdown in software development.

- Currently, software development represents 65% of software expenditures, but the distribution of expenditures will change through the forecast period. By 1991, software development will represent approximately 60% of the software and related services market.

FEDERAL SOFTWARE AND RELATED SERVICES MARKET, GFY 1986-1991



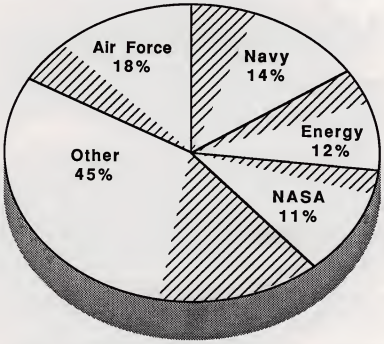
Note: Expenditures rounded to the nearest $100 million

C. LARGEST AGENCY BUYERS, 1986

- Federal agencies fund software and related services acquisitions through portions of several Information Technology Budget categories.
  - Capital investment.
  - Operating Costs.
    - . Lease/rental.
    - . Supplies.
  - Commercial Services.
    - . Programming and analysis.
- Four agencies, Airforce, Navy, Energy, and NASA, spent 55% of the reported software and related services outlays.
  - Navy spent more on software products through its BETA-based Qualified Products List and a number of new programs.
  - Air Force funded a number of initiatives aimed at increased use of software development.
- None of the remaining agencies comprised a significant portion of the Information Technology Budget, but acquisition of software products accounted for nearly 35% of outlays.

EXHIBIT II-3

LARGEST AGENCY BUYERS OF SOFTWARE AND RELATED SERVICES, 1986



Total Expenditures = $1.5 Billion

Key:

▨ = Software Products
□ = Software Development

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D. SOFTWARE DEVELOPMENT VENDOR SELECTION CRITERIA

- When evaluating vendors for a software development effort, federal agencies place most importance on relevant experience.

  - Vendor experience with similar development and integration efforts, the applications to be developed, and the languages to be used outweighs other factors such as price, agency experience, or even federal experience.

  - Both civil and defense agencies rank these experience factors as most important. Ranks on other selection criteria differ only slightly between civil and defense agencies.

- Education and training capabilities are also closely scrutinized by buying agencies. They seek assurance that not only will the vendor be able to develop the system, but also that the vendor will provide the post-implementation support required to operate and manage the systems via in-house personnel.

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SOFTWARE DEVELOPMENT VENDOR SELECTION CRITERIA

- Experience
- Development
- Application
- Target Language
- Integration
- Training

E. AGENCY SOFTWARE PRODUCT SELECTION CRITERIA

- Federal agency buyers tend to focus on product characteristics rather than vendor reputation and experience in the selection of software products.

- Product commitment, ease of use, performance, documentation, and training consistently rank as the most important selection criteria for both systems and applications software products.

- Product commitment is a special concern for buyers who must plan for relatively long system lives. Products which are not supported and enhanced over time may be viewed as unacceptable risks due to eventual replacement and conversion costs.

- Documentation and training are important product characteristics in view of the change and variety of users over the expected lifetime of the product.

- Similar to software development selection criteria, agency respondents report that price and federal experience are given less weight in the selection process.

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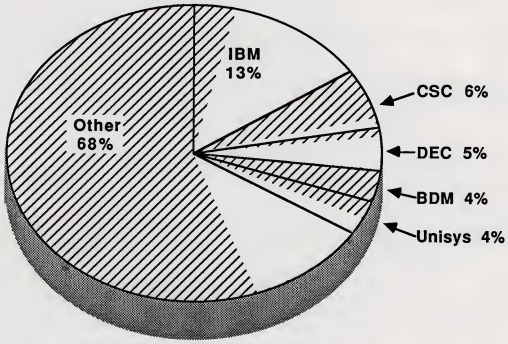
AGENCY SOFTWARE PRODUCT SELECTION CRITERIA

- Product Commitment
- Ease of Use
- Performance
- Documentation
- Training

F. LEADING SOFTWARE AND RELATED SERVICES VENDORS, 1986

- The federal government acquires software and related services from a broad range of vendors including hardware manufacturers, systems houses, professional services firms, and software product developers.
  - Hardware manufacturers and systems houses head the market in terms of revenue.
  - Based on INPUT estimates of federal software and related services revenues, four hardware manufacturers (IBM, Unisys, Honeywell, and DEC) and two systems houses (CSC and BDM) are the leading vendors.
- Independent software products suppliers that have done well in this market include ADR, Cincom, Computer Associates, Software AG, and UCCEL.
  - The success of these types of vendors is based, in part, on combined buys that include hardware and software. This is particularly true in systems software when the conventional wisdom is that or hardware systems buy (as opposed to a hardware plus software buy) from a single vendor offers greater assurance of operability.

LEADING SOFTWARE AND RELATED SERVICES VENDORS, 1986



Total User Expenditures, 1986 = $1.5 Billion

Key:

▭ = Software Products
▨ = Software Development

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G. COMPETITIVE OUTLOOK

- During the forecast period, INPUT expects that the hardware manufacturers and systems houses will retain their current dominant market presence.

- Market share, however, will likely change due to the continuing trend toward system integration contracting by federal agencies.

  - As a group, systems houses are best positioned to take advantage of this trend and could increase market share substantially by providing integrated hardware, software, and development solutions.

  - Hardware and software product vendors may find fewer direct product sales opportunities, but increased opportunity to place their products through the systems houses. Only IBM, among the hardware manufacturers, seems well positioned to gain from growth in systems integration services.

- Despite rapid overall expansion in the software products market segment, individual vendors may not experience corresponding revenue growth. Heavy discounting, in many cases up to 50% off commercial pricing, and site licensing pressures will moderate revenue growth.

COMPETITIVE OUTLOOK

- Hardware Manufacturers and Systems Houses Remain Dominant
- Influence of Integration Contracts
  - Stronger Growth for Systems Houses
  - Diminished Direct Product Sales Opportunities
- Constraints on Software Product Revenues

H. RECOMMENDATIONS

- Vendors may need to adjust their marketing and product development strategies to align more clearly with buyers' expectations. One key issue is product commitment, where agencies seek concrete assurance that the product acquired today will be supported and enhanced over the years to come.

- Software product vendors should investigate alternative distribution channels, such as systems houses, to supplement direct sales. Revenue from one large-scale, multisite integration contract can easily exceed total annual direct sales from single product copies.

- Systems houses can gain a competitive advantage in pricing by building and maintaining long-term relationships with software product suppliers. Reduced development efforts through the use of packaged software modules and lower unit prices accompanying volume purchase agreements both act to hold down costs and improve margins.

- Vendors can expand their market share by planning products and services to meet agency requirements for transportability and interoperability across different hardware suites and operating systems. Agencies continue expressing concern over integration of applications in an extremely diverse hardware environment.

RECOMMENDATIONS

- Align Marketing Strategies with Buyer's Expectations
- Investigate Additional Distribution Channels
- Build Supplier Relationships
- Plan for Transportability and Interoperability

III MARKET ANALYSIS AND FORECAST

A. MARKET STRUCTURE

- In general, federal agencies acquire the software they use in one of the following ways:

  - Purchase with the hardware suite in turnkey systems buys or system integration programs.

  - Purchase "off-the-shelf" packages from the software vendor, either as a standalone purchase or as part of a hardware purchase.

  - Purchase custom development of software that represents a new software product (generally referred to as "programming and analysis" and classified by INPUT as "software development" under the professional services mode).

  - Purchase custom modifications of software already in use by the agency (generally referred to as "software maintenance").

- Only those software products that are purchased, modified, or developed by outside vendors, and therefore represent existing market opportunities, are considered in this report, except for software productivity improvement measures where, in INPUT's view, the agencies' internal activities could be supported or replaced by vendors' products/services.

B. MARKET FORECAST

- Of the $11.7 billion in contracted information technology services listed in the estimated government fiscal year 1986 budget, INPUT forecasts that $1.5 billion will be expended for software and related services. By 1991, these expenditures will have grown to $2.8 billion for an average annual growth rate (AAGR) of 14%, as shown in Exhibit III-1.

  - Approximately 66% of the 1986 expenditures will be for contract programming and analysis. The remaining amount ($0.5 billion) will be expended on "off-the-shelf" software products.

  - One hundred million dollars will be expanded on contract software maintenance. Total software maintenance expenditures are much larger at an estimated 39 cents of every dollar spent on software.

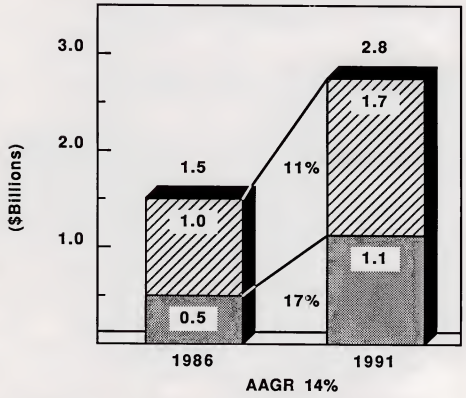
1. MODE FORECAST

- The expenditure growth rate for software products will exceed that for software development through the forecast period. Vendors are more frequently including in their products those functions that have previously forced agencies to seek custom solutions. At the same time, agencies, under funding pressure that forces them to jusify the cost effectiveness of the software solution approach, are "perceiving" fewer unique requirements. The net result of these two events is a greater attractiveness of off-the-shelf software.

  - Some 90% of the government's software is custom-developed, but then some "watch dog" agencies believe the lengthy, expensive process is not justified when much of the software is not fundamentally different from commonly available products.

EXHIBIT III-1

FEDERAL SOFTWARE DEVELOPMENT AND SOFTWARE PRODUCTS MARKET, GFY 1986-1991



Note: Numbers rounded to the nearest $100 million

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- This faster growth rate of software product expenditures will not offset the much slower rate of software development growth due to the sustantially larger size of the latter.

- By type of software expenditures for applications software represent 70% of the forecast for 1986 (see Exhibit III-2). Both packaged and custom software approaches portray this 70:30 split of expenditures. Only maintenance of systems software is on equal footing with applications at apparently 50% of the software maintenance expenditure.

  - This is not an accurate reflection of systems software usage in that much of this software is purchased from the hardware vendor at the time of the hardware purchase.

  - Custom systems software development is not typically a target objective in itself. Rather, the systems software effort is a necessary prerequisite within a larger application orientation.

  - While much of the government is under a "buy not lease" mandate, the reality in software products is that lease acquisitions will continue to show stronger growth (see Exhibit III-3). By 1991, more new purchases will be made via lease then purchase. This data does not reflect lease-to-Ownership Plans (LTOP) now required in the federal supply schedule.

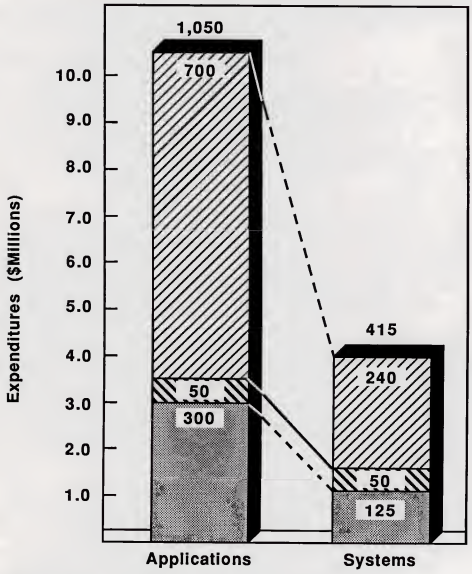
2. AGENCY FORECAST

- Agency government fiscal years 1985-1987 budget requests for line items that include INPUT's "software and related services" categories are similar for defense (see Exhibit III-4) and civil (see Exhibit III-5) organizations.

  - Systems analysis and programming budget requests, which include the custom software development expenditures of this report, have increased at an average annual growth rate of 7%.

EXHIBIT III-2

APPLICATIONS VERSUS SYSTEMS SOFTWARE BY TYPE OF ACQUISITION



Note: Numbers rounded to the nearest $100 million

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EXHIBIT III-3

METHOD OF SOFTWARE PRODUCTS ACQUISITION, 1986-1991

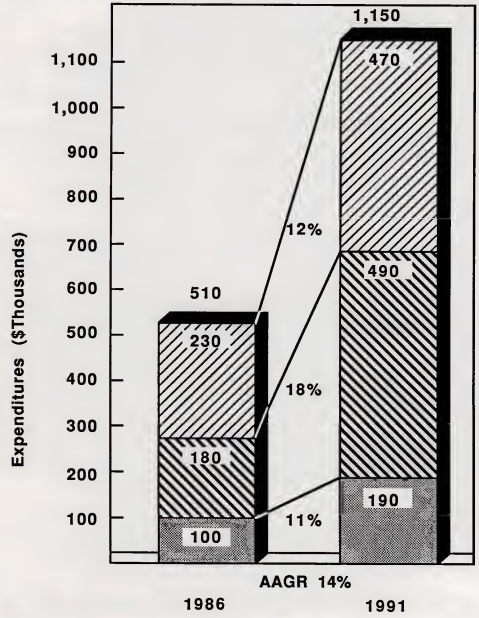

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EXHIBIT III-4

DEFENSE AGENCIES' SOFTWARE BUDGET
GFY 1985-1987

	$ MILLIONS			AAGR PERCENT 1985-1987
	1985	1986	1987	
Systems Analysis and Programming	744	825	920	7
Software (Capital Investment)	85	113	118	12
Total	829	938	1,038	8

EXHIBIT III-5

CIVIL AGENCIES' SOFTWARE BUDGET
GFY 1985-1987

	$ MILLIONS			AAGR PERCENT 1985-1987
	1985	1986	1987	
Systems Analysis and Programming	884	1,006	1,097	7
Software (Capital Investment)	103	123	142	11
Total	987	1,129	1,239	8

- Packaged software expenditures are included in budget requests under capital investment for software, lease/rental of software and "other" supplies, and operation and maintenance (for the software maintenance portion). The budget items presented in the exhibit, capital investment for software, are not inclusive of all packaged software acquisitions but do indicate the direction and magnitude of agencies' software expenditures. As noted, this budget category has increased substantially over the three year period.

- Specific agency budget changes are presented in Exhibit III-6 for software analysis and programming and Exhibit III-7 for capital investment for software.

  - Among defense agencies, the Air Force, Navy, and Army all have substantial systems analysis and programming budgets. But, as mentioned above, growth in expenditures over the last three years has been slow and will remain so for the forecast period. Slow growth not withstanding, these agencies represent significant opportunities for custom software development with over $900 million in planned spending in government fiscal year 1987 alone.

  - Systems analysis and programming budgets for civil agencies are considered smaller than those in defense except for NASA, Energy, GSA, and HHS. Of these, only the latter two have shown consistent growth over the market average. Opportunities for custom software development will be more limited outside of the agencies mentioned.

  - The requested funding for software products under the capital investment category is largest at the Army and Navy. Much of the growth occurred in government fiscal year 1986 and is unlikely to pick up during the forecast period. The Air Force budget reflects the defense attitude toward packaged solutions with less than $1 million requested.

EXHIBIT III-6

SYSTEMS ANALYSIS AND PROGRAMMING BUDGET BY AGENCY GFY 1985-1987

DEFENSE AGENCIES	$ MILLIONS			AAGR PERCENT 1985-1987
	1985	1986	1987	
Air Force	357	381	445	7
Army	96	111	123	9
Navy	196	217	232	6
USMC	22	24	21	(2)
OSD	73	91	98	10
Total Defense	744	824	919	7

(Continued)

EXHIBIT III-6 (Cont.)

SYSTEMS ANALYSIS AND PROGRAMMING BUDGET BY AGENCY GFY 1985-1987

CIVIL AGENCIES	$ MILLIONS			AAGR PERCENT 1985-1987
	1985	1986	1987	
Agriculture	15	24	21	12
Commerce	12	16	18	14
Energy	215	236	259	6
Education	9	9	9	0
Environmental Protection	8	13	13	18
FEMA	1	1	1	0
GSA	114	150	164	13
HHS	125	152	160	9
HUD	8	7	11	11
Interior	11	18	22	26
Justice	14	9	9	(14)
Labor	20	14	9	(24)
NASA	251	240	247	(1)
State	8	10	16	26
Transportation	35	39	50	13
Treasury	16	34	37	32
Other Civil	22	34	51	32
Total Civil	884	1,006	1,097	7
Total Federal	1,628	1,830	2,016	7

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EXHIBIT III-7

SOFTWARE (CAPITAL INVESTMENT) BUDGET BY AGENCY
GFY 1985-1987

DEFENSE AGENCIES	$ MILLIONS			AAGR PERCENT 1985-1987
	1985	1986	1987	
Air Force	.01	.01	.01	0
Army	37	43	48	9
Navy	37	50	47	8
USMC	2	3	6	44
OSD	8	17	17	29
Total Defense	84	113	118	12

(Continued)

SOFTWARE (CAPITAL INVESTMENT) BUDGET BY AGENCY
GFY 1985-1987

CIVIL AGENCIES	$ MILLIONS			AAGR PERCENT 1985-1987
	1985	1986	1987	
Agriculture	14	17	12	(5)
Commerce	5	14	35	91
Energy	3	3	3	0
Education	(Less than 1 million)			0
Environmental Protection	1	1	2	26
FEMA	1	(Less than 1 million)		0
GSA	9	4	5	(18)
HHS	9	13	15	19
HUD	(Less than 1 million)			0
Interior	6	7	9	14
Justice	10	4	3	(33)
Labor	2	2	2	0
NASA	16	16	18	4
State	3	4	4	10
Transportation	6	6	5	(6)
Treasury	8	17	14	21
Other Civil	10	15	15	14
Total Civil	103	123	142	11
Total Federal	187	236	260	11

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- Civil agencies have more propensity for packaged software purchases and represent better vendor targets. Commerce is the largest buyer with $35 million requested in 1987, up an average of 91% since 1985. Other large target agencies include NASA, HHS, Treasury, and Agriculture.

- Exhibits III-8 and III-9 shed additional light on agencies' specific initiatives for software and related services through the forecast period. (Also see Chapter VI for specific key opportunities.)

C. FEDERAL MARKET ISSUES

1. REGULATIONS AND POLICIES

- As noted earlier, there is continuing pressure on agencies to contain costs by maintaining existing software and, when that is not possible, to acquire software packages rather than create new custom software. General Accounting Office (GAO) studies have assessed the experience of agnecies over the last several years and have identified these problems:

  - Agencies spend considerable amounts of programming time and on outside contracts to maintain software, but the maintenance process is frequently undermanaged. Lack of uniform definitions and control of costs are but two of the problems frequently cited.

  - The General Accounting Office has noted insufficient testing of software during development and installation. The establishment and compliance monitoring of testing policies as well as the more frequent use of automated tools and testing techniques, would, in the General Accounting Office's opinion, reduce the more expensive procedure of correcting errors after the software is in operation.

EXHIBIT III-8

MAJOR SOFTWARE DEVELOPMENT PROGRAMS BY AGENCY

	NUMBER OF PROGRAMS	TOTAL FISCAL YEAR 1986-1991 ($K)
DEFENSE AGENCIES		
Air Force	18	329,124
Army	9	751,062
Navy	12	120,256
DLA	1	1,500
Office of the Secretary	3	31,500
Total	43	1,233,442
CIVILIAN AGENCIES		
Agriculture	4	36,377
Commerce	3	146,971
Energy	5	45,920
HHS	3	73,780
Interior	2	132,250
HUD	1	350,000
Justice	1	1,000
Transportation	5	130,168
Treasury	6	195,863
GSA	4	924,043
NASA	6	90,110
EPA	3	72,600
Total	43	2,199,082

EXHIBIT III-9

MAJOR SOFTWARE PRODUCTS OPPORTUNITIES BY AGENCY

	NUMBER OF PROGRAMS	TOTAL FISCAL YEAR 1986-1991 ($K)
DEFENSE AGENCIES		
Air Force	11	265,071
Army	7	275,215
Navy	9	120,818
DLA	2	10,710
Office of the Secretary	3	311,725
Total	32	983,539
CIVILIAN AGENCIES		
Agriculture	4	18,670
Commerce	3	81,615
Energy	2	4,740
HHS	2	79,562
Interior	1	198,600
HUD	1	200,000
Justice	1	8,373
Transportation	3	311,000
Treasury	5	511,821
NASA	10	23,563
Total	32	1,437,944

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- Related to the above, the General Accounting Office has reported dramatic cost and schedule overruns in software development. Frequent problems include premature contracting before agencies fully understand what they need, missing or inappropriate performance criteria, inadequate management of the development process that result in missed agency-vendor communications, and failure to inspect contractors' work at intermediate stages.

- As a result of these and other deficiencies, software acquisition procedures are expected to undergo transition in the coming years.

  - The Army prepared new software support contracting standards (DoD-STD-1467-AR) for DoD-wide application.

  - Navy Data Acquisition Command (NAVDAC) instituted benchmark procedures for software packages that will be specified in future ADPE acquisitions.

  - Defense Acquisition Council to the Federal Acquisition Regulations presented changes to the FAR concerning the government's technical data and software rights when the government contracts for the development. Subsequent rejections by OMB led to a softened position in early 1987.

  - GSA instituted more stringent vendor financial and maintenance requirements for software offered in their computer stores and on FSS schedules.

  - GSA Request For Quotes for the GFY 1987 Software Federal Supply Schedules 70A and 70C required vendors to offer Lease-to-Ownership-Plans (LTOP) or equivalent perpetual leases after not more than 14 payments.

- A proposed change to FIRMR will allow each agency to select an acceptance criterion that is appropriate to the economic and performance risk of specific applications.

- Changes in both the Federal Supply Schedules and the Federal Acquisition Regulations in 1986 require vendors to offer packaged software at lowest "best client" discounted price or to demonstrate the commerciality of the product to support catalogue prices.

- OMB 86-12, "Federal Information Technology Systems and Planning," requires agencies to establish a baseline and set a goal of reducing software maintenance cost by 25% over three years.

- OMB A-130, "Management of Federal Information Resources," established the policy of choice for software packages over custom development and encouraged use of nonprocedural languages and modern software engineering techniques to improve maintainability.

- DoD noted in its fiscal year 1986 budget hearings before Congress its intentions regarding software acqusition, evaluation, and use for programming aids:

  - Use integrated and automated software tools and programming aids.

  - Reuse, where possible, previously acquired software packages.

  - Transfer, as soon as practical, the software development technology from the Software Institute to both in-house and contractor practices.

- These methods are being initiated at federal agencies:

  - The Bureau of Reclamations personnel and payroll system is used by the Departments of Energy and Education.

- ACTION contracted for the modification of an existing accounting system, saving 75% of the development cost and time to build a new system.

- Many agencies use software available from the National Association of State Information Systems.

2. SOFTWARE INTEGRATION

- Software is the interface medium between machines, applications, and end users. Agencies need strategies and vendor support to implement these integrations.

  - Agency respondents 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, as one respondent put it, fits the end-user's needs rather than the end user adapting his need to the capabilities of the software. No where is this demand more urgent than in the PC-based and PC-to-mainframe applications where simple, easy-to-use interfaces are more the exception than the rule.

3. PRODUCTIVITY IMPROVEMENT

- 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 dictionaires.

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

- Better analytic tools for all sizes of machines--microcomputers, minicomputers, and mainframes--that will provide programmers with development aids such as automatic documentation, cross-referencing, etc.

- 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 comprehension development of future systems. Specifications from the American National Standards Institution (ANSI) are now being reviewed by agencies and vendors. While a standard data dictionary software specification is some years away, vendors, especially of Data Base Management Systems (DBMS), need to be cognizant of the pending impact of this trend.

- Fourth generation languages (FGLs) are an integral set of familiar functions (DBMS, screen formatter, etc.) designed to assist end users in developing applications with a minimum technical knowledge. Agencies have started to acquire FGL packages as one means of offloading requests for EDP staff time. As data administration techniques come into play, FGLs will be acquired.

- The Programmer WorkBench (PWB) concept has been sponsored by the GSA's Federal Software Management Support Center. To date, two BETA tests have been established (SSA and DLA), the products have been selected, and contracts are in place for agencies to purchase these products from GSA. If

successful, the program will be expanded to include not only the entire IBM software management suite, but also non-IBM environments.

- Rand Information won the contract to design and implement the infrastructure. Other vendors are providing software products through an indefinite quantity contract with GSA.

- A generalized model of a computer-aided software programming workbench is depicted in Exhibit III-10.

- Artificial intelligence has not progressed beyond the exploration stage in federal agencies but does promise to be an exciting arena in future years. Agencies will continue to approach this market cautiously to sort out the "hypes" from the genuine applications.

4. THE UNIX SOLUTION

- An issue of concern to agencies is the interpretability of software across different vendors' hardware. Some agencies believe UNIX provides a partial solution to this problem. As depicted in Exhibit III-11, UNIX offers a common operating environment for all sizes of hardware, from supercomputers to microcomputers.

- References to a UNIX "standard" are now seen more frequently, although many authorities doubt the frequently quoted figures that 65% of the upcoming specs will specify UNIX.

  - The Army's information system's standards (see Exhibit III-12) include UNIX at both the organizational and work unit level.

  - The Navy has expressed to INPUT a desire to specify UNIX "top to bottom" if they could. And, some procurements now require UNIX (e.g., the Navy/DLA EDMICS program).

EXHIBIT III-10

GENERALIZED PROGRAMMER WORKBENCH

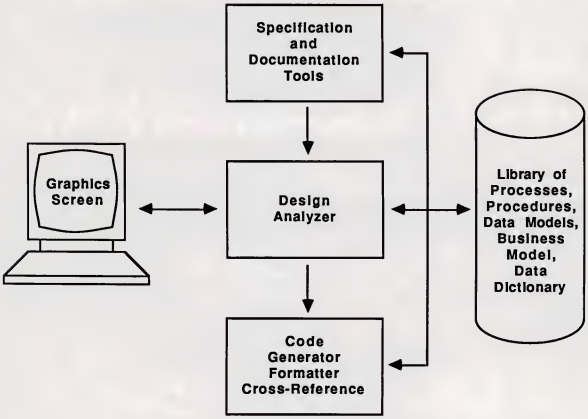

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EXHIBIT III-11

EVOLUTION OF OPERATING SYSTEMS STANDARDS

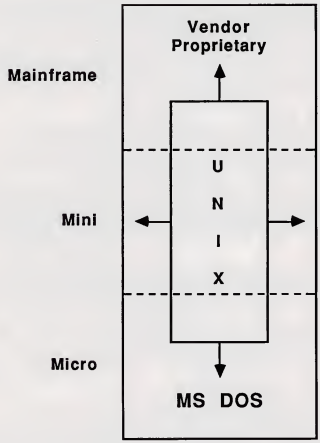

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EXHIBIT III-12

ARMY INFORMATION SYSTEMS STANDARDS

TIER I - REGIONAL PROCESSING

Operating System	-	MVS
Data Base Management System	-	Any DBMS with SQL interface
Hardware	-	No standard defined

TIER II - INSTALLATION/ORGANIZATIONAL

Operating System	-	Unix5; or VM able to host CMS/VSE/MVS/Unix5
Data Base Management System	-	Any DBMS with SQL interface
Hardware	-	No standard defined

TIER III - USER PROCESSING

Operating System	-	Unix5 or MS-DOS
Data Base Management System	-	No standard defined
Hardware	-	PC shall be IBM-compatible

COMMUNICATIONS: Tiers I and II able to use IBM Systems Network Architecture (SNA) or SNA gateway with remote job entry (RJE), 327X emulation, and document interchange/document content architecture (DIA/DCA) and option for DoD protocols.

ARTIFICIAL INTELLIGENCE (AI): Workstations for AI applications will be able to support "common LISP."

Source: DAIM-AD
(Department of the Army Information Management)

- DoD security agencies will be major prospects due to interoperability and ADA requirements.

- ICST/NBS is working on a Portable Operating System (POSIX) UNIX-like standard.

- The IRS has been buying Microsoftware's XENIX for IBM's ATs, and NSA is running UNIX System V on AT&T's 3Bs.

- More widespread adoption of UNIX could be slowed by several large hurdles.

  - Agencies are reluctant to specify UNIX for fear that such a standard would unduly restrict competition and lead to more problems with vendor protests than they care to have.

  - There is the question of the large installed base of applications built on vendor proprietary operating systems such as IBM's MVS. Agencies have neither the money nor inclinations to make this much software obsolete.

  - Finally, a clear, standard UNIX environment is missing. Several versions (e.g., AT&T's, BSD's, XENIX) are on the market. While they are more similar to one another than to other operating systems, the look of a single specification would only lead to the same type of mismatch agencies correctly have.

- It is INPUT's view that these issues will not readily be solved and that the evolution of a UNIX standard will compete with other approaches to software modernization, including fourth/fifth generation languages (FGLs), data administration technologies, programmer's workbench, and the like.

5. ADA USAGE

- While the current (1986) expenditure size of the Ada market can only be estimated in the $200 million range, signs indicate that Ada will continue to develop at a healthy rate. New directives from DoD, for example, make it increasingly difficult to obtain a waiver from the use of Ada in many areas, especially mission critical applications. The Army, in particular, has stated that Ada is the software development language for projects in AWIS, AMC, and ISEC. Rather than waivers, program managers may be given extra time to develop Ada code. Other DoD agencies have also publicly supported Ada, although a more gradual transition seems favored.

- The Software Engineering Institute at Carnegie Mellon University has undertaken several Ada-related projects to develop the software technology: an Ada adoption handbook, an Ada embedded system testbed, an investigation of Ada software engineering technology dissemination, an evaluation of Ada environments, and an analysis of use of Ada with reduced instruction set computers (RISC).

D. FEDERAL SOFTWARE AND RELATED SERVICES VENDORS

- The enormous size of the federal opportunity and the vast spectrum of products and services acquired attracts a host of vendors. Whether covering a breadth of offerings or serving a niche, large and small vendors to the federal government must be counted among the competition. Numerous acquisition channels (GSA programs, sole-sources, competitive bids) and a regulatory structure intended to ensure equal opportunities for vendors provide each vendor with an attractive potential.

- But, the reality of the software and related services market is that a significant share is held by a few vendors.

- In the software products segment, the market is dominated by mainframe hardware vendors, primarily on the strength of their accompanying systems software. Independent software product suppliers form a distant second tier group.

- Similarly, software development revenue from the government is largest for major systems houses which can offer a wide range of professional services. Niche vendors who target specific applications, operating systems, etc., form the second tier.

- Exhibit III-13 depicts INPUT's estimates of revenue and share in the overall software and related services market.

  - IBM heads the list on the strength of its FSS sales, with Digital Equipment Corporation among the computer manufacturers a distant second on sales of software products. A third manufacturer included in the top list is Unisys with nearly equal sales from Sperry in software products and System Development in software development.

  - Systems houses round out the list except for Batelle, a large not-for-profit professional services organization.

- The important point of this exhibit is that no single vendor has a franchise in this market. Rather, the ten leading vendors account for only approximately 50% of the market.

- Market share, indeed the competitive structure of the market, is complicated by the changing pattern of vendor teams for different programs. Today's bidding partners are frequently tomorrow's competitors, and vice versa.

EXHIBIT III-13

ESTIMATED VENDOR REVENUE AND SHARE
GFY 1986

VENDORS	($M) FEDERAL SOFTWARE PRODUCTS 1986	PERCENT FEDERAL SOFTWARE PRODUCTS 1986	($M) FEDERAL SOFTWARE DEVELOP-MENT 1986	PERCENT FEDERAL SOFTWARE DEVELOP-MENT 1986	($M) TOTAL FEDERAL SRS 1986	PERCENT TOTAL FEDERAL SRS 1986
IBM	158	32	40	4	198	13
Computer Sciences Corporation	0	0	94	9	94	6
BDM International	0	0	73	7	73	5
Grumman Data Systems	0	0	70	7	70	5
Digital Equipment Corporation	63	13	5	1	68	5
Batelle Memorial Institute	23	5	36	4	59	4
Unisys	23	5	31	3	54	4
Syscom	0	0	47	5	47	3
CACI	0	0	47	5	47	3
Logicon Corporation	0	0	38	4	38	3
Other Vendors	232	45	529	51	752	50
Total Software and Related Service	499	100	1,000	100	1,400	100

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E. SUMMARY AND CONCLUSION

- The federal government's growing needs for software and related services will not abate through the forecast period. In fact, agency funding requests, planned initiatives, and regulatory changes all point to a fairly robust market for both software development services and, especially, software products.

- But, outside of the FSS, this is not an easy market to address. The distribution of available dollars among agencies is widespread, and each agency has specific software needs that are only infrequently addressable by a large number of vendors.

- After vendors spend resources seeking these opportunities, thay are likely to find long lines of competitors at the same doors. The final attractiveness of the market and the diversity of agencies' needs has swelled the competitors ranks.

- In addition to competition on the basis of price and performance, a necessary condition in this market, vendors must also compete on the basis of their commitment to the offering, general company image, and level of support offered.

- INPUT recommends that vendors not only concentrate on these competitive strategies, but also seek to enhance the desirability of products/services by closely aligning offerings with agencies' needs and requirements. Understanding and addressing agencies' business needs, rather than a "generic, one-size-fits-all" sell, could lead to the capture of additional market share. Issues of transportability and interoperability of software are just two examples of issues that vendors should address opportunistically.

- INPUT also recommends that vendors explore alternative distribution channels, such as systems houses and computer manufacturers. These types of

vendors are learning the value of third-party distribution and are frequently looking for products/services to fill out their own offerings. Their large size and market presence could prove beneficial to smaller vendors with uniqu products who do not have the resources to properly cover the opportunities.

IV AGENCY REQUIREMENTS AND TRENDS

- To uncover differences among agency survey respondents, the data collected during this study was grouped according to the type of acquisition (packaged, modified packaged, or custom developed system) most frequently made by the agency.

A. REASONS FOR TYPE OF ACQUISITION SELECTED

- Respondents who indicated a preference or practice for acquiring packaged, modified, or custom software were asked to cite reasons for this choice.
  - Packaged software buyers stated:
    - The applications are simple and general purpose.
    - Packages are more cost-effective.
  - Modified package software buyers stated:
    - The number of users involved means some modifications to meet some variations.

- Enhancements are made to accomodate new or unique input/output devices.

- It takes too long for custom developers to build systems.

- Custom developed software buyers stated:

  - Unique requirements make it necessary to build unique products.

  - There is an in-house capability to develop software. That capability must be used or lost.

  - The application is classified.

  - A desire to be independent of the vendors' software approaches.

B. EXPECTED CHANGES IN PRODUCT/SERVICE ACQUISITION MIX

- Although the results run counter to the emerging "make-do-with-what-we've-got" philosophy, approximately 50% of these respondents expect their agency's software product/service acquisitions to remain the same or, in some cases, decrease, as shown in Exhibits IV-1 and IV-2. There are, however, notable exceptions:

  - By agency.

    - Both civil and defense agency respondents expect to increase their packaged applications software acquisitions and maintain or reduce both applications and systems that are custom developed.

EXHIBIT IV-1

EXPECTED CHANGES IN PRODUCT/SERVICE ACQUISITIONS BY TYPE OF AGENCY

PRODUCT/SERVICE CATEGORY	RESPONDENT GROUP/EXPECTED CHANGE (PERCENT OF RESPONDENTS)					
	CIVIL			DEFENSE		
	IN-CREASE	DE-CREASE	NO CHANGE	IN-CREASE	DE-CREASE	NO CHANGE
Packaged Applications	11	11	78	0	22	78
Packaged Systems	7	40	53	0	59	41
Custom Applications	16	40	44	18	53	29
Custom Systems	11	74	15	11	61	28
Contract Maintenance	3	45	52	0	30	70

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EXHIBIT IV-2

EXPECTED CHANGES BY TYPE OF PRODUCT/SERVICE ACQUISITIONS

TYPE OF PRODUCT/SERVICE	EXPECTED CHANGE (Percent of Respondents)			TOTAL
	DECREASE	STAY SAME	INCREASE	
Applications Software	11	30	59	88
Systems Software	7	58	35	92
Packaged Software	6	31	63	93
Custom Software	14	57	29	87

- Defense agency representatives, in general, expect to increase contract software maintenance while civil agency representatives noted an almost equal split between maintaining/reducing and increasing software maintenance acquistions.

- By type of product, especially respondents who acquire both applications and systems software:

  - Packaged applications acquisitions are expected to increase while custom developed applications are more likely to remain at their current levels.

  - Packaged and custom developed systems software acquisitions are expected to remain at their current levels although there appears to be an expectation that packaged systems softwar acquisitions could increase.

  - Contract maintenance will likely increase.

- By type of acquisition (package, modified package, custom):

  - Packaged software buyers expect increases in applications acquisitions but not in systems acquisitions.

  - Packaged software acquirers also expect custom developed applications to remain at the same level or decrease.

  - Acquirers of modified packages and fully custom developed software generally expect increases across the board.

  - A majority of respondents in these categories expect contract software maintenance to increase.

- In sum, the general expectations are that contract maintenance acquisitions will increase along with packaged applications, custom applications, and packaged systems acquisitions. Custom systems software acquisitions will remain at current levels. In any case, mission-oriented software acquisitions are expected to grow at a faster rate than "general purpose" business software.

- An indication of the extent of the expected change in software products/services acquisitions in the next two to five years was provided by a subset of the respondents. Exhibit IV-3 indicates for this sample:

  - A strong increase in packaged applications acquisitions.

  - A more moderate increase in contract maintenance and packaged systems software.

  - With change in custom applications development.

  - A significant decline in custom systems development.

C. SIZE OF TARGET MACHINE

- Exhibit IV-4 indicates that the target machines for software acquisitions are mainframes, micros, and minis, in that order. The differences were negligible between civil and defense agencies. However, agencies that acquired packaged software made acquisitions for all sizes of machines while modified packages and custom developed software were generally for mainframe use.

EXHIBIT IV-3

EXPECTED CHANGE OF NEAR-TERM PRODUCT/SERVICE ACQUISITIONS

PRODUCT/ SERVICE CATAGORY	Number of Respondents	CHANGE (Percent)		
		LOW	HIGH	AVERAGE
Packaged Applications	13	5	100	31
Packaged Systems	7	2	25	13
Custom Applications	7	-30	50	4
Custom Systems	3	-100	5	-35
Contract Maintenance	7	2	33	19

EXHIBIT IV-4

SIZE OF RESPONDENTS' TARGET MACHINES

MACHINE SIZE	TYPE OF AGENCY (Percent of Response)	
	CIVIL	DEFENSE
Microcomputer	35	32
Minicomputer	24	29
Mainframe Computer	41	39

D. SOFTWARE AND SERVICES SELECTION CRITERIA

- Ratings of important factors in the selection of applications software vendors by applications package users versus all package users or all respondents did not vary significantly, as shown in Exhibit IV-5, although several observations are noteworthy.

  - Vendor training topped the applications users group selection criteria but appeared in the middle rankings for the other two groups. Vendors' training offerings were rated most critical in applications software.

  - Rankings for ease of use and product commitment by the applications group were stronger, although the three groups placed these criteria at or near the top of the list.

  - The extent of federal experience needed by the vendor was given the lowest rank of each list, with price only one level above. For applications package software buyers, the quality of the product and the positive image of the vendor superseded these issues.

- Systems software package users, as shown in Exhibit IV-6, differed from all package users and all respondents in several ways:

  - All ratings were generally lower for the package user group, reflecting the level of importance attached to applications packages.

  - Performance and product commitment were particularly high-ranking criteria for the packaged systems users.

  - The vendors' federal experience criterion ranking again was very low for the systems group, with few agencies rating it above "1" on a scale of 1 to 5. Packaged software vendors do not need prior experienc in this market, although a positive perception of the vendor is necessary.

EXHIBIT IV-5

PACKAGED SOFTWARE AND VENDOR SELECTION CRITERIA APPLICATIONS SOFTWARE

CRITERION	RESPONDENT GROUP/RATING*		ALL RESPONDENTS AVERAGE
	APPLICATIONS USERS	APPLICATIONS PACKAGE USERS	
Ease of Use	4.6	4.4	4.4
Product Commitment	4.6	4.4	4.4
Performance	4.4	4.3	4.3
Documentation	4.3	4.3	4.3
Training	4.9	4.1	4.1
Support Reputation	4.3	4.0	4.0
Service Quality	3.9	4.1	4.0
Software Features	4.3	3.9	4.0
Application Knowledge	4.0	3.9	3.9
Ease of Implementation	3.7	3.8	3.8
Product Price	3.6	3.3	3.3
Federal Experience	3.0	2.6	2.7

*1 = Not Important; 5 = Very Important

EXHIBIT IV-6

PACKAGED SOFTWARE AND VENDOR SELECTION CRITERIA SYSTEMS SOFTWARE

CRITERION	RESPONDENT GROUP/RATING*		ALL RESPONDENTS AVERAGE
	SYSTEMS USERS	SYSTEMS PACKAGE USERS	
Performance	4.5	4.2	4.5
Documentation	4.3	4.2	4.4
Product Commitment	4.5	4.0	4.4
Ease of Use	4.0	4.2	4.0
Support Reputation	4.0	3.7	3.9
Service Quality	4.1	3.5	3.9
Software Features	3.9	3.3	3.9
Application Knowledge	3.8	3.5	3.7
Training	3.9	3.5	3.7
Ease of Implementation	3.3	4.2	3.4
Product Price	3.1	3.2	3.0
Federal Experience	2.5	1.7	2.5

*1 = Not Important; 5 = Very Important

- By comparing civil to defense agency respondents, the relative importance of each criterion indicates some additional trends.

  - The vendors' support reputation and service quality appeared more important to civil agencies who do not have adequate in-house staffs to maintain applications and software systems on their own.

  - Product commitment was rated as very important in particular to civil and defense agencies buying applications packages but not to defense agancies buying systems software. Again, defense may be more able to rely on in-house capabilities to maintain products.

- Importance ratings for custom software vendor selection (see Exhibit IV-7) also indicated a marked difference between civil and defense agencies regarding vendor support. Although other rankings were similar, civil agencies placed greater importance on the vendor's reputation for support. Civil agencies also ranked target hardware and installation experiences somewhat higher, reinforcing the perception that civil agencies depend more on vendors to deliver complete, fully operational solutions.

- Software performance as a selection criterion will increasingly mean more than answering the question, "Does the product do what we need to have done?" Key criteria now include:

  - Limiting the number of different software packages for each application to effect greater standardization and ease of data center support.

  - Standardizing the data exchange formats to effect file/data portabiltiy between applications.

  - Adopting de facto industry standard packages to ensure availability of I/O device drivers and packaged training programs and documentation.

EXHIBIT IV-7

VENDOR SELECTION CRITERIA
CUSTOM SOFTWARE

CRITERION	RESPONDENT GROUP/RATING*		ALL RESPONDENTS AVERAGE
	CIVIL	DEFENSE	
Development Experience	4.2	4.6	4.4
Application Experience	4.2	4.3	4.3
Target Language Experience	4.1	4.4	4.3
Integration Experience	4.2	4.0	4.1
Training	4.0	3.9	4.0
Support Reputation	4.0	3.5	3.7
Target Hardware Experience	3.9	3.3	3.6
Installation Experience	3.6	2.8	3.2
Price	3.2	3.2	3.2
Federal Experience	3.1	2.5	2.8
Agency Experience	2.8	2.4	2.6

*1 = Not Important; 5 = Very Important

E. ACQUISITION METHODS

- Regardless of whether software was acquired as a package or through custom development by a professional services firm, the methods of acquisition include competitive bids, GSA Federal Supply Schedules, or purchase order (see Exhibit IV-8).

- As indicated in the top portion of the exhibit, differences exist in the frequency with which agencies acquire different types of packages.

  - Competitive bids are more frequently employed than the other alternatives, and defense agencies make more frequent use of the competitive approach than do civil agencies.

  - Typically, packages that will be modified are most frequently acquired by competition.

  - Applications software is also more frequently purchased competitively, with many of the systems software buys tied to the hardware, not to standalone software.

  - GSA Schedule Orders and Direct Agency Purchase Orders, while used less frequently across the board, do provide opportunities for all types of package vendors. Additional frequency usage of GSA schedule is noted in civil agencies and in systems software. Acqusition via purchase orders is used more often by in civil agencies and also systems software.

- Professional services acquisition methods (lower table in Exhibit IV-8), with one exception, follow the same order of frequency of method (bid, schedule, purchase order) regardless of agency or type of software to be developed. The exception is the custom development of systems software where employing GSA supply schedules is the most frequently used approach.

EXHIBIT IV-8

RATINGS OF FREQUENCY OF USAGE OF VARIOUS ACQUISITION METHODS

SOFTWARE PACKAGES

ACQUISITION METHOD	AVERAGE RATINGS BY GROUP*							ALL RESPONDENTS
	AGENCY		PRODUCTS			ACQUISITION		
	Civil	Defense	Application	System	Both	Package	Modified	
Competitive Bid	3.7	4.0	4.4	3.4	3.8	3.8	4.1	3.8
GSA Schedule	3.5	3.3	3.1	3.4	3.5	3.5	3.2	3.4
Purchase Order	3.0	2.3	2.3	3.2	2.8	2.9	2.3	2.8

PROFESSIONAL SERVICES

ACQUISITION METHOD	AVERAGE RATINGS BY GROUP*						ALL RESPONDENTS
	AGENCY		PRODUCTS			ACQUISITION	
	Civil	Defense	Application	System	Both	Custom	
Competitive Bid	3.5	3.7	4.0	3.0	3.6	3.0	3.6
GSA Schedule	2.9	3.2	3.0	3.5	3.0	2.0	3.1
Purchase Order	2.6	1.9	1.4	3.0	2.5	1.0	2.3

* 1 = Not frequently used; 5 = Quite frequently used

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F. TESTING AND ACCEPTANCE PROCEDURES

- The favorite testing and acceptance procedure, regardless of the type of product or service, method of acquisition, or classification of agency respondent, is a trial period. This practice is followed less frequently be benchmarking, parallel testing, or independent verification and validation (IV&V), as shown in Exhibit IV-9.

- IV&V, in particular, was reported as very infrequently used except for civil agencies and agencies acquiring systems software.

- Benchmarking is costly, but sometimes the only appropriate testing procedure. A 1982 GAO study ("Benchmarking: Costly and Difficult, But Often Necessary When Buying Computer Equipment or Services" GAO/AFMD-83-5 (10/22/82) B-208077) of 65 benchmarks indicated that the typical benchmark cost (external cost only) ranged between $40,000 and $200,000, but in GAO's opinion was the only appropriate test of the procurement. Much of the cost, however, stemmed from agency errors in benchmark programs, poor documentation, and dificulties in communicating with the agency in resolving technical issues caused by the first problem. GAO recommended that, when appropriate, other evaluation methods be used. In order of increasing cost, these methods include:

  - "Paper" or technical evaluation.

  - Analytical modeling.

  - Simulation.

- Agencies must, of course, be mindful of GAO's auditing standards in that some agency sytems may be subject to GAO audit. These audits are specifically designed to assess the reliability and, therefore, the degree of risk involved in

EXHIBIT IV-9

RATINGS OF FREQUENCY OF USAGE OF VARIOUS TEST AND ACCEPTANCE PROCEDURES

ACQUISITION METHOD	AVERAGE RATINGS BY GROUP*							ALL RESPONDENTS
	AGENCY		PRODUCTS			ACQUISITION		
	Civil	Defense	Application	System	Both	Modified Package	Modified	
SOFTWARE PRODUCTS								
Trial Period	3.8	4.5	4.0	4.4	4.1	4.0	4.1	4.1
Benchmark	3.4	4.2	4.3	4.2	3.6	3.6	3.9	3.7
Parallel Testing	3.0	2.8	2.5	3.8	2.9	2.9	3.2	3.0
IV and V	2.9	2.3	2.0	2.8	2.7	2.7	2.8	2.6
PROFESSIONAL SERVICES								
Trial Period	3.3	4.6	4.0	4.5	4.4	3.9	5.0	4.3
Benchmark	3.8	4.0	3.7	4.5	3.9	3.6	5.0	3.9
Parallel Testing	3.2	3.1	2.7	4.0	3.2	3.1	3.0	3.1
IV and V	3.1	2.0	2.2	4.0	2.7	2.3	2.0	2.6

* 1 = Not frequently used; 5 = Quite frequently used

G-SRS

using computer processed information. Various data reliability tests are performed by auditors on a timely basis to ensure the relevancy, accuracy, and completeness of computer output.

G. POST-IMPLEMENTATION SUPPORT

- An important part of the vendor selection process is the vendor's reputation for supporting the client and the product. In this research, the ranking of those considerations (see Exibit IV-10) was:
  - Fixing errors.
  - Improving features/functions.
  - Training.
  - Extending features/functions.
  - Adding features/functions.
  - Consulting.
- With few exceptions, the rankings were high indicating a high level of expectations for vendor support services. There was little variations in the rankings; regardless of groupings, all the following variations are noteworthy.
  - Compared to defense agency respondents, civil respondents believe fixing errors and consulting services are more important. Again, this reflects civil's lack of in-house personnel to fulfill these functions.

EXHIBIT IV-10

RATINGS OF IMPORTANCE OF VENDOR REPUTATION FACTORS IN POST-IMPLEMENTATION SUPPORT

SOFTWARE PRODUCTS									
	AVERAGE RATINGS BY GROUP*								
	AGENCY		PRODUCTS			ACQUISITION			
FACTOR	Civil	De-fense	Appli-cation	System	Both	Pack-age	Modi-fied Pack-age	Cus-tom	ALL RESPON-DENTS
Fixing Errors	4.7	4.2	4.7	4.0	4.5	4.6	3.9	4.5	4.5
Improve Features/ Functions	4.1	3.9	4.4	3.3	4.0	4.1	3.7	4.5	4.0
Training	4.0	4.1	4.9	3.2	4.0	4.1	3.9	3.5	4.0
Extend Features/ Functions	3.8	3.8	4.1	3.2	3.8	3.8	3.7	4.0	3.8
Add Features/ Functions	3.8	3.8	4.3	3.3	3.8	3.9	3.6	4.0	3.8
Consulting	3.7	3.1	2.7	3.2	3.7	3.5	3.7	2.5	3.5

* 1 = Not Important; 5 = Very Important

- Applications software users ranked all factors higher than systems software users. This seems to reflect the fact that systems software is more transparent to users than are applications. Training adds additional features/functions are particularly important to applications users.

- Interestingly, training is not rated as critical for custom-developed software as far packaged software. Perhaps the close association with the professional services vendor over the development period provides some of the training that agencies would otherwise look for.

- Consulting services provided by package software vendors is more important since the package buyer looks for advice in selecting a package. In custom development work, the associated consulting services (design, requirements definition) have usually been delivered prior to selecting the actual developer.

- Most respondents did not feel that vendors offered services beyond those listed above, but some examples of additional services identified included systems design/analysis, installation, programming, and data entry.

- When asked if vendors' problem resolution had proven to be "satisfactory," 77% of the respondents said it was.

  - Among those who said it was not satisfactory came the following suggestions for improvement:

    . A more knowledgeable sales staff that shows more interest.

    . More efficient contracting methods.

    . More and better support.

- . Faster service response.

- . Post-implementation following-through on commitments made at the time of sale.

- Respondents were equally divided on the question of whether vendors could improve problem resolution performance. The cynics among the respondents felt poor performance was "just a part of business" and a matter of "economics" for the vendors.

H. SELF-SUPPORT

- An alternative to costly or unavailable vendor support is self-support. To assess the frequency with which agencies engage in self-support activities, respondents were asked to identify, on a scale of 1 to 3, worded as "Never," "Sometimes," and "Usually," their level of self-support.

  - Exhibit IV-11 shows, in general, that installation of updates is usually completed by the agency, but other self-support activities are undertaken less frequently.

  - Defense agencies appear to engage in less self-support, perhaps because more of the work is contracted out.

  - Those who acquire packages, on the other hand, tend to provide more self-support.

- In looking at future directions, these groups expected little change in frequency of self-support.

EXHIBIT IV-11

RATINGS OF FREQUENCY OF USAGE OF TYPES OF SELF-SUPPORT USED WITH SOFTWARE PACKAGES

	AVERAGE RATINGS BY GROUP*							
	AGENCY		PRODUCTS			ACQUISITION		
SELF SUPPORT ACTIVITIES	Civil	De-fense	Appli-cation	System	Both	Pack-age	Modi-fied Pack-age	ALL RESPON-DENTS
Install Updates	2.8	2.4	2.7	3.0	2.6	2.6	2.6	2.6
Centralize Questions	2.4	2.3	1.8	2.3	2.5	2.4	2.0	2.4
Install Release	2.4	2.0	2.0	2.5	2.2	2.3	1.9	2.2
Modify Package	2.1	1.9	2.2	2.7	1.9	1.8	2.6	2.0
Fix Errors	2.1	1.9	2.2	2.5	1.9	1.9	2.1	2.0

* 1 = Never; 3 = Usually

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V COMPETITIVE TRENDS

- The preceding sections provide a view of the federal government market for software and related services from the agencies' perspectives. In this section, the same market is examined by representative vendors' opinions and contrasted with the agencies to develop an understanding of the opportunities and concerns encompassing this market.

A. VENDOR PARTICIPATION

- The software and related services markets, as defined in this report, allow vendors to approach the market with varied capabilities and by at least two general approaches the federal government uses to acquire products/services. Vendor participation in this market is discussed below under the latter category: GSA program participation and individual agency contracting.

1. GSA PROGRAM PARTICIPATION

- GSA frequently acts as the intermediary between vendors and individual agency buyers through a series of programs designed to simplify the contracting process including the specification of approved products/services and the establishment of government-wide prices for their products/services.

- Schedule 70 of the Federal Supply Schedule (FSS) provides a program vehicle for agencies to acquire, among other things, computer equipment purchase and rental; equipment maintenance repair and spare parts; and software rental, purchase, and maintenance.

  - The leading hardware vendors selling software products via FSS 70A in government fiscal year 1986 are listed in Exhibit V-1. Leading Schedule 70A independent software vendors are presented in Exhibit V-2.

  - As noted throughout this report, systems software is frequently acquired with the hardware from the hardware manufacturer. This is reflected in Exhibit V-1, which credits leading hardware suppliers IBM, Digital, Hewlett-Packard, Control Data, and Unisys, with over 57% of the Schedule 70 expenditures.

  - Except for Software AG and ADR, leading independent vendors achieve revenue volume only on a par with the smallest hardware vendors. While these vendors should not overlook this revenue source, they must pursue other strategies that include individual contracts with agency buyers and relationships with leading computer/hardware manufacturers.

- Three other GSA programs of note and the participating vendors are included in Exhibits V-3 and V-4.

  - The Contract Services Program (CSP) provides for the acquisition of professional services, primarily software development, to support the ADP requirement in each of the GSA regionals. Individual task contracts have been awarded for up to $1 million, but contracts between $100 - 500 thousand are more typical. Contracts are awarded for a one-year base period, with two or three possible one-year option add-ons. A total of $148 million was budgeted for CSP in fiscal year 1986.

EXHIBIT V-1

LEADING GSA SCHEDULE 70A SOFTWARE PRODUCTS VENDORS GFY 1986

VENDOR	($M) SOFTWARE RENTAL, PURCHASE AND MAINTENANCE	PERCENT OF SCHEDULE 70A VENDOR'S TOTAL	PERCENT OF SOFTWARE SCHEDULE TOTAL
IBM	93.8	15	35
Digital Equipment	23.2	9	15
Hewlett-Packard	5.6	9	4
Control Data	3.2	17	1
Unisys:	2.2	6	2
Sperry 1.5		5	2
Sys. Dev. .7		6	<1
Xerox	2.0	5	2
Tektronic	.9	4	1
Gould S.P.L.	.7	4	1
Data General	.5	1	2
Other Vendors	43.0	7	37
Total	176.1		100

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EXHIBIT V-2

LEADING GSA SCHEDULE 70 INDEPENDENT SOFTWARE VENDORS

VENDOR	FISCAL YEAR 1985 DOLLAR VOLUME ($ MILLIONS)
Software AG	2.8
ADR (Ameritech)	1.9
Computer Associates	1.7
CINCOM	1.6
UCCEL	1.2
Information Builders	0.9
Sterling Software*	0.7
Sage	0.6
Oracle	0.5
Mathematica (Martin Marietta)	0.4
Pansophic	0.4

* Includes both Informatics General Corporation and Sterling Software Marketing

EXHIBIT V-3

GSA CONTRACT SERVICES PROGRAM (CSP)

Region 1:	**Vanguard Technologies Corporation**
Region 2:	**Computer Data Systems, Inc.**
Region 3:	**Computer Data Systems, Inc.**
Region 4:	**Computer Sciences Corporation**
Region 5:	**Systems and Applied Sciences Corporation***
Region 6:	**OAO Corporation**
Region 7:	**OAO Corporation**
Region 8:	**Systems and Applied Sciences Corporation**
Region 9:	**Planning Research Corporation**
Region 10:	**Computer Sciences Corporation**
National Capital Region (NCR):	**Planning Research Corporation**

* Now part of ORI Group, Atlantic Research Corporation

EXHIBIT V-4

FEDERAL SOFTWARE MANAGEMENT SUPPORT CENTER PROGRAMMERS' WORKBENCH PRODUCTS

TOTAL CATEGORY	SUPPLIER
PWB/Base Configuration	Rand Information Systems, Inc.
PWB/Data Base Configuration	Rand Information Systems, Inc.
Test Coverage Monitor	Aldon Computer Group
Translator	UCCEL Corporation
Reformatter	Blackhawk Data Corporation
Data Standardization	Marble Computer, Inc.
Cross-Reference	Marble Computer, Inc.
Documentation	Peat, Marwick, Mitchell & Co.
Source & File Compare	Sterling Software Corporation
Data Manipulation	XA Systems Corporation
Restructurer	Peat, Marwick, Mitchell & Co.
Code Analyzer	VIASOFT, Inc.

Source: GSA Federal Software Management Support Center

- Current contractors under this program are listed in Exhibit V-3. The GSA reorganization from eleven regions to five zones will take effect as the current contracts expire. Solicitations are expected to be released from early 1987 through the end of 1989.

- Systems software products contractors for the Programmers WorkBench (PWB) Program of the GSA Federal Software Management Support Center (FSMC) are listed in Exhibit V-4.

  - In this program, GSA has distribution rights based upon a negotiated price for a period of one year with four one-year options.

  - While vendors are required to provide training and maintenance for one year, software problems are routed through GSA to Rand Information (the chief architect of the workbench), and from there to the vendor.

- One other example of GSA's support programs, also coordinated at FSMC, is the Office of Software Development and Information Technlogy(OSD IT). This program provides for the acquisition of services for software conversion and software improvement under Basic Agreements. The ADP Fund in GSA's Office of Information Resource Management provides the agency using the Center's services with the option of paying the contractor directly or paying the contractor through the ADP fund. Current BA holders for each service are listed in Exhibit V-5.

2. GENERAL MARKET PARTICIPATION

- The federal government is the largest customer of professional services and thereby attracts the widest range of vendors by size and specialization. Exhibit V-6 indicates the leading vendors by market share to the extent that portion of their federal revenues are identifiable.

EXHIBIT V-5

VENDORS HOLDING BA AGREEMENTS WITH OSD IT

VENDOR	PROGRAM	
	CONVERSION	IMPROVEMENT
Batac Corporation		X
C.A.C.I. Federal	X	
Cap Gemini America	X	X
Compu-Staff		X
Computer Data Systems	X*	X
Computer Science Corporation	X	X
Daimo Victor, Incorporated	X	X
Data Base Management, Incorporated		X
Electronic Data Systems		X
Grumman Data Systems	X	X
HRB Singer	X	X
INPUT OUTPUT Computer Services		X
Martin Marietta Data Systems	X	X
OAO Corporation	X	X
PRC Government Information Systems	X	X
Pect, Marwick, Mitchell & Co.		X
Rand Information Systems	X	
Sterling Systems		X
Systems Automation Corporation	X	X
Tidewater Consulting	X	
Unisys Corporation	X	

* Note - More than one group holds a BA

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EXHIBIT V-6

ESTIMATED VENDOR REVENUE AND SHARE
GFY 1986

VENDORS	($M) FEDERAL SOFTWARE PRODUCTS 1986	PERCENT FEDERAL SOFTWARE PRODUCTS 1986	($M) FEDERAL SOFTWARE DEVELOP-MENT 1986	PERCENT FEDERAL SOFTWARE DEVELOP-MENT 1986	($M) TOTAL FEDERAL SRS 1986	PERCENT TOTAL FEDERAL SRS 1986
IBM	158	32	40	4	198	13
Computer Sciences Corporation	0	0	94	9	94	6
BDM International	0	0	73	7	73	5
Grumman Data Systems	0	0	70	7	70	5
Digital Equipment Corporation	63	13	5	1	68	5
Batelle Memorial Institute	23	5	36	4	59	4
Unisys	23	5	31	3	54	4
Syscom	0	0	47	5	47	3
CACI	0	0	47	5	47	3
Logicon Corporation	0	0	38	4	38	3
Other Vendors	232	45	529	52	752	50
Total Software and Related Service	499	100	1,000	100	1,400	100

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- The market is dominated by system houses and hardware firms.

  - These firms require a broad range of in-house or consultant skills to meet software development and implementation requirements.

  - Hardware firms primarily provide systems software, with applications software packages and software development as secondary lines of business.

- Bidding strategies for this mode are different than for others.

  - A primary requirement is availability and commitment of key qualified managers and professionals.

  - There is an increasing tendency toward the use of fixed-price bids on late development and the implementation phases of new or replacement systems.

  - Some specialized small businesses, consulting firms, and academic groups are key to an award where the agency believes they have the requisite background or functional experience.

  - In-depth support of the main body of employees and managers can be a key criteria.

  - Reputation has high value in this service mode, especially for cost control, management commitment, staff quality, and availability.

  - Knowledge of available and applicable software packages that can be fitted to agency requirements can be a deciding factor in some bids.

- A thorough knowledge of government contracting procedures, audit requirements, and bid evaluation processes are essential to maximize proposal scores for negotiated procurements.

- In-depth knowledge of, and exposure to, agency mission and system functional requirements are important elements for establishing credibility with the potential client.

- The software products segment of the market is led by computer manufacturers with independent software package vendors ranked as distant seconds (see Exhibit V-6). This ranking includes systems and applications software products.

  - Key strategies for selling software products in the federal arena are not uniformly practiced by all of the successful vendors, but some combinations apply.

    - Discounts for multiple sites within an agency are important.

    - Discounts for multiple agencies within a cabinet-level department also apply.

    - BETA testing of applicable products by key agencies permits placement on the Qualified Products List (QPL) for future accelerated acquisition.

    - Qualification for the GSA Federal Supply Schedules (FSS) sometimes permits uncontested acquisition in small lots. (The "ground rules" for an FSS annual agreement have some serious drawbacks, however.)

      - The vendor must offer product/service discounts as large as those received by the vendor's "best customer," including foreign clients.

- The vendor must offer a purchase plan or permanent license after a specified rental period.

- The vendor must offer post-installation service and support on a nearly universal basis.

. Demonstrated post-implementation support, especially of the "Quick Reaction" (QR) type.

. Availability of the package for several host machines, especially for agencies with a variety of CPUs.

. A continuing client education program to "let them know your products' capabilities." (There is some brand name loyalty evident.)

3. ADA VENDORS

- Growing interest in the segment of the software and related services market requiring Ada dictates a closer look at the participating vendors. Exhibit V-7 lists major Ada vendors ranked by the number of validated Ada compilers each vendor offers. While this ranking does not relate directly to revenue realized from this segment, it does provide an indication of vendor commitment.

- The top three vendors expend nearly 100% of their resources in the development, marketing, and sales of Ada products. For other vendors the effort is considerably smaller. Altogether, there are nearly 30 organizations offering at least one validated Ada compiler. Over 60 different compilers are now available covering nearly every size of machine.

- Many of the vendors not listed may have only one or two products or have compilers for development purposes only. Notable omissions include IBM (2 compilers), New York Univeristy (4), and Rational (1). IBM has yet to make a

EXHIBIT V-7

MAJOR ADA COMPILER VENDORS

VENDOR	NUMBER OF VALIDATED COMPILERS
Alsys	14
Verdix	11
Telesoft	6
Intermetrics	4
Systems Designers Software	3
Harris	3
Rolm	3
Dansk Datamatik, International	2
Honeywell	2
Softech	2

Source: Ada Information Clearinghouse

strong commitment to Ada product development. New York University's compiler is not commercially sold, and Rational's compiler is sold as a part of a complete development environment which costs between $295,000 for six user systems to $755,000 for twenty.

B. VENDOR MARKET PERCEPTIONS

- In the opinion of vendors interviews by INPUT, the federal software and related services market will stay strong in the near term. While vendors are typically optimistic in their growth forecasts, Exhibit V-8 indicates some agency/vendor agreement about growth trends.

  - Both agency and vendor respondents agree that packaged software represents the fastest growing segment, and both groups agree that packaged applications, in particular, will grow at a rate of over 31% annually.

  - The two groups do not agree, however, on the strength of the packaged systems software growth. The explanation may lie in the optimism of systems software vendors and the varying definitions of packaged systems software.

    . If vendors are using history as a base for optimism, they would do well to remember that government fiscal years 1983 through 1986 was a period of significant government activity focused on upgrading and replacing obsolete hardware and its necessary systems software. Such a period of activity may not occur again until the early 1990s.

    . On the issue of definition, the data includes vendors who offer data base management systems that INPUT classifies as systems

EXHIBIT V-8

AGENCY VERSUS VENDOR EXPECTATIONS OF PERCENTAGE CHANGE IN NEAR-TERM PRODUCT/SERVICE ACQUISITIONS

PRODUCT/SERVICE CATEGORY	AVERAGE CHANGE (PERCENT)	
	AGENCY	VENDOR
Packaged Applications	31%	36%
Packaged Systems	13	28
Custom Applications	4	22
Custom Systems	-35	16

software. Respondents from agencies may have viewed these types of systems in terms of their ultimate applications, and thus classified them with applications software, leaving only operating systems, system tools, and productivity aids in the systems category.

- Both agency and vendor respondents also agree that custom development of software will not grow at the fast rate of packaged software. Again, however, the two groups differ dramatically in the rate of change expected.

  . Agency respondents forecast only minimal (4%) growth in the purchase of custom applications, but vendors believe growth will be a healthy 22%. INPUT estimates, based on the proposed programs of the various federal agencies, put the growth at 20%.

  . The most dramatic agency/vendor difference in growth perception regards custom development of systems software. This difference may be definitional as discussed above, with agencies thinking "operating systems" and vendors responding to the view that much of the custom activity is completed under the umbrella of "system integration" in which the replacement, upgrade, or new start includes hardware, systems software, and applications development.

C. VENDOR SELECTION CRITERIA

- Agency and vendor respondents indicate only moderate agreement with respect to the relative importance of criteria used by agencies in the selection of vendors from which to purchase packaged applications software (see Exhibit V-9).

EXHIBIT V-9

AGENCY VERSUS VENDOR RATINGS OF FACTORS IMPORTANT IN THE SELECTION OF PACKAGED APPLICATIONS SOFTWARE VENDORS

FACTOR	AVERAGE RATING*	
	AGENCY	VENDOR
Ease of Use	4.4	5.0
Product Commitment	4.4	4.0
Performance	4.3	5.0
Documentation	4.3	4.4
Training	4.1	4.5
Support Reputation	4.0	4.8
Service Quality	4.0	4.8
Software Features	4.0	4.2
Application Knowledge	3.9	4.6
Ease of Implementation	3.8	4.0
Product Price	3.3	4.4
Federal Experience	2.7	3.8

*Rating: 1 = Least Important; 5 = Very Important

- There is agreement that the first concern is for the operation of the software. The factors "ease of use" and "performance" were highly rated by both groups.

- The characteristics directly related to the software (i.e., documentation, features, ease of implementation, and price) also found general agreement, with two exceptions.

  - Software documentation was ranked higher by vendors than by agencies. This is surprising, given the frequent complaints agency clients express about the quality of software documentation.

  - The price of software was ranked higher by vendors than by agency representatives. It is reasonable that vendors are sensitive to the issue of price, particularly in dealing with the federal government. However, with the limited funds with which agencies have to work and the near across-the-board mandate that outside service be purchased on a competitive basis, the next-to-last ranking given price by the agencies seems unusual. By this ranking, agencies seem to be indicating that price is a "necessary," but not a "sufficient" criterion for selection (which opinion may not be shared by contract officers).

- The general category of support (training, support reputation, service quality, and commitment to the product) was perceived by vendors to be more important than it reportedly is to agencies.

  - Only the criterion of training among this support grouping was rated by both sets of respondents as moderately important.

  - Vendors rated service quality and support reputation among the highest agency criterion while the agencies actually rated these as only moderately important.

- The biggest difference in this category, however, was in the respective ratings of the importance of product commitment as a selection criterion. Vendors, with an apparently shorter view of product life, thought agencies would rate this criterion among the lowest. Agencies, ever mindful of the effort required to fund and then implement applications software, look for vendors to maintain the specific software in the vendor's active product line for some time.

  - It is important that vendors have product expansion plans, including management teams, R&D budgets, and an understanding of changing requirements in place, and to be able to articulate these to buyers.

- Finally, respondents differed on the importance of the vendor's level of applications experience as a criterion, but did agree that the vendor's federal experience was not an issue.

  - Both groups agreed on the lack of importance of the vendor's federal experience, rating it last among the 12 criteria.

  - Application experience was perceived by vendors to be important to the agencies, while agency respondents actually rated this criterion quite low. Apparently, applications software vendors cherish their knowledge of the ability to develop software for specific applications and think that agencies will hold these experiences in high regard as well. Agencies, on the other hand, assume that any packaged applications software being considered will have the applications knowledge behind it and, further, that the proof is in the performance, not in the vendor.

- The ratings of agencies and vendors regarding agencies' selection criteria for packaged systems software (see Exhibit V-10) indicated rankings similar to those of packaged applications software, but with some notable exceptions.

EXHIBIT V-10

AGENCY VERSUS VENDOR RATINGS OF FACTORS IMPORTANT IN THE SELECTION OF PACKAGED SYSTEMS SOFTWARE VENDORS

FACTOR	AVERAGE RATING*	
	AGENCY	VENDOR
Performance	4.5	4.6
Documentation	4.4	4.6
Product Commitment	4.4	3.6
Ease of Use	4.0	4.6
Service Quality	3.9	4.6
Software Features	3.9	4.2
Support Reputation	3.9	3.8
Application Knowledge	3.7	4.0
Training	3.7	4.0
Ease of Implementation	3.4	4.6
Product Price	3.0	4.2
Federal Experience	2.5	3.4

*Rating: 1 = Least Important; 5 = Very Important

- While the general group of factors relating to the software is ranked second to actual software use, the specific factors of ease of implementation and price were ranked high on the vendors' perception list and low on the agency respondents' list.

  . Agencies do not seem to make an issue of implementation, either because they assume vendors can and will install the software or because they assume their agency's staff will be capable of installing it. With the many stories about man-year efforts to install what was thought to be straightforward system, vendors seem to be accurate in holding the issue of implementation high on their list.

  . For price, it appears that vendors are more sensitive to the issue while agencies believe their systems software needs outweigh the cost of meeting their ADPE objectives.

- In the category of support criteria, vendors perceive service quality and training as more important than agencies actually ranked them, and product commitment as less important than it is (see the discussion above).

- The factor of experience was ranked fourth as a group and, again, vendors perceived their knowledge of the application as more important than agencies did.

- The rankings of factors for the selection of vendors of custom software development are presented in Exhibit V-11. For clarity of the analyses, the factors were grouped into the categories "vendor capabilities" (previous experience in development, integration, and installation; experience in the specific application; and experience with the target language and target hardware), "vendor enhancements," and "vendor federal experience."

EXHIBIT V-11

AGENCY VERSUS VENDOR RATINGS OF FACTORS IMPORTANT IN THE SELECTION OF CUSTOM SOFTWARE VENDORS

FACTOR	AVERAGE RATING*	
	AGENCY	VENDOR
Development Experience	4.4	4.6
Application Experience	4.3	3.8
Target Language Experience	4.3	4.0
Integration Experience	4.1	4.1
Training	4.0	3.6
Support Reputation	3.7	4.3
Target Hardware Experience	3.6	3.9
Installation Experience	3.2	4.4
Price	3.2	4.3
Federal Experience	2.8	3.8
Agency Experience	2.6	3.2

*Rating: 1 = Least Important; 5 = Very Important

- The differences between the rankings of agencies and vendors' perceptions of these rankings were more dramatic than those discussed above.

  - Agency and vendor respondents agreed that the vendor's development experience was the most important selection criteria. And both groups reported similar rankings for integration experience, placing it in the upper one-third of the list, and for hardware experience, placing that criterion in the lower one-third of the list.

    . However, the other criteria in the "vendor capabilities" grouping were nearly opposite.

    . Agencies put more weight on the vendor's experience in the specific application area and on the experience of the vendor with the target language to be used in the development. Vendors rank these two factors near the bottom of the capabilities group, replacing them with the importance of installation experience.

    . It seems that the "buyers" are looking for specific capabilities that will ensure that the development effort in question may be effectively and efficiently done by the vendor. The vendors, on the other hand, hope to "sell" their general installation experience instead. While it seems only natural that vendors would want their general capabilities recognized, these rankings indicate that vendors must also become thoroughly familiar with the specifics of a given opportunity and translate their general capabilities into the specifics of the opportunity to be most successful.

- Consistent with the above rankings, vendors also perceived that "vendor enhancements" would be more important to agencies than they actually appear to be.

- Both price and support reputation were rated in the top one-third by the vendors but only in the middle one-third by the agencies.

- Similarly, traning was given a relatively high ranking by the agencies while vendors thought it would appear near the bottom of the criteria.

- Again it seems that vendors are sensitive to competition based on price and the need for quality support rather than some of the "vendor capabilities" listed above, while agencies are concerned about the vendor's capability to do a specific job, regardless of the enhancements that the vendor may bring to the assignment.

- Both groups agree that the vendor's federal experience and their experience with the specific agency are among the least important criteria.

D. ACQUISITION METHODS AND TEST AND ACCEPTANCE PROCEDURES

- Most of the vendors intereviewed indicated that their product/service is most frequently purchased by the federal government by competitive bidding. This is entirely consistent with the agency respondents' statements that competitive bidding is the most frequently used acquisition method.

- In this limited sample of vendors, only the smaller packaged software vendors with apparently lower priced software reported use of purchase orders, and no vendor reported the use of the GSA Schedule.

- Vendors did differ from agency respondents in the perceived frequency of usage of various test and acceptance procedures. While agencies reported similar frequencies for both trial period and benchmark tests, vendors reported more frequency of benchmark procedures, regardless of whether the

software was custom developed or packaged. No vendor in this sample reported experience with an independent verification and validation exercise by a third party.

- Given the vendors' perception of the frequency of use of competitive bids, it is not surprising that they also feel the most frequent test of the software is a benchmark, either against criteria established by the agency or against competitive vendors.

- What may be surprising is the absence of vendors reporting experience with trial periods. It may be the case that this testing method is becoming less frequently used than reporting by the agencies. And, it is also likely that vendors are less willing to risk the effort required to install and de-install software without tangible returns or without a sizeable opportunity waiting at the completion of a successful trial period.

E. POST-IMPLEMENTATION SUPPORT AND END-USER INVOLVEMENT

- Exhibit V-12 indicates general agreement between the perceptions agencies have of vendors' reputation for support and the vendors' perceptions of the agencies' view. The ratings are consistently favorable for both groups, indicating that vendors are responsive to these agency needs and that agencies recognize the quality support they receive.

- Variations between the two groups do exist. Agencies seem to value changes in the product more than training or consulting about the product while vendors reverse the importance. This is entirely consistent with early analyses which indicated that vendors are inclined to support the client with service rather than with additional development.

EXHIBIT V-12

AGENCY VERSUS VENDOR RATINGS OF VENDOR REPUTATION FOR POST-IMPLEMENTATION SUPPORT

FACTOR	AVERAGE RATING*	
	AGENCY	VENDOR
Fixing Errors	4.5	4.5
Improve Features/Functions	4.0	3.8
Training	4.0	4.2
Extend Features/Functions	3.8	3.5
Add Features/Functions	3.8	3.9
Consulting	3.5	4.2

*Rating: 1 = Least Important; 5 = Very Important

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VI KEY OPPORTUNITIES

- This section describes specific opportunities in the federal information technology market. Three lists of programs are provided.
  - Recent awards.
  - Future software product opportunities.
  - Future software development opportunities.

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

- The list of opportunities becomes smaller after fiscal year 1988 because new programs have not yet been identified or initially approved by the responsible agencies. Subsequent issues of this report and the INPUT Procurement Analysis Reports will include additional programs and detailed program information for the fiscal years 1989 through 1992 time frame.

A. PRESENT AND FUTURE PROGRAMS

- Funding for software and related services is provided in several budget categories of federal government agencies.

- Software and equipment as a line item under capital investment does not include software bundled with hardware and software that is acquired on a lease basis.

- The programming and analysis item includes some packaged software that will be purchased to be modified or as a part of some larger program.

- The operations and maintenance item may include software maintenance as part of facilities management.

- New information technology programs, including software and related services acquisitions, 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 Act of 1980.

  - Agency annual operating budget requests submitted to both congressional oversight and appropriations committees based on the OMB A-11 information.

  - Commerce Business Daily notice of specific opportunities, for qualification as a bidder, and for requesting a copy of 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 to qualified DoD contractors.

- Software products and software development opportunities may or 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 these requirements.

  - Some mission requirements could be satisfied equally well by software products, custom software development, or a combination of both.

  - Agencies have shown an increasing tendency to use integration contracts for larger, more complex systems. Software product and development requirements may be included in these contracts, rather than being met through separate acquisitions by the agencies.

  - To add to the difficulty of identifying planned software buys, most medium and smaller buys valued at less than $1 million are rarely identified in agency budget documents.

- All funding proposals are based on cost data of the year submitted with inflation factors dictated by the Administration as part of its fiscal policy, and are subject to revision, reduction, or spread to future years in response to Congressional direction. Some additional reductions will be likely in fiscal year 1988 and beyond due to the deficit reduction constraints of the Gramm-Rudman-Hollings Act.

B. SOFTWARE PRODUCTS OPPORTUNITIES BY AGENCY

AGENCY	PROGRAM	PAR CODE	TOTAL VALUE ($K)
DEFENSE - AIR FORCE			
AFDSDC	Command Budget Automated System RFP Release: 3Q FY87	V-1-21	6,743
ATC	Command Readiness Exercise System RFP Release: 2Q FY87, 3Q FY87	V-1-34	12,580
AFGWC	Upgrade and Relocate the Space Environmental Support Function to the Space Forecast Center RFP Release: 5/87	V-1-61	8,447
AWS	Computer Replacement Enhancement at USAFETAC, OLA RFP Release: 1Q FY88	V-1-74	7,395
IISG	First Information Systems Group Improved Service Program RFP Release: 3Q FY87	V-1-78	52,870
AFLSC	FLITE Conversion to On-Line System RFP Release: 3Q FY87 (final phase)	V-1-90	6,804
MAC	Software Improvement at the USAF Environmental Technical Applications Center RFP Release: 10/87	V-1-94	14,878
MAC	MAC Information Processing System (MAC IPS) Award: 8/87	V-1-101	75,339
ESD	Unified Local Area Network Architecture (ULANA) Phase I Award: 8/87	V-1-102	10,000
ESD	WIS Joint Mission Processor RFP Release: 3Q FY87 (est.)	V-1-103	38,123

AFLC	Contracting Data Management System - Phase II RFP Release: 8/87	V-1-104	31,892
DEFENSE - ARMY			
ISEC	Unit Level Computer RFP Release: 2Q FY87	V-2-20	8,053
ISEC	Army World-Wide Military Command and Control System (WWMCCS) Information System (AWIS) System Development RFP Release: 2Q FY87	V-2-21	12,000
USAMSSA	Headquarters Integrated Office System (HIOS) RFP Release: 3Q FY87	V-2-22	26,686
MEPCOM	Computer Adaptive Testing (CAT) RFP Release: 1Q FY88	V-2-27	7,133
AMC	Standard Depot Systems (SDS) RFP Release: 4Q FY87	V-2-28	89,000
ISEC	General Purpose Computing Requirement RFP Release 4Q 1987	V-2-29	8,000
ISEC	Army Corporate Data Base Project (ACDBP) RFP Release: 4Q FY87	V-2-31	24,343
DEFENSE - NAVY			
DNL	Navy Laboratory Technical Office Automation and Communication System (NALTOACS)	V-3-1	35,710
NMPC	Military Personnel - Navy (MPN) Financial Sytsem (MFS) RFP Release: FY89	V-3-29	3,250
MSC	Strategic Mobility Subsystem (STRATMOB) RFP Release: 3Q FY87	V-3-68	12,177
NAVSUPSYSCOM	Headquarters Project (Integrated Information System) Award: 4Q FY87	V-3-76	17,700

COMNAVOCEANCOM	COMNAVOCEANCOM Large Scale Computer Plan RFP Release: 7/87	V-3-78	33,717
NAVSUPSYSCOM	Engineering Data Management Information and Control Systems (EDMICS) RFP Release: 6/87	V-3-79	6,101
	ADPE Acquisition & Operations Support for Bases and Stations Information System (BASIS) RFP Release: 3Q FY88	N/A	5,976
	Recruiting Station Microcomputers RFP Release: 3Q FY87	N/A	970
	Office Automation for NAVMEDCOM RFP Release: 4Q FY87	N/A	5,217
DEFENSE - DEFENSE LOGISTICS AGENCY			
	Defense Automatic Addressing System (DAAS) ADPE Replacement Program (DARP) RFP Release: 3Q FY87	V-4A-4	2,710
	ADP Systems - Europe and Pacific Award: 3Q FY87	V-4A-5	8,000
DEFENSE - OFFICE OF THE SECRETARY			
TPO	Composite Health Care System (CHCS) RFP Release: 3Q FY87	V-4E-1	300,000
WHQS	Document Storage and Retrieval System RFP Release: 4Q FY87	V-4E-3	1,725
OASD (A&L)	Computer Aided Logistics Systems (CALS) RFP Release: Various	V-4E-4	10,000
CIVIL - AGRICULTURE			
ARS	Laboratory/Office Automation RFP Release: Various	VI-5-22	6,000
FMHA	Automated Administrative Management System (AAMS) RFP Release: FY88	VI-5-24	8,178

FNS	Replacement of Existing O/A and ADP Equipment Bids Due: 5/87	VI-5-25	3,000
FSIS	Inspection Position Coverage System (IPCS) RFP Release: 1Q FY88	VI-5-26	1,492
CIVIL - COMMERCE			
CENSUS	Computer Replacement (Nos. 1 and 3) RFP Release: FY88	VI-6-3	16,515
BEA	Competitive Replacement of Computer Systems RFP Release: 3Q FY87	VI-6-4	520
NWS	Advanced Weather Interactive Processing System (AWIPS) RFP Release: FY88	VI-6-24	64,580
CIVIL - ENERGY			
ORC	Power Control System RFP Release: FY88	VI-7-57	3,740
METC	Class III Computer System RFP Release: FY88	VI-7-69	1,000
CIVIL - HEALTH AND HUMAN SERVICES			
SSA	ADMIN/MI Capacity Upgrade RFP Release: 5/87	VII-8-7	35,000
HCFA	Project to Redesign Information Systems Management (PRISM) RFP Release: 1Q FY88	VII-8-20	44,562
CIVIL - INTERIOR			
BLM	Automated Land and Mineral Record Sysem (ALMRS)	VII-9-11	198,600
CIVIL - HOUSING AND URBAN DEVELOPMENT			
	HUD Integrated Information Processing Service (HIIPS) RFP Release: 5/87	VII-9B-4	200,000

CIVIL - JUSTICE			
ANTITRUST	Office Automation RFP Release: 1Q FY88	VII-10-17	8,373
CIVIL - TRANSPORTATION			
USCG	Aircraft Maintenance Information System (AMIS)	VII-11-19	4,000
FAA	Weather Message Switch Center Replacement Award: 3Q FY87	VII-11-24	7,000
FAA	National Airspace System Plan RFP Release: Various	---	300,000
CIVIL - TREASURY			
IRS	Automated Examination System (AES) RFP Release: 4Q FY87	VII-12-5	400,000
IRS	Tax System Redesign RFP Release: 4Q FY87	VII-12-6	60,100
IRS	Service Center Cost Accounting/ Integrated Management System (IMS) Award: 3Q FY87	VII-12-35	6,074
IRS	Files Archive Image Storage and Retrieval (FAISR)	VII-12-37	28,647
IRS	Distributed Input System (DIS) RFP Release: 1/88	VII-12-50	17,000
CIVIL - NATIONAL AERONAUTICS AND SPACE ADMINISTRATION			
HQ	Headquarters IBM 370/158 Replacement	VIII-15-1	850
JSC	Flight Data System Upgrade RFP Release: 3Q FY87	VIII-15-53	1,070
JSC	Replace 9 Telemetry Pre-Processing Computer Systems (TPC Systems) RFP Release: FY88	VIII-15-54	3,000
JSC	Space Station Definition and Preliminary Design Program RFP Release: 4Q FY87	VIII-15-61	10,000

GSFC	Customer Data and Operations System (CDOS) RFP Release: 3Q FY87	VIII-15-62	3,000
	Flight Dynamics System; NASA GSFL RFP Release: 3Q FY87	N/A	1,190
	Telemetry Processor Replacement; NASA JPL RFP Release: 2Q FY88	N/A	1,200
	Command Processor Replacement; NASA JPL RFP Release: 2Q FY88	N/A	1,121
	Sperry 1100/92P Replacement RFP Release: 2Q FY89	N/A	930
	Augment Center Information System RFP Release: 2Q FY88	N/A	1,202

C. SOFTWARE DEVELOPMENT OPPORTUNITIES BY AGENCY

DEFENSE - AIR FORCE

AFCC	Project 6000 RFP Release: 1Q FY88	V-1-2	57,537
MAC	MAC Command and Control (C2) Upgrade RFP Release: 1Q FY88	V-1-6	UNK
AD	Armament Division Scientific Computer Replacement RFP Release: 3Q FY87	V-1-10	4,720
AFDSDC	Command Budget Automated System RFP Release: 3Q FY87	V-1-21	6,734
ESD	Air Force WWMCCS Information System (AFWIS) RFP Release: 4Q FY87	V-1-27	10,840
ATC	Command Readiness Exercise System RFP Release: 3Q FY87	V-1-34	9,743
AFLC	Automated Technical Order System (ATOS) RFP Release: 4Q FY87	V-1-53	10,908

AFGWC	Computer Replacement of Two UNIVAC 1100/82 at AFGWC RFP Release: 2Q FY88	V-1-63	14,148
AWS	Computer Replacement Enhancement at USAFETAC, OLA RFP Release: 1Q FY88	V-1-74	8,121
IISG	First Information Systems Group Improved Service Program RFP Release: 2Q FY88	V-1-78	29,940
AFCAC	Standard Multi-user Small Computer Requirements Contract (SMSCRC) Award: August 1987	V-1-83	21,700
MAC	Software Transition Program (STP) RFP Release: FY88	V-1-89	28,954
AFLC	Network Front End Processor for C3I RFP Release: 3Q FY87	V-1-91	3,277
MAC	Software Improvement at the USAF Environmental Technical Applications Center RFP Release: 4Q FY87	V-1-94	14,112
MAC	MAC Information Processing System (MACIPS) RFP Release: 3Q FY87	V-1-101	72,100
ESD	Unified Local Area Network Architecture (ULANA) Phase I RFP Release: 3Q FY87	V-1-102	UNK
ESD	WIS Joint Mission Processor RFP Release: 4Q FY87	V-1-103	7,625
AFLC	Contracting Data Management System - Phase II RFP Release: 8/87	V-1-104	28,656
DEFENSE - ARMY			
ISEC	Army World Wide Military Command and Control System (WWMCCS) Information System (AWIS) RFP Release: 7/87	V-2-8	372,082

FORSCOM	Continental Army Management Information System (CAMIS) RFP Release: 4Q FY87	V-2-10	122,469
TRADOC	Technical Support Services (TSS) RFP Release: 4Q FY87	V-2-15	52,000
USAMSSA	Headquarters Integrated Office System (HIOS) RFP Release: 1Q FY88	V-2-22	19,711
MEPCOM	Computer Adaptive Testing (CAT) RFP Release: FY88	V-2-27	7,133
ISEC	General Purpose Computing Requirement RFP Release: 4Q FY87	V-2-29	30,000
ASB	Corps Theater ADP Service Center II (CTASC II) RFP Release: 4Q FY87	V-2-30	123,338
ISEC	Army Corporate Data Base Project (ACDBP) RFP Release: 4Q FY87	V-2-31	24,334
ISEC	Army Information Systems Integration Project (AISI) RFP Release: 2Q FY87	V-2-33	UNK
DEFENSE - NAVY			
NAVSEASYSCOM	Navy Integrated Computer-Aided Design, Manufacturing, and Maintenance (NICADMM) RFP Release: 1Q FY88	V-3-14	7,560
NAVAVIONCEN	Competitive (Computer) Replacement Naval Aviatics Center RFP Release: 4Q FY87	V-3-33	1,600
NAVSUPSYSCOM	Uniform Automated Data Processing System (UADPS) RFP Release: 4Q FY87	V-3-51	22,019
MSC	Strategic Mobility Subystem (STRATMOB) RFP Release: 7/87	V-3-68	7,817
NAVSUPSYSCOM	Headquarters Project (Integrated Information System) RFP Release: Various	V-3-76	15,300

NFEC	SEABEE Automated Mobile Management System (SAMMS) Bids Due: 7/87	V-3-77	7,316
NAVSUPSYSCOM	Engineering Data Management Information and Control Systems (EDMICS) RFP Release: 7/87	V-3-79	6,101
	Shipyard Modernization - Computer Aided Division/Manufacturing (CAD/CAM) (L36) RFP Release: 4Q FY87	N/A	11,803
	SPAR Data Base Design and Implementation Support (SPAR - L58A) RFP Release: 4Q FY87	N/A	8,971
	SNAP II Data Base Development (SNAPII-X52) RFP Release 3Q FY87	N/A	8,190
	SNAP II Supply/Financial Systems (SNAPII-X52) RFP Release: 3Q FY87	N/A	8,510
	Systems Analysis and Programming for Measure RFP Release: Various	N/A	15,069
DEFENSE - DEFENSE LOGISTICS AGENCY			
	Mainframe Computer for DLA Disposal System RFP Release: 4Q FY87	V-4A-12	1,500
DEFENSE - OFFICE OF THE SECRETARY			
WHQS	Document Storage and Retrieval System RFP Release: 3Q FY87	V-4E-3	1,400
	Composite Health Care System (CHCS) RFP Release: 3Q FY87	V-4E-1	100,000
	Secure International Treaties Information System RFP Release: Various	V-4E-4	30,000
CIVIL - AGRIGULTURE			
AMS	Cotton Electronic Recording System RFP Release: 4Q FY87	VI-5-13	1,417

ARS	Laboratory/Office Automation RFP Release: Various	VI-5-22	16,000
FMHA	Automated Administrative Management System (AAMS) RFP Release: FY88	VI-5-24	8,179
FNS	Replacement of Existing O/A and ADP Equipment RFP Release: 7/87	VI-5-25	10,781
CIVIL - COMMERCE			
CENSUS	Computer Replacement (No. 1 and 3) RFP Release: FY88	VI-6-3	16,511
BEA	Competitive Replacement of Computer Systems RFP Release: 3Q FY87	VI-6-4	1,300
NWS	Advanced Weather Interactive Processing System (AWIPS) RFP Release: 2Q FY88	VI-6-24	129,160
CIVIL - ENERGY			
NMFECC	Advanced Computer Center RFP Release: 3Q FY87	VI-7-18	2,000
LLNL	Class VI/VII Computer System RFP Release: 4Q FY87	VI-7-22	20,920
ORC	Upgrade Central Computer Facility RFP Release: 3Q FY87	VI-7-58	4,000
NMFECC	Basic Energy Sciences Shared Computer Facility RFP Release: FY88	VI-7-68	18,000
METC	Class III Computer System RFP Release: FY88	VI-7-69	1,000
CIVIL - HEALTH AND HUMAN SERVICES			
SSA	ADMIN/MI Capacity Upgrade RFP Release: 7/87	VII-8-7	34,100
HCFA	Project to Redesign Information Systems Management (PRISM) RFP Release: Various	VII-8-20	35,650

	Integrated IHS Hospital Information Systems RFP Release: 1Q FY87	VII-8-22	4,030
CIVIL - INTERIOR			
FWS	Commercial Services RFP Release: FY88	VII-9-10	4,250
BLM	Automated Land and Mineral Record System (ALMRS) RFP Release: 3Q FY87	VII-9-11	128,000
CIVIL - HOUSING AND URBAN DEVELOPMENT			
	HUD Integrated Information Processing Service (HIIPS) RFP Release: 6/87	VII-9B-4	350,000
CIVIL - JUSTICE			
OIT	Data Center Enhancement RFP Release: Various	VII-10-14	1,000
CIVIL - TRANSPORTATION			
USCG	Aircraft Maintenance Information System (AMIS) RFP Release: 4Q FY87	VII-11-19	4,000
OST	Department Accounting and Financial Information System (DAFIS) RFP Release: 3Q FY87	VII-11-20	23,668
USCG	Vessel Tracking System (VTS) New Orleans RFP Release: 3Q FY87	VII-11-22	5,000
FAA	Weather Communications Processors RFP Release: 6/87	VII-11-25	7,500
FAA	FAA/Air Force Radar Replacement (FARR) RFP Release: 7/87	VII-11-26	90,000
CIVIL - TREASURY			
IRS	Automated Examination System (AES) RFP Release: (Phase II) 4Q FY87	VII-12-5	125,700

IRS	Tax System Redesign RFP Release: 4Q FY87	VII-12-6	23,574
IRS	Automated Criminal Investigation Management Information System RFP Release: 7/87	VII-12-15	21,446
IRS	Automated Financial System RFP Release: 4Q FY87	VII-12-29	21,238
FMS	Financial Center Telecommunications Network RFP Release: FY88	VII-12-46	1,890
FMS	Quality Assurance Program RFP Release: Various	VII-12-48	2,015
CIVIL - GENERAL SERVICES ADMINISTRATION			
	Contract Services Program (CSP) RFP Release: Various	VIII-14-10	826,343
FCSC	Office of Software Development and Information Technology RFP Release: Various	VIII-14-15	90,000
	Enhancement of Honeywell 6600 Computer Resources - Information Resources Management Service	N/A	30,556
	Network Services - Circuit Inventory Accounting System (CAIS) RFP Release: 3Q FY87	N/A	6,350
CIVIL - NATIONAL AERONAUTICS AND SPACE ADMINISTRATION			
ARC	Master Programming Contract RFP Release: FY88	VIII-15-8	55,666
LERC	Class VII Computer System RFP Release: FY88	VIII-15-57	20,000
	Health Information Management System (HIMS) - NASA HQ RFP Release: 3Q FY87	N/A	2,300
	Agency Wide Central Computer - NASA HQ RFP Release: 2Q FY88	N/A	3,500

Super Computer Systems Support - NASA Levis RFP Release: 3Q FY87		1,449
Programming Analysis for FPO Telos Replacement - NASA IPL RFP Release: 2Q FY88		8,800

CIVIL - ENVIRONMENTAL PROTECTION AGENCY

Applications Systems Development and Enhancements RFP Release: 3Q FY87	VIII-17-3	30,600
Studies and Analyses - Renamed Information Technology Architectural Support RFP Release: 1Q FY92		25,000
Application Systems Development and Enhancements (Recompetition) RFP Release: 2Q FY88		51,000

APPENDIX A: INTERVIEW PROFILES

A. FEDERAL AGENCY RESPONDENT PROFILE

1. CONTRACT SUMMARY

- Agency contacts were made both by telephone and through mailed questionnaires.

- The distribution of job classifications among individual agency respondents for the 1985 analysis is shown in Exhibit A-1.

2. LIST OF AGENCIES

- Respondents to the 1985 questionnaires represented the agencies listed below. The number in parentheses indicates the number of different contacts within each agency.

  - Civil agencies.

    . Agriculture (4).

    . Commerce (3).

    . Education (1).

EXHIBIT A-1

AGENCY RESPONDENT PROFILE

PROFILE CATEGORY	TYPE OF AGENCY (Number of Respondents)		TOTAL
	CIVIL	DEFENSE	
Respondent Title:			
Manager	15	12	27
Analyst	7	7	14
Programmer	10	1	11
Type of Acquisition:			
Package	27	13	40
Modified Package	4	5	9
Custom	1	2	3
Type of Product/Service Acquired			
Applications	3	4	7
Systems	5	1	6
Both	24	15	39
Total	32	20	52

G-SRS

- EPA (1).
- FCC (1).
- FEMA (1).
- GSA (1).
- HHS (3).
- HUD (2).
- Interior (2).
- Justice (2).
- Labor(1).
- NASA (5).
- NSF (1).
- State (1).
- Transportation (2).
- Treasury (1).

- Defense agencies.
  - Air Force (4).
  - Army (7).

- Navy (4).
- Other defense agencies (5).

- For the 1986 analysis, INPUT contacted agency contracting and program management officials for the major software product and development initiatives listed in Section VI of this report.

B. VENDOR RESPONDENT PROFILE

- The information services vendors interviewed during the course of this research represent a diversified group of vendors conducting software and related services business with the federal government. Most notable in Exhibit A-2 is the product/service mix of these vendors, which indicates that companies are not readily classified as "software houses" or "systems houses." In some cases, the companies derive revenue from the federal government from both packaged software and custom-developed software, regardless of their most noted product/service offerings. In the case of vendors who provide custom (software) development, the packaged software portion consists of "thinly" circulated software that is generally available but that is not actively marketed by the vendor.

EXHIBIT A-2

VENDOR RESPONDENT PROFILE

PROFILE CATEGORY	AVERAGE RATING*		
	SOFTWARE HOUSE	SYSTEMS HOUSE	TOTAL
Revenue Size			
$ Millions	$13-94	$16-97	$13-97
Average $ Millions	$43	$35	$37
Functional Responsibility			
Executive	5	7	12
Marketing	3	5	8
Product/Service			
Packaged Applications	5	2	7
Systems	6	2	8
Custom Development			
Applications	2	12	14
Systems	3	3	6

G-SRS

APPENDIX B: 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 nontechnical terminology that is associated with applications, documentation, budgets, authorization, and the procurement/acquisition process is included in Appendix C, Glossary.

A. SERVICE MODES

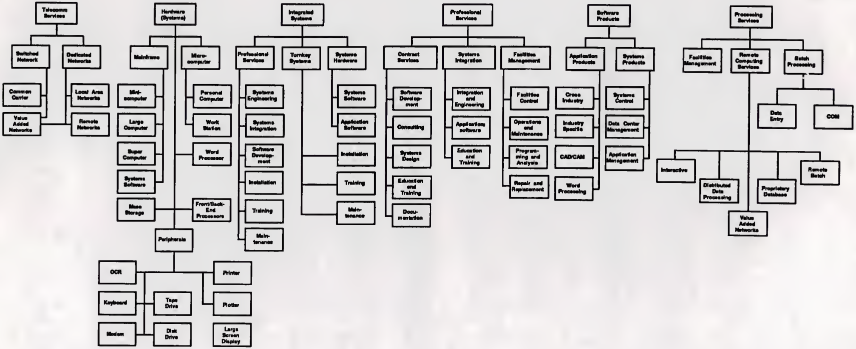
1. PROCESSING SERVICES

- Processing services include remote computing services, batch services, and processing facilities management.

- REMOTE COMPUTING SERVICES (RCS) - Provision of data processing to a user by means of terminals at the user's site(s). Terminals are connected by a data communications network to the vendor's central computer. The most

EXHIBIT B-1

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES



frequent contract vehicle for RCS in the federal government is GSA's Teleprocessing Services Program (TSP). RCS includes submodes:

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

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

- PROPRIETARY DATA BASE - Characterized by the retrieval and processing of information from a vendor-maintained data base. The data base may be owned by the vendor or by a third party, or licensed by a federal agency.

- VALUE-ADDED NETWORK SERVICES - Special-purpose and/or high-quality network specifically designed to carry digital information with features not usually provided by the voice-grade switched public network.

- DISTRIBUTED PROCESSING SERVICES - Alternately called Distributed Data Processing (DDP) that can provide:

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

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

. Availability of significant software that may be "downloaded" as part of the service.

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

- PROCESSING FACILITIES MANAGEMENT (PFM) - Also referred to as "Resource Management," "Systems Management," or "COCO" (Contractor-Owned, Contractor-Operated). The management of all or part of a user's data processing functions under a long-term contract of not less than one year. This would include remote computing and batch services. To qualify as PFM, the contractor must directly plan, control, operate, and own or lease the facility provided to the user, either on-site, through communications lines, or in a mixed mode.

2. PROFESSIONAL SERVICES

- Professional services provide labor-intensive consulting, design, education and training, programming and analysis, management, and systems integration as defined within general categories.

  - CONTRACT SERVICES - Provision of professional and technical services of various skill levels to accomplish specific tasks not specifically or necessarily associated with a delivered product other than paper or ADP media records. Contracts generally require vendor management of staff and/or resources.

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

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

- SYSTEMS DESIGN - Preparation of systems/subsystems architecture, specifications, and performance criteria from functional information processing statements or performance of an operations requirements study. May include ADP, telecommunications, site layout, training, and maintenance facilities.

- SOFTWARE DEVELOPMENT - Also known as programming and analysis services, includes applications and systems software design, contract or custom programming, code conversion, independent verification and validation (IV&V), and benchmarking. These services may also include follow-on software development and maintenance.

• PROFESSIONAL SERVICES FACILITIES MANAGEMENT (PSFM) - Also referred to as GOCO (Government-Owned, Contractor-Operated) services. The computing equipment is owned or leased by the client (government), not by the vendor. The vendor provides the staff to operate, maintain, repair, schedule, and manage the client's facility over a term of three to five years. Submodes include:

  - FACILITIES CONTROL - Vendor management, including scheduling of resources and personnel, to meet specified operations objectives or produce specified information products with no direct client supervision.

- OPERATION AND MAINTENANCE (O&M) - Vendor operation and maintenance of government-owned ADP/telecommunications equipment in a government-owned/leased facility (on-site) without vendor management of the facility.

- PROGRAMMING AND ANALYSIS (SUPPORT) - Vendor-furnished professional and technical staff support, which may be provided on or off the client's site, to analyze information processing requirements, plan resource applications, and develop/modify/maintain custom software over a period of time not less than one year. Contracts tend to be task-oriented to control the work flow.

- HARDWARE AND/OR SOFTWARE MAINTENANCE - Vendor-furnished services provided after installation and acceptance by the government, where the vendor may not be the original supplier (third-party maintenance or TPM), and may use either on-site or on-call personnel to perform services.

- REPAIR AND REPLACEMENT - Vendor-furnished services and acquires information system components to repair or replace worn or defective equipment and to add equipment needed to meet new or unusual requirements.

• SYSTEMS INTEGRATION - Services associated with design and integration, software development, and installation and government acceptance of ADP/telecommunications systems. Services may also include related engineering activities such as Systems Engineering and Integration (SE&I) or Systems Engineering and Technical Assistance (SETA).

- ENGINEERING AND INTEGRATION - Vendor-furnished technical services provided separately from acquisition of hardware and software to expand the critical design into specifications, interface descriptions, installation, and operating instructions of the complete system.

- APPLICATIONS SOFTWARE - Custom software development to satisfy non-commercially available information processing requirements of an integrated system.

- EDUCATION AND TRAINING - Vendor development of training aids, manuals, and curricula for indoctrinating client management, operation and maintenance, and information product user personnel on the newly integrated information system.

3. TURNKEY SYSTEMS

- Turnkey systems, also known as integrated systems, include systems and applications software packaged with hardware as a single entity. Most CAD/CAM systems and many small business systems are integrated systems. This mode does not include specialized hardware systems such as word processors, cash registers, and process control systems.

4. SOFTWARE PRODUCTS

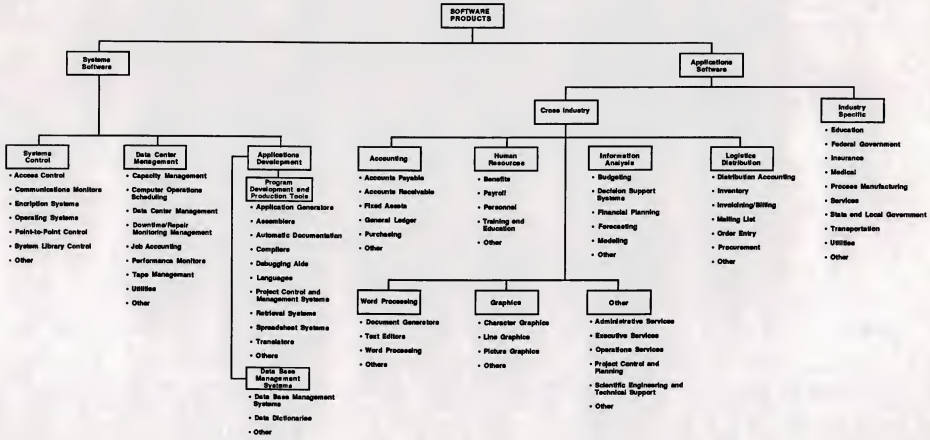
- Software products include user purchases of applications and systems packages for in-house computer systems. Included are lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement and maintain the package at the user's sites. Expenditures for work performed by organizations other than the package vendor are counted in the category of professional services. There are several subcategories of software products, as indicated below and shown in detail in Exhibit B-2.

- APPLICATION PRODUCTS - Software that performs processing that services user functions. The products can be:

  - CROSS-INDUSTRY PRODUCTS - Used in multiple industry applications as well as in federal government sectors. Examples are payroll, inventory control, and financial planning.

EXHIBIT B-2

SOFTWARE PRODUCTS



- INDUSTRY-SPECIALIZED PRODUCTS - Used in a specific federal government sector, such as planning, resource utilization, aircraft flight planning, military personnel training, and others. May also include some products designed to work in an industry other than the federal government but applicable to specific government-performed commercial/industrial services, such as hospital information, vehicular fleet scheduling, electrical power generation and distribution, CAD/CAM, and others.

- SYSTEMS PRODUCTS - Software that enables the computer/communications system to perform basic functions. These products include:

  - SYSTEM CONTROL PRODUCTS - Function during applications program execution to manage the computer system resources. Examples include operating systems, communication monitors, emulators, and spoolers.

  - DATA CENTER MANAGEMENT PRODUCTS - Used by operations personnel to manage the computer systems resources and personnel more effectively. Examples include performance measurement, job accounting, computer operations scheduling, and utilities.

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

5. HARDWARE AND HARDWARE SYSTEMS

- Hardware includes all ADP and telecommunications equipment that can be separately acquired by the government with or without installation by the vendor and not acquired as part of an integrated system. For the purpose of

this report, hardware is grouped in three major categories: peripherals, terminals, and hardware systems (processors).

- 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 - Modems, encryption equipment, special interfaces, and error control.

  - STORAGE DEVICES - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, drums, solid state (integrated circuits), and bubble and optical memories.

- TERMINALS - Federal government systems use three types of terminals as described below.

  - USER-PROGRAMMABLE - Also called intelligent terminals, including:

    . Single-station or standalone.

    . Multi-station shared processor.

    . Teleprinter.

    - Remote batch.

- NON-PROGRAMMABLE - Also called "dumb" terminals, including:

    - Single-station.

    - Multi-station shared processor.

    - Teleprinter.

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

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

    - MICROCOMPUTER - Combines all of the CPU, memory, and peripheral functions of an 8- or 32-bit computer on a chip in the form of:

        - Integrated circuit package.

        - Plug-in board with more memory and peripheral circuits.

        - Console including keyboard and interfacing connectors.

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

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

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

  - Personal business computer.

  - Small laboratory computer.

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

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

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

- SUPERCOMPUTER - High-powered processors with numerical processing throughput that is significantly greater than the fastest general purpose computers, with capacities in the 10-50 million floating point operations per second (MFLOPS) range. Newer supercomputers, with burst modes approaching 300 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-three gigabyte class, are labeled Class IV 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.

- SUPER (_____) COMPUTER - Term applied to micro, mini, and large mainframe computers with performance substantially higher than attainable by Von Neuman 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 semi-permanent interfaces. May vary in capacity from microcomputers to parallel processor computer systems.

6. TELECOMMUNICATIONS

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

- COMMON CARRIER NETWORK - A public access network, such as provided by AT&T, consisting of conventional voice-grade circuits and regular switching facilities accessed through dial-up calling with leased or user-owned modems for transfer rates between 150 and 1,200 baud.

  VALUE-ADDED NETWORK (VAN) - Provided by vendors through common carrier or special-purpose transmission facilities with special features not available in the voice-grade switched public network. These include:

  . DEDICATED NETWORK - Also known as a private network, established and operated for one user or user organization using dedicated circuits to establish permanent connections between two or more stations.

  . PACKET SWITCHING - Real time network routing, transmitting, and receiving data in the form of addressed packets, each of which may be part of a message or include several messages without exclusive use of a network circuit by the transmitting and receiving stations.

  . MESSAGE SWITCHING - Non-real time process for routing messages through a network where a user message is received, stored, and forwarded from switch to switch through the network without an end-to-end circuit between sending and receiving stations; used primarily for data.

- LOCAL AREA NETWORK (LAN) - Limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within a metropolitan area. Uses one of two signalling methods.

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

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

  - Multiple channels through FDM or TDM.

  - High-speed data transfer via parallel mode at rates of up to 96,000 baud.

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

  - MODE - may be either:

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

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

- MEDIA - May be any of the following:

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

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

  - COAXIAL CABLE - A cable consisting of an insulated central conductor surrounded by a cylindrical conductor with additional insulation on the outside and covered with an outer sheath used in HF (high frequency) and VHF (very high frequency), single frequency, or carrier-based systems; requires frequent reamplification (repeaters) to carry the signal any distance.

  - MICROWAVE - UHF (ultra-high frequency) multi-channel, point-to-point, repeated radio transmission, also capable of wide frequency channels.

  - OPTICAL FIBER - Local signal distribution systems employed in limited areas, using light-transmitting glass fibers and TDM for multi-channel applications.

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

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

B. GENERAL DEFINITIONS

- 103/113 - Bell standard modem for low-speed transmission up to 300 bps, asynchronous, half or full duplex.
- 212 - Bell standard for medium-speed transmission at 1200 bps, asynchronous or synchronous, half or full duplex.
- 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 through appending of 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.
- BENCHMARK - Method of testing proposed ADP system solutions for a specified set of functions (applications) employing simulated or real data inputs under simulated operating conditions.

- BPS - Bits per second--also mbps and kbps, million bits per second and thousand bits per second, respectively.

- BSC - IBM's binary synchronous communications data link protocol. First introduced in 1968 for use on point-to-point and multipoint communications channels. Frequently referenced as "bisync."

- 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 service that permits 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 and which 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 multi-point configuration.

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

- DATA ENCRYPTION STANDARD (DES) - 56-bit key, one-way encryption algorithm adopted by NBS in 1977, implemented through hardware ("S-boxes") or software. Designed by IBM with NSA guidance.

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

- 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.

- 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 characteristics.

- DTE - Data Terminal Equipment--hardware which is a data source or sink or both, such as video display terminals that convert user information into data for 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 - Electrical, 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 own functions. The end user may buy a system from the hardware supplier(s) and do his 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 changes to improve the product after it has been released to production.

- ENGINEERING CHANGE ORDER (ECO) - The follow-up to ECNs--they include 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).

- 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 data in graphic form, 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 - Bidirectional 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 - Bidirectional 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--usually do not supply 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. To be contrasted with interconnection, which merely guarantees a physical network interface.

- ISDN - Integrated Services Digital Network--integrated voice and non-voice public network service which is completely digital. Not clearly defined through any existing standards although FCC and other federal agencies are participating in the development of CCITT recommendations.

- KEYPUNCH OPERATORS - Individuals operating keypunch machines (similar in operation to electric typewriters) to transcribe data from source materials onto punch cards.

- LEASED 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 that is 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 until the device is repaired and returned to user service.

- MEAN TIME TO RESPOND - The mean of elapsed times from the user call for service 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.

- 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 acknowledgements.

- 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-mechnanical 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 which 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 of 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.

- 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 throughput.

- 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 - Undirectional 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 or operations of computer systems, such as printer paper, keypunch cards, 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 turnkey 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 that 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 completely fulfill 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 circuit.

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

C. OTHER CONSIDERATIONS

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

APPENDIX C: GLOSSARY OF FEDERAL 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. ACRONYMS

• AAS	Automatic Addressing System.
• AATMS	Advanced Air Traffic Management System.
• ACO	Administrative Contracting Offices (DCAS).
• ACS	Advanced Communications Satellite (formerly NASA 30/20 GH_z 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.
AMPE	Automated Message Processing Equipment.
AMPS	Automated Message Processing System.
AMSL	Acquisition Management Systems List.
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.
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.
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.
• 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.
• 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 Requirements List.
CFE	Contractor-Furnished Equipment.
CFR	Code of Federal Regulations.
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 Objectives 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.
- 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.
• 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.
• FTPS	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.
GPO	Government Printing Office.
GPS	Global Positioning System.
GS	General Schedule.
GSA	General Services Administration.
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.
IQ	Indefinite Quantity Contract.
IR&D	Independent Research & Development.
IRM	Information Resource Manager.
IXS	Information Exchange System.
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	Letters of Interest.
LRPE	Long-Range Procurement Estimate.
MAISRC	Major Automated Information Systems Review Council (DoD).
MANTECH	MANufacturing TECHnology.
MAPS	Multiple Address Processing System.
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 Repair.
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.
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.
P^3I	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.
PPBS	Planning, Programming, Budgeting System.
PR	Purchase Request or Procurement Requisition.

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-1	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/Analyst Services.
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	Qualified Requirements 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 Administration.
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.
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

- ADP Automatic Data Processing.
- ADPE Automatic Data Processing Equipment.
- ANSI American National Standards Institute.
- CAD Computer-Aided Design.
- CAM Computer-Aided Manufacturing.
- CBEMA Computer and Business Equipment Manufacturers Association.
- CCITT Comite Consultaif Internationale de Telegraphique et Telephonique; Committee of the International Telecommunication Union.
- COBOL COmmon Business-Oriented Language.
- CPU Central Processor Unit.
- DBMS Data Base Management System.
- EIA Electronic Industries Association.
- IEEE Institute of Electrical and Electronics Engineers.
- ISO International Organization for Standardization; voluntary international standards organization and member of CCITT.
- ITU International Telecommunication Union.
- LSI Large-Scale Integration.
- PROM Programmable Read-Only Memory.
- UPS Uninterruptable Power Source.
- VLSI Very Large Scale Integration.

APPENDIX D: 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-76 Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government.
- 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.

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 Policy and Procedures for the Management and Control of High-Order Languages and Mandate for Use of Ada Language for all DoD Mission-Critical Applications.
- 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-7920.1 — Life Cycle Management of Automated Information Systems (AIS).
- 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 NBS 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 NBS 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 Replaces 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	NBS Data Encryption Standard (DES).
• FIPS 81	DES Modes of Operation.
• FIPS 100	NBS Standard for Packet-Switched Networks; Subset of 1980 CCITT X.25.
• FIPS 107	NBS Standard for Local Area Networks, Similar to IEEE 802.2 and 802.3.
• 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.
• MIL-STD-188-114C	Physical interface protocol similar to RS-232 and RS-449.
• MIL-STD-1750A	Embedded system microchip architecture specification.
• MIL-STD-1777	IP - Internet Protocol.
• MIL-STD-1778	TCP - Transmission Control Protocol.
• MII-STD-1780	File Transfer Protocol.
• MIL-STD-1781	Simple Mail Transfer Protocol (Electronic Mail).

- MIL-STD-1782 — TELNET - Virtual Terminal Protocol.
- MIL-STD-1815A — Standard for the Ada Programming Language, February 1983.
- 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).

APPENDIX E: RELATED INPUT REPORTS

A. ANNUAL MARKET ANALYSES

- Procurement Analysis Reports, GFY 1987-1992.
- U.S. Professional Services Market, 1985-1990.
- U.S. Software Products Market, 1985-1990.
- U.S. Information Services Cross-Industry Markets, 1986.
- U.S. Information Services Industry, 1986.
- U.S. Information Services Vertical Markets, 1986.

B. INDUSTRY SURVEYS

- Directory of Leading U.S. Information Services Vendors, 1986.
- Information Services Industry Report, 1986.
- Eighteenth Annual ADAPSO Survey of the Computer Services Industry, 1984.

C. MARKET REPORTS

- Analysis of Software Service and Support, 1986.
- Federal Office Information Systems Market, 1986-1991.
- Federal Systems Integration Market, 1986-1991.
- Departmental Systems and Software Directions, 1986.
- IBM Operating Systems Strategies, 1986.
- Federal ADP Facilities Management Market, 1985-1990.
- Federal Government Professional Services Market, 1985-1990.
- Applications Software Development Tools, 1985.
- Data Base Management Systems Markets, 1985.
- Fourth Generation Languages Markets, 1985.
- Information Services Markets in Artificial Intelligence, 1985.
- New Generation of Integrated Software, 1985.
- Professional Services Market Directions, 1985.
- Selling Micro Software to Corporate America, 1985.
- Software Product Pricing Trends, 1985.

- Trends in Microcomputer Operating Systems, 1985.
- Management, Technology, and Strategy for Large Systems, 1983.

D. SOFTWARE PLANNING REPORTS

- Software Productivity, 1986.
- Departmental Systems and Software Directions, 1986.
- IBM Operating Systems Strategies, 1986.
- Analysis of Prototyping, 1985.
- Applications Software Development Tools, 1985.
- Artificial Intelligence, 1985.
- Data Base Management Systems, 1985.
- Decision Support Systems: Experience and Knowledge, 1985.
- Fourth Generation Language Tools, 1985.
- Micro-Mainframe Software, 1985.

APPENDIX F

SOFTWARE AND RELATED SERVICES - AGENCY QUESTIONNAIRE

1. Have you acquired in the past or do you plan to acquire any software packages or custom professional services over the next two to five years?

	Past		Future		
	Yes	No	Yes	No	Why
a. Applications Software Packages					
b. Systems Software Packages					
c. Custom Applications Software Development					
d. Custom Systems Software Development					
e. Contract Software Maintenance					

2. What is your total annual expenditure for software packages, custom applications, systems software development, and contract software maintenance? $_____

3. About what percent of your total software budget is spent on each of the following:

Applications Software Packages _____%

Operation Systems Software Packages _____%

Custom Applications Software Department _____%

Custom Systems Software Development _____%

Contract Software Maintenance _____%

4. In which of the following categories of software and services do you expect either an increase or decrease in the next 2 to 5 years and by what percent change, in your opinion?

	Increase	Decrease	Percent Change
Applications Packages	_____	_____	_____%
Systems Packages	_____	_____	_____%
Custom Applications Software Development	_____	_____	_____%
Custom Systems Software Development	_____	_____	_____%
Contract Software Maintenance	_____	_____	_____%

5. Do you believe that some of your future software requirements can be satisfied by commercial software packages? Yes _____ No _____

5a. (If Yes)

1. Which types of applications software and for which size hardware:

(Mainframe, Mini, or Micro)?

_____

_____

2. Which types of systems software and for which size of hardware:

(Mainframe, Mini, Micro)?

_____

_____

5b. (If No)

Do you believe that commercial software packages could be modified by a vendor to meet your needs? Yes _____ No _____

1. (If Yes)

a. Why? _____

_____

b. Type of Applications Software _____

_____

c. Type of Systems Software _____

_____

2. (If No):

Why? _____

_____

6. Do you believe that your software requirements are sufficiently unique that they can only be satisfied by custom development? Yes _____ No _____

6a. (If Yes)

1. Why? _____

_____

2. Could you identify some of the applications and/or systems software that you will need?

_____

_____

_____

3. Which programming and analysis resources would you use?

Agency Staff _____

GSA Region _____

Contractor _____

6b. (If No)

Why? _____

7. If you have, or plan to acquire commercial software packages, please rate the importance of the following list of factors from 1 to 5, with 1 being the least important factor in buying software and 5 being the most important factor:

	Applications Software	Systems Software
1. Ease of Use	1 2 3 4 5	1 2 3 4 5
2. Software Performance	1 2 3 4 5	1 2 3 4 5
3. Customer Support Reputation	1 2 3 4 5	1 2 3 4 5
4. Documentation	1 2 3 4 5	1 2 3 4 5
5. Ease of Implementation	1 2 3 4 5	1 2 3 4 5
6. Service Quality	1 2 3 4 5	1 2 3 4 5
7. Software Features	1 2 3 4 5	1 2 3 4 5
8. Product Price	1 2 3 4 5	1 2 3 4 5
9. Vendor Application Knowledge	1 2 3 4 5	1 2 3 4 5
10. Vendor Federal Experience	1 2 3 4 5	1 2 3 4 5
11. Vendor Commitment to Maintain Product	1 2 3 4 5	1 2 3 4 5
12. Training	1 2 3 4 5	1 2 3 4 5

8. If you have or plan to acquire custom software development, please rate from 1 to 5 the importance of the following factors in selection of a contractor:

	Rank
1. Application Functional Experience	1 2 3 4 5
2. Software Development Experience	1 2 3 4 5
3. Target Language Experience	1 2 3 4 5
4. Target Hardware Experience	1 2 3 4 5
5. Integration Experience	1 2 3 4 5
6. Installation Experience	1 2 3 4 5
7. Customer Support Reputation	1 2 3 4 5
8. Federal Contract Experience	1 2 3 4 5
9. Agency Experience	1 2 3 4 5
10. Training	1 2 3 4 5
11. Price	1 2 3 4 5
12. Other	1 2 3 4 5

9. Please rank on a scale of 1 to 5, with 5 being the most frequent, the use of these acquisition methods for software development:

   a. Purchase or lease of software packages:

GSA Schedule (including Computer Store)	1 2 3 4 5
Competitive Bid	1 2 3 4 5
Purchase Order	1 2 3 4 5
Other (what?) _____	1 2 3 4 5

   b. Purchase of custom professional services

GSA Contractor Support Program	1 2 3 4 5
Competitive Bid	1 2 3 4 5
Purchase Order	1 2 3 4 5
Other (what?) _____	1 2 3 4 5

10. Please rank, on a scale of 1 to 5, with 5 being the most frequent, the following test and acceptance procedures for software:

   a. Testing and acceptance of software packages:

Benchmark	1 2 3 4 5
Trial Period (e.g., 60 days operation in house)	1 2 3 4 5
Parallel Measurement Testing	1 2 3 4 5
IV & V (Independent Verification and Validation)	1 2 3 4 5
Other (what?) _____	1 2 3 4 5

   b. Testing and acceptance of custom software

Benchmark	1 2 3 4 5
Trial Period (_____ days)	1 2 3 4 5
Parallel Operation (_____ days)	1 2 3 4 5
IV & V (Independent Verification and Validation)	1 2 3 4 5
Other (what?) _____	1 2 3 4 5

11. In relation to post implementation software support services, how important is the contractor's reputation in each of the following factors to your organization generally? Rate on a scale of 1 to 5, where 5 represents the highest importance, and please note whether there are any exceptions.

A Reputation For:	Generally	Exception to Rating
Fixing Errors	1 2 3 4 5	_____
Improving Features or Functions	1 2 3 4 5	_____
Extending Features or Functions	1 2 3 4 5	_____
Adding Features or Functions	1 2 3 4 5	_____
Training	1 2 3 4 5	_____
Consulting	1 2 3 4 5	_____
Other (_____)	1 2 3 4 5	_____

12. What kinds of services do your vendors/contractors offer in addition to those listed above? _____

_____

13. Overall, is problem resolution performance by software vendors satisfactory?

Yes _____ No ____

a. How should it be improved? _____

_____

b. Do you expect it to be improved? _____

_____

14. Do you currently perform, or plan to perform in the future, the following types of software package self-support? Rate from 1 to 3, where 1 is never, 2 is sometimes, and 3 is usually.

Type	Currently	Future
Install Initial Release	1 2 3	1 2 3
Install Subsequent Releases	1 2 3	1 2 3
Modify Packages	1 2 3	1 2 3
Fix Errors	1 2 3	1 2 3
Assign a Single Point for Vendor Questions	1 2 3	1 2 3

15. Do you currently employ a systems design methodology in your systems development cycle? Yes _____ No _____

(If Yes)
Which one(s)? _____

_____

16. How do you measure software development or operations productivity improvements?

_____

_____

_____

17. INPUT concludes that the most noticeable change in the software development process has been the involvement of end users.

Do you use prototyping with end-user involvement? Yes _____ Plan to _____ No _____

Do you make significant use of PCs? Yes _____ Plan to _____ No _____

Are PCs linked to mainframes? Yes _____ Plan to _____ No _____

18. GSA and GAO studies indicate that software maintenance is the most costly part of the software life cycle. What impact do you think user involvement will have on maintenance?

_____

_____

_____

19. Are there other software support issues that are important to you or your organization? Yes _____ No _____

(If Yes)

What? _____

_____

_____

_____

SOFTWARE AND RELATED SERVICES - VENDOR QUESTIONNAIRE

1. Which of the following software products or custom professional services have you provided (Past) or plan to provide (future) to the federal government over the next 2 to 5 years?

	Past		Future		
	Yes	No	Yes	No	Why
Applications Software Packages					
Systems Software Packages					
Custom Applications Software Development					
Custom Systems Software Development					
Contract Software Maintenance					

2. What was your total revenue for software packages, custom software development, and/or contract software maintenance last year? $ _____

3. About what percent of your federal software and services revenues were generated in each of the following areas?

	Percent
Applications Software Packages	_____
Operation Systems Software Packages	_____
Custom Applications Software Development	_____
Custom Systems Software Development	_____
Contract Software Maintenance	_____

4. Would you categorize your organization as a

_____ Software House

_____ Systems House

_____ Services Organization

5. In which of the following categories of software and services do you expect either an increase or decrease in the next 2 to 5 years and by what percent change, in your opinion?

	Increase	Decrease	Percent Change
Applications Packages			
Systems Packages			
Custom Applications Software Development			
Custom Systems Software Development			
Contract Software Maintenance			

6. Do you believe that current or future federal software requirements are sufficiently unique that they can only be satisfied by custom development?

Yes _____ No _____

6a. (If Yes)

1. Why? _____

_____

2. Could you identify some of the applications and/or systems software and for which size hardware (mainframe, mini, or micro) that would require custom development? _____

_____

_____

_____

6b. (If No)

Why? _____

_____

7. Do you believe that future federal software requirements could be satisfied by commercial software products? Yes _____ No _____

7a. (If Yes)

Which types of products for which size hardware (mainframe, mini, or micro)?

_____

_____

_____

7b. (If No)

Why? _____

_____

8. Do you believe that commercial packages could be modified to meet federal software requirements? Yes _____ No _____

8a. (If Yes)

Have you modified software products for federal agencies? Yes ____ No ____

8b. (If Yes)

Could you identify the products, applications, and hardware size?_____

_____

_____

8c. (If No)

Could you give me some applications examples? _____

_____

_____

9. If you have provided or plan to offer commercial software packages, how do you believe federal agencies rate the importance of the following list of factors in buying software, from 1 to 5, with 1 being the least important and 5 being the most important:

	Application Software	Systems Software
1. Ease of Use	1 2 3 4 5	1 2 3 4 5
2. Software Performance	1 2 3 4 5	1 2 3 4 5
3. Customer Support	1 2 3 4 5	1 2 3 4 5
4. Documentation	1 2 3 4 5	1 2 3 4 5
5. Ease of Implementation	1 2 3 4 5	1 2 3 4 5
6. Service Quality	1 2 3 4 5	1 2 3 4 5
7. Software Features	1 2 3 4 5	1 2 3 4 5
8. Product Price	1 2 3 4 5	1 2 3 4 5
9. Vendor Applications Knowledge	1 2 3 4 5	1 2 3 4 5
10. Vendor Federal Experience	1 2 3 4 5	1 2 3 4 5
11. Vendor Commitment to Maintain Product	1 2 3 4 5	1 2 3 4 5
12. Training	1 2 3 4 5	1 2 3 4 5

10. If you have provided, or plan to offer, custom software development, how do you believe federal agencies rate the importance of the following factors in selection of a contractor, where 1 is least important and 5 most important:

1.	Application Functional Experience	1 2 3 4 5
2.	Software Development Experience	1 2 3 4 5
3.	Target Language Experience	1 2 3 4 5
4.	Target Hardware Experience	1 2 3 4 5
5.	Integration Experience	1 2 3 4 5
6.	Installation Experience	1 2 3 4 5
7.	Customer Support Reputation	1 2 3 4 5
8.	Federal Contract Experience	1 2 3 4 5
9.	Agency Experience	1 2 3 4 5
10.	Training	1 2 3 4 5
11.	Price	1 2 3 4 5
12.	Other	1 2 3 4 5

11. Please rank on a scale of 1 to 5, with 5 being the most frequent, your experience with the acquisition methods used by federal agencies for buying software:

a.	Purchase or lease of software packages:	
	GSA Schedule (including Computer Store)	1 2 3 4 5
	Competitive Bid	1 2 3 4 5
	Purchase Order	1 2 3 4 5
	Other (what?) _____	1 2 3 4 5
b.	Purchase of custom professional services:	
	GSA Contractor Support Program	1 2 3 4 5
	Competitive Bid	1 2 3 4 5
	Purchase Order	1 2 3 4 5
	Other (what?) _____	1 2 3 4 5

12. Please rank, on a scale of 1 to 5, with 5 being the most frequent, your experience with federal agency software test and acceptance procedures:

a. Testing and acceptance of software packages:

Benchmark	1 2 3 4 5
Trial Period (e.g., 60 days operation in house)	1 2 3 4 5
Parallel Measurement Testing	1 2 3 4 5
IV & V (Independent Verification and Validation)	1 2 3 4 5
Other (what?) _____	1 2 3 4 5

b. Testing and acceptance of custom software:

Benchmark	1 2 3 4 5
Trial Period (_____ days)	1 2 3 4 5
Parallel Operation (_____days)	1 2 3 4 5
IV & V (Independent Verification and Validation)	1 2 3 4 5
Other (what?) _____	1 2 3 4 5

13. In relation to post-implementation software support services, in your opinion, how important to the Federal Agencies is the contractor's reputation in each of the following factors generally? Rate on a scale of 1 to 5, where 5 represents the highest importance, and please note whether there are any exceptions.

A REPUTATION FOR:		EXCEPTION TO RATING
Fixing Errors	1 2 3 4 5	_____
Improving Features or Functions	1 2 3 4 5	_____
Extending Features or Functions	1 2 3 4 5	_____
Adding Features or Functions	1 2 3 4 5	_____
Training	1 2 3 4 5	_____
Consulting	1 2 3 4 5	_____
Other (_____)	1 2 3 4 5	_____

14. What other kinds of services do you offer the federal government, in addition to those listed above? _____

_____

15. Overall, do you believe that your problem resolution performance is satisfactory?
Yes _____ No _____

a. How could it be improved? _____

_____

b. Do you expect it to be improved? _____

_____

16. Do you currently employ a systems design methodology in your software development cycle? Yes _____ No _____

(If Yes)

Which one(s) _____

_____

17a. How do you measure software development or operations productivity improvements? _____

_____

17b. How do your federal clients measure productivity improvements? _____

_____

18. INPUT concludes that the most noticeable change in the software development process has been the involvement of end-users.

a. Do you promote the use of prototyping with end-user involvement? Yes _____ Plan to _____ No _____

b. Do you suggest significant use of PCs? Yes _____ Plan to _____ No _____

c. Should the PCs be linked to the mainframes? Yes _____ Plan to _____ No _____

19. GSA and GAO studies indicate that software maintenance is the most costly part of the software life cycle. What impact do you think user involvement will have on maintenance? _____

_____

20. For what types of applications, languages, and size of hardware (mainframe, mini, micro) do you provide software products, software development, and/or support services?

APPLICATIONS	LANGUAGE(S)	HARDWARE

21. Are you now, or do you plan to become qualified in Ada programming?

_____ Now _____ Plan to _____ No

(If Now or Plan to)

Do you have access to one or more certified Ada Compilers? Yes _____ No _____

22. Are there other software support issues that are important to you or your organization? Yes _____ No _____

(If Yes)

What? _____

_____

_____

_____