COMMERCIAL SYSTEMS INTEGRATION MARKETS

1986 - 1991

INPUT

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Commercial Systems Integration Markets, 1986-1991

COMMERCIAL SYSTEMS INTEGRATION MARKETS, 1986-1991

ABSTRACT

Commercial systems integration, or the sole-source provision of complex information systems requiring project management, systems design, software/hardware/network integration, and implementation services, is fast becoming a huge market with strategic importance for both vendors and users.

U.S. businesses in all industry sectors are facing an unprecedented onslaught of competition from both domestic and foreign sources. Competing in this new environment requires optimized use of information systems and service resources as well as constant evaluation of the processes that they serve.

INPUT's new report, Commerical Systems Integration Markets, 1986-1991, clarifies the opportunities and risks associated with this multi-billion dollar market and examines the succeses to date of the market leaders.

This report contains 196 pages, including 77 exhibits.

COMMERCIAL SYSTEMS INTEGRATION MARKETS, 1986-1991

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EXHIBITS

1 INTRODUCTION

I INTRODUCTION

- 1986 initiated major changes in the patterns of end-user purchasing. Users began a "digestive pause" while they reevaluated their information systems strategies (centralized, distributed, networked), their software strategies (operating system for the 1990s, DBMS), and their use of PCs.

- Many of the issues raised call for deeper understanding and technological skills than the average user can muster. Even when able to determine the direction they wish to move in, most are not able to take the necessary steps. For the majority, however, the difficulty lies in perceiving the strategy that should be adopted in today's vast array of technologically feasible options.

- Further, the hardening of competition in all categories of commercial activity demands that U.S. companies be able to respond rapidly and accurately to market needs in cost-effective ways. One part is real need in the quest for higher productivity, better margins, and reduced costs. Another part is also perceived need, based on the fear of competitors gaining "an edge."

- As a result of these forces, systems integration, once the near-exclusive province of developers of federal government systems, is becoming commonplace in commercial industry sectors.

- The growing importance of the concept of commercial systems integration (CSI) has wide-ranging strategic implications for large firms and the MIS

management that supports that interest. While the extent of the impact of CSI will vary from industry to industry, each will be affected by it as these large, integrated systems impact the very core of each business.

- CSI has equally large implications for a wide variety of vendors--hardware manufacturers, software products suppliers, communications vendors, professional services firms, and other information services suppliers (e.g., aerospace firms and management consultants). The adoption of a CSI strategy will have a significant impact on most classes of information industry firms, bringing nontraditional competitors (e.g., engineering/construction firms) into the information services arena.

- CSI not only represents an opportunity for new markets but also a threat to old ones. The enormous size of contracts being let and the shift in responsibility from the user to the vendor imply new and immense strategic power for successful participants. These vendors will be able to specify at unprecedented levels of detail the technical components--hardware, software, and communications--that comprise a major system.

A. REPORT OBJECTIVES

- INPUT has watched and reported on systems integration since 1984. The first report to focus on systems integration in the commercial sector was published in 1985 (Commercial Systems Integration: Opportunities and Challenges). The current report is an update and expansion of that first CSI report.

- The primary objectives of this report are to:

  - Ascertain the current status and probable future course of development of this market, including industries and applications most suited to the concept.

- Provide a forecast of the size and growth rate of CSI from 1986 to 1991 on an industry by industry basis in terms of the market components (hardware, software, communications, professional services, etc).

- Identify business conditions under which CSI will be most successful by analyzing management needs, MIS needs, and user needs as they differ with respect to CSI.

- Identify the major current and likely players, market entry requirements, key success factors, and strategies for success, including interactions among participating and nonparticipating information services providers and other nontraditional firms.

- Users of the report will be able to size the market and evaluate opportunities, learn what others are doing or planning to do, understand the pitfalls and learn from the mistakes of others, and plan strategies to either exploit the opportunity or defend against it.

B. REPORT SCOPE

1. DEFINITION OF COMMERCIAL SYSTEMS INTEGRATION

- CSI is the sole-source responsibility for the provision of a "total solution" to a complex, multidisciplinary information systems requirement (see Exhibit I-1). Typically, the integrator provides project management and "end-to-end" responsibilities for systems design, provision, and/or development of all hardware, software, and communications systems; coordination of teaming arrangements with outside suppliers of engineering, data processing, and personnel resources; and the documentation, training, and post-implementation support required by the client (see Exhibit I-2).

EXHIBIT I-1

CHARACTERISTICS OF CSI

- Single Vendor Responsibile for Delivery of Solution
- "Total Solution" Required by Client Organization
- Desired System is Complex, Multidisciplinary
- "Transparent" Subcontractors Supply Specific Components
- Singificant Project Management Role for Integrator
- Minimum Contract Value of $5 Million

EXHIBIT I-2

TYPICAL TASKS INVOLVED IN CSI PROJECTS

- Total Project Management
- Process Feasibility and Tradeoff Studies
- Systems Design
- Selection/Configuration of Hardware and Network
- Selection of Systems Software
- Selection/Modification of Applications Software
- Installation of Hardware and Software
- Systems Integration (Hardware and Software)
- Testing and Demonstration of System
- Documentation
- Client Staff Training
- Operation and Maintenance of Hardware and Software

- In assuming the responsibility and the risk, the CSI vendor warranties the success of the system, essentially guaranteeing that it will operate as promised, be delivered as stated, and cost a "predetermined" amount.

2. REPORT PARAMETERS

- The following characteristics are typical of the complex, multidisciplinary information systems projects to which CSI is applied and around which the forecasts included in this report were developed:

  - Projects are usually multi-year efforts.

  - Projects have significant project management demands.

  - Target systems are strategically significant to the client's information environment.

  - These systems require significant portions of the software to be custom developed and/or include a substantial network requirement.

  - Projects typically have a total contract value of $5 million or greater. (Note: This expenditure "floor" was used as a guideline to distinguish CSI contracts from turnkey systems and "standard" professional services with a communications or hardware component.)

- The focus of this report is restricted to non-federal government industries within U.S. borders. While state and local government is included, "commercial" systems integration is used rather than the more awkward "non-federal government" because this term has already been widely used to designate the market we cover in this report. All major industries are covered separately, while industries that have a minor role in the CSI market are presented in the aggregate.

C. METHODOLOGY

- The data for this report was derived from interviews with companies that have been or are in the process of being implemented in large, complex systems. Vendors who have entered or are planning to enter this market were also interviewed.

- In developing INPUT's forecast of the CSI market, the following approach was used:

  - The number of establishments, by industry, that are capable of supporting a major project effort were estimated based on INPUT's knowledge of current activity in CSI. This number was grown at a nominal rate.

  - The percent of these companies that might actually have major projects in any year was then estimated, and the number of possible projects based on this assumption was calculated.

  - The average dollar value of these major projects was estimated based on current CSI contracts, and the average value grown at a nominal rate to account for moderate inflation (2%).

  - The proportion of this total dollar value to be contracted to CSI vendors was estimated, as was the growth rate in the contracted portion versus the portion that users will undertake by themselves. From this the total CSI contract value in any one year was calculated.

  - At this point, the sales value in each year of CSI contracts was known, but not the revenue, which depends on the rate at which the contract is implemented and how the money is spent.

- To spread the contract over the life of the project, INPUT assumed an average project life of three years for development and, for simplicity, put the outyear expenditures (i.e., ongoing support, operation, and maintenance) in a fourth year.

- INPUT also assumed that, on average, the components of the project would be acquired according to the following general schedule:

	Year 1	Year 2	Year 3	Year 4
Computer Hardware		100%		
Communications Hardware			100%	
Systems Software Packages		100%		
Applications Software Packages			100%	
Consulting	60%	20%	20%	
Project Management Fees	40%	20%	20%	20%
Design/Integration	45%	35%	20%	
Software Development		50%	50%	
Education/Training and Documentation			33%	67%
O & M			33%	67%
Other				100%

- Then, by industry, INPUT estimated the proportion of the total project dollars to be spent on each component and calculated the percent of the total to be expended in each of the four years of the project. Growth rates for 1985/1986 were assumed for the prior years.

- Finally, the dollars to be spent in each year on each component was calculated by multiplying the proportion of the total project to be allocated to each component by the total value of the contracts for the appropriate year.

- For example, the estimated total CSI contract value for banking/finance in 1984 was approximately $78 million. Since 1985 is the second year of those 1984 projects, INPUT allocated 23% of the total to computer hardware purchased in 1985.

- Vendor share data was estimated by identifying the contract value of the CSI projects awarded in 1986.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- Commercial systems integration (CSI) is a single-source supply of solutions to large, complex information systems requirements where one vendor assumes responsibility for all aspects of a system including hardware, software, and communications. Vendors who may provide portions of the solution are transparent to the user.

- It is difficult to overestimate the importance of CSI to information services vendors and others who have targeted the Fortune 2000 companies as their principal source of business. The complexity and variety of information systems solutions and the constant flow of new technology have reached a point where fewer and fewer people are capable of designing conceptually sound systems that incorporate distributed hardware, relational data bases, integrated applications software, and local and remote networks that tie them all together. This offers an opportunity to vendors who not only have the talent to provide these services, but who are also coming to accept the responsibility for the provision of total solution project management.

- The key lies in this transfer of control. The vendor who obtains the control of a series of multi-year, multi-million dollar contracts not only has a stable backlog but gains account control to a degree unheard of until now.

A. USER DRIVING FORCES IN THE CSI MARKET

- Foreign competitive pressure on quality and cost has increased markedly in recent years in most if not all of the domestic industry sectors. The competition is not only working harder but working smarter, forcing America's businesses to adopt new strategies for survival.

- To track their progress in these arenas, there is an ever-increasing need for real time information on a wide range of data ranging from product sales analyses and consumer credit verification to cash flow requirements and manufacturing capacity. As a result, many companies now find information systems at the very heart of the organization and believe that new technologies will help them achieve the optimum systems solutions they require.

- But most of today's systems were conceived in reponse to single applicational needs. The vast majority of installed systems address single requirements and are, therefore, often fragmented and incomplete. What is needed is a system solution that integrates the data, text, and image processing needs of the corporation, one that fosters a better use of existing systems.

- These envisioned systems are complex, however, and frequently incompatible with existing hardware, software, and network systems. Further, the in-house staff frequently lacks both the time and technical skills required to implement such complex solutions on time and within budget.

- CSI promises quick and successful development of these very complex systems by allowing vendors skilled in complex systems implementation and management to take responsibity for the entire project, allowing in-house ressources to concentrate on the (very important) task of day-to-day operations and problems.

INPUT®

USER DRIVING FORCES IN THE CSI MARKET

- Competitive Need for Real Time Information Systems
- Need for Integration of Single-Application Systems
- In-house Inability to Deal with Complex Systems while Maintaining Ongoing Systems
- Need for On-Time, within Budget, Successful Delivery

B. MARKET FORECAST, 1986-1991

- The commercial systems integration was worth $1 billion in 1986 and is expected to grow to $5.4 billion by 1991, averaging an annual growth rate of 38%. In a sense, the development of CSI could not have occurred at a better time for the many vendors active in the federal systems integration market. With defense spending already stalled (and, with the Democrats in control of both the Senate and House, likely to shrink), a new opportunity was needed to replace the lack of growth in the federal arena. Nearly two-thirds of CSI expenditures will be on professional services. Information systems and hardware will be the second largest market, while communications hardware expenditures will grow at the fastest rate. Software products expenditures, meanwhile, will grow to over $300 million by the end of 1991.

- While IS managers have demonstrated an increasing propensity to buy packaged software rather than pay for custom development, the unique and complex nature of CSI projects is such that customized software development is likely to be in far greater demand than the purchase of software products.

- Professional services are at the heart of CSI projects. Users are buying the contractor's ability to "make it happen." Consulting (feasibility studies), project management, systems design and integration, software development, education/training, and documentation will all be in substantial demand.

- This is not to say that the professional services vendors will have the edge in obtaining CSI business. The overriding importance is to have the image of being able to accomplish the task (rather than, e.g., federal systems references). Thus, the hardware manufacturers will have a great competitive advantage because users believe that IBM, DEC, Unisys, etc., "must" know how to implement complex systems.

MARKET FORECAST, 1986-1991

	User Expenditures ($ Billions)		AAGR (Percent)
	1986	1991	
Professional Services	$0.62	$3.10	38%
Comm. Hardware	$0.08	$0.40	41%
IS Hardware	$0.30	$1.50	36%
Software Products	*	$0.30	38%
Other	*	$0.10	*
Total	$1.00	$5.40	38%

* = Small Value

EXPENDITURES

C. MARKET TRENDS, 1986-1991

- As the competitive urgency of strategically significant systems increases, the need to bring these systems on-line quickly and growing user comfort with a CSI approach will result in a greater share of major projects being contracted out rather than being attempted in-house as is the case today. Twenty-one percent of these major project expenditures were spent with outside vendors in 1986, and this will increase to 39% by 1991.

- As large, representative companies in each industry adopt CSI and implement these systems for competitive advantage, similar systems development efforts will be precipitated in the competitive ranks. The importance of competitive information systems and services continues to grow so that the competitiveness alone can be reason for upgrade rather than equipment obsolescence.

- This same competitive "fear" will apply to vendors as well. When the size, complexity, and strategic value of these large contracts become known, most large professional services, hardware manufacturer, and consulting firms which are not already in the market will conclude that they are missing an opportunity. Certainly all vendors must decide what their strategy is toward CSI, whether they enter the market themselves or partner with a "prime" vendor.

- Users' analysis of the threat (loss of systems control) and promise (faster, more successful development) of CSI will be resolved early as users "try" CSI on their largest, most critical applications. The long-term success of the market will hinge on the project management and technical integration skills of the CSI contractors.

- CSI will bring into competition some unlikely groups, with professional services vendors, consultants, hardware vendors, engineering and construction firms, and software vendors competing together for the same business.

MARKET TRENDS

- Competitive Urgency of Strategically Significant Systems Will Increase
- Users Will Contract More Projects Externally
- Successful CSI Projects Will Drive Competitive Users and Vendors to Imitate
- CSI Potential for Account Control Cannot Be Ignored
- Industry Knowledge as well as Project Management and Integration Skills Critical

D. FORECAST BY INDUSTRY SECTOR

- The greatest opportunities in the CSI market will be in discrete manufacturing which will exceed the next largest opportunity by almost two to one. Many of the CSI projects in discrete manufacturing will be related to computer integrated manufacturing (CIM), a market that INPUT has analyzed in-depth recently (see Computer Integrated Manufacturing Markets, 1986-1991).

- The main objectives in discrete manufacturing CSI projects will be to link the factory shop floor with the back office planning and control activities, to tie the network of upstream suppliers and their delivery schedules with the daily manufacturing plan, and to provide a two-way link from the factory to the field sales force to integrate customer requirements.

- The second largest CSI market will be banking and finance. While this sector is still recovering from the over-ambitious attempts of software product vendors to integrate banking operations, deregulation insures that companies in this sector cannot stand still. As with manufacturing, integration of upstream and downstream operations into a cohesive, single information system will provide great CSI opportunities.

- While differences exist among the industries and between individual companies in each industry, the dominant forces driving users to CSI are similar and include extensive competition that requires faster real time information on operations to enhance decisionmaking and to reduce costs and increasingly time-sensitive aspects of business requiring near-constant communications among all company divisions.

FORECAST BY INDUSTRY SECTOR

SECTOR	EXPENDITURES ($ Millions) 1986	1991	AAGR (Percent)
Discrete Manufacturing	$320	$1,320	33%
Banking/Finance	$115	$785	47%
State & Local Government	$47	$590	66%
Insurance	$100	$530	40%

E. VENDOR GOALS AND OPPORTUNITIES

- CSI offers an opportunity to seize account control from established vendors. Because of the critical importance of these systems to the end user and because the duration of the contract will be multi-year, the opportunity is afforded to the vendor to develop a unique relationship with the customer that can transcend existing relationships.

- Whoever controls the CSI project also controls downstream expenditures. The CSI/user relationship becomes so intimate, the contractor's knowledge of the user's environment so detailed, and the user's dependence on the contractor so strong that long-term relationships seem inevitable. This greater account control will also provide the vendor with an increased ability to fend off competitive incursions.

- Moreover, most, if not all, CSI projects are such that no single vendor can expect to satisfy the user's requirements alone. As a result, lasting partnership relationships will be formed that will be difficult to compete against or break. It is, therefore, crucial for vendors to choose, early on, partnerships that serve their best long-term strategic interests.

- To properly prepare for the CSI competitive environment over the next five years and beyond, vendors now must choose the envelope of services, industry markets, and skills that will be the focus of their CSI efforts. They can then isolate those capabilities, products, and services that are needed to complement their own catalog and begin selection of the ideal partner or partners that can not only provide the skills needed but enhance the vendor's public CSI image and therefore the likelihood of obtaining business.

- Vendors should direct their envelope of services to carefully defined vertical markets, developing their market expertise as they go.

INPUT®

VENDOR GOALS AND OPPORTUNITIES

- Long-Term Account Control
- Downstream Expenditure Control
- Lasting, Strategic Partnerships
- Envelope of Services, Industry Targets, and Skills

F. CSI COMPETITION

- While several classes of vendors will participate in this market, the actions of specific companies will be more important than the individual vendor's category. The principal categories of vendors already active in the market include professional services, hardware manufacturers, aerospace companies, engineering and construction firms, management consultants, and communications vendors.

- Successful vendors will have to develop a track record of successful, completed reference projects. This demonstrated success in developing systems on time and within budget will not only serve to alleviate user fears and lead to additional business but will also provide practical off-the-shelf products and methodologies to reduce the risk of failure in similar, subsequent projects (another reason to focus attention on vertical specialty markets).

- Exhibit II-6 provides INPUT's estimates of the relative share of total user expenditures on major projects that each of the above categories will obtain in 1986 and 1991. While the majority of the expenditures will stay in-house, nearly 40% will be spent with outside suppliers in 1991.

- The principal beneficiary will be the hardware manufacturers with 18% of the 1991 expenditures, followed by the professional services vendors with 9%. It is important to realize that the successful vendors in each category will number less than ten, with even the smaller vendors in each category benefitting from CSI revenues in excess of $50 million over the forecast period.

CSI COMPETITION

CATEGORIES	1986		1991	
	%	$M	%	$M
Hardware Manufacturers	10%	$815	18%	$3,830
Professional Services	6%	$490	9%	$1,920
Engineering & Construction	4%	$325	5%	$1,060
Communications Vendors	1%	$80	3%	$640
Aerospace (Divisions)	*	*	3%	$640
Total	21%	$1,710	38%	$8,090

* = Small Value

CONTRACT AWARDS

G. STRATEGIES FOR SUCCESS

- There are several key strategic elements to be considered in entering the CSI market. Containing the risk element and consciously managing each project to reduce the possibility of failure is an essential part of continued participation in the market. It is likely that, given the enormous impact that CSI can have on the continued operation and viability of the user's company, legal exposure will be very high.

- In the past, "admission of failure" has been avoided wherever possible by users and vendors alike. In the future, and given the size, visibility, and impact of CSI projects, the likelihood is that no such easy way out will be afforded to the unsuccessful vendor.

- To be successful in the CSI market, the prospective vendor must have an understanding of the processes that govern the fundamental business of the customer so as to be in a position to recommend workpractice changes as well as simple automation. This clearly means that systems design, programming, project management talent, etc., is the second most important component of a CSI vendor's makeup, the first being a ground-level understanding of the nature of the customer's business--now and in the future.

- This is why market specialization is a must, not just a sensible marketing approach. It is also why the selection of relevant partners is so crucial to the success of the CSI vendor. Not even IBM pretends to be able to undertake any project and will, in fact, deliberately choose to act as the secondary vendor in some bids rather than the prime vendor everyone expects them to be.

- Lastly, CSI is a big-stakes game. Typically, a vendor will spend between 3% and 5% of the contract's value in bidding in preliminary systems evaluation, design, and bid support. A $50 million CSI contract can cost upwards of $1.5 million just to bid with no assurance of success. Planning adequate funding before entering the market is therefore an absolute necessity.

STRATEGIES FOR SUCCESS

- Publicly Acknowledged Expertise in Industry and Application Area
- Quality Third-Party Relationships
- Ability to Assess, Contain, and Manage Risk
- Funded and Disciplined Bid Preparation
- Complex Project Management Skills

III MARKET SIZE, ANALYSIS, AND FORECAST

III MARKET SIZE, ANALYSIS, AND FORECAST

- Commercial systems integration is a new market and, as such, there is very little operational experience available in either the client community or the vendor community. INPUT believes that this situation could change rapidly over the course of the forecast period as key initiatives "go the CSI route." When a major system with strategic significance is developed by a single firm in a heavily competitive industry, others could follow rapidly, creating an "explosion" of contract signings.

- In this section that scenario and others are explored in an analysis of the structure, driving forces, size, and growth rate of this market.

A. MARKET STRUCTURE

1. GENERAL MARKET CHARACTERISTICS

- Systems integration is an approach to the development of new, upgraded, or expanded information systems for client organizations. In this approach, a vendor or team of vendors assumes responsibility for providing the information products and services which result in a comprehensive solution to the client's information systems problem.

- This approach is most applicable to major project efforts that involve the development of complex, multidisciplinary systems. The typical size of these projects, the fact that large portions of the software must be customed developed, and/or the substantial network requirements usually means that the total project effort is multi-year.

- It involves not only the actual integration or interfacing of the components of the solution, but also:

  . The analysis of the problem.

  . Design of the solution.

  . Selection, development, and implementation of the hardware and software.

  . Such post-implementation support as testing, client staff training, documentation, and, in some instances, operation and maintenance of the newly-developed system for a specified period of time.

- Generally, these projects are bounded at the start by the selection of the successful bidder and at the end by the acceptance of the new system by the client. The close relationship established between the vendor and the SI contractor can lead to sales of additional products or services unrelated to the SI project, but these opportunities have been explicitly excluded by INPUT in the development of the CSI forecast.

- Critical to the approach from both the client's and vendor's perspectives is the sharing or total transfer of responsibilty (and risk) for the successful development of the system from the client organization to the vendor(s). In exchange for assuming the risks of failure to deliver the desired solution on time and within budget, the integrator receives

not only project management fees from the client but also markups from subcontractors and the "inside track" in providing any of the products and services that comprise the total solution.

- Exhibit III-1 enumerates the component products and services that may be a part of a systems integration project and from which the vendor can expect to receive revenue. Since each project is unique in terms of specific requirements, not all of these components are applicable to all SI projects. Further, the unique requirements dictate the proportion of the total project expenditures to be made for each component involved.

2. COMMERCIAL VERSUS FEDERAL SYSTEMS INTEGRATION

- The federal government has relied on systems integrators to develop, upgrade, or replace automatic data processing systems for some time. Commercial systems integration, with some of its roots in Federal SI, has both striking similarities and differences with government contracting (see Exhibit III-2).

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

  - Vendor characteristics differ as well.

    . A key difference is the formality with which vendor reputation is evaluated as a part of the bid selection procedures in the federal marketplace. In most cases, a vendor's estimated versus actual performance on cost and schedule measures is recorded (the Defense Contract Audit Agency does this for Defense, but

EXHIBIT III-1

PRODUCTION/SERVICES IN CSI PROJECTS

- Hardware
  - Information Systems
  - Communications
- Software Products
  - Systems Software
  - Applications Software
- Professional Services
  - Consulting
    - Feasibility and Tradeoff Studies
    - Selection of Hardware, Network, and Software
  - Project Management
  - Design/Integration
    - Systems Design
    - Installation of Hardware, Network, and Software
    - Demonstration and Testing
  - Software Development
    - Modification of Software Packages
    - Modification of Existing Software
    - Custom Development of Software
  - Education/Training and Documentation
  - Operation and Maintenance
- Other Miscellaneous Products/Services
  - Data Processing Supplies
  - Processing/Network Services
  - Data/Voice Communication Services

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EXHIBIT III-2

COMMERCIAL VERSUS FEDERAL SYSTEMS INTEGRATION CHARACTERISTICS

CHARACTERISTIC	COMMERCIAL	FEDERAL
CUSTOMERS		
Requirements Knowledge	Low	High
Technical Knowledge	Variable	High
Interface	Multiple	Single
VENDORS		
Vertical Expertise	Preferred	Mandatory
Customer Base	Leveragable	Reference
Conceptual Strength	Required	Optional
Reputation	Media-Based	Historic
BUSINESS CONDITIONS		
Competitive Bids	Optional	Required
Bid Complexity	Variable	High
Expenditure Commitment	Deferrable	"Guaranteed"
Risk Exposure	High	Contained
Contract Type	Fixed-Price	Combination
Price Restrictions	Competitive	Ceilings
Bonuses	Unlikely	Awd./Incent.
Penalties	Unlikely	Exception

makes the evaluations available to all agencies). Agencies use this historic information to specifically and formally weigh the vendor's past performance. In the commercial world a federal track record of successful implementations is highly desirable and leverageable.

- The vendor's customer base is much more leverageable in the commercial sector in that the client, for the sake of cost, will not venture too far technically from the existing IS environment. This is not necessarily the case in the federal sector where the demands for competitive bidding seem to outweigh "easy" interfacing of new systems by contracting with the current vendor(s).

- The requirement for competitive bids for expenditures over $25,000 in the federal sector has no counterpart in the commercial world. While competition is a vehicle for the client to achieve the best solution at the best price, other factors (vendor reputation, comfort level with the vendor, etc.) do come into play. Further, the requirements for competition are such that agencies may not generally specify specific products in the RFP. So, at once, the federal process is more open and public, fostering a great deal of competition in which discounting is frequent.

- Competitve bidding in the federal sector makes for bidding complexity that involves more time, effort, and money on the part of the vendors.

- The tradeoff is that once the process starts in the federal sector, the expenditures are virtually guaranteed. This is not the case in the commercial area where expenditure commitments may be deferred or withdrawn at the client's choosing.

- The risks to the contractor appear to be much greater in the commercial marketplace. The rigid rules of contracting that are in play in the federal arena lead to compliance with the "letter" of the specifications. The absence of these rules in the commercial marketplace creates an environment where the "spirit" of the specifications is more at issue and, consequently, more subject to interpretation (and misinterpretation), creating a greater chance of contract performance suits.

  - Federal regulations specify price ceilings. Some regulations specify that profit can be no more than 15% and/or that the government must be treated as a "most favored" customer by receiving the vendor's best price. Requlations permit agencies to audit vendor records to verify these conditions.

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

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

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

- In summary, then, the commercial/federal distinctions revolve around the formality and regulatory backbone of the process. While it remains to be seen which, if any, of these more formal practices of the federal market are adopted by the commercial market, it is clear that commercial clients will quickly adopt those practices that protect them.

B. FACTORS DRIVING THE CSI MARKETPLACE

- While the use of integrators for the development of major systems has been frequent in the federal government sector, its application in commercial industries is only now beginning to emerge. Why are users turning to SI? What are the driving forces from both the users' and vendors' perspectives?

1. USER PERSPECTIVES

- From the buyer's point of view, use of a systems integration approach offers a process through which client organizations can, with rapidity and some greater assurance of success, put in place those information systems that are critical to revenue generation and cost control. Without an outside contractor taking charge of the development of critical systems, these systems could be longer in development and more costly, given the personnel and ongoing operational constraints faced by corporate MIS management.

- Specifically, client organizations are facing several critical issues. Among them are:

  - The need to meet growing information systems demands in the face of a shortage of skilled in-house staff and a more complex technical environment.

- The pervasiveness of information systems within organizations and the criticality of these systems to the very success of the business.

- The demand, at the highest levels of the organization, for a more productive utilization of corporate assets, including capital imvestments, human resources, and information.

a. Growing Demands and Staff Shortages

- Demands from all corners of the organization for additional MIS support are ever-increasing. Information systems have moved to the very heart of corporate business and now require better solutions for such divergent applications as:

  - Networks that tie inter-company groups together, especially in large, geographically dispersed companies, and networks that tie buyers and sellers together for the electronic exchange of data that ranges from orders to invoices, bill of lading to receipt of goods acknowledgement, and the like.

  - Document exchange capabilities among various media (data, text, image), multiple layers of computing (personal, departmental, corporate, inter-company), and various types of equipment from a multitude of vendors that permit the development of efficient and effective office information systems.

- Many of the existing data processing systems lack the transaction speed and size to satisfy requirements. The aging of equipment in the face of increasing demands requires that obsolete systems be replaced on a timely basis. This becomes all the more urgent as technology advances and offers new capabilities. "Super systems" that integrate several applications bound to fourth generation languages, corporate data base management systems, data that ranges from the personal level to the corporate level, and end-user tools that

range to intelligent workstations requiring mainframe links have moved from the "desirable" to the "necessary" category.

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

  - What seems to be occurring with respect to the continuing employment of an in-house technical staff is tied, in part, to the financial health of the company and to the criticality of the information systems to the business.

  - "Smoke stack" industries hurt by the economy are reducing staff and focusing the remaining capability on the maintenance of existing systems.

  - Where the systems are critical to revenue generation or to remaining competition, development efforts continue with little regard for the current economic impacts.

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

b. Pervasiveness of Information Systems

- Company management has shown an increasing desire to automate the very core of their businesses, demonstrating their awareness for the need for (even necessity for) the acceptance of automation as a competitive weapon. In the current economy of slow growth and narrowing profit margins and with stiff competition from around the globe, companies are unwilling to wait for internally-developed solutions in such areas as factory floor automation, financial decision support, customer service, sales/marketing, and management reporting.

- This pervasiveness has also brought forth a concern for the proper management of the corporation's information systems assets, including hardware, personnel, and data/information. Companies have moved from a reactive to a proactive orientation that requires the containment of costs and the leveraging of assets, the reduction of maintenance costs, and the prioritization of development efforts.

c. Demands for Productivity

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

- All of this created a deliberate "wait and see" attitude that looked for "industry-wide" standards before further development. Companies have used this "breather" from the rapid pace of development to rethink and redesign their information systems plan. Companies that have been through the process have eliminated some projects, combined others, and prioritized all of

them. They think they know what they want and realize the importance of contracting some of the effort.

- From the users' perspective, then, systems integration has several attractive characteristics, as shown in Exhibit III-3:

  - First, the integrator assumes the risk of development. At once, this starts to relieve the client of the worry that the system will be built at all and provides greater assurance that the project will be completed on-time and within budget. If the integrator fails for any reason, the client is risking only the time and money to the point of failure.

  - The client also hopes to be relieved of the time-consuming and potentially confusing logistics of finding and controlling several contractors. The assumption is that the integrator has or will develop solid business and technical relationships with the vendors who will be involved in the solution and that these relationships will smooth the interaction of multiple vendors. In the worst case, these vendor problems get passed on to the integrator, not to the client.

  - Related to this, in CSI it becomes the integrator's responsibility to integrate divergent and incompatible products. This may require a level of technical sophistication that the user organization does not possess.

    - Office information systems, for example, require a strategic office systems architecture that incorporates and interconnects multiple media, levels of computing, and functionality.

    - These electronic offices require highly advanced communications and integration of data, information, and knowledge bases.

ATTRACTIVE CHARACTERISTICS OF CSI APPROACH

- Meet Business Objectives Rapidly
- Reduce Risk of Systems Development
- "Acquire" Project Management Skills
- Integrate Fragmented Systems
- Save Costs Over Internally Development Solutions
- Use New Technology to Achieve Optimum Solution

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

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

- A systems integration approach also solves the lack of in-house project management skills. INPUT studies consistently show that DP management feels that project management skills and certain technical skills, especially systems design, are lacking in their organizations. Many, if not most, MIS departments have a mediocre record of completing major projects on budget and on time. SI solves this problem by transferring responsibility to a third party which can demonstrate these skills.

2. VENDOR PERSPECTIVES

- From the vendors' point of view, CSI represents opportunities for additional revenue from several sources:

  - CSI represents a net additional expenditure over "traditional" approaches to major projects in the form of fees for managing the project and the subcontractors who may be a part of the solution.

  - For both integrators and third-party vendors CSI opens new distribution channels for sale of products and services.

- The vendor may also hope to receive revenue in the form of markups from components of the solution supplied by other vendors.

- The close business relationship between the integrator and the client and the integrator's intimate understanding of the client's needs assure the integrator of the "inside track" in the award of bids for components of the complete system and for products and services completely unrelated to the integration project. While vendors would find it unwise to enter the market or bid on systems integration projects solely on the basis of these secondary benefits, they do need to appreciate the significant amount of "account control" that such projects afford.

- Strategically, the typical CSI client may represent a different class of user to the vendor; a group to which the vendor needs increased exposure. This will be particularly true in the early years of CSI as the largest and most powerful companies in each industry move to CSI first.

- Defensively, vendors may need to offer CSI to remain competitive in the marketplace. As more and more of the vendor's client base look for "one stop, full service," the vendor will need to respond with a CSI offering or seek assurances from both the client and potential integrators that the vendor will be included in the solution.

3. UNATTRACTIVE CHARACTERISTICS

- There are, of course, several unattractive characteristics of the market that may serve to constrain its growth.

- From the user's perspective, CSI appears to be net additional cost over either in-house development or piecemeal external development. While the value of this additional expense seems more than justified in organizations with critical information systems needs and an inability to meet those needs in a timely

fashion, it is not at all clear how users will perceive this added expense. Nor is it clear how rapidly, if at all, a positive valuation will spread to second- and third-tier organizations in each industry.

- A CSI approach also represents a loss of control of the development of critical systems. From an MIS management perspective, control is lost but responsibility remains. Generally, MIS is less favorable to SI than company management as a result. A system large enough to warrant a CSI approach is also important enough to the company to generate acute tensions around this dichotomy.

  - The natural tension in this situation creates a demarcation point at systems delivery. Many companies do not want facilities management, hardware maintenance, or similar "post-installation" services combined with CSI. They will operate and maintain the system.

- CSI also limits in-house exposure to design and implementation. Using outside contractors, the company does not develop the expertise inherent in the project within their in-house personnel. The skills developed during the course of the engagement remains with the vendor, and the user remains dependent on the contractor. Some MIS managers believe this weakens the company's ability to do additional work for when the contractor leaves, the expertise leaves.

- For their part, vendors may constrain the market by being unwilling or unable to assume the tremendous risks. Some vendors will manage the risk internally and/or spread it among subcontractors to limit financial exposure, but others may "sour" the market with unsuccessful efforts to do the same.

4. FUTURE COURSE OF DEVELOPMENT

- While conditions will vary by company and industry, CSI will be more common in well-run MIS operations with a history of use of outside services. These

firms know what they need and perceive the value of the services that the integrator brings to the project. Commercial systems integration will grow fastest in those industries where integrated systems are a key part of the strategy to remain competitive or seek an edge.

- Aerospace, energy production, telecommunications, manufacturing, and banking/finance are industry sectors that are heavily impacted by systems integration in the drive to remain competitive.

- Other selected large firms show a continuing need to develop strategic information systems which are very complex, yet essential to the welfare of the business.

o Small projects will be used as the vendor "proving grounds" before major awards.

- These early projects will practice technical conservatism in the form of off-the-shelf hardware, conventional languages, and step-by-step development.

- But as systems are built and seen to be successful, anxiety will be reduced, the size of projects will increase, and solutions that represent advanced technology will appear more frequently.

- Sales cycles will shorten and business conditions "standardize" as CSI experience is gained within industries.

o The characteristics that a client organization looks for in an integrator (see Exhibit III-4) should not change dramatically in the early years, but weightings of importance may change.

- Experience will outweigh project management skills, third-party relationships, and access to support services as client organizations use the

WHAT A CLIENT LOOKS FOR IN A CSI CONTRACTOR

- Industry Expertise
- Application Knowledge
- Past Integration Experience
- Relationships with Third-Party Vendors
- Project Management Skills
- Access to Other Support Services
  - Technical Consulting
  - Operations Management
  - Testing
  - Documentation
  - Education and Training
- Effective Reporting to Corporate Management
- Pragmatic Approach to Problem Solving

vendor's previous success as a benchmark for the chance of failure on the client's project. As clients begin to understand the specific skills associated with project management and as additional vendors gain experience, effectively reducing the ability of this criteria to differentiate among vendors, it is likely that the importance of these specific skills will grow. The client wants no surprises and looks at these criteria to find vendor characteristics that will ensure there are none.

- Similarly, in evaluating proposals (see Exhibit III-5) it is unlikely that the criteria will change significantly in the next few years, but the weightings may.

- As mentioned above, early projects will generally be technically conservative so the technical merit of the proposal could be secondary to the vendor's track record. However, as clients become comfortable with CSI, technical adventurism may set in and proposals evaluated for their offerings of advanced solutions.

C. MARKET FORECAST

- INPUT's market expenditure forecast for the total commercial systems integration market (all sizes of CSI projects) is $1.2 billion in 1986, growing to $6.0 billion in 1991. Overall annual growth should be at a 38% rate with smaller (under $5 million) project expenditures growing at a 35% rate.

- Commercial systems integration projects over $5 million, the focus of this report, are expected to become a $5.4 billion market by 1991 with growth at an average annual rate (AAGR) of 38% from the current $1.0 billion estimated by INPUT (see Exhibit III-6).

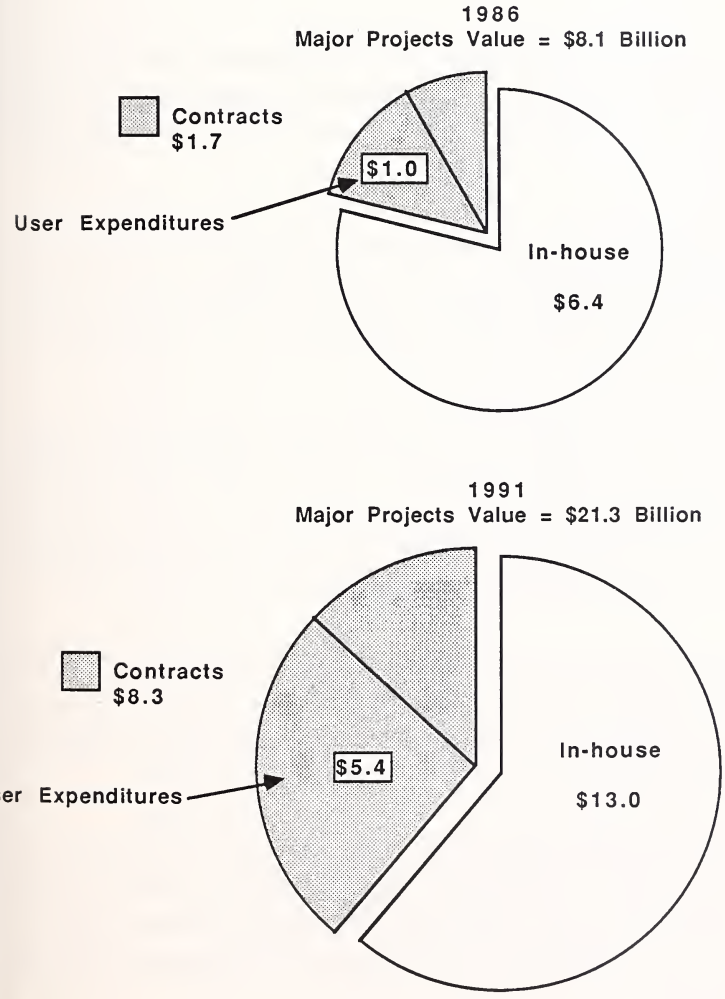
EXHIBIT III-5

PROPOSAL EVALUATION CRITERIA

- Does Proposal Address the Need?
- Overall Technical Merit
- Specific Hardware or Software
- Vendor's Track Record for Delivering Solutions
- Risk Containment Measures
  - Experience of Proposed Staff
  - Project Control Procedures
  - Type of Contract Proposed

EXHIBIT III-6

MAJOR PROJECTS VALUE AND EXPENDITURES, 1986-1991
($ Billions)



- Through this five-year period some $25.7 billion in major projects will be contracted with accumulated revenues from those contracts totaling nearly $16 billion in the same timeframe.

  - Including in-house development of major projects, the total market could swell to over $82 billion in accumulated user expenditures through 1991.

  - Further, since both users and vendors have difficulty controlling the schedule and expenditures involved in such large projects, actual expenditures may exceed planned contract values by a substantial amount.

- This forecast assumes that only the largest of companies will use the CSI approach and estimates their number at 10,360 in 1986, growing by 1,280 to 11,640 by 1991. (See Chapter I for an explanation of the forecasting procedures.)

  - Many of these companies will not undertake any large projects, either internally or externally, through the forecast period. But, estimating that 18% of these companies will undertake a major project in 1986 and that over one-third will do so in 1991, a total of 16,500 major projects will be initiated through the forecast period.

  - At an estimated average project value of $4.4 million in 1986 and $5.5 million in 1991, an AAGR of 5%, some $8.1 billion in projects will be started in 1986. By 1991 this total projects value should by approximately $21.3 billion.

  - An estimated 21% of these expenditures in 1986 will be associated with projects that are contracted out. By 1991, 39% of the total project expenditures should be contracted. The total 1986 contracted CSI project value is approximately $1.7 billion. The comparable 1991 value is $8.3 billion.

- Since CSI projects average over three years in duration, expenditures for the typical project trail the value of the signed projects. In 1991, for example, $21.7 billion in contracted projects will be "on the books." Only $14.3 billion of that will have been spent through 1991, for a backlog of $7.4 billion. This sales-to-expenditures ratio is yet another attractive aspect of CSI for vendors--the ability to identify with some certainty a future amount of revenue.

- Exhibit III-7 identifies several CSI-type projects let in 1986. While the list is only exemplary, it does suggest the extensive level of activity both in terms of types of projects and in terms of expenditures.

- While INPUT realizes that, under certain scenarios, CSI could grow very rapidly and exceed current forecasts by a large margin, INPUT believes that the market will be "lumpy" for the next year or two, due to the newness of the concept and the very large projects involved. This may favor federal sector SI vendors accustomed to long pre-sales activities. However, CSI should be attractive to a number of vendors for when each of the industries does take off, multiple CSI awards are unlikely to be with the same vendor for competitive reasons.

- In this section INPUT explains its forecast, first by the component expenditures of major projects and then by industry.

I. FORECAST BY CSI COMPONENT

- By their very nature, each CSI project is different, each solution unique. Expenditures for one or two components in the "typical" CSI project might comprise the whole project. Since projects can be so different, vendors need to assess each job, for both "primary" and "secondary" benefits to know how to bid. For the purposes of this forecast, however, INPUT has assumed that, on average, each of the components of a CSI project will appear with some regularity.

EXHIBIT III-7

CSI CONTRACT EXAMPLES, 1986

CLIENT	PROJECT	VALUE ($ Millions)	VENDOR
Agway Stores	Supermarket Network	$14	IBM
Bank One	N/A	N/A	EDS
Bonneville Power	Energy Management System	$10	CDC
Citicorp	N/A	$15	EDS
Contel	Telephone Billing	$5	EDS
Equitable Life	N/A	N/A	IBM
Federal Home Loan	Clearinghouse Network	$10	EDS
GE (Medical)	Integrated Diagnostic System	$10	IBM
Kmart/UVO	Store Network/POS	$20	EDS
Labforce	N/A	N/A	IBM
NY Stock Exchange	Bond Buyer Network	$5	AA
Pacific G&E	Energy Management System	$20	CDC
Proprietary "Confidential"	CIM Total Installation	$40	AA
Snyder General	N/A	N/A	EDS
State of California	Microwave Network	$15	AA
State of New Jersey	N/A	N/A	CSC
State of New York	Medical Claims Processing	$133	CSC
Texaco	N/A	$15	IBM
USC	Voice/Data Network	$22	AT&T
United Airlines	Reservation/Ticketing Network	$200	IBM

N/A = Not Available.

- The proportion of expenditures by component group is depicted in Exhibit III-8 and by individual component in Exhibit III-9 (see Appendix A for definitions of components). In general, nearly two-thirds of the expenditures will be for software and services with custom software development the primary service. Through the forecast period, the distribution of component expenditures will be decidedly stable. This is the result, in part, of the uniqueness of each project to the client; that is, CSI projects within any given company do not seem to build on previous projects. This stability also reflects the fact that many different companies will be following the same CSI path to upgrades and new starts as opposed to a few companies completing many projects.

a. Hardware

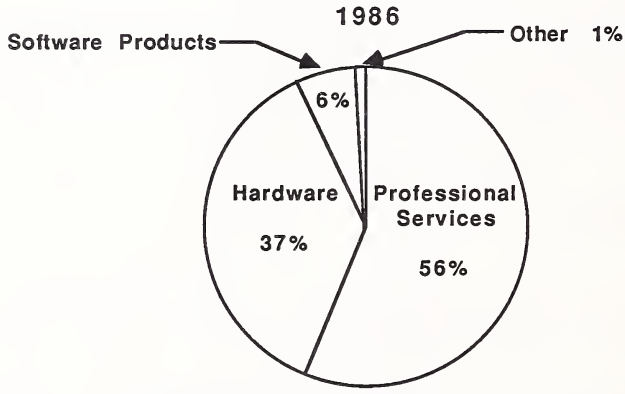
- Information systems and communications hardware will continue to be the largest component of the CSI expenditures.

  - Although projects integrating numerous users in geographically-dispersed locations and projects requiring extensive input/output and storage devices will demand extensive terminal, intelligent workstation, or other peripheral expenditures, these will be outweighed by host and distributed processors and the communications gear required to connect users to processors and/or processors to processors.

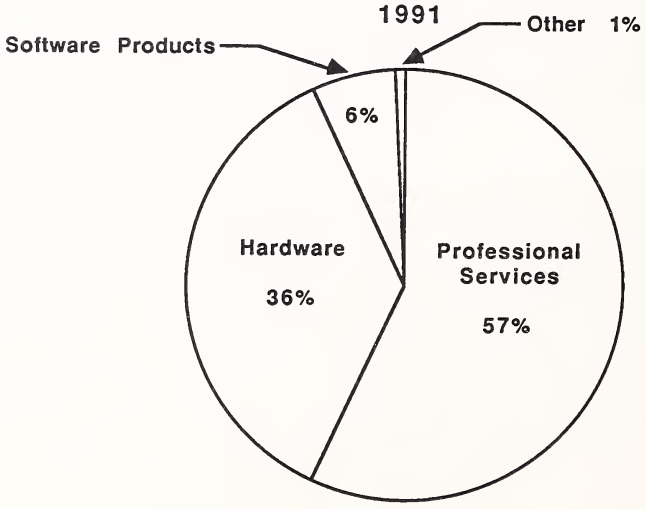
  - Similarly, some projects may require special-purpose computer/communications-related equipment (vector or array processors, RISC machines, or large data base machines), but this should not have a material impact on the overall allocation for "run-of-the-mill iron." This "special-purpose" equipment (not custom turnkey systems which are specifically excluded from the definition of CSI) may involve "exotic" hardware in some cases but will more likely involve "back-end" data base processors, manufacturing systems, and computer-assisted subsystems for design, microforms, instruction, etc. As discussed

EXHIBIT III-8

CSI EXPENDITURES BY PROJECT COMPONENT GROUPS, 1986-1991

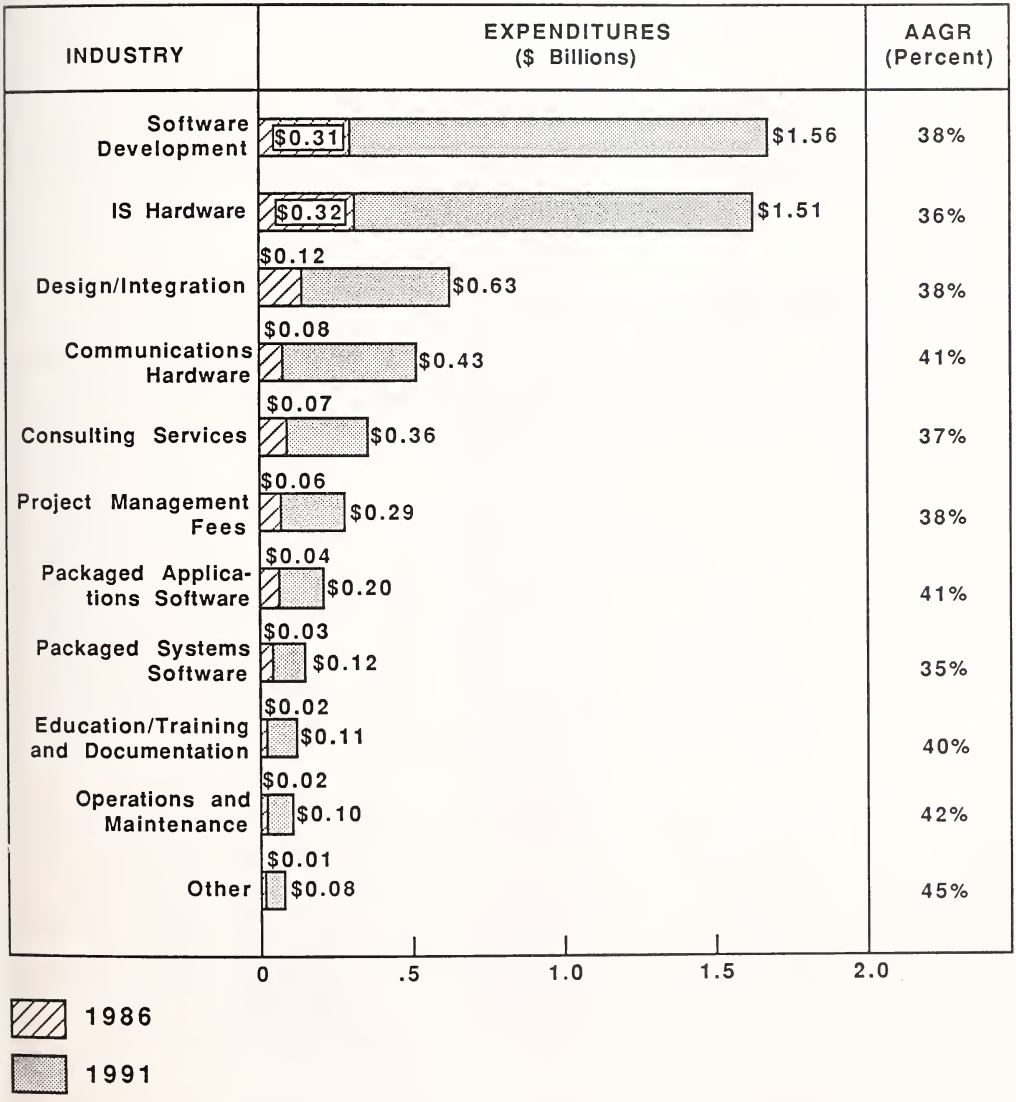


1986 Total Expenditures = $1,080 Million



1991 Total Expenditures = $5,400 Million

CSI EXPENDITURES: PROJECT COMPONENTS
ALL INDUSTRIES



above, CSI projects, in the early years at least, will be rather conservative in nature. It is likely that "leading edge" technology will be avoided.

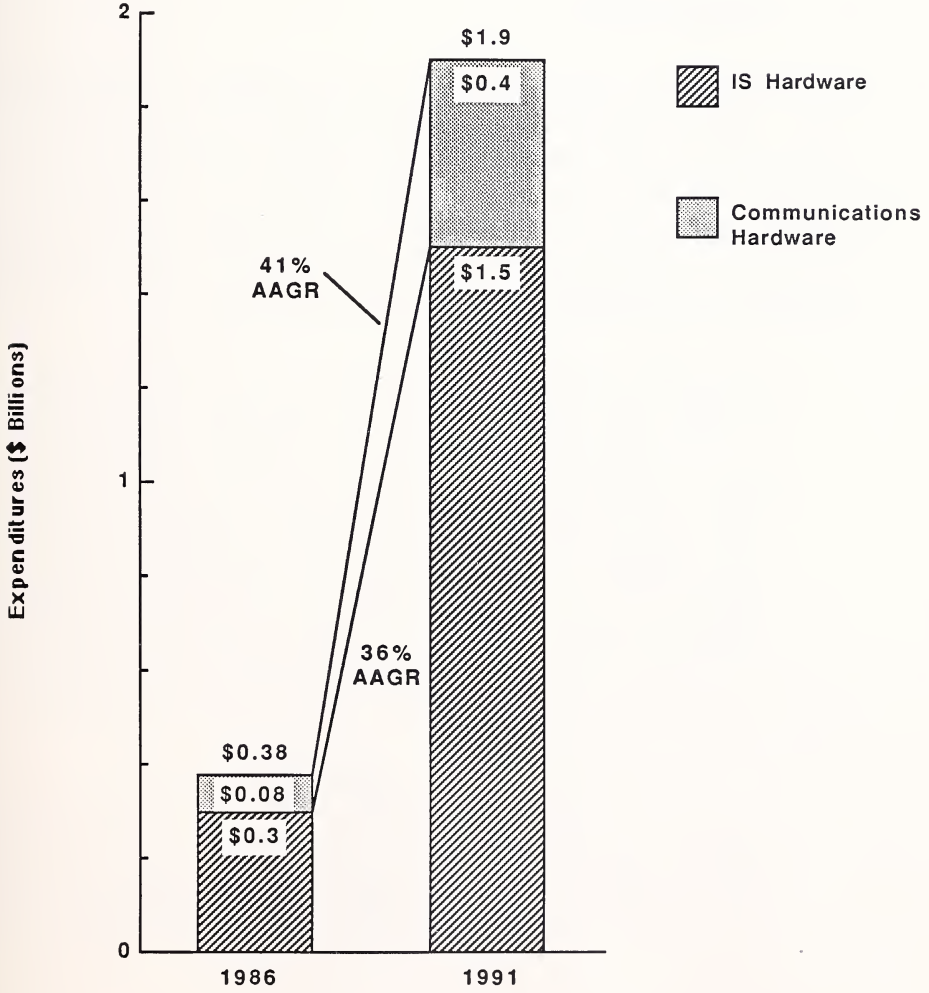
- Information systems hardware expenditures, estimated at $0.3 billion in 1986 and growing by 36% annually to $1.5 billion in 1991 (see Exhibit III-10), represent approximately 30% of CSI projects. These new systems will be required to replace obsolete equipment that is expensive to maintain and without the capability of handling the volume and speed requirements of CSI projects. Demand will be greatest in the discrete manufacturing industry ($385 million in 1991) and will grow the fastest in the wholesale/retail distribution industry (AAGR 49%).

- Communications hardware expenditures (see Exhibit III-10) will be made on networks, transmission facilities or media (wire, cable, microwave, optical fiber, satellites, cellular), transmission systems (modems), multiplexers and converters, and the communications processors (front-end/network processors and switching processors) required to manage the entire communications system.

  - While expenditures will be modest compared to information systems hardware, the importance of this component and the expenditures made for communications will pick up speed through the forecast period. This growth will be particularly visible when the necessary information systems hardware buys begin to slow as the installed base of new equipment grows.

  - Communications capability is a vital force in most CSI projects. Client organizations are anxious to connect their fragmented businesses and leverage the computer-related assets (data, hardware, personnel) in better ways. Clients reason that they cannot get control over these systems until they are connected and integrated under a master resource plan.

CSI PROJECT COMPONENT EXPENDITURES, 1986-1991
HARDWARE



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- New applications are emerging as well. Electronic data interchange, electronic mail, teleconferencing, telemetry applications (remote diagnositics and meter reading), new consumer-oriented applications in POS, and credit card authorizations head the list of applications that require adaptive technologies combining the utility of point-to-point communication with the specific communication requirements of the application.

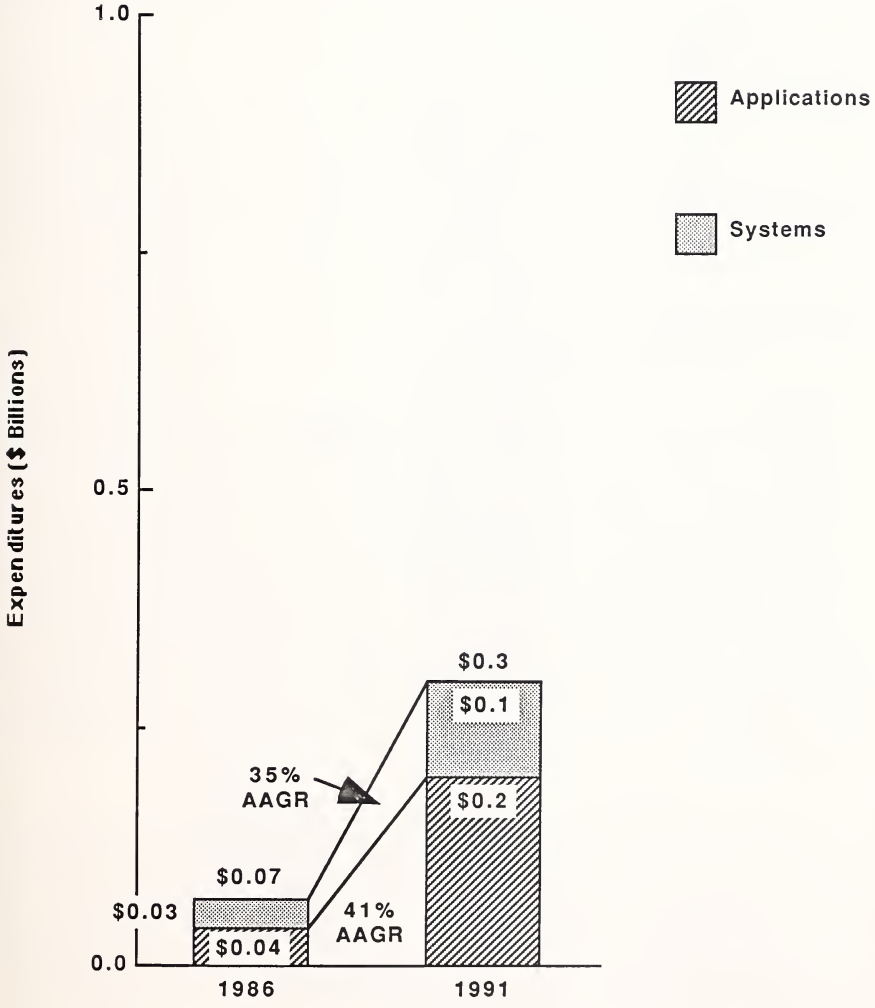
b. Software Products

- Packaged software does not represent a major expenditure in most CSI projects. While IS managers have been demonstrating a propensity to buy packages rather than pay for unique, custom development of software, the fact is that CSI projects by their nature preclude extensive use of these packages. As indicated in Exhibit III-11, both applications and systems software package expenditures will grow at an AAGR above 35%, but by 1991 the annual expenditure will amount to only 6% of the total CSI dollars.

  - Projects focus on applications rather than the computer environment on which those applications will run. Accordingly, applications software will outpace systems software throughout the forecast period. While CSI projects are typically focused on core business areas (financial planning, accounting, personnel, production, inventory control) and would, therefore, seem to be targets for cross-industry applications software in these areas, INPUT believes that the same perception of unique needs that bring clients to consider a CSI approach will prevail and that clients will reject packaged applications as not being able to meet these unique needs.

  - The systems software to be acquired in the CSI market will be basic products that provide IS with the control and management of the computer facility. Systems software is the key to how processing power and data will be distributed over computer/communications

CSI PROJECT COMPONENT EXPENDITURES, 1986-1991
SOFTWARE PRODUCTS



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networks. Memory management, scheduling and resource management, and a system structure that integrates these are specific examples of systems software to be acquired.

- Data base management systems will also be acquired with frequency as some CSI projects focus on integrating corporate data and providing users with a central repository. The integration of voice, data, and image information bases holds promise for additional systems software expenditures.

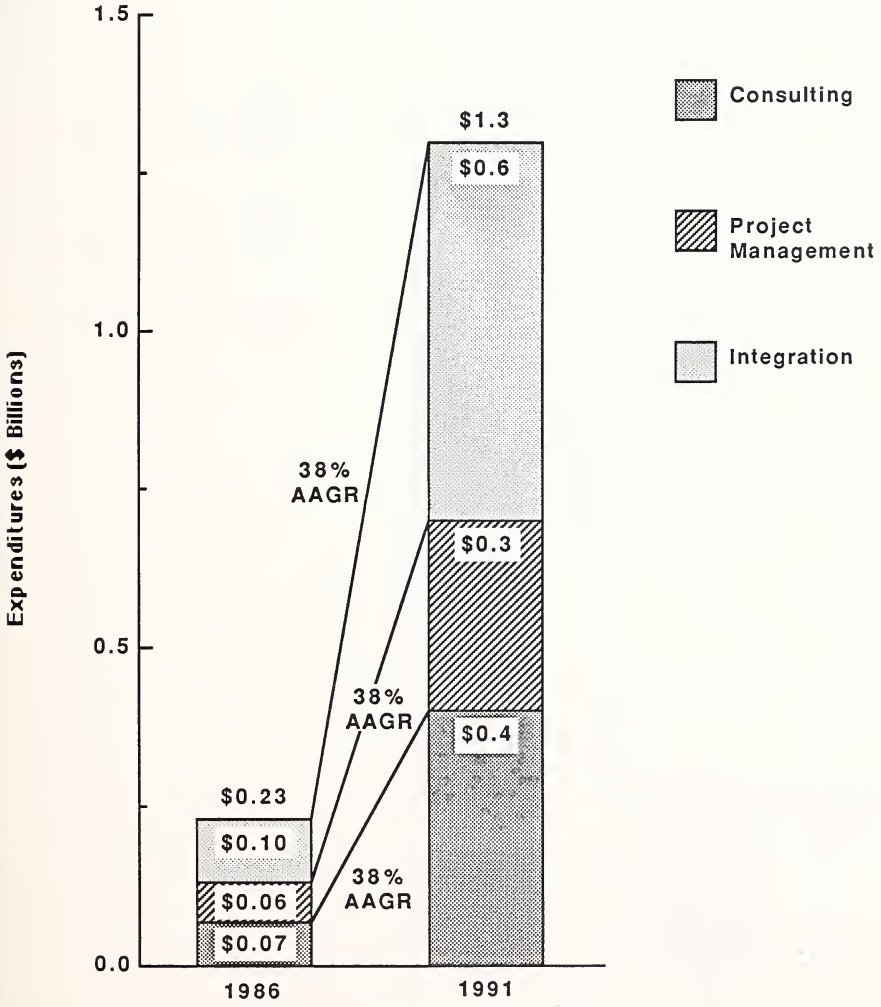
- Finally, users may view these major project efforts as a time to acquire and upgrade systems production tools that seek to maximize the use and ease of use of equipment and provides an efficient environment for the development, testing, and introduction of new functions.

c. Professional Services

- Professional services are at the heart of CSI projects. Clients are buying the integrator's ability to "make it happen," and these are the services that do that. Forecasted expenditures and growth rates are depicted for each type of professional services in Exhibit III-12 and Exhibit III-13. There are two main types of professional services: Management Level consisting of Consulting, Project Management, and Integration; and Operational Level consisting of Software Development, Education/Training and Documentation, and Operations and Maintenance. Each type of service should witness growth in the 38-42% range and over the forecast period amount to some $9.5 billion in expenditures.

  - By industry, expenditure size is more a function of the overall level of CSI activity in the industry. So, with few exceptions, discrete manufacturing firms should account for the most professional services expenditures. Other industries with large professional services expenditures include, in order, banking/finance, insurance, and distribution.

CSI PROJECT COMPONENT EXPENDITURES, 1986-1991
PROFESSIONAL SERVICES (MANAGEMENT LEVEL)



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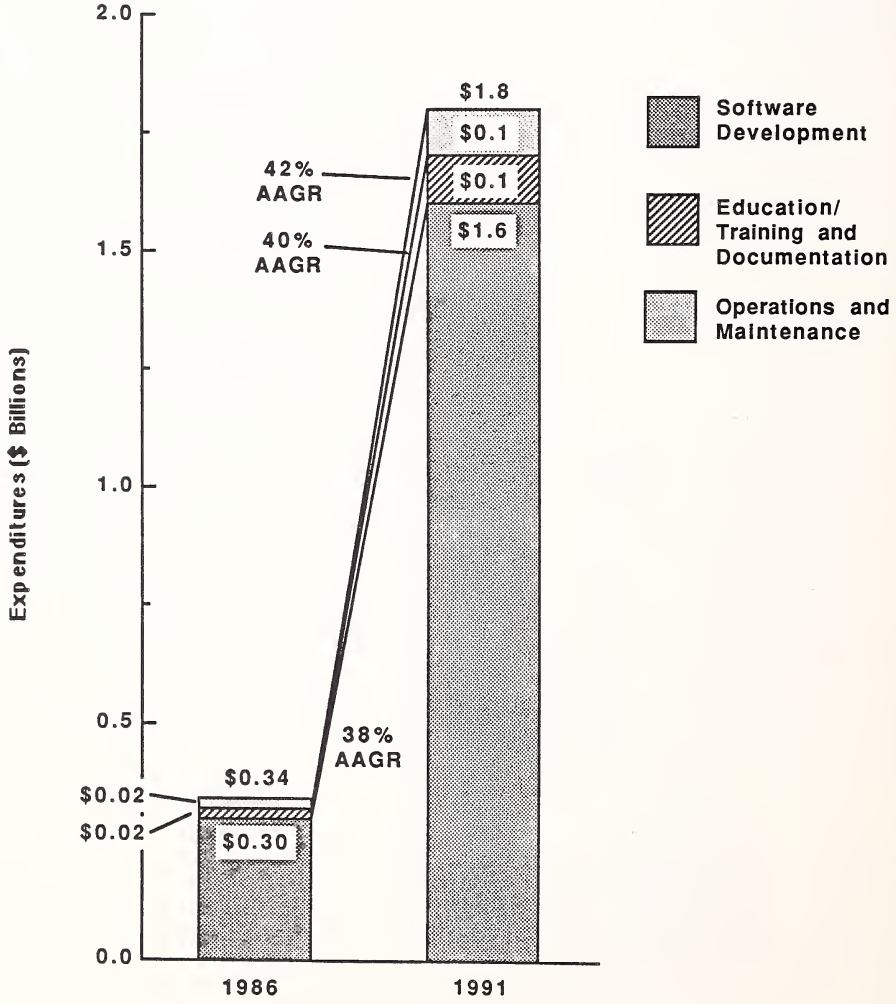
CSI PROJECT COMPONENT EXPENDITURES, 1986-1991
PROFESSIONAL SERVICES (OPERATIONAL LEVEL)



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- Growth rates of professional services by industry will reflect the reverse of the order of industries by expenditures. That is, the smallest of these four industries, distribution, will grow at the fastest overall rate and be followed by insurance, banking/finance, and discrete manufacturing.

- Consulting services are the precursor of most systems integration projects. Overall planning assistance, feasibility studies, and cost/effectiveness trade-off studies guide the client to plan for the desired solution. Consulting services can also serve to feed sales through the in-depth knowledge acquired during the project. Some clients will separate consulting and the big project, others will not.

- Project management fees are paid to the integrator for planning, scheduling, and controlling the materials and human resources required for the execution of the project. It involves the coordination of complex group activities to meet time, cost, resource allocation, and performance targets.

  - Chief among the tasks of the integrator are negotiations with third-party vendors who will provide components of the solution. This contract management seeks to manage elements critical to the complex project but which are outside the direct influence of the client organization and the integrator.

  - It is also through these fees that vendors are compensated for assuming the risks involved in "guaranteeing" the effectiveness of the solution.

  - Project management also includes all of those reporting obligations that the integrator has for keeping the client informed of progress and avoiding surprises.

- A role assumed by the integrator or another subcontractor is the actual technical integration of the components. Design/integration services include

systems design, integration of computing components, installation, and client acceptance of the DP/communications systems.

- The actual development of new custom software, the conversion of existing software, or the modification of commercial software packages are key professional services. While this is essentially programming and analysis, it does, occasionally, include independent verification and validation of the new system and software maintenance of that system for a specified period of time.

- Education and training of the client staff on operation of the system as well as full documentation of the systems' operation and maintenance are also critical to the success of the project. Expenditures in this category are low, however, in that vendors provide many of these services on a "goodwill" customer service basis, otherwise the market for these services would be far greater.

- Some major projects include a requirement that a vendor operate and maintain the developed system for a specified period of time. This is vendor-staffed on-site support of the system. Under some contracts, this a warranty period while under others it is a specifically negotiated arrangement that transitions the system from the vendor(s) who built it to the clients who will use it.

d. Other Expenditures

- Most projects include other product and service expenditures that are not easily classified elsewhere. This category includes those miscellaneous items such as computer supplies, business support services and supplies, and other items required to provide a smooth development effort. Processing/network services and communications services that may be required during the course of development are included in this category.

e. Mark-Ups and Administration Fees

- An item of obvious interest to all vendors associated with commercial systems integration efforts is the mark-up that a vendor receives from the client for handling the purchase of components of the project.

- The dollars involved are significant (up to 15% of the expenditures for a project), and some vendors seem to have begun to rely on mark-ups as the sure money in a CSI project. This is especially true in the higher margin hardware components.

  - Vendors are feeling immense pressure from the downturns in hardware prices and rapidly increasing PC capability. Hardware manufacturers are advising turnkey vendors and integrators alike not to rely on hardware margins. As a result, increasing emphasis is being placed on after-sale service and support, pre-installation consulting, and other "intangibles" to increase sales.

2. FORECAST BY INDUSTRY

- The total contract value of CSI projects, that is, the value of new projects sold in any year, is forecasted to grow from the current level of $1.7 billion to $8.3 billion in 1991, an AAGR of 38%. Estimated contract value by industry is depicted in Exhibit III-14. The largest participants in the CSI market are forecasted to be discrete manufacturing, banking/finance, insurance, and state/local government establishments.

- The forecast for CSI expenditures by industry are presented in Exhibit III-15. In general, the larger CSI participating industries will grow at the fastest rate. INPUT's forecast of CSI for each industry as well as detailed information on industry market issues are presented in Chapter IV.

EXHIBIT III-14

TOTAL CSI CONTRACT VALUE
1986-1991

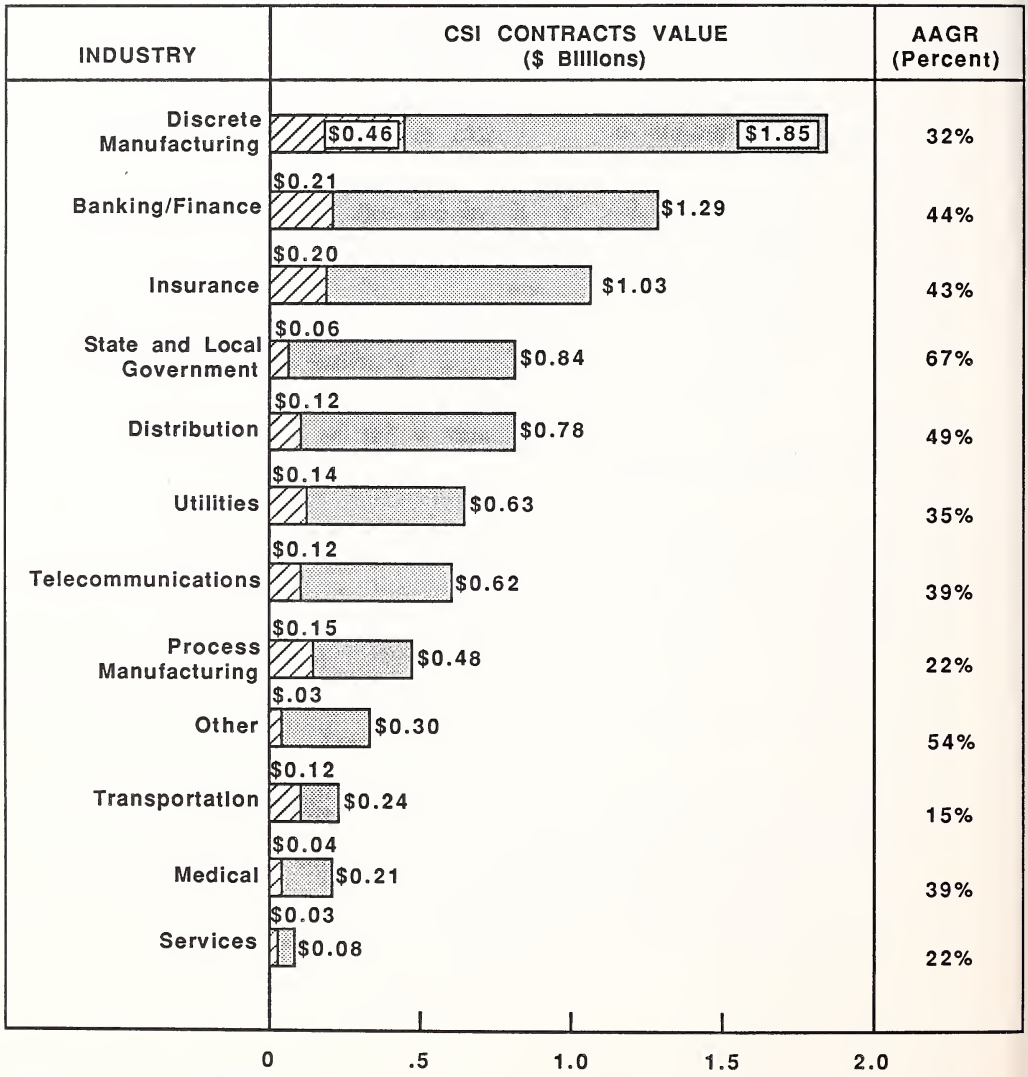

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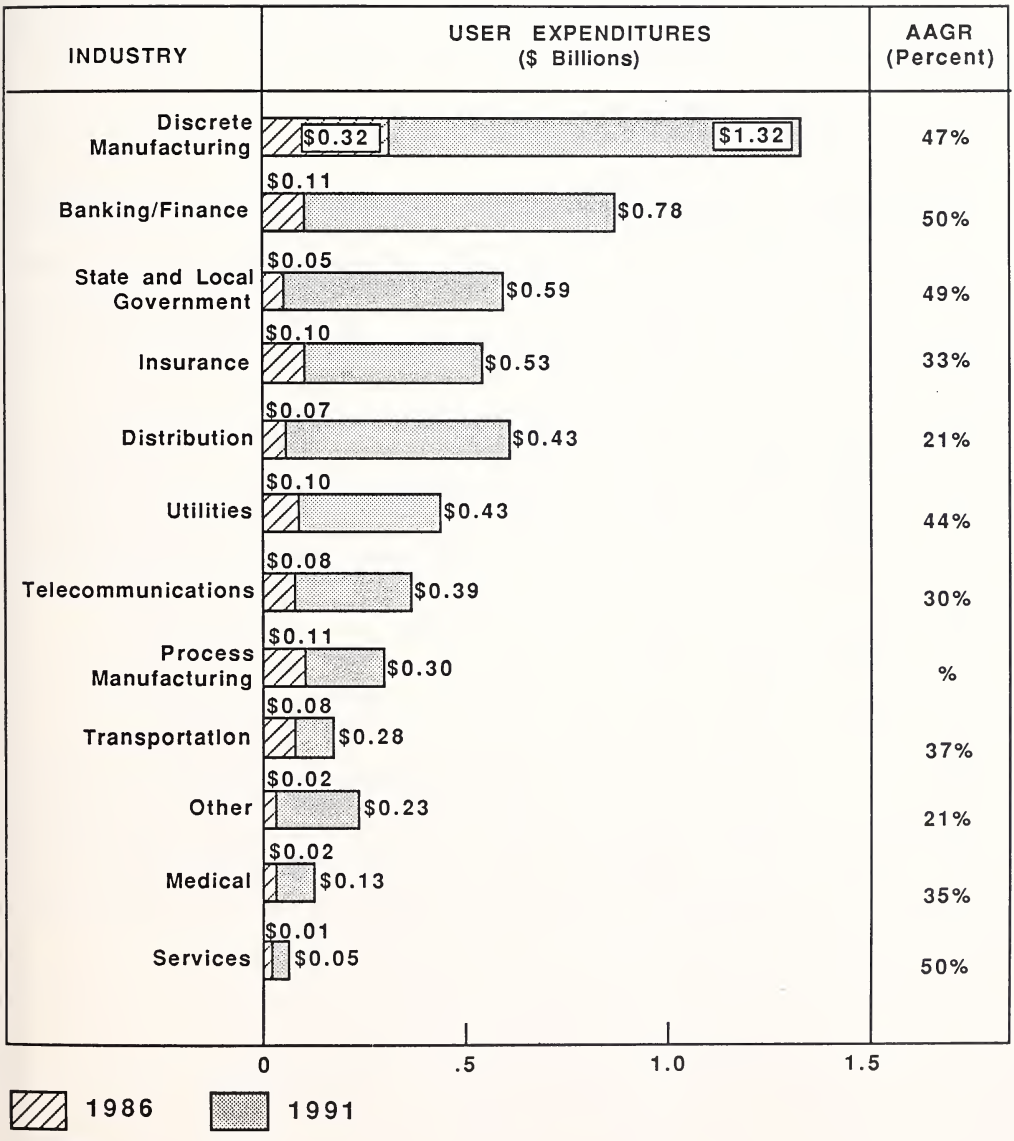
EXHIBIT III-15

TOTAL CSI EXPENDITURES
1986-1991



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D. COMMERCIAL SYSTEMS INTEGRATION COMPETITIVE ENVIRONMENT

1. CURRENT MARKET PARTICIPANTS

- Exhibit III-16 depicts INPUT's estimate of leading CSI contractors in 1986. Some 53% of the estimated value of contracts let in 1986 is accounted for by the ten vendors listed. The top five are profiled below.

a. IBM

- The center of IBM's CSI activities is the Complex Systems Organization within the Federal Systems Division. CSO's charter is to pursue commercial business worldwide. The CSI activities are limited only to the extent that CSO can include other vendors' peripherals and software in an SI project based on IBM mainframe processors.

- Total FSD revenue in 1986 is expected to be $1.4 billion from sales involving over ninety contracts in worldwide markets. IBM expects CSO revenue to increase to $5 billion by 1990. So fast is the growth of CSO that it is the only group within IBM to be authorized to hire, at will, additions to its 5,500 person workforce.

- IBM offers three levels of partnering:

  - "Prime," where IBM is the lead vendor and the responsible party vis-a-vis the customer for integrating IBM and non-IBM products in a total solution; "secondary," where another vendor is the prime and IBM is a subcontractor; and "commodity," where IBM supplies hardware and software products to any and all bidders on a contract which IBM has not itself bid.

EXHIBIT III-16

U.S. CSI MARKET SHARE, 1986

RANK	VENDOR	MARKET SHARE	
		SALES $ MILLIONS	PERCENT
1	IBM (FSD/CSO)	$470	28%
2	Arthur Andersen	220	13%
3	Electronic Data Systems	120	7%
4	AT&T	55	3%
5	Control Data Corp.	50	3%
6	Digital Equipment Corp.	37	2%
7	Computer Science Corp.	30	2%
8	TRW	27	2%
9	Systems Control	12	<1%
10	Boeing Computer Services	8	-
Subtotal		$1,029	61%

- Principal industries targeted are health care, manufacturing, banking/finance, and transportation.

b. Arthur Andersen

- Long known as a "Big 8" accounting firm, Arthur Andersen also has a substantial management information consulting organization. Some 6,000 professionals (4,500 in the U.S.) generated over $400 million in revenue in 1986.

- Arthur Andersen has set up two separate organizations to target manufacturing and network integration:

  - One hundred fifty fully dedicated network consultants, supervised by 25 senior partners, pursue network contracts.

  - After a purported $12 million advertising campaign, Arthur Andersen is promoting itself as a sole source integrator and project manager of CIM implementations.

- Arthur Andersen also has visibility in banking/finance, utilities, and state/local government. Their accounting/auditing base is ideally positioned to assist in identifying large projects.

- The company is expected to compete with EDS as the second largest systems integrator after IBM over the next five years.

c. Electronic Data Systems

- EDS has pursued large-scale integration projects since its inception, but in the early years had a hard time getting business from the Fortune 100 companies.

- EDS has followed the example of IBM in actively seeking partners for joint bidding of major contracts. To date, the company has jointly bid and won 17 contracts with AT&T.

- EDS has been very successful in the facilities management arena and sees CSI as an excellent entre to large-scale, long-term FM contracts.

- EDS is accelerating its involvement in CSI, primarily in manufacturing, health care, retail distribution, and banking. Network integration is a common denominator across these vertical markets and recurs in the contracts EDS has received over the last 12 months both in the U.S. and abroad.

d. AT&T

- AT&T has a unique opportunity to become a prime supplier of network integration. So far, however, the company has been slow to capitalize on its unique image, reputation, and technical skills.

  - While other vendors are scrambling to put together teams of talent capable of designing, integrating, and implementing large networks that tie the myriad information systems products together, AT&T, which has the talent, does not see the opportunity. Moreover, the company does not see itself as having SI capabilities, except where pure networks are concerned.

  - This explains why AT&T has bid 17 contracts in partnership with EDS. EDS takes the project manager/information systems/software role and leverages the network image and engineering skills of AT&T. AT&T provides the network engineering, lines, and network products.

- It is speculation as to whether AT&T will rise to the enormous opportunity that faces them. Certainly the recent USC contract is a step in that direction.

e. Control Data Corporation

- Control Data Corporation (CDC) is very active in marketing its standard hardware and software to manufacturing, utilities, and government markets. It has also begun to realize the importance of offering SI. Two groups have been established to serve the two main market targets--the CIM Division, aimed at manufacturing, and Energy Management, aimed at the utilities industry.

- The latter group has been successful in getting 27 contracts. These contracts range from $15-20 million (and average 25 manyears), depending on whether they have monitoring control, network analysis, forecasting/scheduling, customized software development, communications integration, and training. All of the contracts signed to date use the Cyber 180 system as a central processor.

- CDC will attempt to duplicate their energy management success in CIM.

2. POTENTIAL MARKET PARTICIPANTS

- The attractiveness of CSI in terms of its revenue potential and account control characteristics is likely to result in a sizeable number of vendors claiming that they are systems integrators, but a far fewer number who are, by INPUT's definition at least, true integrators who are able to plan and manage major projects that result in the successful delivery of solutions desired by the client organization.

  - While many information services sectors support a large number of participants, CSI is likely to become a heavily concentrated business because of the project's size and technical demands. Casual participation is very unlikely.

- The promise of rapid growth in the CSI market is likely to attract large and respected competitors. But the combination of newness, large competitors, and intrinsic tensions on the customer side will result in very demanding market conditions.

- These tensions may be exacerbated by the unique interests and motivations that likely participants will bring to the CSI market. Each has a different portfolio of strengths to be exploited and weaknesses to be covered, and the CSI market with its numerous and varied project components permits both strategies.

- Three things do seem certain--no firm currently has a "franchise" in this market, the opportunity exists for vendors to create such a franchise from their particular position of strength, and the end result will likely result in strategic alliances among different classes of vendors.

  - Outside the federal government sector, systems integration is too new for any vendor to have established a significant position. Vendors are integrating their product lines or positioning to provide "full service" coverage, but few have assumed the responsibility (and risks) of providing the total solution.

  - But, unlike many other markets, vendors approaching the CSI market from a variety of perspectives may be able to build a transition to their individual capabilities to achieve a significant position in CSI. The essentials are not "productized" but rather revolve around integration experience, application and industry knowledge, and the skill and wherewithall, in terms of financial strength, financial stability, and management temperment, to assume the tremendous responsibilities and risks. Strategic alliances between different classes of vendors will result from the desire of certain vendors to advance into new markets adjacent to exisiting ones and the desire of other vendors to protect their "territories" in the face of changing market conditions.

- These forces are moving traditional and nontraditional vendors to CSI. These and other drivers may combine in powerful ways to create a whole new class of commercial service activity merging elements of professional services, software products, network design, and hardware selection.

- Teaming arrangements should become a commonplace strategy as integrators expand the perception, if not the actuality, of the breadth of their offerings. The competitive dynamics could become quite intricate as vendor teams on one project become competitors for the next project and as traditional information services participants team with vendors from other industries such as engineering and construction, aerospace, or telecommunications.

- INPUT estimates of vendor market share in 1986 and 1991 are presented in Exhibit III-17. The strengths and weaknesses of classes of likely participants are discussed below. These classes, or types of vendors, are the focal point rather than individual vendors since "likely" entrants are as important to the competitive structure as current participants and since vendors will enter the market from their historical strengths. To be sure, the behaviors of individual firms will be more important to long-term success than the original entry point, but these points reflect the positions from which each group will try to expand.

- Vendor class rankings based on INPUT's analyses of 15 success factors are summarized in Exhibit III-18.

a. Computer Manufacturers

- CSI represents a significant opportunity to seize the "high ground" of systems planning and implementation for these vendors, giving them a broader role in the information services industry.

EXHIBIT III-17

CSI MARKET SHARE BY CLASS OF COMPETITION
1986-1991
(Contract Bookings)

VENDOR CLASS	1986 MARKET SHARE		1991 MARKET SHARE	
	$ MILLIONS	PERCENT	$ MILLIONS	PERCENT
Computer Manufacturers	$815	10%	$3,830	18%
Communications Vendors	80	1%	640	3%
Professional Services	490	6%	1,920	9%
Management Consultants	*	*	210	1%
Aerospace	$325	4%	640	3%
Engineering and Construction	*	*	1,060	5%
Other Information Services	*	*	*	*
In-House	6,430	79%	13,000	61%
Total	$8,140	100%	$21,300	100%

* = Small Values; Companies are BCS, Grumman, MMDS, Becthel, Flour, Brown & Root, Halliburton.

EXHIBIT III-18

CSI VENDOR SUCCESS FACTOR RATINGS

Categories	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Manage-ment	Design/ Engineering	Implemen-tation	Skill Base	Customer Base	Vendor Independ-ence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	Inter-national Presence	Finance
Computer Manufacturers	5	5	5	5	4	5	5	4	5	1	5	3	5	5	5
Communications Vendors	2	1	4	3	3	4	1	2	5	3	3	5	3	4	3
Professional Services	4	4	3	5	4	4	5	5	4	5	2	5	3	4	4
Management Consulting	3	4	2	4	3	3	2	3	5	4	2	5	3	3	3
Aerospace	2	2	4	3	5	5	4	5	2	4	4	3	2	2	4
Other information Services	1	3	3	2	2	2	3	1	3	3	2	2	2	3	4
Engineering and Construction	3	3	4	4	4	5	4	4	3	5	3	3	3	4	5
In-House*	4	4	1	3	3	3	4	4	N/A	4	3	N/A	N/A	N/A	3

Rating: 1 = Low, 5 = High

* = As measured against own in-house projects

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- By gaining control of major projects, manufacturers hope to be in a position of influencing the choice of hardware, software, protocols, and telecommunications. In key contracts, the control of the "cornerstone" component(s) can affect systems selection choices which can be significantly greater in value than the cornerstone component itself.

- Manufacturers believe that over the next ten years a number of mega-projects will be initiated. The size of these projects will have a major impact on market presence and market share in key sectors. To miss these opportunities could mean loss of control or market share and absence from possibly the fastest growing market in the information services industry.

- While they may be perceived as biased "iron mongers," their strengths are formidable (see Exhibit III-19).

  - These vendors have tremendously large client bases that include many, if not all, of the likely buyer organizations. Besides their ability to identify opportunities quite early, these in-place relationships are usually of such long-standing quality that clients feels quite comfortable with the vendor. While, with few exceptions (IBM, CDC, UNISYS, Honeywell), there is little track record, the commercial world has a tendency to believe that the manufacturer "knows how to do it."

  - They can, of course, claim extensive technical knowledge of their own products and can be very competitive in at least the hardware portion of their bids. To the extent that projects involve a 20-35% expenditure for IS hardware, pricing can be a very attractive benefit.

  - Major vendors generally have extensive professional services capabilities as well. IBM, for example, was the professional services revenue leader in 1985 with nearly $1 billion in revenue. Burroughs' Systems Development Corporation has a lengthy history of professional services

EXHIBIT III-19

HARDWARE MANUFACTURERS' CSI RATINGS

Hardware Manufacturers	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Manage-ment	Design/ Engineering	Implemen-tation	Skill Base	Customer Base	Vendor Independ-ence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	Inter-national Presence	Finance
IBM	5	5	5	5	5	4	4	5	5	N/A	5	5	5	5	5
DEC	4	4	4	4	2	3	4	5	5	N/A	4	3	4	4	4
CDC	3	3	3	3	4	4	4	4	4	N/A	3	3	3	4	1
UNISYS	3	4	4	4	4	4	4	4	5	N/A	4	3	3	5	4
WANG	3	2	2	2	1	4	1	2	2	N/A	1	3	2	2	4
NCR	2	4	3	3	3	4	3	3	3	N/A	3	2	4	3	5
DG	1	1	1	1	2	2	2	1	1	N/A	2	1	1	1	2
Honeywell	3	4	4	4	4	4	4	4	5	N/A	4	4	3	4	3

Rating: 1 = Low, 5 = High

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experience in general and federal systems integration experience in particular. Sperry has also been an active player in the federal systems integration market and has attempted to port those skills to the commercial sector as well.

- Beyond the perceived hardware bias, computer manufacturers face other issues which may detract from CSI success.

  - Manufacturers' resources for systems integration projects are structured for and applied to the federal government. These commitments are not going to go away, making it questionable as to whether resources exist to freely pursue the commercial SI marketplace. Staffing level freezes and a general inability to find qualified technical personnel have further constrained resources.

  - Over the next five years, manufacturers will face tremendous operating margin squeezes and fierce competition. Management attention and capital resources will be absorbed by the core business--making hardware--rather than by pursuing CSI.

- Strategically, many of these vendors are trying to diminish clients' belief that they are biased with respect to the "best" solution.

  - IBM's Complex Systems Division, for example, seems to be willing to bid non-IBM equipment if that is necessary for the solution desired.

    Digital Equipment, as another example, has made recent strides to recognize and deal with both the political and technical requirements of multi-vendor environments. The DEC environment has been frequently associated with systems augmented by peripherals and software from an extensive third-party marketplace.

- Manufacturers will also be looking for strategic alliances to pursue CSI. These alliances will be between individual manufacturers and professional services companies or between the manufacturer and telecommunications vendors. This pursuit of these alliances will, of course, depend on the shortfall of in-house capabilities, making IBM, CDC, Unisys, and Honeywell less likely to vigorously participate in the alliance-forming activities.

- The liklihood of success in CSI for manufacturers seems to be good but is mainly due to the application of federal SI resources and know-how in the commercial marketplace. Alliances with professional services vendors and management consultant groups will benefit some manufacturers, as will the commercial buyers' belief that a computer manufacturer represents a reliable supplier of CSI capabilities.

- Competition in this CSI vendor class could be formidable.

  - The prime competitor is IBM due to its name, marketing and sales muscle, advanced technical capabilities, track record, financial resources, etc. IBM has given the Federal Systems Division "carte blanche" to pursue commercial systems integration projects worldwide and to hire at will--the only IBM division to be given this authority.

  - Honeywell's strong international network, including alliances with Bull and NEC, and its track record in major federal projects (WIMCCS, etc.) give Honeywell a natural entree to this market.

  - Unisys has been involved in CSI on both sides of the new company. Sperry has a solid federal SI background and some commercial experience after a big marketing push in 1985. Burroughs' System Development Corporation has had a large number of federal projects and has developed a good image with many referral accounts.

- DEC and CDC have less experience but are keen to grow their capabilities. DEC, in particular, recently formed a group to pursue CSI.

b. Communications Companies

- To the extent that projects involve extensive networking requirements, these vendors seem a logical choice. From one perspective it may make sense to focus on the network rather than on the information systems that are a part of the network nodes. However, a standalone "network" approach may not be meaningful.

- These vendors have not sufficiently proven their skills and capabilities in either IS hardware or the professional services required to build and operate application systems. And, surprisingly, there has been very little effort made to capitalize on the CSI market's potential (see Exhibit III-20).

- The joint venture between AT&T and EDS and the announcement that AT&T recently pursued the acquisition of EDS makes for interesting "what if. . ." speculation, but extensive participation from this venture or other telecommunications providers is not expected. Rolm, now involved with several major network developments with IBM, may be an exception.

- Communications vendors may be targets of strategic alliances by other integrators looking for the expertise had by the former group. However, the market direction, management, and drive will have to come from the partner, not the telecommunications vendor. Arthur Andersen recently moved in this direction with a major RBOC.

c. Professional Services Companies

- The professional services market is experiencing the emergence of a new class of professional services vendor. This select group (such companies as Computer Task Group, Electronic Data Systems, Computer Sciences, Planning

EXHIBIT III-20

COMMUNICATIONS VENDORS' CSI RATINGS

Communications Vendors	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Management	Design/ Engineering	Implementation	Skill Base	Customer Base	Vendor Independence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	International Presence	Finance
AT&T	5	5	5	4	4	4	3	4	5	2	5	4	2	N/A	5
Northern Telecom	2	2	3	1	1	3	3	1	2	3	2	4	2	N/A	3
GTE	4	4	3	4	3	4	3	4	4	4	3	4	3	N/A	4
Mitel	1	1	2	2	2	3	3	3	1	4	1	1	1	N/A	1
ROLM	4	4	4	3	2	4	3	4	3	1	3	3	3	N/A	2
PACTEL	3	3	5	4	3	1	1	2	4	5	3	2	4	N/A	5
Nynex	3	4	4	3	3	2	2	3	3	5	4	3	4	N/A	4

Rating: 1 = Low, 5 = High

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Research Corporation, Systems Development Corporation, Martin Marietta Data Systems, Bolt, Beranek & Newman, Logicon, DBA Systems, SYSCON, Science Applications International) has steadily grown in terms of share of the professional services marketplace. Each has over $100 million in revenue from professional services each year and each is a recognized leader in the market.

- As a class, they bring some attractive strengths to the CSI marketplace (see Exhibit III-21).

  - Most provide a "full service" approach to professional services that includes capabilities in consulting, software development, education/training, and, in some cases, facilities management. They are accustomed to meeting the wide-ranging requirements of the client.

  - As a part of this "full service" strategy, many of these vendors have in-place relationships with third-party providers that could be readily leveraged in a systems integration project.

  - They are familiar with, and capable of, demonstrating performance under intense conditions.

  - Many can claim specific applications or industry experience. Each seems to have a rising number of "expert" consultants.

  - Those vendors whose previous experience has largely been in the federal systems integration sector are also able to claim integration experience.

  - Professional services vendors in particular are well qualified to assume responsibility for and execute manpower-dependent projects. Their experience in hiring and organizing labor pools of focused talent will be

EXHIBIT III-21

PROFESSIONAL SERVICES VENDORS' CSI RATINGS

Professional Services	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Management	Design/ Engineering	Implementation	Skill Base	Customer Base	Vendor Independence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	International Presence	Finance
PRC	3	2	2	3	3	3	4	4	3	2	1	3	1	3	1
CSC	3	3	3	4	5	4	5	4	2	4	2	3	2	5	4
EDS	5	4	3	4	5	5	5	5	3	3	2	3	4	3	5
TRW	3	3	4	4	5	4	3	5	4	3	4	3	2	3	5
Logicon	2	2	4	4	4	4	3	3	2	4	4	4	2	2	3
Syscon	2	2	4	4	3	4	3	4	2	4	3	2	3	3	3
SDC	3	2	3	3	4	4	4	5	4	2	3	2	3	4	4
Systems Control	1	2	2	3	4	4	4	3	3	5	4	4	2	4	5
BBN	2	2	3	4	5	3	3	4	3	4	3	2	4	2	2
BDM	1	2	3	4	5	3	3	4	3	4	3	2	2	3	4
CTG	3	2	2	3	4	3	4	4	4	4	1	3	2	2	3
C3	1	1	2	4	4	3	3	4	3	4	2	4	3	3	3

Rating: 1 = Low, 5 = High

a major advantage--few classes of competitors know how to deal with this issue successfully. A strong in-house management pool that knows how to work together adds an additional dimension to these vendors.

- They do have weak spots with respect to CSI requirements, however.

  - Few of these vendors have the technical integration experience in specific operating environments to "beat" the learning curve usually required with a particular hardware/systems software/communications architecture. And even fewer of these vendors have the economies of scale in hardware purchases to make pricing of these components sufficiently attractive to the client.

  - Only those vendors with extensive, successful federal systems integration experience can claim quality and sophistication in project management skills required on major projects. And those that developed these skills in the federal sector are generally short on commercial experience and have little understanding of "free market" business practices where the lowest bid does not always win and where there are few, if any, legal vehicles for protesting lost bids.

  - Image, marketing strength, and specific industry experience may be a disadvantage for vendors who do not have a wide-ranging commercial presence.

- Professional services vendors will likely form alliances with computer hardware manufacturers and acquire industry-specific capabilities. Strategically, early accounts in high-visibility projects will be key to rapid growth and market penetration.

- It will be essential for professional services vendors to focus their efforts rapidly into a short list of opportunities within defined areas of hardware skills, software environment strengths, and industry sector knowledge.

Creating strategic alliances and spending marketing/sales within these defined areas will prove more successful than more global alliances and thin marketing/sales expenditures over many areas.

- There will likely be several specific competitive vendors of concern to professional services providers.

  - Although C3 customers have traditionally been 70% federal government-based, C3 has successfully partnered with CSC, IBM, Rockwell International, Raytheon, Sperry, Hughes Aircraft, and E-Systems in the commercial environment. C3 has several specialized systems software tools that may be applied to CSI, including Command Control Operating System, integrated logistics support services (operator training, maintenance training, reliability, and availability analyses), and simulation and monitoring tools. C3's main commercial experience is in discrete manufacturing.

  - Bolt, Beranek & Newman has also been a traditional federal government supplier. In separate operating divisions they have a focus on critical aspects of CSI--communications, software development (including natural languages and expert systems), and simulation and training. The company has teamed with IBM, DEC, Apollo, Prime, Data General, and Symbolics LISP-based computers.

  - SDC and SYSCON, with enormous CSI potential, have not publically declared their intentions. SDC's advantage could be in its insurance and health care or education (grant processing) experience. Close ties with Burroughs could prove to be a disadvantage.

  - Systems Control is a rapidly growing subsidiary of SCICON, itself a subsidiary of British Petroleum. Commercial business accounts for 75% of revenue, and the company has strength in utility, energy, manufacturing, and state and local government. Currently, the company is

pushing integration in manufacturing (e.g., the $21 million CIM project for Firestone).

d. Management Consultants

- Management consultants have, to date, limited themselves to conceptual guidance of management, not implementation of systems. Arthur Andersen, who has involved itself in every professional services market, is a notable exception. Other exceptions come from companies whose role is mixed (e.g., Metier Management Systems, a turnkey supplier, and Index Systems).

- Because of their traditional role as counselors to American management on every new development, problem, and technology since 1950, this group is eminently well placed to leverage their image and customer base into a significant involvement with CSI projects (see Exhibit III-22). The "Big 8" accounting firms have the advantage of the largest customer base, the "true" management consultants (Arthur D. Little, McKinsey, etc.) have the best image.

- Except for Arthur Andersen and Coopers and Lybrand (CIM experience), however, this class of vendors has an inability to implement the systems they recommend, design, or select. For this reason, they cannot be considered strong competitors. They are good candidates for alliances that could leverage their contacts, customer base, and image. They would make excellent front-end partners for conceptual guidance in marketing.

- Arthur Andersen is already formidable in CSI as applied to manufacturing (CIM) and networks. The company runs the risk of lacking industry focus in its wide-ranging efforts, however. Metier Management offers one of the few turnkey systems for project control and methodology. Arthur Andersen, by virtue of its actual experiences in Professional Services, is included in the Professional Vendors category in Exhibit III-17 instead of being shown in the Management Consultants category.

EXHIBIT III-22

MANAGEMENT CONSULTANTS' CSI RATINGS

Management Consulting	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Manage-ment	Design/ Engineering	Implemen-tation	Skill Base	Customer Base	Vendor Independ-ence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	Inter-national Presence	Finance
ADL	5	5	2	4	4	3	2	3	4	5	2	3	3	5	3
McKinsey	5	4	2	4	4	4	2	3	4	5	2	3	3	4	4
Booz Allen	4	4	2	3	4	2	2	3	4	5	2	3	3	4	3
Arthur Andersen	5	5	4	5	5	5	4	4	5	5	4	4	5	5	5
Other Big 8	1	4	1	1	1	1	1	1	5	5	1	2	1	4	3
Metier	4	4	5	4	5	3	2	3	3	3	5	2	4	3	3
Index System	3	3	2	3	4	3	3	3	2	4	3	3	3	2	2

Rating: 1 = Low, 5 = High

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e. Aerospace Companies

- Outside the principal businesses of aerospace companies (aircraft/aircraft systems manufacturing and federal government activities) there is a small, but growing, group of information services providers whose goal is to develop a viable (and profitable) business that does not rely on in-house support for its continued existence.

- CSI represents an opportunity to leverage their strong image as major complex project managers and implementers while minimizing their small size.

- Technical sophistication and elaborate project management skills seem to be the attractive characteristics of aerospace companies (see Exhibit III-23).

  - Ford, Boeing, Hughes, and selected others have proven their ability to apply computer and communications technology to the development of specific products. Each has a large skill base that can be called upon to participate in most project categories. Further, proprietary capabilities that stem from core in-house businesses are also available.

  - The project management skills that these firms bring to CSI could be a serious basis of competition. Aerospace firms seem to be stronger in the project management category than some of the other classes of vendors. They understand project management methodologies and have the application systems in place.

- Despite the potential, the computer services arm of each of these aerospace vendors may be distracted from the CSI market by internal needs whenever a conflict occurs for the same skills. The leverage of these skills on internal operations worth billions cannot be compared to the leverage of the same skills on operations worth only millions. Other weakensses include lack of industry breadth, narrow commercial customer base, and marketing/sales skills as applied to CSI.

EXHIBIT III-23

AEROSPACE VENDORS' CSI RATINGS

Aerospace	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Manage-ment	Design/ Engineering	Implemen-tation	Skill Base	Customer Base	Vendor Independ-ence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	Inter-national Presence	Finance
Hughes	5	3	5	5	5	5	5	5	4	4	3	3	3	4	5
Ford	3	3	4	5	5	5	5	4	3	3	5	2	2	3	4
Boeing C.S.	3	2	4	3	4	4	4	3	3	4	3	3	3	3	5
McDonnell Douglas	3	3	3	2	3	3	3	3	4	2	2	2	3	3	3
General Dynamics	3	2	3	4	4	5	5	4	3	4	3	2	2	2	4
Lockheed	4	2	4	3	4	5	5	4	3	3	4	2	3	3	4
MMDS	3	4	3	4	4	4	4	4	4	3	3	3	4	4	4

Rating: 1 = Low, 5 = High

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- If these computer services divisions can focus their marketing accurately and ally themselves with useful marketing and skill base partners, there is good reason to believe some of these vendors will be very successful in the market.

- While each is a competitor of the other in their core businesses, there is less likelihood that they will be other than occasional competitors in CSI. Strategic alliances should isolate them from each other and the large size of the market, requiring marketing focus up front, may lead them to different arenas.

f. Other Information Services Vendors

- Some federal information services vendors have tried unsuccessfully to penetrate the commercial marketplace over the years. For these vendors, CSI represents a mainstream opportunity to leverage existing skills.

- Competition from these other types of information services providers will likely impact the success of professional services vendors.

  - Independent software products vendors could attempt to leverage continuing development/modification relationships they have established with existing clients. Some of these vendors can also lay heavy claim to applications and/or industry experience and to in-depth knowledge of selected hardware and operating systems architecture. Particularly attractive to some systems integration efforts is skill within their ranks with respect to large-scale data base management systems. But for the most part even the largest of these vendors does not have the required breadth of experience nor the financial strength.

  - Turnkey systems vendors' revenue has suffered from falling hardware prices and the inability to find adequate margins at these prices. INPUT expects consolidation in this sector. The top ten vendors currently account for 22% of expenditures, but this may rise to as high as

33% in five years. These vendors will not, however, be a major force in large-scale systems integration. Firms of any size tend to be highly specialized, often in CAD/CAM, while most lack the scale and resources to be credible.

g. Engineering and Construction Firms

- Some CSI projects are not oriented toward solving an information systems problem specifically. These projects focus on a larger context, of which information systems are a necessary part. The construction of a nuclear power plant, for example, includes information systems as a necessary part of the project, but the total project is much more extensive. Engineering and construction firms (E&C) have seen the proportion of dollars spent on information systems and services rise from 5% in the early 1950s to over 40% in 1986. As information systems become more integral to modern facilities, engineering and construction firms are finding themselves with systems integration opportunities and, accordingly, entering the information services industry; pouring concrete is no longer sufficient. In some instances the information system is tied so directly to non-IS requirements that only the engineering or construction contractor can meet them.

- E&C firms have found themselves in CSI without choice. Once there, they have recognized the huge opportunities in nontraditional markets (e.g., medical, transportation, distribution, banking/finance) which come at a time when the traditional businesses are entering a phase slowed by reduced capital spending and uncertainty due to the new tax legislation.

- Their strength lies not so much in the development of the IS application, but in their understanding of the requirements of that application (see Exhibit III-24). These vendors view applications quite functionally and may have a more intimate view of the specific elements of the need than even the most sophisticated industry-specific information services vendors.

EXHIBIT III-24

ENGINEERING AND CONSTRUCTION FIRMS' CSI RATINGS

Management Consulting	Image/ Recognition	Industry Breadth	Advanced Technical Expertise	Track Record	Project Manage-ment	Design/ Engineering	Implemen-tation	Skill Base	Customer Base	Vendor Independ-ence	Proprietary Capability	Strategic Alliances	Marketing/ Sales	Inter-national Presence	Finance
Bechtel	3	4	4	5	5	5	5	4	4	4	4	4	2	4	5
Fluor	2	2	2	4	4	4	4	4	3	4	2	4	2	3	4
Integral	2	2	2	3	4	4	3	4	3	4	2	4	2	2	3
AGIPLAN	2	2	2	3	4	4	3	3	3	4	2	4	2	2	3

Rating: 1 = Low, 5 = High

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- E&C companies accomplish complex project management and integration as their bread and butter business. They are eminently qualified to manage large multidisciplinary projects and to assemble, on short notice, large pools of talent.

- Their strongest market presence is in aerospace, utilities, energy, automotive manufacturing, and federal government.

- Most have first class simulation--test bed facilities including automated work flow simulation of entire factories to identify bottlenecks.

- The E&C companies are having difficulty with their low recognition status in information systems integration projects. As a result, there is no determined thrust to market themselves as SI contractors. Most are continuing "business as usual" and wondering why they are not asked to bid on more major projects. In addition, most E&C groups are divided into sector-specific operations that have their own markets, customers, and contacts which are not shared. As a result, there is no single contact point for discussions, RFP deliveries, or capabilities information. Further, E&C firms are facing new competitors (i.e., Arthur Andersen) without a clear sense of the basis of competition.

- E&C companies deal with a number of industries who are big users of technology and new methodologies. Accordingly, they are being forced to become involved in using and implementing leading edge technologies. Most are doing it alone and would rather not have partner arrangements. This strategy may not be totally viable given the needs of the market.

- E&Cs should be strong competitors in CSI markets where they have traditional business bases. They are unlikely to be successful in nontraditional areas because, historically, their successes have taught them to be cautious and less aggressive in new markets. They could be a formidable competitor in any market they choose to address.

- Bechtel is by far the strongest competitor and is already engaged in energy/utility CSI projects. The company is capable of doing well in this market. No data is currently available on other E&Cs' CSI activities.

h. In-House Groups

- As in other information services markets, the in-house MIS organizations represent a major source of competition for all CSI vendors. Beyond the natural tendency of these groups to believe that they "should be able to" complete large projects internally, there are concerns about involving outside contractors.

  - In-house MIS groups want to maintain control over major projects. They know they will have to live with the consequences of the project and feel that by doing it themselves they can ensure more positive long-term consequences.

  - In general, MIS groups also have a low opinion of outside help. Outside contractors are regarded as overpaid, unspecific, and unaware of the practical and political realities of the company's day-to-day businesses.

- The main strengths of the internal groups are, in fact, their intricate knowledge of the operation, the history of why things happen the way they do, and the political and logistical stumbling blocks that will play a role in the SI project. This "inside" view is also their major weakness. It is difficult for these groups to rise above today's problems and visualize new ways of doing business.

- For success, the outside contractor must have the chief executive's backing for the CSI project at the outset. Not only will top level approval be required for the expenditure, but without top level authority, it will be difficult for the integrator to overcome the in-house politics and antagonisms that are often evident in large U.S. corporations. SI contractors should recognize symptoms

of a less supportive in-house group and learn effective ways of dealing with these groups.

IV MAJOR INDUSTRY MARKETS OF SYSTEMS INTEGRATION

IV MAJOR INDUSTRY MARKETS OF SYSTEMS INTEGRATION

- In isolating likely industry targets for CSI, each vendor must take account of the following:

  - Overall sector vulnerability to CSI: This results from the impact of a broad set of factors including deregulation (e.g., banking), market competition (e.g., manufacturing), level of technical sophistication of the industry, ability to fund CSI-type projects, and number of prospective candidates over the next five years.

  - Vertical market expertise: To be in a position to counsel prospective customers on the best strategy for CSI implementation, vendors must have an intimate knowledge of the processes used in the vertical industry as opposed to knowledge of only the information systems and services requirements.

  - Density of competition: It is preferable to avoid competing head-to-head with companies likely to have better-than-even chances of winning business. This suggests that not only certain types of businesses should be avoided but also certain types of contracts. There is no point in spending marketing/sales dollars unnecessarily and reducing proposal hit rates.

- Exhibit IV-1 uses these measures to analyze the potential of each industry. The following discussion details key issues of each industry and the potential each holds for CSI.

EXHIBIT IV-1

OVERVIEW OF INDUSTRY SECTOR POTENTIAL FOR CSI

SECTOR	Regulatory	Market Competition	Sophistication	Funding	Profits Volume	Competitor Density	COMMENTS
Discrete Mfg.	L	H	L	M	H	L	CIM market incipient; no market leader. Multiplicity of islands of automation.
Process Mfg.	L	H	M	M	L	L	
Banking/Finance	H	H	M	H	M	H	In period of transition; "running scared."
Distribution	L	H	L	L	H	L	High volume, low margins; control and cost cutting.
Insurance	M	M	M	H	L	L	Coming out of a slump in profits into period of plenty.
Medical	H	H	M	H	M	M	Coming out of period of plenty into cost-cutting mode.
Services	L	M	M	M	H	L	Diverse, scattered market.
Telecommunications	H	H	H	H	M	M	Heavy competition, very aggressive, diversification oriented.
Transportation	M	M	L	L	L	L	Heavy competition, union ridden; aggressive but broke.
Utilities	H	L	H	H	L	H	Steady implementors of automation and control projects.

Ratings: L = Low, M = Medium, H = High

A. BANKING AND FINANCIAL SERVICES INDUSTRY

- This sector covers commercial and mortgage banks, savings and loan institutions, credit unions, security and commodity brokers, and other financial institutions such as development banks and cooperatives.

I. INDUSTRY FORCES

- Changes in state and federal regulations governing financial institutions (commercial and mortgage banks, saving and loans, credit unions, security/commodity brokers, etc.) instituted in the first half of the decade have had a major influence in changing the structure of the banking and finance industry.

- The Depository Institutions Deregulation and the Monetary Control Act of 1980, for example, changed not only what businesses banking and financial institutions engage in but have also been instrumental in influencing how these businesses are conducted. The change is not complete, and major restructuring is likely to continue into the 1990s.

- The major business practice change (paying interest on normal checking accounts and other deposits at competitive rates, prohibited under previous regulations) set in motion much of the current turmoil in this industry. As the spread between price of deposits and loans has narrowed, services have been either curtailed or priced more realistically with respect to costs.

  - This pressure on operating margins has forced the closure or consolidation of many financial institutions, and many more will follow. Competition has arisen in nontraditional areas including retail chains, insurance companies, and stock and mutual fund brokerages, such as Sears, J.C. Penney, Kroger, Prudential Bache, Merrill Lynch, and Shearson-American Express.

- Regional consolidations and multi-bank holding companies are strategies being used to contain costs and leverage assets. It is an environment of "swallow or be swallowed" but above all be profitable. These consolidations will lead to requirements for systems that integrate the operations of the acquired institutions.

- The critical requirement for profitability in an industry with a growing number of competitors has been and will continue to be containing costs and developing new financial products. For those who are struggling to survive, technology has become the preferred answer to both of these goals.

  - The dynamics of the industry are such that cost per transaction is now a critical, closely watched aspect of the business. Changes in pricing occur frequently.

  - More creative products are being introduced--around-the-clock arbitrage, electronic trading systems implemented on private value-added networks, and many other services based on interactive, on-line, real time systems.

  - ATM/POS/EFT, use of personal computers by investors, and, longer term, bank debit cards and "smart cards" offer a wide-range of financial and other consumer services. All of these systems amount to additional electronic transactions and electronic switching between critical services.

  - The competitive marketplace has changed the time value of money from months and years to days, and in some cases, hours. Daily clearing of funds, variable interest rates on credit cards based on average daily balances, and corporate trade payments have all become more time-sensitive.

- Banking, particularly wholesale banking, is now accomplished through multiple electronic networks. From commercial and consumer entry points (treasury workstations, ATMs, POSs) to worldwide transfer operations, these networks reflect the dynamic restructuring of the industry. In these high-volume transactions, electronic transfer is far more cost-effective than paper.

- Integrated data services networks (IDSNs) are currently offered on a regional basis and by 1991 will extend worldwide. Citicorp, as one example, has direct telecommunications capabilities in over 160 cities in 90 countries on a 24-hour basis.

- The goal is full relationship-based banking that offers a portfolio of financial services including brokerage services, investment advice, money market, and other nontraditional types of services as well as the more traditional banking services.

2. IMPACT ON INFORMATION SYSTEMS AND SERVICES

- The consolidation of financial institutions, the interest in containing costs, and the advancement of new products/services has brought information systems and services to the forefront as a competitive weapon that meets the need to move more data and information easily and efficiently.

- The wider range of financial products now offered and the competitive sensitivity to costs and pricing requires that information systems and services move more data/information both downstream to the customer and upstream to the institution's financial management.

  - Whether it is interstate banking, electronic banking, electronic funds transfer, or automatic teller machines, the networking requirements of today's financial institution are enormous. In addition, the average life cycle of today's systems is steadily becoming shorter, and obsolescence is a constant fear.

- At the same time, management needs more information and detailed analyses to allow them to make the decisions that will help keep the company competitive. Requirements have increased for on-time delivery of needed data. Integrated funds/cash management which gives managers control over a consolidated cash flow is highly desirable.

- With more people on-line there have been increasing demands for flexibility in the applications systems and for increased support for education of the user and the need to deal with the (sometimes unrealistic) expectations of users.

- Banking and financial institutions are increasingly requiring distributed data processing integrated with central DP applications via standardized network protocols and systems architecture. PC users need to interact with central computer facilities combining office tasks and financial processing in one device (PC, intelligent terminal, etc.).

- As the network of customers and users who have access to the data grows, the need for data management mounts as well. Control of data and data integrity are now frequent concerns of banking/financial management.

3. CSI POTENTIAL

- The potential for CSI in banking/financial institutions is strong, second only to discrete manufacturing. The external pressures on information systems and services are evident, and the search for and implementation of new technology to core business practices has become critical (see Exhibit IV-2).

- Systems that are closest to the primary business (direct deposit and loan in banks, for example) will be the most active area of development. In addition, distributed data processing and electronic data interchange that facilitate the gathering and distribution of information will be central targets.

EXHIBIT IV-2

KEY FACTORS IMPACTING CSI POTENTIAL IN BANKING/FINANCE

POSITIVE

- Very Strong Competition Demands
- Time-Sensitive Information Requirements
- Growing Body of End Users
- Technical Innovation Desired

NEGATIVE

- Structural Changes Underway, but Incomplete
- "Parochial" View of In-House Capabilities
- Many "Product" Alternatives
- Opportunities Hard to Locate
- Industry and Application Experience Required

- These "platform" systems include:
  - Trust systems (all types).
  - Centralized customer information systems.
  - Correspondant banking services check processing systems.
  - Commercial loan systems.
- Systems that automate the setup of new accounts and tie to integrated deposit systems that include ATMs on the user end and customer information files on the other end will be in demand.
  - Office automation projects correlated to the platform systems are also a target opportunity. While executives are focusing on "office automation," products that have an immediate payoff within the competitive environment will be more frequently acquired. Loan analysis systems and platform officer support are examples where the "OA" and banking/finance applications may merge on the officer's desktop. This industry segment has above average demand for applications software, communications hardware, and integration services. The deregulation of the industry in the first part of the decade spurred large banks and financial institutions to upgrade their hardware suites to more easily take advantage of new, unregulated businesses.
- This hardware acquisition phase was given additional impetus by the tightening economic environment that forced industry members to institute systems to more closely control financial assets. Today, demand is for completing communications hardware purchases and then integrating these systems.

- Communications technology will be particularly important as companies in this sector seek to extend their reach across the country and around the world. National networks of ATMs and debit cards have become a competitive necessity. Other services that require extensive networking are sure to follow as the competitive nature of this market grows hotter.

- Applications software packages should continue to be popular in this segment. Many software vendors have targeted banking/finance as a growth industry for integrated applications. In fact, the market is so saturated with alternative products that many firms believe off-the-shelf solutions are the approach of choice. However, this addresses only the central application part of the software requirement and will not impede growth of CSI which addresses the entire integrated solution need.

- There are several issues that will impact the direction and speed of CSI development in this marketplace:

- Opportunities are relatively limited. The top 300 banks, while less than 2% of all commercial banks by number, account for over 60% of current information services expenditures. Similarly, the top 100 money center and regional banks comprise over 40% of total information services spending.

  - The financial marketplace is increasingly international in scope. Vendors targeting the largest banking/financial services institutions must be in a position to demonstrate international capabilities.

  - Banking/finance requires highly sophisticated, industry-specific knowledge for successful systems development. Vendors must integrate advanced technology into industry-specific applications knowledge.

  - User management in this sector believes they are innovators in applying technology. While this is a positive position from the vendor's perspective, it demands that vendors be able to meet high levels of

expectations, even though some environments may require integrating past, current, and future generations of technology within the same environment.

- Like the majority of CSI prospects in other sectors, the in-house staffs will be the main competition, with strong temptations to "go it alone" in planning, managing, and executing large projects.

- Buyers in this sector place a premium on the vendor's ability to understand requirements and demonstrate experience in the industry and in specific application areas. The issue of the vendor's ability to fulfill the demands of the CSI project does not come to the forefront until these experience-related criteria are met. Vendors should take care to match the buyer's changing criteria in the sales cycle.

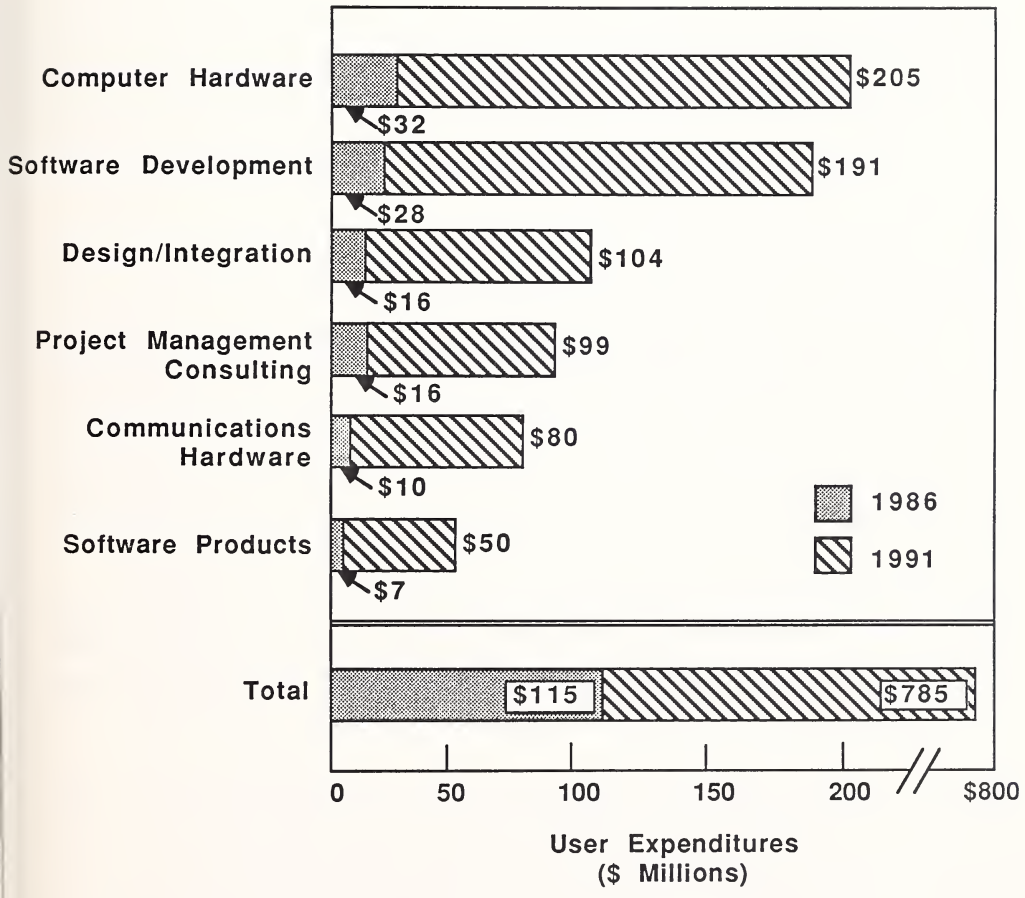
- The management of security is a critical issue in this industry. Validation/authentication of messages in transaction networks and prevention of network infiltration and tampering are now an important aspect of systems development. The security issue also means opportunities for disaster recovery technologies, secure networks, and signature verification systems.

4. CSI FORECAST

- Exhibit IV-3 summarizes the main components of the CSI market for 1986 and 1991. Computer systems will be the single largest component of CSI expenditures, followed closely by software development. Design/integration and project management/consulting together will draw as much expenditure as computer systems, growing to over $200 million by 1991. During the five-year period, the banking/finance CSI market will grow sevenfold to $785 million of annual expenditures.

EXHIBIT IV-3

BANKING/FINANCE CSI FORECAST
1986-1991



- Over 400 information services and commercial bank vendors target this market. No single vendor dominates, but several leaders emerging in selected markets include NCR, ADP, and EDS in commercial banks; NCR, CDC, and EDS in savings and loans; and Quotron, Telerate, and ADP in securities and commodities.

B. DISTRIBUTION INDUSTRY

- This sector includes retail distribution including single establishments and chains in apparel, food, appliances, drugs, hardware, etc., as well as wholesale distibution (establishments selling goods to retailers or industrial/commercial/institutional groups acting as brokers).

1. INDUSTRY FORCES

- The steadily shrinking margins and growing competition in this sector have encouraged the development of very high volume, very low margin units that are constantly seeking ways of drawing customers by offering unique or convenience-oriented services. This has led retailers to become involved in elctronic funds transfer systems, check verification systems, and POS networks.

- There are only 800 large retailers out of a total exceeding one million, but as many as 20% of wholesalers exceed 1,000 employees. These are the principal targets for CSI in the immediate future. The emphasis will be on improving and integrating external and internal communications.

  - Externally, communications with customers have become very important. Better communications links facilitate the flow between retailers, wholesalers, and customers. Particularly in retail sales, the use of information systems for credit checking and POS data collection

ensures the steady flow of funds while monitoring inventory. Back office use of computer-to-computer order processing increases the speed of locating and delivering merchandise.

- Internally, use of automation has become critical for closely monitoring finances, supporting financial decisions, analyzing profit margins, and providing other management decision information where and when it is needed.

- While management is concerned with the increasing communications costs required to support a broader network, they believe that the use of technology is the only way to simultaneously control costs while handling larger volumes.

2. IMPACT ON I.S.

- The mission of IS, given the broad diversity of products handled by each outlet, is to offer systems that control the logistics associated with warehouse and shelf inventory, pricing and obsolescence of goods, etc., while also handling the logistics of credit/bad check verification, bad credit losses, cash handling, and funds consolidation and transfer.

- In addition they must develop customer-oriented services that provide faster and simpler order entry, transaction processing, in-store processing (distributed processing), and the use of such technologies as EDI to reduce paperwork.

- Real time information for improved decisions means improved marketing/sales data, sales demand forecasting, vendor performance ratings, telemarketing systems, and inventory deployment models.

- The integration of data processing and communications has become a target of opportunity in the distribution industry. As more and more establishments go on-line, there is strong interest in connectivity in general, distributed processing in particular, and end user support throughout. All of these

requirements have meant a drastic redesign of outdated distribution applications and a general reconsideration of the use of technology. But in-house skills are insufficient for the conception, design, and implementation of such complex integrated systems while at the same time dealing with the pressures of maintaining existing systems stretched to the limit by the increases in volume. CSI fills this void.

3. CSI POTENTIAL

- While the number of firms in the distribution industry that could support CSI is large, major project expenditures have been limited. Member firms have traditionally not been driven by the need for automated solutions as much as by merchandising skill. But this is changing of necessity as large wholesalers and retailers find their margins shrinking in a more competitive environment (see Exhibit IV-4).

- From a functional point of view, client organizations are seeking help primarily in communications network integration, voice/data integration, micro/mainframe connectivity, and office information systems integration.

- IS managers' analysis of their own in-house capabilities and constraints suggests that they feel the current staff is not available and/or does not have the technical capabilities required in these types of projects. Specific skills they require relate to network design and complex project management.

4. CSI FORECAST

- The forecast for this market (see Exhibit IV-5) shows rapid growth in CSI (AAGR 44%) as the impact of automation as a competitive weapon is felt from the display floor to the loading dock. Software development activities should be in particular demand in CSI projects as applications software needs cannot be met by off-the-shelf packages.

EXHIBIT IV-4

KEY FACTORS IMPACTING CSI POTENTIAL IN DISTRIBUTION

POSITIVE

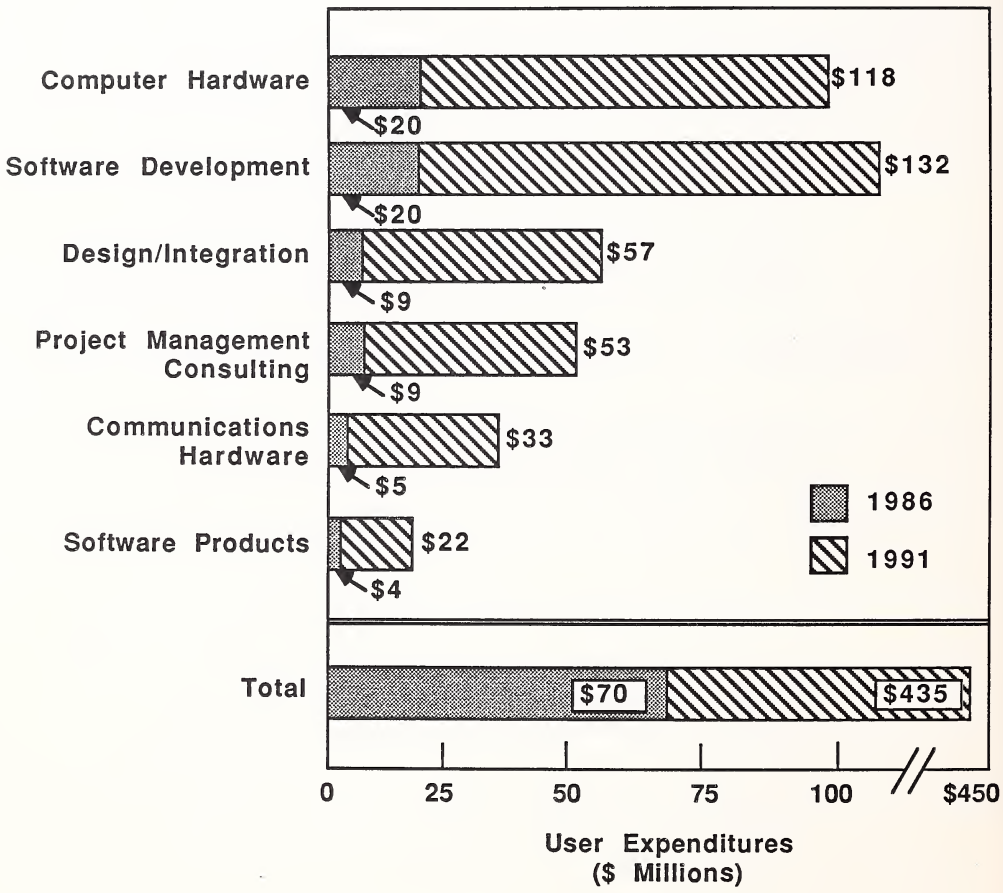
- Network Requirements
- Increasing Use of POS and Optical Technology
- Strong Interest in Customer Service
- Network Design and Project Management Skills Missing

NEGATIVE

- Infrequent User of Outside Services
- Smaller than Average Project Expenditures

EXHIBIT IV-5

DISTRIBUTION CSI FORECAST
1986-1991



- Application areas extend from sales/marketing (sales demand/budgeting/forecasting, scheduling, sales tracking, telemarketing, order entry/processing, and credit checking) to management (payroll, retail accounting, human resources, accounts receivable, purchase order systems, and warehouse control).

- By 1991, user expenditures on CSI are expected to grow to $435 million annually from a 1986 base of $70 million. By that time, software development expenditures are expected to outstrip expenditures on computer systems to become the single most important market. Sales of software products, meanwhile, are expected to be subdued. While the need is apparent, use of outside services has not been frequently made in this industry sector. Broadly speaking, IBM and NCR dominate the hardware segment. Moderate expenditures and strong growth are expected, but most projects will be relatively small compared to other industries.

C. INSURANCE INDUSTRY

- This sector is comprised of life, property, casualty, and health insurance, and the re-insurance segment.

1. INDUSTRY FORCES

- Financial institutions have made their appearance in the insurance market as competitors with "benefit consultants," "financial planners," and "full service" business planners. At the same time, severe losses in the insurance industry during 1984-1985 on the heels of deregulation of the banking/financial industry (in which many of the larger insurance companies participate) has forced the same kinds of restructuring of this industry as is occurring in banking/finance.

- There has been, and will continue to be, a contraction in the number of competitors. However, following disastrous losses in the 1984-1985 period, 1986 seems to have been a very profitable year, enabling the surviving companies to undertake some much-needed restructuring of their sales networks and agencies.

  - The increase in the number of agents under a given company umbrella requires greater control and standardization of procedures and, in the process, more automation requirements in each agency and more connectivity between each agency and the home office.

  - A more competitive environment has led to new insurance products (variable life "lifestyle" policies, for example) and more complex premium calculations.

  - Competition has also led to diversification into financial areas and interest sensitive products with fluctuating interest rates that need constant monitoring.

2. IMPACT ON I.S.

- As with many other industries, the tight economy and increased competition has led IS to a need to reduce costs by improving the efficiency of business.

  - This "opportunity" for improving operations and productivity will likely be accomplished with a stable or diminished workforce. IS managers realize they need to plan carefully for the increasing capacity that the automation of insurance functions will have on existing systems, manage the growth of the hardware installation, and choose hardware carefully to ensure maximum reliability.

  - A chief role of IS is becomming the effective management of change--anticipating systems needs for new product lines and providing problem management.

- Further, in the modern insurance industry, systems flexibility is a must, for as more products are introduced, the customer becomes a prospect for all of them, not just a policy holder. This change in view may alter the poor image that this industry now has; it certainly has required the development of nationwide systems consolidated across all lines of business. The intricacies of intra- and inter-company businesses require a level of compatability among systems that rivals those of the banking/financial industry.

- In the interest of writing better, more competitive policies, insurance companies have a need for more timely information, especially in claims administration. By providing more users with access to mainframe data and with enhanced communications capabilities, IS hopes to foster a level of user involvement (and independence) to offset some of the staff reductions. At the same time there are requirements to build an infrastructure to support agents in the field, giving them a sales support system. Networking within and between offices is a high priority under these circumstances.

3. CSI POTENTIAL

- Much like the banking/finance industry, insurance is feeling the competitive pressure and need to manage not only insurance products but also financial products. In fact, recent industry changes have led insurance companies into the same arena as banks and other financial institutions.

- Insurance firms are also similar to firms in the banking/finance industry in component purchases for CSI. The IS hardware is coming into place, applications software packages are prevalent, and networking needs are clear. CSI projects should focus on integrating systems among product lines (insurance and financial, for example) and between the parent organization and the vast structure of the sales organizations.

- Two needs of major insurance establishments seem certain--corporate data bases that cut across product lines and communications network integration that provides the vehicle for access to these data bases.

- These idealized data bases might include subsystems for sales/marketing (product management, client file, agent support system, new insurance/claims applications, etc.), for management (accounting, accounts payable, insurance administration, office applications control system), and for policy management (loss system, rating/policy issuance, casualty rating, etc.).

- The opportunity for CSI vendors appears to be more in the development of new systems rather than upgrades and expansions of current ones. These new systems are important to the business, but IS is unable to develop them both because of their appropriation of personnel to maintenance and the lack of capabilities in more sophisticated technologies of integrated systems design and network design. IS managers in this industry have also frequently indicated the importance of project management skills behind these former two and recognized the lack of these skills within the in-house staff.

- Large expenditures and above average growth are expected in this sector. Projects tend to be large but are usually industry-specific. Industry knowledge is a must (see Exhibit IV-6).

4. CSI FORECAST

- The forecast for this sector (see Exhibit IV-7) shows a 40% growth from a small base of $100 million in 1986 to $530 million of annual revenues by 1991. The single largest market in that same year will be software development with $142 million due to the highly customized nature of the requirements, a fact reflected in the low forecast for standard software products.

- There is little CSI experience in this sector with the notable exceptions of several large insurance companies that have built complex headquarters/field networks, IBM's national insurance broker network, and Arthur Andersen's project to develop a similar but private network. Vendors may face obstacles in changing that. This industry exhibits strong beliefs in its own IS competence and self-sufficiency.

EXHIBIT IV-6

KEY FACTORS IMPACTING CSI POTENTIAL IN INSURANCE

POSITIVE

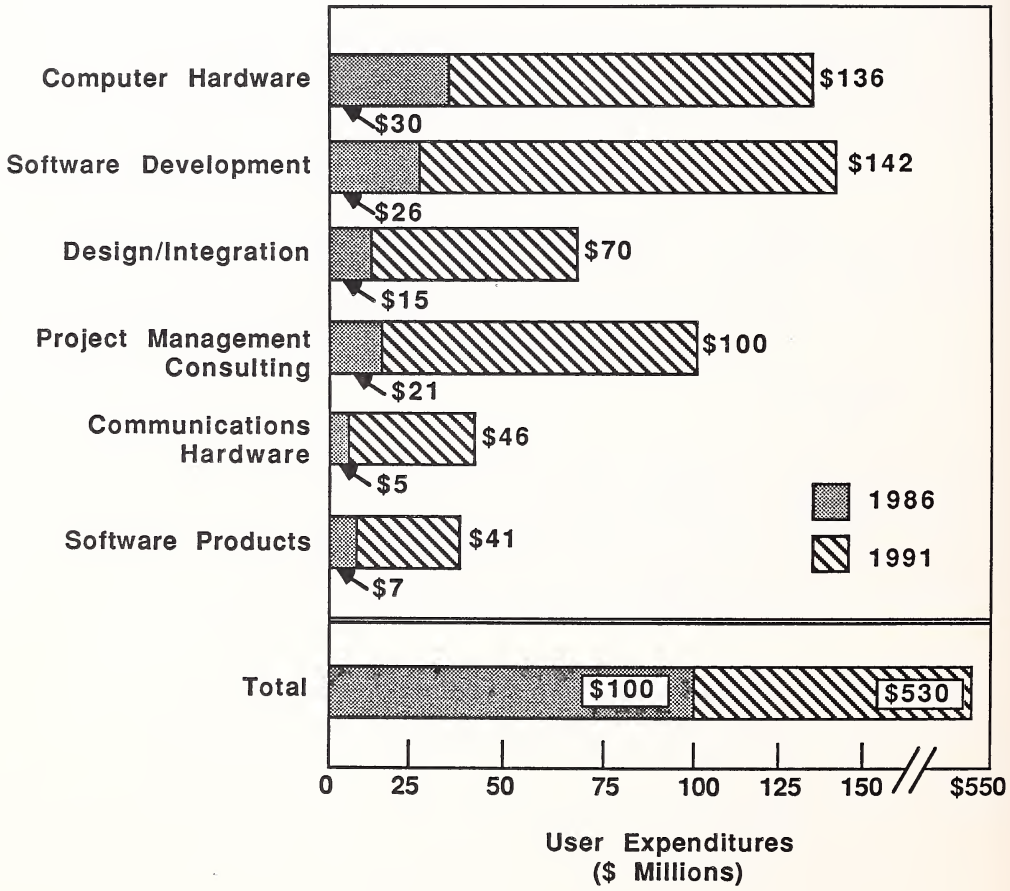
- Shrinking In-House IS Staff
- New Products (Insurance and Financial) Require Support
- Need for Policyholder/Client Information
- Integrated Network Requirements
- Lack of In-House Skills in Sophisticated Technologies

NEGATIVE

- Cost Control Measures Limit New Starts
- Ongoing Industry Restructuring
- Industry-Specific Knowledge/Experience
- Self-Sufficiency Mentality

EXHIBIT IV-7

INSURANCE CSI FORECAST
1986-1991



- While IBM, Arthur Andersen, ARC/AMS, Policy Management Systems, and Redshaw lead the competition in this market, only IBM and Arthur Andersen seem to have the interest and project management expertise to pursue large-scale integration projects.

D. DISCRETE MANUFACTURING

- This sector covers a wide variety of assembly-type manufacturing activities, and care must be taken not to view the sector forecasts as referring to a homogeneous market. Discrete manufacturing is the largest sector of the commercial marketplace, but it is also the most disparate collection of narrowly focused vertical markets, each with its own specific characteristics.

1. INDUSTRY FORCES

- Foreign competition successes in penetrating domestic markets has restricted growth in this sector, but there have been significant productivity gains achieved as well. In fact, contrary to popular wisdom, there is no statistical evidence for the widely publicized conversion of the U.S. economy from a manufacturing and industrial base to a services economy.

- At present, manufacturing represents the same percentage of the U.S. GNP (22%) that it did in 1960. However, competition from Pacific Basin companies has become particularly intense. Some industry reorganization has occurred, but the primary change agent has become advanced in manufacturing technologies and the adoption of widespread automation.

  - Manufacturers are implementing flexible manufacturing systems such as "Just-in-Time" to reduce the costs of carrying inventory. They see automation of the shop floor and the effective utilization of inventory and capacity as the main productivity goals of the industry.

- Applications of artificial intelligence to the development of expert systems and continued emphasis on computer-integrated manufacturing (CIM) are additional thrusts of productivity through technology.

- INPUT believes that the application of these technologies will contribute to cost control, but real advances in productivity will come only by revising the entire manufacturing process rather than by piecemeal automation of (often) inefficient procedures. Also, domestic manufacturers need to put strong emphasis on customer service, a basis of competition that foreign producers have had trouble with.

2. IMPACT ON I.S.

- The DP environment in discrete manufacturing seems stable, perhaps mature. Decreasing hardware costs, better price/performance ratios, and an emphasis on purchasing rather than leasing equipment have all served to create a very large base of installed systems, both hardware and software.

- The push to automate manufacturing processes has also created a very large base of (mostly incompatible and unconnected) automation equipment ranging from materials handling, CAD/CAE, and process controllers to the more exotic robots and automated guidance vehicles for parts retrieval from stores.

3. CSI POTENTIAL

- This industry has been at the forefront of CSI expenditures for some time, principally from the attention given to computer integrated manufacturing (CIM). The need to remain competitive, especially with Pacific Basin countries, and the applicability and availability of automated systems to the manufacturing function have encouraged firms to adopt CSI.

- Expenditures for CSI in 1986 are estimated to be nearly three times larger than the second largest industry--banking/finance. The growth rate will slow

over the forecast period, especially in comparison to the other major industries in the CSI market, as the industry's use of CSI moves further from its embryonic stage toward maturity.

- Expenditures may be held back, not by the reluctance to move projects out-of-house but by the lack of new project starts among the largest of firms. According to INPUT estimates, by 1991 over 50% of the 1,500 largest discrete manufacturing firms will initiate projects in a given year and contract some 70% of the expenditures involved. Unless a significant number of today's smaller firms graduate to the ranks of these major firms or the size of the average job increases substantially over the forecast, this market segment could mature rapidly.

- The size of this sector and the large expenditures are attractive features for CSI (see Exhibit IV-8). Projects tend to be large (e.g., $40 million) multi-year efforts that fit well with the stable DP environment. Many dollars are also available for smaller, shorter projects. Coupled with this is the fact that the use of outside services is growing faster than inside services in this sector. Since familiarity and acceptance of contractors is a must for CSI, this propensity is also an attractive characteristic.

- Several descriptors characterize projects in this sector:

  - Many are international in scope.

  - They tend to be communications-intensive as well as software-intensive.

  - Projects are conventional in nature.

  - Many involve IBM hardware since IBM dominates processors in this market.

EXHIBIT IV-8

KEY FACTORS IMPACTING CSI POTENTIAL IN DISCRETE MANUFACTURING

POSITIVE

- Extensive Competition to Be Countered By New Technology
- Stable DP Environment Reduces Risks of CSI
- Larger Sector, Extensive Project Expendtures
- Communications Network Integration Needs

NEGATIVE

- IBM Dominates Hardware Component
- Conventional Projects
- Some Negative Experiences with CSI
- Industry and CSI Experience Prerequisite

- Projects frequently involve extensions of existing systems, although new starts are also frequent.

- The types of projects are widespread from the shop floor to the front office, indicating a gradual development in traditional areas. Accordingly, application targets tend to be in common areas such as industry-specialized manufacturing systems, including:

  - Production/process automation.

  - Manufacturing information systems (inventory control, scheduling, material requirements planning, manufacturing resource planning).

  - CIM and "factory of the future" developments.

- Functionally, communications network integration is a most important activity and one that provides entry to CSI vendors who do not engage in "shop floor" automation. Frequently mentioned activites also include micro/mainframe links, corporate data base development, voice/data integration, office automation, departmental computing, electronic data interchange (EDI), and security.

  - Security in the manufacturing sector is an emerging issue as companies interface and integrate systems. Bills of material, accounts receivable, and scheduling data, capacity, and resource planning systems are all sensitive to manufacturers. Gateways giving access to these types of corporate data outside the plant are cause for concern.

  - Manufacturing applications protocol (MAP) is being embraced for CIM applications. While vendors have rushed to support a MAP standard, there is some concern that users will wait for MAP to develop before implementing MAP products.

- IS managers understand the importance of project management and frequently cite the absence of this skill in the staff. Managers also believe other skills critical to major projects are also required--hardware selection, requirements definition, and systems and network design.

- Many IS managers in discrete manufacturing report use of CSI contractors and many have negative feedback. They fear the loss of control that seems to be inherent in CSI and show concern for the vendor's lack of industry experience and CSI experience. Vendors may need a large sales effort to get the major projects.

- As in other markets, IBM's position and strategy are a factor. They have short-term products in place (CAD/CAE, industrial robots, shop floor microcomputers, etc.) and an apparent long-term strategy of tying these components together in an architecture based on a DBMS on the mainframe. Vendors should be sensitive to the presence of IBM and to the impact of IBM's strategies on the current effort.

4. CSI FORECAST

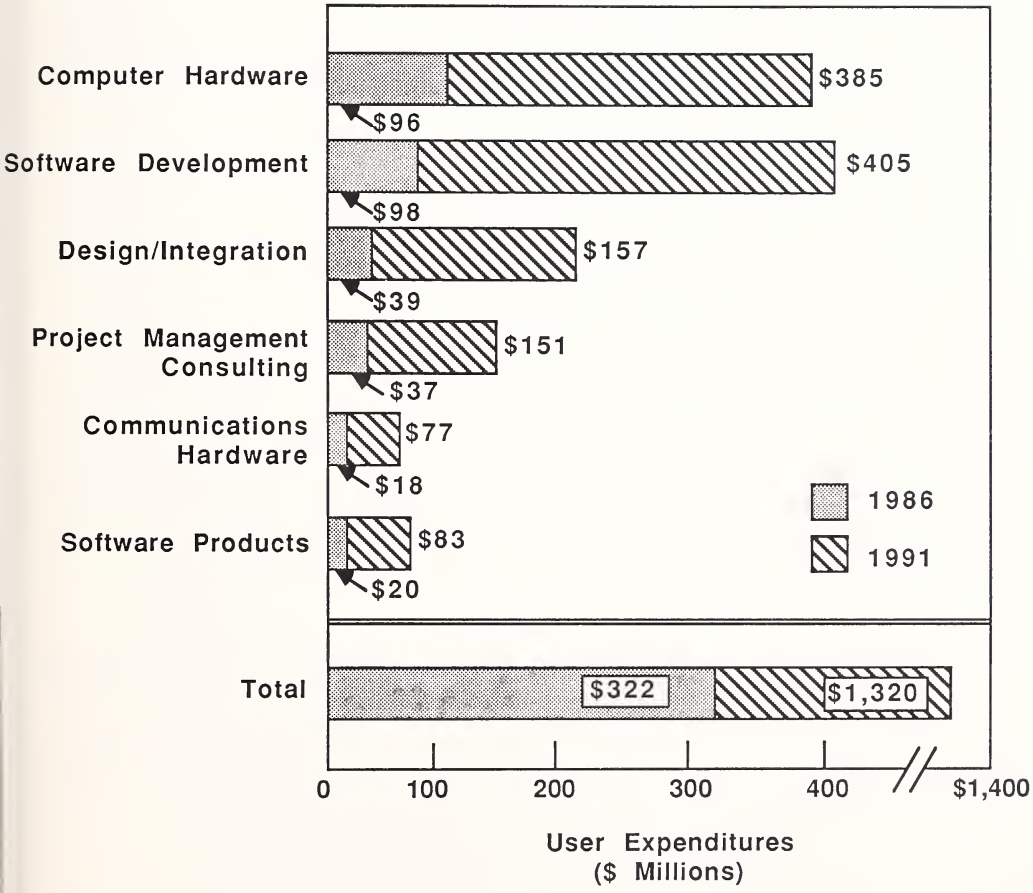
- The forecast for this sector (see Exhibit IV-9) shows a market nearly twice as big as the next largest CSI opportunity. Again, software development is the single largest requirement, reaching $405 million by 1991.

- The integration of the "islands of automation" found on the shop floor and the interconnection of supplier networks and sales networks with the planning and control processing executed within the information systems department offer enormous scope for the development of CSI-type projects to the great benefit of the end user and his goals of cost reduction and response to the market.

- Besides IBM, the competitive CSI leaders list includes Arthur Andersen, EDS, and DEC. The market is vast, however, so that even with formidable competition, discrete manufacturing remains the single largest opportunity for most systems integrators.

EXHIBIT IV-9

DISCRETE MANUFACTURING CSI FORECAST
1986-1991



E. PROCESS MANUFACTURING

- This sector is a combination of very large, powerful corporations active in oil and gas, mining, tobacco, chemicals, paper, food products, and rubber and plastics.

1. INDUSTRY FORCES

- All except the tobacco industry have been hit by a downturn in raw material prices. The tobacco industry and others have been hit by reduced demand, and all have been hit by competition.

- The process manufacturing sector has been driven in recent years more by the economy than by manufacturing technologies. Major efforts are focused on reducing costs and maintaining a competitive posture through automation.

2. IMPACT ON I.S.

- Financial, technical, and personnel factors have all forced moderation of growth in IS. Automation of manufacturing processes, as in discrete manufacturing, is a key initiative. Unlike discrete manufacturers, however, process manufacturers also have extensive needs for communications network integration that ties the "natural" resource to the processor and the processor to the seller.

- The sector is a target for process control, inventory control, and shipping control systems with heavy engineering and instrumentation content. Processes to be automated tend to be simple in overall concept but complex in detail. Quality control and inspection systems with associated materials handling has become a point of focus in recent years.

- Automation efforts to date have been almost entirely focused on production. Information systems and software have been dedicated to MRP/MRP II, accounting, inventory control, and statistics. Little or no integration has been achieved. CIM applies equally well to process manufacturing as to discrete, but has seen little application (except by Comserv and even then only for MRP II).

3. CSI POTENTIAL

- Unlike their discrete manufacturing counterparts, process manufacturing firms have been much slower to adopt CSI. Expenditures in 1986 are estimated at approximately $100 million and the growth rate at a below-average 21%. The smaller number of firms and the fewer number of major project starts sets these two industries apart (see Exhibit IV-10).

- The physical aspects of finding, extracting, and processing natural resources seem much less amenable to automation than discrete manufacturing. When projects are undertaken, the current emphasis is on the backbone IS and communications hardware that will support these firms in the future. Custom software development is also a major expenditure in CSI-type projects.

- IS managers see the need for and in-house shortcomings in project management and network design but do not, in general, seem particularly inclined to pay an integrator for these capabilities. Interestingly, training and transition management is also highly valued in projects, but internal staff is poorly rated in providing it. In this market, support may be a key benefit to be offered by CSI contractors.

- There are no principal competitors, but a number of potential partners for CSI exist in the body of heavy machinery and automation vendors in each vertical segment.

EXHIBIT IV-10

KEY FACTORS IMPACTING CSI POTENTIAL IN PROCESS MANUFACTURING

POSITIVE

- Competitive Need
- Lack of In-House Skills
- Network Design/Integration Requirements

NEGATIVE

- Few Large Establishments
- Reluctance to Contract for Services

4. CSI FORECAST

- The forecast for this sector (see Exhibit IV-11) is less than one-quarter the size of the discrete manufacturing forecast for all of the reasons given. CSI contracts in the sector are already in evidence, e.g., Arthur Andersen (food products), but they will be much more difficult to come by and smaller on average.

- By 1991, yearly CSI expenditures are expected to reach $300 million, up from a base of $115 million in 1986. Software development, although the most important of the component markets, is still a relatively small opportunity.

F. MEDICAL INDUSTRY

- This sector includes physicians, dentists, hospitals, medical and dental laboratories, nursung homes, outpatient care facilities, and allied services.

1. INDUSTRY FORCES

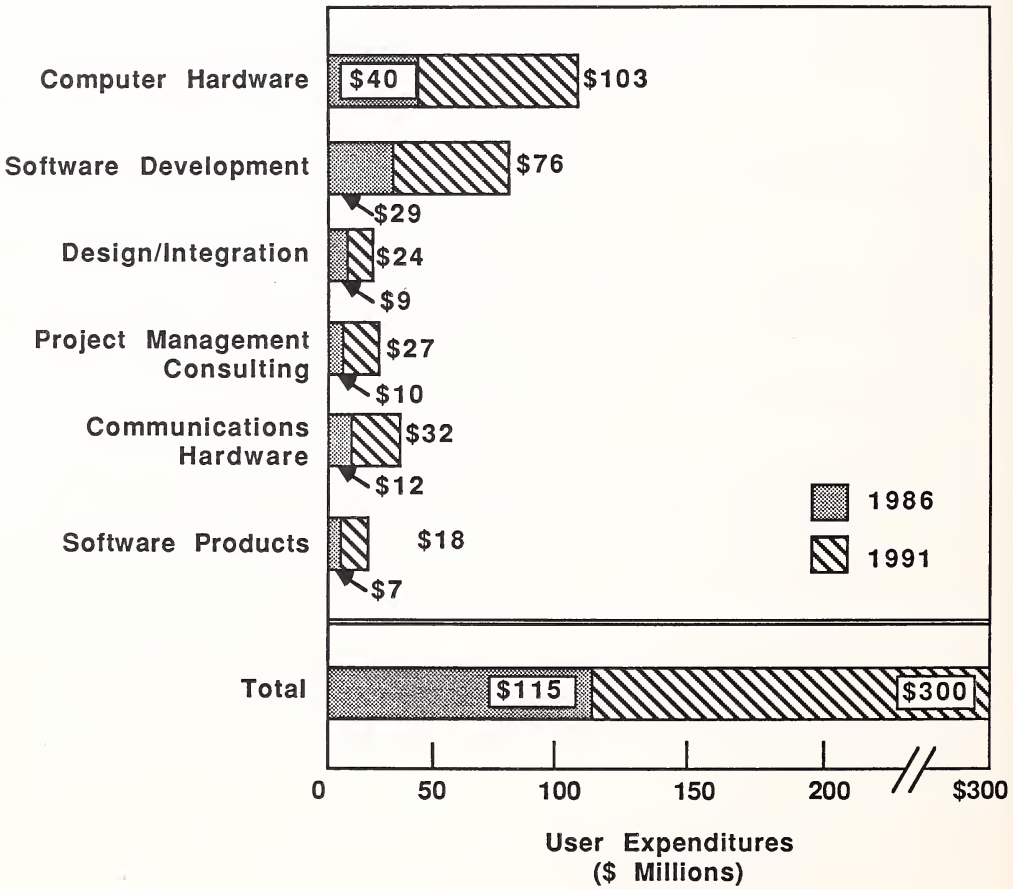
- In 1984, for the first time in two decades, the rate of growth in this sector fell below double digits, and the trend has continued since. Competition is already a factor with the emergence of health maintenance organizations (HMOs) and investor-owned hospitals and group practices.

- The federal government, Blue Cross/Blue Shield insurance companies, and even large employers are pressuring health care providers (physicians/dentists, hospitals, laboratories, nursing homes, outpatient care facilities) to reduce costs.

- The government has established diagnostic-related groups (DRGs) and is shifting reimbursements from a cost basis to a DRG-basis. Health care

EXHIBIT IV-11

PROCESS MANUFACTURING CSI FORECAST 1986-1991



coverers and large employeers concerned that costs are rising faster than revenues are also seeking reductions. As a result, providers are seeking solutions to lower costs.

2. IMPACT ON I.S.

- DRG-based reimbursements demand current, on-line handling of patient information on a cost rather than expenditure basis. Separate systems for financial operations, patient care, nursing management, laboratory management, etc., are being integrated as one means of reducing data entry redundancy, error rates that accompany constant re-entry of the same information, and the wasted manpower that occurs with both.

- Cuts in federal support of health care, particularly Medicaid, will continue, and the efficiency in such diverse areas as reimbursement systems, medical records, patient history, pharmacology, and bed occupancy will fuel CSI activity.

3. CSI POTENTIAL

- The size of the medical industry is constrained by the limited number of establishments large enough to support the size of effort typical in systems integration. In INPUT's forecast, less than 350 firms are sufficiently large enough and of these, only 25-30% undertake major projects either internally or externally (see Exhibit IV-12).

- IS hardware purchases as a proportion of the CSI component expenditures are above average as are applications software products. Expenditures for communications hardware and the technical integration of the components is below average.

- Intra-hospital communications networks will be important with some networks extending to other community providers (physicians, laboratories, etc.).

EXHIBIT IV-12

KEY FACTORS IMPACTING CSI POTENTIAL IN MEDICAL INDUSTRY

POSITIVE

- Pressure to Reduce Medical Services Costs
- Pricing Structure Changing to Cost Basis
- Lack of In-House Skills
- High Use of Outside Contractors

NEGATIVE

- Turnkey Systems Vendors Very Active
- Industry Experience Required
- Limited Number of Large Companies
- Financial Limitations

Equally important will be large data bases that consolidate patient information and insurance claims tracking. Major projects will involve integrating applications within the same physical location.

- In the absence of many of the skills required during the course of major projects (planning and project management in particular) use of outside information services has been high. Vendors are required to have industry experience and, in many cases, knowledge of and experience with the specific medical establishment. Turnkey systems vendors have done well in this market and will likely continue to do so. This is not a market where entry is particularly easy.

- Other unattractive aspects of this market are the limited number of large establishments and the financial constraints that frequently prohibit large project expenditures. CSI vendors will need to overcome the financial limitations with creative project financing and by building a strong case for the cost savings that will result from planned projects.

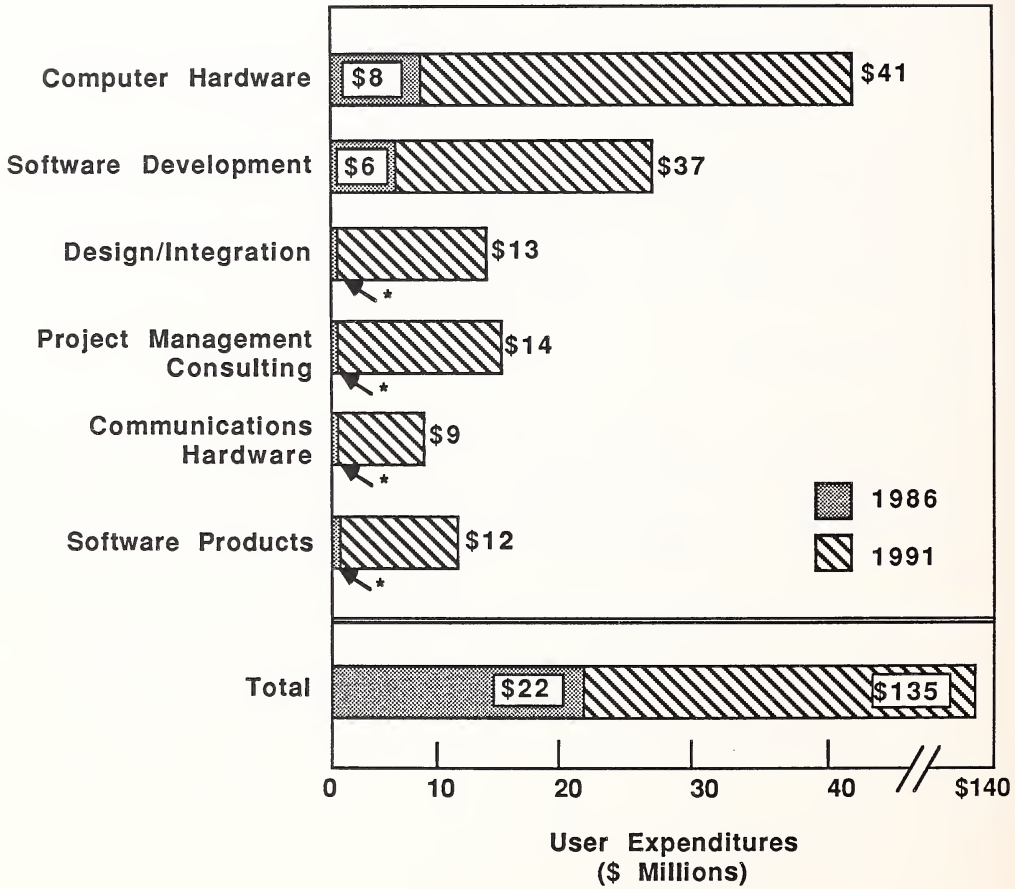
4. CSI FORECAST

- The forecast for this sector (see Exhibit IV-13) shows the limited potential for CSI that INPUT expects, reaching an annual expenditure of only $135 million by 1991. One or two unforeseeable major projects could make this forecast look very conservative.

- More than 160 vendors sell information systems and services to the medical sector. Leaders in MIS include HBO, SMS, and Mediflex. Leaders in patient care are IBM, EDS, and Cycare. Alliances with these vendors could be beneficial to CSI contractors.

EXHIBIT IV-13

MEDICAL CSI FORECAST
1986-1991



* = Less than $5 Million

G. SERVICES INDUSTRY

- This sector is composed of professional services (e.g., accounting, legal, engineering), personal services (e.g., garment cleaning, reproduction, dwelling services), business services (consulting, public relations, telemarketing), and membership services. Others include automotive repair, recreation, and educational/social services.

1. INDUSTRY FORCES

- The sector is characterized by small businesses, professional practices, and other groups that do not represent a target for CSI. No single vertical market is worth structuring a specific marketing thrust for, and the entire market will be opportunistic.

- Automation of functions has not played a large role in the development of this industry, although recent interest in information accumulation, handling, and disposition has led to new starts in such areas as information networks, textual data bases, etc.

2. IMPACT ON I.S.

- Since this sector is characterized by small businesses, professional practices, and partnerships, the IS function is significant only in the largest firms. Accounting, legal, engineering, and automotive seem the most susceptible to CSI.

3. CSI POTENTIAL

- Even the largest segments present few large-scale opportunities, so no single area is worth a dedicated marketing thrust. Further, in some sectors ("Big 8" accounting firms, large engineering companies) the capabilities exist for in-

house management of major projects, lessening the size of the CSI market in this sector further.

- Competitors and possible CSI partners include Reynolds and Reynolds, Mead Data Central, and West Publishing.

4. CSI FORECAST

- The forecast for this sector (see Exhibit IV-14) shows limited CSI potential, with only $55 million in yearly CSI expenditures by 1991 from a small base of $15 million in 1986.

H. STATE AND LOCAL GOVERNMENT

- This sector includes city, county, and state government bodies, particularly those involved with public safety, highways, welfare, education, health care, and sanitation.

1. INDUSTRY FORCES

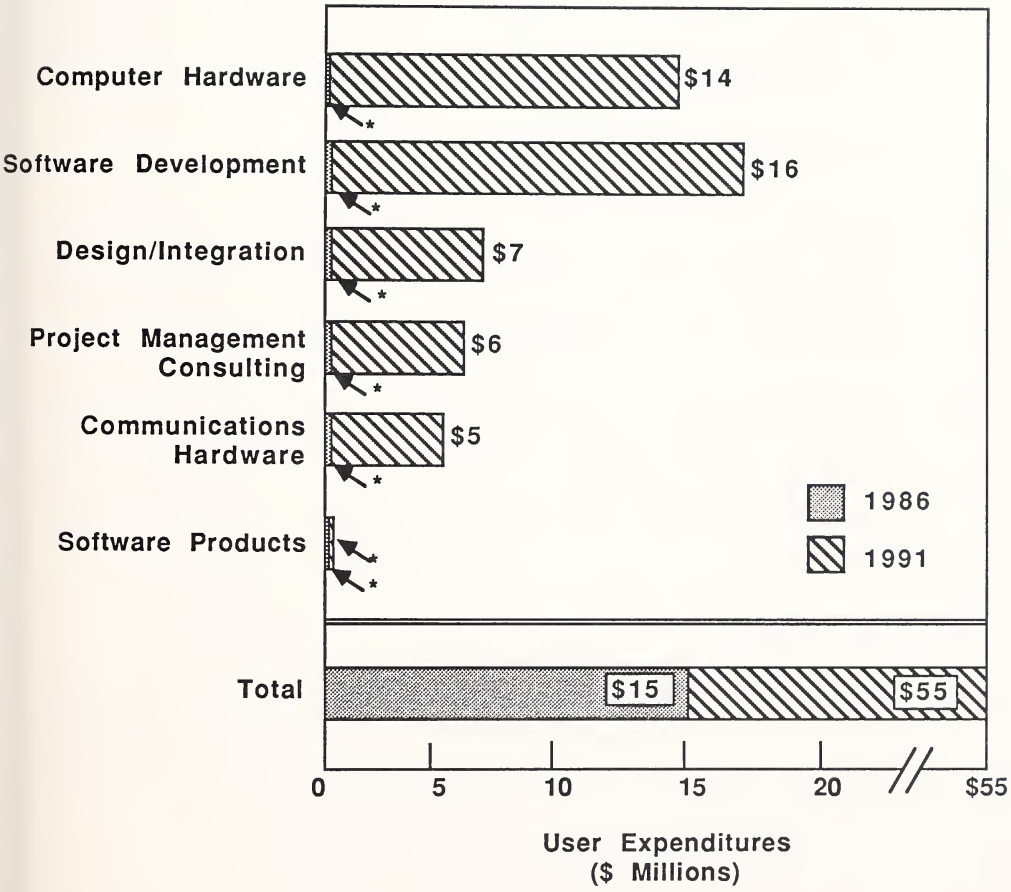
- Much like the federal government, state and local governments have come under increased financial pressure as requirements for services increases without corresponding increases in the tax revenue base.

- The passage of Gramm-Rudman-Hollings has had an immediate (and continuing) impact on federal support of state governments, but large CSI contracts have not ceased. CSC, IBM, Arthur Andersen, and EDS all look to this sector to generate significant opportunities in the next five years.

- If the past patterns are anything to go by, 45% of all state and local government expenditures will come from state governments, 30% from cities, 14% from counties, and only 11% from districts and other.

EXHIBIT IV-14

SERVICES CSI FORECAST
1986-1991



* = <$5M

S3 S

2. IMPACT ON I.S.

- The mission of information systems departments in state and local governments has broadened considerably in recent years. Increased requirements for tax collection and control/registration systems (e.g., motor vehicle registrations and licenses) are just two examples.

- But cutbacks in staff and the inability of government agencies to remain competitive with private industry in salaries for salaries of technical personnel has resulted in a shortfall of qualified in-house staff. This creates a natural opportunity for CSI.

3. CSI POTENTIAL

- The need is large and the projects that will be contracted will likely be very large, making this sector attractive. CSC, for example, recently won a medical claims processing integration project valued at $133 million in the state of New York. It is unlikely that other jobs in this sector will be as large.

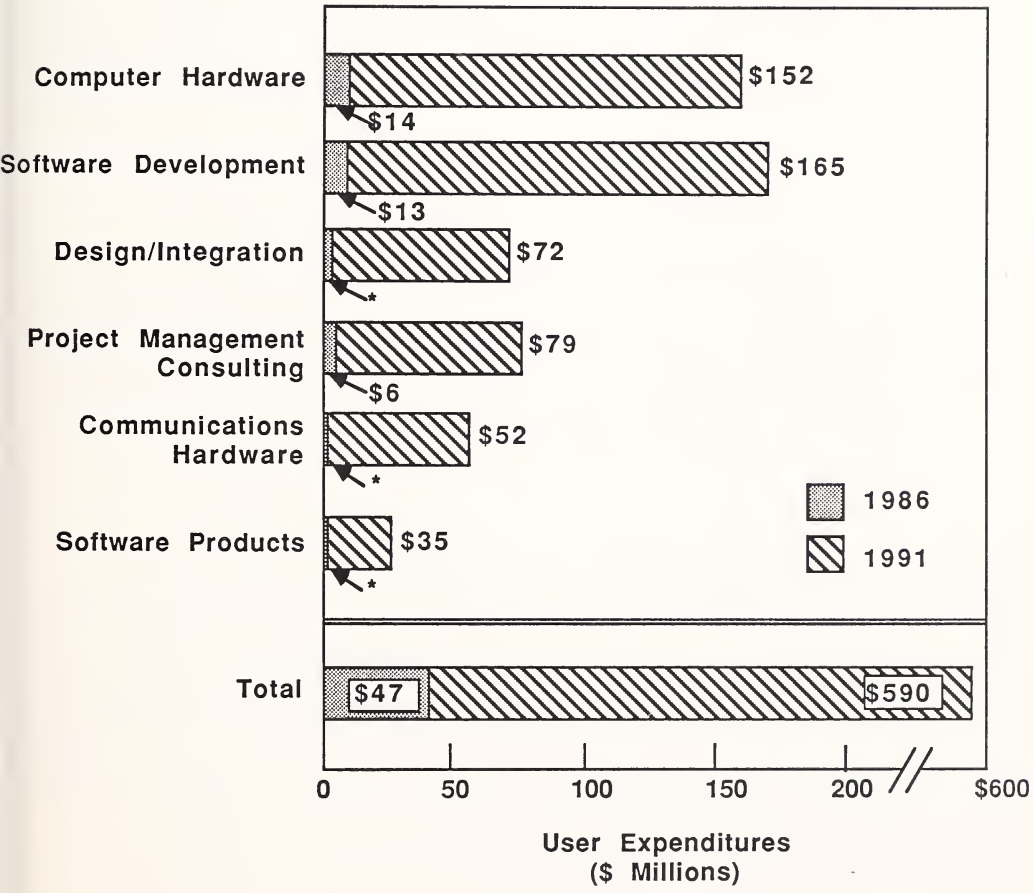
- One interesting door of opportunity appears to be facilities management contracts. It is not infrequent for FM contractors to extend CSI projects into FM contracts on completion. By then the contractor is well known to the client and has a better understanding of the system than anyone, the client included.

4. CSI FORECAST

- The forecast for this sector (see Exhibit IV-15) shows state and local government to be the third largest CSI opportunity after discrete manufacturing and banking/finance, growing to a 1991 estimate of $590 million from a base of $47 million in 1986.

EXHIBIT IV-15

STATE AND LOCAL GOVERNMENT CSI FORECAST 1986-1991



* = Less than $5 Million

- Within state governments, welfare entitlement, departments of transportation, law administration, and hospitals are the best targets. Yet again, the implementation of networks and the integration of voice/data/text and image on a single network will represent a common requirement.

I. TELECOMMUNICATIONS INDUSTRY

- This sector is composed of the major providers of telecommunications (AT&T, the Regional Bell Operating Companies, independent local exchange carriers, long-distance resellers, and cellular operators) as well as companies providing broadcasting, cable TV, fiber optics, and satellite networks.

1. INDUSTRY FORCES

- The telecommunications industry has also been hit with the twin impacts of deregulation and competition. Lower costs of long-haul communications and the growing importance of connectivity have led to increased traffic volumes. The scope and complexity of these new telecommunications offerings are enormous and frequently offer opportunities for CSI.

2. IMPACT ON I.S.

- Managing this change has been particularly hard in the IS organization where information systems hardware and communications technologies were generally separate. Today, the question is not whether to merge these technologies, but by how much. Their merger not only enables cheaper and faster communications and improves customer service but also allows reduction of personnel, a serious concern of management and unions alike in this highly-unionized industry.

- The changing cost of services as well as the impacts of new technologies and deregulatory actions have led to requirements for tools to plan and manage new communications channels such as satellites, fiber optics, microwave, and new types of data networks.

- In addition to the competition deregulation fostered, Bell telecommunications companies lost a major source of IS support when they were separated from AT&T that must be replaced by in-house capabilities or by external contractors. They also lost data processing resources to cost-cutting measures, creating even greater opportunities for CSI vendors.

3. CSI POTENTIAL

- Telecommunications firms, while few in number, tend to undertake projects that are significantly larger on average than the other industry segments. These characteristics tend to be offsetting, making this sector moderately attractive in terms of overall expenditures (see Exhibit IV-16).

- Hardware requirements tend to be below average while custom software development efforts and the design and integration activities required to connect the components are quite strong and expenditures, as a proportion of the "typical" project, above average.

- In addition to applications that will handle the smooth transition from a regulated environment to a deregulated one, telecommunications companies need to put in place (replace) basic systems in accounting, payroll, and billing. Engineering productivity systems for both internal and field service use also appear to be good opportunities.

- Network integration is an important consideration in most projects as are micro/mainframe links while data bases, office information systems, and voice/data integration are not. Directory publishing and the advertising and marketing systems that the directories sell are about to explode as a market.

EXHIBIT IV-16

KEY FACTORS IMPACTING CSI POTENTIAL IN TELECOMMUNICATIONS

POSITIVE

- Merger of Computers and Communications
- Internal Lack of Project Discipline
- Network Integration Opportunities

NEGATIVE

- Industry Restructuring Delay Projects
- Perceived In-House Technical Skills
- Highly Unionized Workforce

Already in-bound telemarketing is producing significant revenue. However, the telecommunications vendors may believe they know more about network integration than the CSI vendors.

- Client organizations are attracted to CSI because the approach provides the project discipline so frequently missing in recently deregulated businesses. Client organizations are assured of project management skills beyond their own in-house capabilities and the likelihood of bringing projects on-line within time and budget limitations.

4. CSI FORECAST

- The forecast for this sector for substantial growth from a base of $82 million in 1986 to $390 million of annual expenditures on CSI by 1991 is shown in Exhibit IV-17. Given a limited number of major establishments, a number of projects already under way, and a "parochial" attitude regarding some CSI skills, this may be a very difficult market to penetrate for all but a few. Computer manufacturers and industry-specialized professional services vendors (e.g., EDS and BBN) will be the prime CSI competitors.

J. TRANSPORTATION INDUSTRY

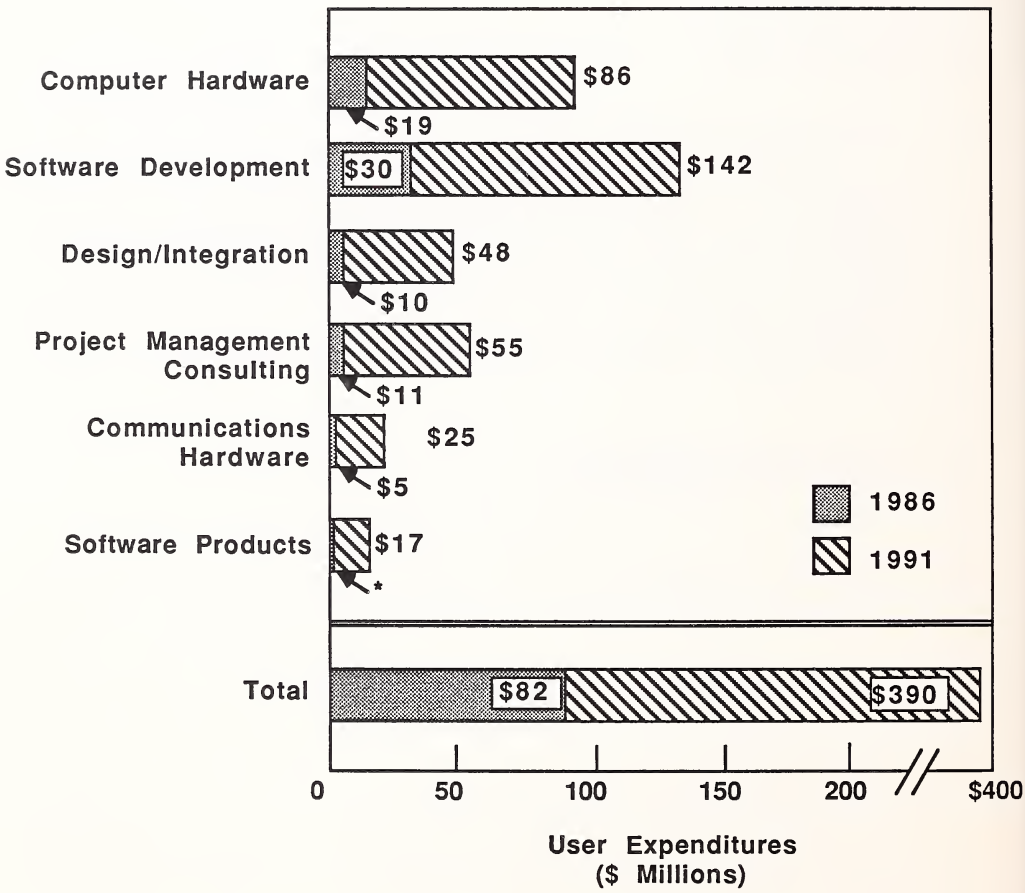
- This sector is composed of airlines, railroads, trucking, and other transportation segments including shipping, mass transit, postal, and pipeline.

1. INDUSTRY FORCES

- The downturn in the economy has been particularly felt in the transportation industry which is so dependent on the good health of other industries (farming, steel, etc.) for business. Although concern over the rising cost of fuel has abated, cost containment, increased productivity, and improved customer

EXHIBIT IV-17

TELECOMMUNICATIONS CSI FORECAST
1986-1991



* = Less than $5 Million

service are the common denominators of competing in this market and fending of competition from other modes of transport.

- Deregulation of airlines and stiff competition from alternative carriers of air and rail traffic have led to additional declines in business. Complicated and ever changing airfares and rate tariffs create additional needs for enhanced reservation systems that seek to maintain market share. The consolidation of vendors into a small group of very large corporations is evident in all sectors except mass transit (heavily influenced and controlled by state and local government). Twelve airlines now account for the majority of the nation's air traffic, only four of the seven largest air cargo carriers are expected to survive the next five years, and the number of failed trucking companies has risen each year since 1980.

2. IMPACT ON I.S.

- For all of these reasons little growth in IS expenditures is expected. Efforts are underway to control costs and remain competitive. Productivity and efficiency are paramount as establishments seek to reduce personnel costs.

- Part of the strategy is to replace personnel with technology-driven systems. Technology lowers the cost of overall service by reducing labor costs and at the same time improves the speed of response required to remain competitive. Systems are necessarily communications intensive. Travel reservations systems, crew scheduling, route optimization modeling, and the like are the current backbone of the industry.

- The ability to communicate inexpensively with small, remote sites is also critical to some segments of the industry; whether it is connecting moving vehicles (trucks, ships) or getting basic information (billing, orders, routing) to customers, communications are central to services.

- These systems, when properly designed, also provide management with better information for statistical analyses of operations data, rapid response to changing market prices, cost savings in labor and fuel, carrier scheduling, and sales/marketing planning and analysis.

3. CSI POTENTIAL

- The recent deregulation of this industry has fostered a competitive environment that demands the use of automation technologies as a competitive weapon. Price wars have cut so dramatically into revenue that funds for major projects appear limited. This, plus the fact that the industry includes only a limited number of large transportation companies, significantly reduces the attractiveness of this industry for CSI (see Exhibit IV-18).

- However, there are major opportunities and projects that tend to be larger than the average of other industries. Two major expenditures in these large projects involve communications hardware and design/integration services. The competitive battleground is largely in the reservation systems required for securing, at a guaranteed price, space for the movement of either people or cargo, and since prices seem to change daily and the agents who need this up-to-date information are dispersed over a vast area, network requirements are paramount.

- Many of the systems that represent target applications are not new. They include:

  - Tracking/reservation systems.

  - Remote agency office/sales support.

  - Parts tracking and maintenance scheduling and control.

  - Materials management.

EXHIBIT IV-18

KEY FACTORS IMPACTING CSI POTENTIAL IN TRANSPORTATION

POSITIVE

- Competition and Changing Rates Require Support
- Strong Need for End-to-End Systems
- Network Design/Integration Requirements
- In-House Skill Limitations

NEGATIVE

- Few Opportunities Outside of Airline Segment
- Little Growth in IS Expenditures
- Limited Use of Outside Services

- Vehicle control with on-board computers for safety and efficiency.

- Electronic data interchange.

- Accounting and revenue allocation systems.

- General ledger and accounts payable.

- Financial reporting.

- CSI will be attractive to client organizations for several reasons:

  - CSI solves the problem of how to make changes to a complex system both easily and while in production mode.

  - CSI vendors offset the recognized technical weaknesses in internal staff as well as the their limited capabilities in project management.

  - Presumably, vendors will address the concern of many IS managers regarding the directions of IBM and the hardware likely to survive.

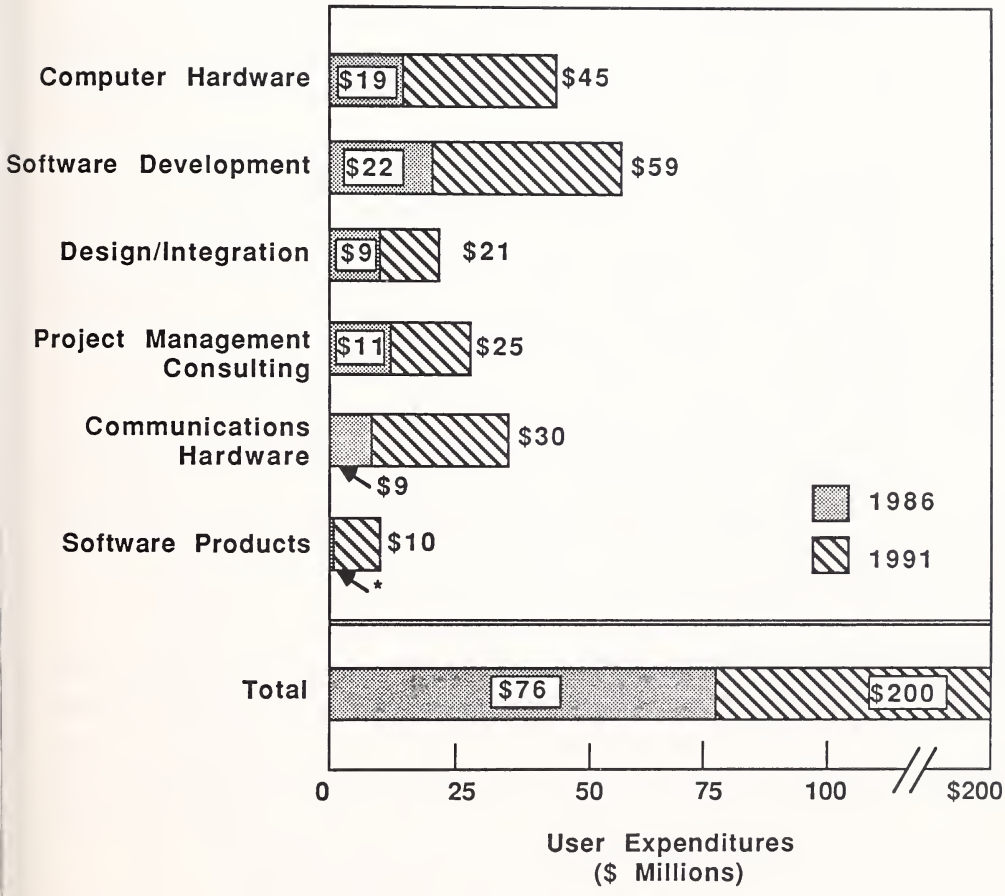
- The most unattractive features of this market are the limited number of projects and the low level of anticipated expenditures outside the airlines segment. Outside major airlines, the industry is not economically capable of supporting many large projects, nor are these other segments particularly accustomed to either the use of technology or the need to acquire development expertise.

4. CSI FORECAST

- The forecast for this sector (see Exhibit IV-19) shows that from a base of $76 million in 1986, CSI yearly expenditures are expected to grow to $200 million by 1991. Principal competition in this industry will be from computer manufacturers in conjunction with smaller, sector-specific vendors.

EXHIBIT IV-19

TRANSPORTATION CSI FORECAST
1986-1991



* = Less than $5 Million

K. UTILITIES INDUSTRY

- This sector includes the energy market (electricity generation--coal/nuclear/hydro/oil/solar/geothermal, gas generation), water utilities, and sewage/waste disposal and treatment.

1. INDUSTRY FORCES

- Until the beginning of the 1980s, most of the utilities industry were not under serious competitive pressure. Each utility acted in a geographic monopoly and had little concern for competition, focusing instead on day-to-day business.

- The sector has nevertheless been a steady if unspectacular consumer of external services. Contracts are typically large and multi-year and mainly the province of engineering and construction firms. Changing price structures, alternative energy sources at competitive rates, and dedicating resources to marketing diversified products are some of the current strategies.

- The poor condition of balance sheets resulting from the enormous cash drain many utilities have suffered as a result of litigation, project overruns, etc., in nuclear power plant construction is unlikely to be resolved in the near future.

2. IMPACT ON I.S.

- IS has been rudely awakened from a comfortable day-to-day orientation to one where they must meet demands with constrained budgets. With this has come an interest in enhancing efficiency and productivity to make the utility more profitable and decrease costs while increasing the ability to serve users. The principal factors impacting CSI in the utilities sector are given in Exhibit IV-20.

- There is much more interest in long-term hardware planning and the curtailment of rapidly escalating operations and management costs associated with outdated equipment. Corporate management seems much more aware of IS, due, perhaps, to the growth of end-user computing and the need for better data administration.

- IS management's attention is turning to data communications requirements that will make systems available to users, even at remote locations. Many of the automated systems are going from batch to on-line, and issues of the proper use of advanced technologies and distributed versus central processing are now under discussion.

- Utilities are also discovering the use of technology for competitive edge. Customer files are becoming marketing data bases to improve service to customers and to market the new products.

3. CSI POTENTIAL

- The forecast for CSI in this sector (see Exhibit IV-21) estimates that approximately $97 million in CSI will be expended in 1986. By 1991, these expenditures will climb to over $430 million at an average annual rate of 35%.

- IS hardware and custom software development expenditures will dominate most projects. Large utilities have a strong interest in modernizing their systems for estimating user demands for electricity, gas, water, and the like. Equally strong are the interests in managing these commodities and developing automated systems for the collection of usage data. Use of hand-held meter readers are an example.

- Applications are rather basic, including such systems as:

  - Management-related systems for payroll, accounting, billing, resource management, and funds management. Product-related systems for

EXHIBIT IV-20

KEY FACTORS IMPACTING CSI POTENTIAL IN UTILITIES

POSITIVE

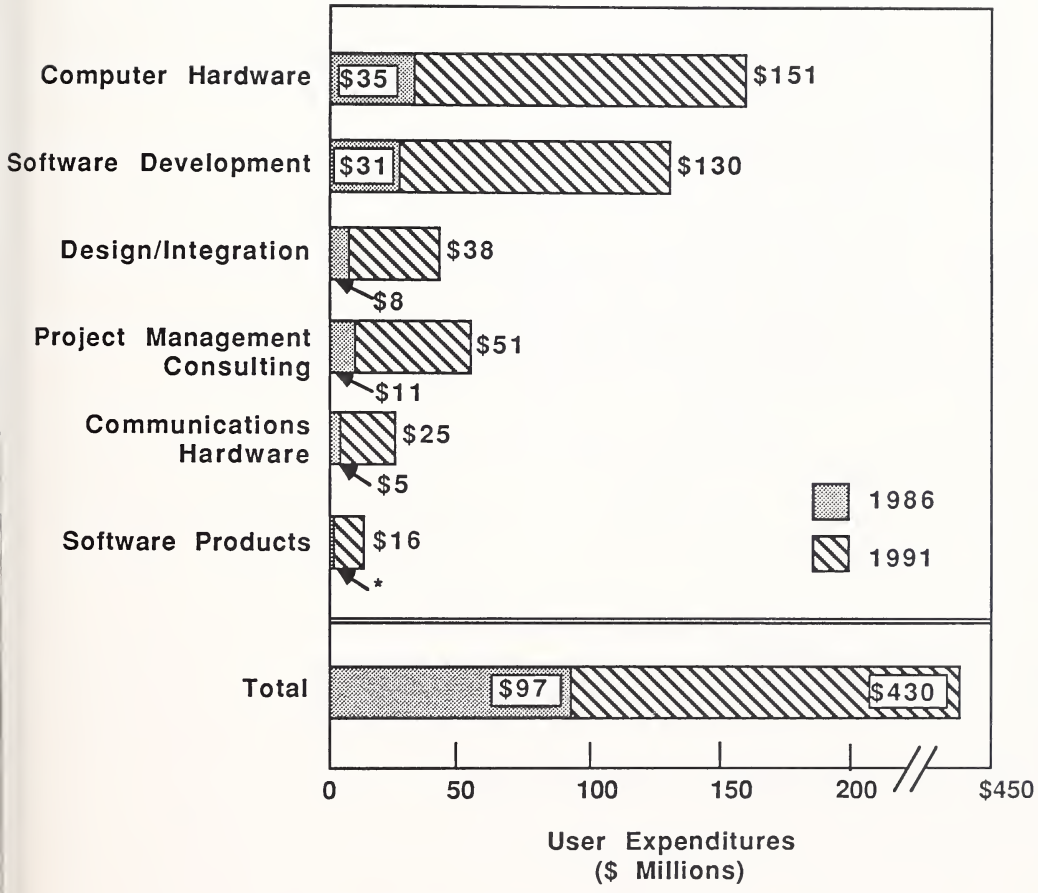
- Increasing Interest in Use of Technology for Competition Advantage
- Interest in Corporate Data Base Interaction
- Need to Support End Users
- Opportunity for Financial Applications

NEGATIVE

- Day-to-Day Orientation of IS
- Limited Number of Estiblishments
- Financial Constraints
- Modular, Rather than Total, View of System

EXHIBIT IV-21

UTILITIES CSI FORECAST
1986-1991



* = Less than $5 Million

inventory control, material management, distribution center control system, drafting/mapping, maintenance system, work order control system, scheduling, tracking, nuclear safety, load control, and process control.

- Marketing-related systems of customer information for merchandise point-of-sale, rate refund systems, hand-held meter reading, and overall customer service.

- The main CSI competitors will be CDC, Bechtel, Fluor, and Systems Control.

L. OTHER INDUSTRY

- The other industries include education and agriculture. In each of these sectors there are a few large firms that dominate and are capable of supporting large projects. The difficulty is finding these opportunities among the multitude of establishments included in this category.

- From a sector point of view, the number and size of CSI project opportunities in these sectors are less attractive than those of other industries. However, there are projects of significance in these sectors that should not be overlooked.

- In education, for example, statewide systems that link remote campuses and inter-campus networks represent opportunities in the higher education marketplace. Statewide integration has been completed by less than 15 state-level college/university systems, and of a potential 2,200 institutions, only 150 have completed campus-wide networks.

V MARKET STRATEGIES, CONCLUSIONS, AND RECOMMENDATIONS

V MARKET STRATEGIES, CONCLUSIONS, AND RECOMMENDATIONS

- The enormous attractions of the CSI market should not obscure the very real risks that CSI vendors face when transacting business in this market, namely the risks to the company's finances and reputation when systems integration projects fail.

- Regardless of the reason(s) for failure and regardless of the source of the "fault," it is the integrator who, having taken responsibility for the success of the project in the first place, must bear the brunt of the repercussions. The dollar size of the projects, the importance of these projects to the client organizations, and the notoriety that such projects will receive make it unlikely that failure will be ignored, either by the share holders or by the press.

- To achieve the rewards of systems integration and avoid the front page, not to speak of the courts, vendors must diligently assess, manage, and, as necessary, contain the inherent risks. This is not a one-time activity, but rather involves constant monitoring of the systems integration plan and its execution.

A. DO COMMERCIAL USERS KNOW WHAT THEY WANT?

- While it is true that commercial users will accept federal systems implementations as valid references for commercial contracts, there are significant

differences between federal systems integration (FSI) and commercial systems integration (CSI), as shown in see Exhibit V-1.

- The success of systems integration in the federal sector, where literally dozens of major systems have been built successfully using the SI concept based on relatively well-defined systems specifications, cannot be expected to automatically apply to the commercial environment where customers do not always know what they want.

- In the early years of CSI it is unlikely that the commercial sector will approach the formality of the federal government in the specification of projects. Requests for proposals (RFPs), bidder's conferences, and statements of bid evaluation procedures will frequently be informal or nonexistent.

- User specifications may be off-target for a number of reasons:

  - Representatives from a number of functional areas in the client organization may be involved in specifying the CSI project; each has their own views of the system and each is able to articulate those views only from their own level of technical and functional understanding.

  - Further, each articulates those specifications based on some assumptions of what a CSI contractor can and cannot do. With many different concepts of CSI and limited experience with a CSI approach in each organization, specifications are likely to be clouded by what they think will happen as opposed to what "should" happen. The statement of specifications may be technical, functional, or some combination of both. In any case, these specifications may not match what the client "really" wants.

  - If the specifications are technical in nature they may be reflective of the developer's knowledge of technology rather than of the business

CSI VERSUS FSI

Characteristics	CSI	FSI
Risk Exposure	High	Contained
Customer	Multiple Contacts	Few Contacts
Project Scope	Broad	Focused
Vendor	General	Specialized
Bid	Fixed-Price	Cost Plus/Fixed-Price/ Bonuses

requirements. This is a frequent occurrence in the federal government when the specifications are developed by a third party.

- Frequently missing from the specifications is a consideration of the long-term requirements of the IS organization. Unless future migration is taken into consideration at some level, it is possible that the CSI-developed system, while satisfactory to the client at the end of the project, quickly becomes obsolete as the IS environment changes.

- A strategic decision to be made by the CSI bidder in any of these cases is in establishing the congruence between what the client "wants," "needs," and is willing to pay for. To avoid these and other pitfalls, CSI vendors may prefer to propose feasibility studies as a first step in a major project. This early participation in a consultancy role has the additional advantage of establishing a level of comfort between contractor and client that may pay off in managing the project and the client later.

- At the very least, vendors should develop a detailed checklist of generic tasks associated with CSI. This checklist can be used in early conversations with the client to discuss both what the project entails and whether the integrator or the IS staff is to take responsibility for each individual task.

B. BID DEVELOPMENT AND INVESTMENT

- The investment required of vendors in developing a bid is substantial, perhaps involving 5-6% of the contract value. Significant amounts of time and money must be spent in understanding the functional requirements, technical specifications, time and financial constraints, business terms and conditions, other salient factors (internal politics, key decision makers, buyer perceptions), and the selection process and evaluation criteria to be used in that process.

- Once these specifics are uncovered and understood, additional time and money must be expended on developing the bid. An assessment of in-house capabilities must be made vis-a-vis the requirements. What does the bidder bring to the project? This suggests the need to conduct an internal skills inventory that can be leveraged and what skills they need to acquire. (This inventory has the additional benefits of providing the vendor with a sales tool that highlights his skills and a logistics tool for putting internal teams together.)

- Some potential projects will be so technically advanced as to invite the question, "Can it be done?" For these projects an investment in engineering a prototype may be required. If the prototyping requirement is expensive, the buyer may underwrite the cost.

C. MANAGING THE BID

- The bid itself requires an assessment of the feasibility of delivering the solution using specified criteria.

  - Can the desired solution be delivered within the constraints imposed by the customer and the operational environment?

  - What subcontractors will be required?

  - How much new development is entailed?

  - How much is unproven technology?

  - What are the alternatives or contingencies: If the proposed solution does not work? If a subcontractor fails to deliver?

- What are the project risks? What do those risks mean in dollars? In damaged reputation?

- How are these risks offset by the potential rewards? Is the revenue worth the risk?

- What level and type of risks should be reflected in the type of contract proposed? That is, what level of confidence is there that the risk can be contained/managed? At what price?

- What formal risk management procedures will be implemented?

- In addition to assessing the project risks, the potential bidder must also assess the competition and determine a probability of winning the award. As explained in other sections, there are several indicators about classes of possible competitors that the vendor may use as a starting point for the competitive assessment.

  - No vendor has a "franchise" in any industry and none is likely to attain one for competitive reasons. Computer manufacturers do seem to have a slight preferential edge, but this could change quickly as other classes of vendors secure major, notable project awards.

  - Buyers tend to lean toward the vendor(s) who are most readily aligned with the major component of the project. For example, in a project that includes a significant expenditure for information systems hardware, the buyer may be inclined toward hardware manufacturers.

  - A sound track record in SI is important to buyers as is a demonstration of project management skills in complex projects. Vendor financial stability may be important to the extent that some projects will require significant up-front investments.

- Marketing capabilities will be as important as technical skills, especially in the early market, as buyers approach the solicitation of bids in an informal way and as they assume a technically conservative posture in initial projects.

- The significant investment for the bidder comes in competitive analysis. Far more than listing the strengths and weaknesses of the competition, this assessment requires the development of an "as if" bid. In this method the bidder's staff actually develops the bid that they think the competitor might submit. The bidder's actual bid must beat this bogus bid in the internal review before being submitted to the buyer. When the size of the award dictates, the internal effort applied to the development of these two bids can result in a very strong and, hopefully, winning bid.

D. BID SELECTION AND USER PURCHASE CRITERIA

- Beyond the technical content, the bid must also reflect a congruence between the buyer's perception of in-house strengths and weaknesses and the capabilities of the bidder. The bid should leave the buyer with the feeling that the bidder recognizes these capabilities and has plans for covering the weaknesses.

- Individual client organizations differ with respect to these strengths and weaknesses but, in general, in-house IS staff "perceives" the following:

  - The IS staff understands the industry and the application.

  - To a point, IS is technically knowledgable, especially about IS hardware and DP techniques.

- IS is less knowledgeable about network architecture and network design.

- IS does not have the capabilities required to successfully integrate hardware, communications, and software.

- IS does not have strong project management skills to apply to complex problems. These skills are most lacking in scheduling, developing detailed budgets, and overall project management.

- IS is generally unable to deliver major development efforts on time and within budget.

- The bid should also exclude those services that the vendor might like to provide but which have a low requirement--multi-vendor maintenance, maintenance of a network, and maintaining the total system are just three examples.

- The type of contract proposed by the bidder makes a strong statement of the bidder's concern about the risks involved and his confidence in managing and containing this risk.

  - A fixed-price with performance guarantees and even strong penalty clauses tells the buyer of the bidder's confidence in successfully completing the project to the buyer's satisfaction.

  - Fixed-price contracts with performance guarantees are currently much more acceptable to clients than other types of business terms, including fixed-price without those guarantees.

  - The performance guarantee requirement is a risk tradeoff from the client's perspective. With diminished control over the developing system, users seek maximum assurance through guarantees. In many situations this "guarantee" becomes mandatory.

- Cost plus, with its various add-on incentives and award fees, and time and material types of contracts connote varing degrees of less confidence in dealing with the unknowns of the project. Time and material contracts are generally less acceptable to clients. Cost plus contracts by themselves are usually unacceptable.

- Most proposals will contain a number of contract types, reflecting both this sense of confidence and the realities of the business conditions.

  - Cost plus-type contracts are generally applicable to the product buy (hardware, communications devices, packaged software) where the cost is known and the bidder is looking only for a reasonable payment for the effort required to make the arrangements.

  - Where the amount of effort required to develop the software for the system is known, bidders generally propose fixed-price. If the unknowns are extensive, time and material bids seem more appropriate.

  - Time and material bids are also frequently used in providing support. In this case, the time required is generally dependent on the client's needs and the materials are incidental.

E. PROJECT AND USER MANAGEMENT

- Project management requirements have been emphasized throughout this report and will not be elaborated further here. Skill in these associated tasks are critical to managing/containing risks, and vendors need to have a deep understanding of the theory and techniques and strong supportive tools.

- Vendors need to carefully consider their approach to selling and using project management techniques. Awareness of "schools of thought" on general and

even industry-specific project management techniques is growing, leading to philosophical conflicts with client organizations espousing particular methods. There is also danger that the necessarily qualitative methods of project management offend "people-oriented" companies.

- One aspect of project management frequently overlooked by contractors is the need to vest authority in the project manager. Too often it seems that layers of company bureaucracy must be traversed for the simplest of solutions. In time-critical projects such "politics" impede the schedule and add unnecessary risks. The results of assigning responsibility to a single manager who can act quickly far outweigh the results of the risks of project delays and cost overruns.

- Another aspect of management frequently neglected in SI-type projects is the need to manage the user. The contractor does not want to be second-guessed on every decision. To avoid that, the user must be kept informed of impending decisions, and when decisions are made, the user must be informed of the decision and convinced that the decision was the alternative that best met the user's interests.

- User management also entails avoiding surprises. Both formal and informal status reports must be made to various levels of the client organization on a timely basis.

F. RISK CONTAINMENT, SHARING, AND PARTNERING

- The assumption of risk that is necessary in CSI does not mean that the SI contractor must solely take all responsibility. It is possible that the risks, once assumed, can be shared with third-party providers.

- Subcontracts with these providers should be written in such a way that the provider guarantees on-time delivery at a specified price. Further, the contract should warrant the third-party's products/services and provide the integrator with remedies if these guarantees and warrants are violated.

- Just as important as the legal relationship in these situations are the personal ones. If subcontractors are made to feel responsible for a part of the overall project, even if in a small way, they will be more inclined to extend the extra effort that will ensure success. In some instances the quality of the relationship is fostered by interest in long-term business alliances. When these seem out of the question, it seems best to appeal to the third-party's financial interest.

- The important aspect for the integrator is the assurance that these parties will do their part to ensure the project's success. Legal remedies may help the integrator recover financially, but nothing will heal the integrator's damaged reputation from a project failure caused by a "transparent" third party.

- This "control" must be tempered by an ability to manage under uncertainty. Project activity variances do occur. In fact, a critical aspect is the management of creativity that creates a project culture which fosters autonomy for creativity, but insists on accountability.

G. COMPANY LIABILITY INSURANCE

- There are possibilities of tremendous legal and financial liability when things go wrong in a CSI project.

  - Just as there is a question of the users' willingness to share the risks of complex systems development, there is also the question of the course of action users may pursue if the developed system is unsuccessful.

- Unlike federal agencies, commercial users may be less inclined to risk the adverse publicity of a failure. Further, the body of law relating to responsibilities in CSI-type projects is largely untested which is a far different situation than in the federal government where the "adversarial" relationship between contractor and client seems to be exactly what makes FSI work.

- It seems prudent for vendors to prepare for this eventuality by carefully assessing company liability insurance coverage. Does the existing coverage protect against the unique risks of CSI? Will the company be covered if the project is a failure? If a third party fails to deliver? If the client sues just because he does not like what he got?

H. CONCLUSIONS AND RECOMMENDATIONS

1. CSI TRENDS

- There is already considerable evidence that large corporations have recognized the need to maximize the information processing resources that they possess by interconnecting and integrating them. In so doing they are responding to another underlying trend, that of making real time decisions based on real time information. However, they also are beginning to realize that in-house skills and resources are often not sufficient in order to accomplish these tasks, either at all or in a reasonable timeframe.

- Consequently, the trend is to spend a greater and greater proportion of their large-scale projects' budgets on outside skills (see Exhibit V-2) and where possible to assign total responsibility for the entire project to a third party. Given the enormous scope of these projects, it is impossible for any single vendor to cover the entire spectrum of needs, including IBM.

CSI USER TRENDS

- Users Going Outside for More and More Projects: 1986 - 21%, 1991 - 39%

- Strategic Alliances Mandatory - No Single Vendor, Including IBM, Can Cover the Spectrum

- Therefore, to participate in the CSI market vendors must develop stategic partnerships that extend the scope of their capabilities. Even then the scope of knowledge required, particularly as it pertains to industry processes, will stretch even the broadest skill base. To avoid overstepping the boundary of their skills, vendors must specialize. This has already started, in some cases more as a result of predilection and opportunity than by choice.

- Exhibit V-3 lists the emerging specializations of the top three CSI vendors to date.

2. MARKETING IS KEY

- In the early stages of the CSI market the degree to which vendors are able to leverage their marketing strengths to focus on the target markets will determine who obtains the early lead (see Exhibit V-4). Although IBM, EDS, and Arthur Andersen all have corporate policies limiting them from disclosing details of their business, it is to their advantage (and that of every other CSI vendor) to leverage early contract successes by giving them a high degree of visibility.

- Market positioning (or the ability to occupy a specific place and fulfill a specific role in the market) is not only dependent on the natural skill base that a vendor may have but also, at this stage of the market, a question of posturing (seizing the high ground in a given market area and holding it).

- Technical positioning is a different matter altogether (see Exhibit V-5). Here a vendor must analyze with respect to the target market(s) his abilities in terms of industry processes (e.g., shop floor operations in manufacturing) and typical hardware and systems software environments found (e.g., DEC/VMS, IBM/VM/MVS) in addition to the applicational requirements of the individual companies.

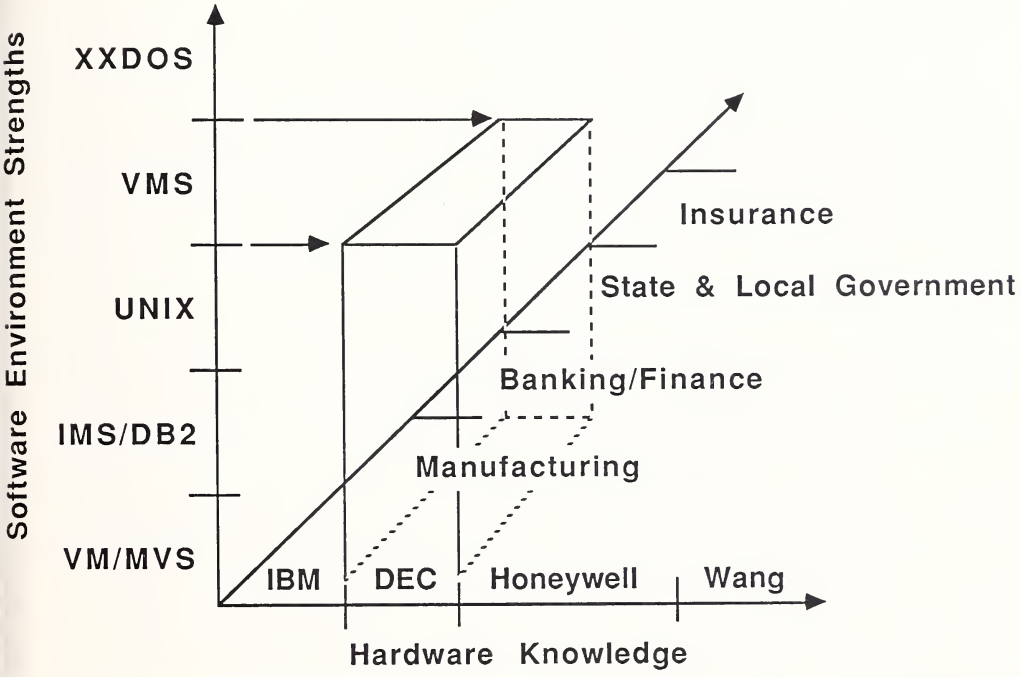
CSI VENDOR TRENDS

- Development of Industry Sector-Specific, Complex Project Expertise/Image:
  - IBM - Banking, Insurance
  - Arthur Andersen - Manufacturing, Networks
  - EDS - Manufacturing, Distribution, Networks

MARKETING IS KEY

- IBM, EDS, and Arthur Andersen Showing:
  - Marketing/Sales Strength
  - CSI Focus Leadership
  - Early Success in the Market
- But Limited by Corporate Disclosure Rules

OPPORTUNITY MATRIX POSITIONING



- Clearly then each vendor must define his strategic goal with respect to CSI now (see Exhibit V-6) both in terms of the companies assets that will be leveraged (customer base and its composition, the internal skills and strengths, and the industry processes to which the company can bring an understanding if not a new approach) and in terms of the partners that will be needed to complement the company's assets. In many cases, this will require a restrucuring of the company's organization.

3. NETWORK INTEGRATION

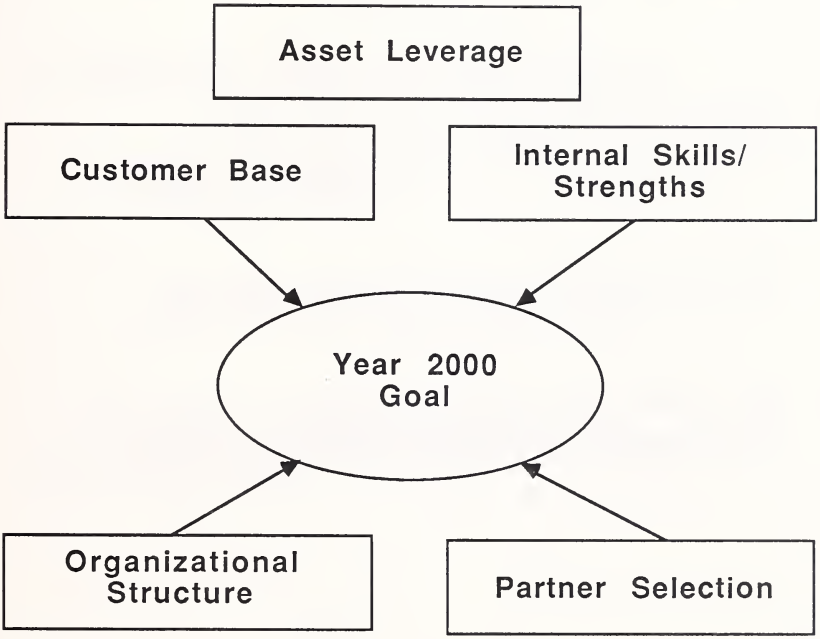
- Cutting across all the industry-specific applications and skills requirements is network integration (see Exhibit V-7). It is a fact that most of the CSI projects funded in 1986 had a large network integration component, and by 1991 a CSI project that does not have a network component will be the exception.

- True network integration, i.e., the use of a single conduit for voice, data, text and image transfer, will become the largest cross-industry market for CSI in the years to come. Meanwhile, the use of networks to interconnect separate "islands of automation" as well as regional processing centers with the corporate facility will be the main need. Because of the increasing frequency that networks will be a part of CSI projects, vendors must prepare their response whether it is through internal skills or partnerships.

4. MARKET ANALYSIS

- Selection of target markets depends not only on internal skills inventory and customer base analysis but also on CSI potential (see Exhibit V-8). This includes an examination of (among other things) the current state of sophistication of the user base (which will affect the vendor's ability to sell complex systems solutions), the ability of the target market to fund large projects, and the number of CSI projects that are likely to be funded in the next five years.

DEFINE STRATEGIC GOAL NOW



NETWORK INTEGRATION - MANDATORY TARGET

- Most CSI Projects Already Have Significant Network Integration Needs
- Best Single Cross-Industry Market
- By 1991 CSI Projects Without Network Integration Component Will Be Exceptions

MARKET ANALYSIS

- Examine Target Market Potential
  - Ability to Fund
  - State of User Sophistication
  - Number of CSI Projects in Next Five Years

- It is then necessary to examine the company's knowledge of the industry processes found in the target market, particularly those vertical market processes that will be the foundation of the vendor's ability to counsel users on CSI implementations. Ultimately, while it is possible to participate in systems integration projects that do no more than update the technical solutions to a process that has already been automated, the future belongs to those vendors who are able to innovate at the industry process level.

- Finally, vendors would do well to examine the density of competition found in a given market as well its size. CSI is an extremely expensive market to participate in in terms of bidding/proposal costs in addition to the normal sales/marketing costs. To go head-to-head with overwhelming competition is not a smart use of sales/marketing dollars however enticing the market may appear.

5. MONITOR YOUR COMPETITION

- Once the target CSI markets have been selected, it is vital to monitor the competition in the designated markets for new products, services offered, pricing approaches, and guarantees/warranties that appeal to the users need for reassurance and, of course, for any swift change in market share.

6. RISK MANAGEMENT

- One of the reasons that users are amenable to the net additional expenditures of a CSI approach is that the integrator assumes the risks inherent in the development of such large, complex systems. These risks (see Exhibit V-9) are formidable and wide-ranging and, at this early stage of CSI, their ultimate result is largely unknown.

MANAGE RISK CONTAINMENT

- Size of Risk Varies with Project Size, Complexity
- All Levels of Company Need To Be Sensitized to Risk Management
- Marketable

- Sources of risk include:
  - Off-target, even unspecified, systems requirements that vendors cannot pin down long enough to bid or changes that occur after the award.
  - Substantial bid development investment.
  - User and multi-contractor project management.
- Risk management is a company-wide activity and is ongoing. It is important to sensitize all levels of the company to the need for continuous monitoring of progress, costs, and performance against specification rather than to limit this crucial aspect of operations to the project manager.
- Just as important is the realization that risk management is not something that should be hidden away but can be capitalized on as a marketing tool in front of the prospect (for whom it is a serious concern).

7. STRATEGIES FOR SUCCESS

- In summary, there are several critical success factors, among which:
  - Publicly acknowledged expertise in an industry and application area.
  - Demonstrated experience with a variety of technologies.
  - Quality third-party relationships and marketing strength.
  - Ability to assess, contain, and manage risk.
  - Willingness to accept risk.

- Disciplined bid preparation.

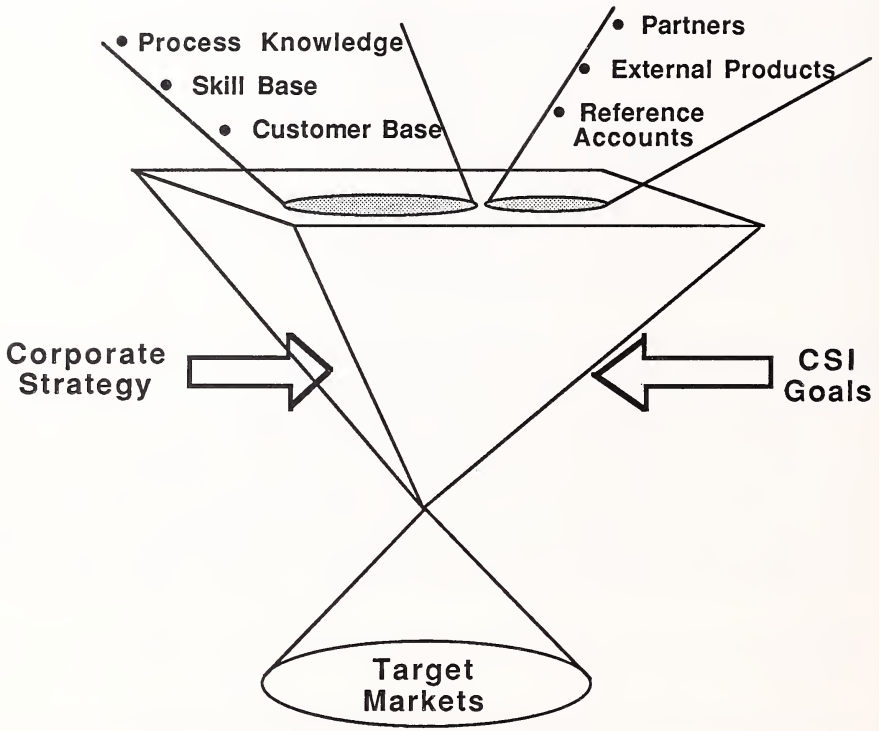
- Complex project management and risk management skills.

- The realistic potential for each vendor must be sized and weighed against the entry requirements and costs involved. Caution also dictates that the vendor consider possible modes of participation. It may be preferable for the vendor to participate in CSI as a prime or subcontractor rather than as the integrator.

- Select targets carefully (see Exhibit V-10). Selection of the industries to enter will be very important. CSI will be a dynamic, ever-changing market over the next five years. User perceptions will change, vendor positions will not be static, and requirements will change.

- Obviously, CSI will be only a part of the overall corporate strategy of any given vendor, and in some cases its goals may conflict with more important long-term aspirations. Like most markets, vendors who will be a success in the CSI market will be those who are able to continuously focus their energies, products, and services on markets that have direct relevance to their corporate goals, thereby maximizing the efficiency of their marketing, sales, and technical skills and investments.

FOCUS, FOCUS, FOCUS



APPENDIX A: DEFINITIONS

APPENDIX A: DEFINITIONS

A. MANUFACTURING-SPECIFIC DEFINITIONS

- Bill of Material (BOM). A listing of all subassemblies, parts, and materials that go into an assembled part (showing the quantities of each).

- CAD/CAE. The integrated applications of CAD and CAE.

- Capacity Requirements Planning. The translation of open shop orders and planned shop orders into hours of work by time period and work center.

- Computer-Aided Design (CAD). Applications of computer and graphic technology to engineering, design, and drafting.

- Computer-Aided Engineering (CAE). The use of the full range of software and systems to model, simulate, and analyze a product before construction of production models.

- Computer-Aided Maintenance Management (CAMM). Systems for analyzing and scheduling maintenance in manufacturing plants. The predictive maintenance functions would be the next logical development.

- Computer-Integrated Manufacturing (CIM). Integration of separately automated factory functions. These functions include MRP II, CAD/CAE,

DSS, process control, ATE, and robotics. CIM is a philosophy of operations requiring management commitment.

- Electronic Data/Document Interchange (EDI). The use of a communictions network to transmit and receive electronic business transactions between multiple locations on an intra- or inter-company basis.

- Finite Element Analysis. As used in this report, includes all tasks involved in structural analysis using finite element methods--mesh generation, preprocessing, finite element analysis processing, and post-processing.

- Group Technology. The application of classification and coding technology to search a data base for information on similar parts and to apply this to CAD and CAM tasks.

- Material Production Schedule. An anticipated build schedule that drives the MRP systems.

- Manufacturing Resource Planning (MRPII). An extension of MRP where MRP is integrated with financial planning, a simulation capability, and other functions on a closed-loop basis for the planning of all of the resources of a manufacturing company.

- Master Production Schedule. An anticipated build schedule that drives the MRP systems.

- Nesting. Software to automatically or interactively arrange patterns for parts within stock material boundaries.

- Numerical Control (NC). Fixed sequence control of machine tool programs. (Also see DNC - Direct Numerical Control.)

- Shipments. The dollar equivalent of products shipped by a manufacturing establishment. Will usually be approximately equal to revenue.

- Shop Floor Control. Control of the progress of each customer order or stock order through the operations of its production cycle and the collection of data about actual completion status.

- Value Added. The portion of product shipment values originating in that industry; includes factors such as labor costs, depreciation, various business expenses, and energy costs. It is basically the difference between shipments and raw or input materials costs.

B. OTHER DEFINITIONS

- Data Base Management System (DBMS). A software system that allows a user to structure a data base by defining the data, its organization, and the association between data elements. It also includes a data manipulation language (for accessing, sorting, merging, etc.) and controls for concurrent use (security, request, queuing, etc.). Functions as a common interface to multiple applications.

- Distributed Data Base. A data base that is physically located at multiple sites, with each site having a part of the total data base. The sites are usually linked to a central site and have access to each other.

- Distributed Processing. Multiple computers simultaneously processing elements of a CAD task.

- Management Information System (MIS). A DP system specifically designed to provide business managers with company, financial, project, or program data.

- Networking. The interconnection and control of remotely located systems and devices over communications lines.

APPENDIX B: CSI DATA BASE FORECASTS, 1986-1991

APPENDIX B: CSI DATA BASE FORECASTS, 1986-1991

- Exhibits B-1 through B-13 provide the details on how the forecasts were created with the assumptions, base data, establishment counts, and CSI project expenditure breakdowns.

- This same data is available from INPUT on floppy disk in a Lotus 1-2-3 format for client utilization and manipulation.

EXHIBIT B-1

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
BANKING/FINANCE

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	2,680	3,110	3%
Establishments with Major Projects (Percent)	12%	23%	15%
Total Major Project Expenditures ($ Millions)	$1,500	$4,440	24%
Expenditures Contracted (Percent)	14%	29%	16%
Total SI Contract Value ($ Millions)	$210	$1,290	44%
Total SI Expenditures ($ Millions)	$115	$785	47%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$32	$205	45%
- Communications (Hardware)	$10	$80	52%
- Applications Software Packages	$4	$32	52%
- Systems Software Packages	$3	$18	43%
- Consulting Services	$9	$54	43%
- Project Management Fees	$7	$45	45%
- Design/Integration	$16	$104	45%
- Software Development	$28	$191	47%
- Education/Training & Documentation	$2	$15	50%
- Operation and Maintenance	$2	$15	50%
- Other Expenditures	$2	$26	67%
Total SI Expenditures ($ Millions)	$115	$785	47%

EXHIBIT B-2

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE DISTRIBUTION

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	2,350	2,600	2%
Establishments with Major Projects (Percent)	15%	31%	16%
Total Major Project Expenditures ($ Millions)	$1,030	$3,000	24%
Expenditures Contracted (Percent)	12%	26%	17%
Total SI Contract Value ($ Millions)	$120	$780	45%
Total SI Expenditures ($ Millions)	$70	$436	44%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$20	$118	43%
- Communications (Hardware)	$5	$33	46%
- Applications Software Packages	$1	$7	48%
- Systems Software Packages	$3	$15	38%
- Consulting Services	$5	$29	42%
- Project Management Fees	$4	$24	43%
- Design/Integration	$9	$57	45%
- Software Development	$20	$132	46%
- Education/Training & Documentation	$1	$7	48%
- Operation and Maintenance	$1	$7	48%
- Other Expenditures	$1	$7	48%
Total SI Expenditures ($ Millions)	$70	$436	44%

EXHIBIT B-3

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
INSURANCE

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	1,140	1,260	2%
Establishments with Major Projects (Percent)	27%	44%	10%
Total Major Project Expenditures ($ Millions)	$1,500	$3,450	18%
Expenditures Contracted (Percent)	13%	30%	18%
Total SI Contract Value ($ Millions)	$200	$1,035	39%
Total SI Expenditures ($ Millions)	$100	$530	40%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$30	$136	35%
- Communications (Hardware)	$5	$46	56%
- Applications Software Packages	$4	$29	49%
- Systems Software Packages	$3	$12	32%
- Consulting Services	$8	$36	35%
- Project Management Fees	$6	$30	38%
- Design/Integration	$15	$70	36%
- Software Development	$26	$142	40%
- Education/Training & Documentation	$1	$10	58%
- Operation and Maintenance	$1	$10	58%
- Other Expenditures	$1	$9	55%
Total SI Expenditures ($ Millions)	$100	$530	40%

EXHIBIT B-4

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
DISCRETE MANUFACTURING

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	1,330	1,470	2%
Establishments with Major Projects (Percent)	28%	50%	12%
Total Major Project Expenditures ($ Millions)	$1,710	$4,300	20%
Expenditures Contracted (Percent)	27%	43%	10%
Total SI Contract Value ($ Millions)	$460	$1,850	32%
Total SI Expenditures ($ Millions)	$322	$1,320	33%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$96	$385	32%
- Communications (Hardware)	$18	$77	34%
- Applications Software Packages	$13	$55	33%
- Systems Software Packages	$7	$28	32%
- Consulting Services	$20	$81	32%
- Project Management Fees	$17	$70	33%
- Design/Integration	$39	$157	32%
- Software Development	$98	$405	33%
- Education/Training & Documentation	$6	$27	35%
- Operation and Maintenance	$6	$27	35%
- Other Expenditures	$2	$8	32%
Total SI Expenditures ($ Millions)	$322	$1,320	33%

EXHIBIT B-5

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
PROCESS MANUFACTURING

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	510	540	1%
Establishments with Major Projects (Percent)	25%	31%	4%
Total Major Project Expenditures ($ Millions)	$540	$910	11%
Expenditures Contracted (Percent)	28%	45%	10%
Total SI Contract Value ($ Millions)	$150	$410	22%
Total SI Expenditures ($ Millions)	$115	$300	21%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$40	$103	21%
- Communications (Hardware)	$12	$32	22%
- Applications Software Packages	$3	$8	22%
- Systems Software Packages	$4	$10	20%
- Consulting Services	$5	$15	25%
- Project Management Fees	$5	$12	19%
- Design/Integration	$9	$24	22%
- Software Development	$29	$76	21%
- Education/Training & Documentation	$3	$7	18%
- Operation and Maintenance	$3	$7	18%
- Other Expenditures	$2	$6	25%
Total SI Expenditures ($ Millions)	$115	$300	21%

EXHIBIT B-6

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
MEDICAL

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	310	340	2%
Establishments with Major Projects (Percent)	13%	29%	18%
Total Major Project Expenditures ($ Millions)	$150	$480	26%
Expenditures Contracted (Percent)	27%	44%	10%
Total SI Contract Value ($ Millions)	$40	$210	39%
Total SI Expenditures ($ Millions)	$22	$135	44%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$8	$41	39%
- Communications (Hardware)	$1	$9	55%
- Applications Software Packages	$1	$7	48%
- Systems Software Packages	$1	$5	38%
- Consulting Services	$1	$7	48%
- Project Management Fees	$1	$7	48%
- Design/Integration	$2	$13	45%
- Software Development	$6	$37	44%
- Education/Training & Documentation	$0.3	$3	58%
- Operation and Maintenance	$0.3	$3	58%
- Other Expenditures	$0.3	$3	58%
Total SI Expenditures ($ Millions)	$22	$135	44%

EXHIBIT B-7

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE SERVICES

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	100	120	4%
Establishments with Major Projects (Percent)	20%	25%	5%
Total Major Project Expenditures ($ Millions)	$70	$130	13%
Expenditures Contracted (Percent)	43%	62%	8%
Total SI Contract Value ($ Millions)	$30	$80	22%
Total SI Expenditures ($ Millions)	$15	$55	30%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$4	$14	28%
- Communications (Hardware)	$1	$5	38%
- Applications Software Packages	$0.5	$1	15%
- Systems Software Packages	$0.3	$1	27%
- Consulting Services	$1	$3	25%
- Project Management Fees	$1	$3	25%
- Design/Integration	$2	$7	28%
- Software Development	$4	$16	32%
- Education/Training & Documentation	$0.4	$1	20%
- Operation and Maintenance	$0.3	$1	32%
- Other Expenditures	$0.1	$3	97%
Total SI Expenditures ($ Millions)	$15	$55	30%

EXHIBIT B-8

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
STATE AND LOCAL GOVERNMENT

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	75	90	4%
Establishments with Major Projects (Percent)	15%	25%	11%
Total Major Project Expenditures ($ Millions)	$300	$1,340	35%
Expenditures Contracted (Percent)	21%	60%	23%
Total SI Contract Value ($ Millions)	$65	$845	67%
Total SI Expenditures ($ Millions)	$48	$583	67%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$14	$152	63%
- Communications (Hardware)	$4	$52	67%
- Applications Software Packages	$2	$22	62%
- Systems Software Packages	$1	$13	67%
- Consulting Services	$3	$43	70%
- Project Management Fees	$3	$36	64%
- Design/Integration	$4	$72	78%
- Software Development	$13	$165	66%
- Education/Training & Documentation	$1	$11	73%
- Operation and Maintenance	$1	$11	73%
- Other Expenditures	$2	$6	29%
Total SI Expenditures ($ Millions)	$48	$583	66%

EXHIBIT B-9

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
TELECOMMUNICATIONS

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	150	170	3%
Establishments with Major Projects (Percent)	27%	47%	12%
Total Major Project Expenditures ($ Millions)	$410	$1,070	21%
Expenditures Contracted (Percent)	29%	58%	15%
Total SI Contract Value ($ Millions)	$120	$620	39%
Total SI Expenditures ($ Millions)	$82	$390	37%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$19	$86	35%
- Communications (Hardware)	$5	$25	38%
- Applications Software Packages	$3	$13	34%
- Systems Software Packages	$1	$4	32%
- Consulting Services	$7	$34	37%
- Project Management Fees	$4	$21	39%
- Design/Integration	$10	$48	37%
- Software Development	$30	$142	36%
- Education/Training & Documentation	$2	$8	32%
- Operation and Maintenance	$1	$7	48%
- Other Expenditures	$0	$2	38%
Total SI Expenditures ($ Millions)	$82	$390	36%

EXHIBIT B-10

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
TRANSPORTATION

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	250	270	2%
Establishments with Major Projects (Percent)	16%	22%	7%
Total Major Project Expenditures ($ Millions)	$390	$680	12%
Expenditures Contracted (Percent)	31%	35%	3%
Total SI Contract Value ($ Millions)	$120	$240	15%
Total SI Expenditures ($ Millions)	$73	$200	21%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$19	$45	19%
- Communications (Hardware)	$5	$30	27%
- Applications Software Packages	$3	$7	28%
- Systems Software Packages	$1	$3	25%
- Consulting Services	$7	$15	16%
- Project Management Fees	$4	$10	20%
- Design/Integration	$9	$21	18%
- Software Development	$22	$59	22%
- Education/Training & Documentation	$1	$5	38%
- Operation and Maintenance	$1	$3	25%
- Other Expenditures	$1	$2	27%
Total SI Expenditures ($ Millions)	$73	$200	21%

EXHIBIT B-11

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE UTILITIES

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	520	630	4%
Establishments with Major Projects (Percent)	21%	32%	8%
Total Major Project Expenditures ($ Millions)	$420	$960	18%
Expenditures Contracted (Percent)	33%	66%	15%
Total SI Contract Value ($ Millions)	$140	$630	35%
Total SI Expenditures ($ Millions)	$97	$430	35%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$35	$151	34%
- Communications (Hardware)	$5	$25	38%
- Applications Software Packages	$2	$11	41%
- Systems Software Packages	$1	$5	38%
- Consulting Services	$6	$27	35%
- Project Management Fees	$5	$24	37%
- Design/Integration	$8	$38	37%
- Software Development	$31	$130	33%
- Education/Training & Documentation	$2	$9	35%
- Operation and Maintenance	$1	$5	38%
- Other Expenditures	$1	$5	38%
Total SI Expenditures ($ Millions)	$97	$430	35%

EXHIBIT B-12

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
OTHER INDUSTRY

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	945	1,040	2%
Establishments with Major Projects (Percent)	11%	30%	23%
Total Major Project Expenditures ($ Millions)	$120	$540	35%
Expenditures Contracted (Percent)	29%	55%	14%
Total SI Contract Value ($ Millions)	$35	$300	54%
Total SI Expenditures ($ Millions)	$20	$229	63%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$6	$67	62%
- Communications (Hardware)	$2	$21	60%
- Applications Software Packages	$1	$8	52%
- Systems Software Packages	$1	$6	43%
- Consulting Services	$1	$16	74%
- Project Management Fees	$1	$13	67%
- Design/Integration	$2	$22	62%
- Software Development	$5	$65	67%
- Education/Training & Documentation	$0.3	$4	68%
- Operation and Maintenance	$0.3	$4	68%
- Other Expenditures	$0.3	$3	58%
Total SI Expenditures ($ Millions)	$20	$229	63%

EXHIBIT B-13

COMMERCIAL SYSTEMS INTEGRATION FORECAST DATA BASE
TOTAL ALL INDUSTRIES

INDUSTRY DATA ELEMENT	MARKET SIZE 1986	MARKET SIZE 1991	AAGR 1986-1991 (Percent)
Number of Large Establishments	10,360	11,640	2%
Establishments with Major Projects (Percent)	18%	33%	13%
Total Major Project Expenditures ($ Millions)	$8,140	$21,300	21%
Expenditures Contracted (Percent)	21%	39%	13%
Total SI Contract Value ($ Millions)	$1,690	$8,290	37%
Total SI Expenditures ($ Millions)	$1,081	$5,400	38%
SI Component Expenditures ($ Millions)			
- Information Systems (Hardware)	$323	$1,510	36%
- Communications (Hardware)	$77	$435	41%
- Applications Software Packages	$37	$200	41%
- Systems Software Packages	$26	$120	35%
- Consulting Services	$73	$360	38%
- Project Management Fees	$58	$295	38%
- Design/Integration	$125	$633	38%
- Software Development	$312	$1,560	38%
- Education/Training & Documentation	$20	$107	40%
- Operation and Maintenance	$18	$100	42%
- Other Expenditures	$12	$80	45%
Total SI Expenditures ($ Millions)	$1,081	$5,400	38%