COMMERCIAL SYSTEMS INTEGRATION

IMPLEMENTATIONS

INPUT

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Abstract

Commercial systems integration, the provision of complex information systems requiring multiple products and services, is rapidly moving to a position of strategic importance to both users and vendors. Consideration of this type of approach to systems development and implementation is now frequent among users contracting projects with complex requirements, and vendors are posturing to take advantage of the emerging opportunity.

While some of the "rules" have been carried from its birthplace in the Federal Government, commercial users and vendors are struggling to find appropriate procedures to apply to commercial systems implementations.

INPUT's latest report, COMMERCIAL SYSTEMS INTEGRATION IMPLEMENTATIONS, analyzes how users are applying the approach and how vendors are offering it. Specific case studies are examined for success and failure factors and recommendations are made to adjust the balance in favor of more effective, and profitable, implementations.

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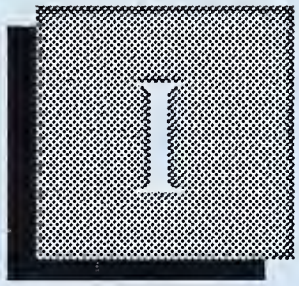


Introduction

I Introduction

A Report Objectives

In its early years of development in the commercial arena systems integration (SI) is undergoing continual reappraisal of the conceptual and practical issues embodied in this approach to information systems development. The notions of SI emanating from its birthplace in the Federal Government are still being adapted to the unique needs of distant cousins in state and local government and to non-relatives in other industry sectors.

To fully capitalize on the opportunities afforded users and vendors, commercial systems integration (CSI) implementation issues must be understood. Such issues include:

- What problems have users encountered in selecting a CSI approach, evaluating/selecting vendors, and managing user and vendor activity?
- What approaches have been instituted to deal with these problems and what level of success have they achieved?
- How are vendors organizing their resources to attack the opportunity?
- What strategic positions are vendors trying to establish? Why? To what effect?
- How are vendors managing the sales and fulfillment of CSI? What successes are being achieved by these strategies?

The primary objective of this study is to examine case studies of actual CSI implementations to point out pitfall and success stories relating to these and other issues. By understanding specific implementation scenarios vendors will be able to plan for salient issues that may be present in CSI projects. Similarly, understanding vendor organizational practices, capabilities, sales/marketing strategies, etc. should allow vendors to evaluate competitive approaches.

INPUT clients should benefit from the user and vendor experiences in CSI. This report is a logical extension of two previous INPUT reports on CSI that defined the parameters and forecast the growth.

B

Report Scope

1. Definition of Commercial Systems Integration

In its earlier report (Commercial Systems Integration Markets, 1986-1991) INPUT defined CSI as the sole-source responsibility for the provision of a "total solution" to a complex, multi-disciplinary information systems requirement. Typically, the integrator provides project management and "end-to-end" responsibilities for systems design, provision and development of 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-1 for a list of typical CSI project tasks).

In that definition several CSI project characteristics were suggested:

- A single vendor is responsible for delivery of solution
- A "total solution" is required by the customer .
- The desired system is complex and multi-disciplinary
- "Transparent" subcontractors supply specific components
- There is a significant project management role for the integrator
- The system(s) to be developed require significant portions of the software to be custom developed and/or include a substantial network requirement.

In assuming the responsibility and 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 "pre-determined" amount.

ADAPSO's Information Systems Integration Committee defines SI as the "process of identifying and bringing together various technologies in order to define and deliver a complete information system that will fulfill specific design, operational, and management objectives."

The "white paper" goes on to explain that the systems integrator is not limited to a preconceived solution with a set technology, but instead is a provider of cost-effective programs responsive to the customer's needs. By providing a single point of responsibility and accountability that operates independently of specific product concerns, the systems integrator accepts the challenge of fulfilling all tasks inherent in systems devel-

opment and implementation — planning, design, construction, implementation, training, and if necessary, operation.

EXHIBIT I-1

TYPICAL TASKS INVOLVED IN CSI PROJECTS

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

2. Report Parameters

This report covers only non-Federal systems integration implementations. The term "commercial" is used in place of the more awkward "non-Federal" label to which it synonymously applies in this report.

Only U.S.-based CSI implementations are considered. These projects may have an international component, but the thrust of the projects included in this analysis are for support of U.S. businesses.

Targeted CSI implementations include mixed vendor situations, network integration efforts, and specific applications in office automation, computer-integrated manufacturing, distribution (retail and wholesale), distributed data processing, etc.

In previous reports on CSI, INPUT suggested a minimum contract value of $5 million as a means of distinguishing CSI contracts from turnkey systems and "standard" professional services with a hardware or communications component.

- While this was an attempt to avoid custom turnkey projects, it created an artificial parameter that eliminated many legitimate SI projects.

- In this report that distinction has been replaced with a careful assessment of the activities involved with each project. When projects are essentially the assembly of hardware and software at the vendor's site with delivery and implementation as minor activities, the project is considered a custom turnkey, regardless of its dollar cost.

C

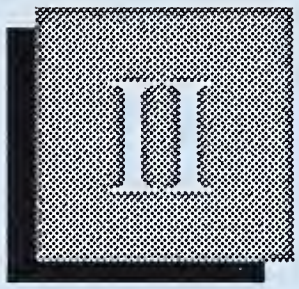
Methodology

The research for this report came from several converging information streams:

- Twelve in-depth interviews were conducted with CSI users using the questionnaire in Appendix B. When available, the RFP or other documentation regarding the project was also analyzed.

- Concurrently, interviews were conducted with leading vendors of CSI using the vendor interview protocol included in Appendix B.

- INPUT also accessed its knowledge base of CSI stemming from consulting studies it has conducted. While no proprietary information is revealed, the knowledge gained is reflected in this report.



Executive Summary

II

Executive Summary

Commercial systems integration, the provision of complex information systems requiring multiple products and services, is rapidly moving to a position of strategic importance to both users and vendors.

To fully capitalize on the opportunity, CSI implementation issues from both the users' and vendors' perspectives must be understood. Only when the dynamics of the process are understood will both groups be in a position to negotiate and implement a mutually beneficial project. This report details actual implementations of SI approaches to complex problems as a means of providing the information required on these dynamics.

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

Key points of the entire report are summarized in Exhibit II-1 through Exhibit II-5. The left-hand page facing each exhibit contains the script that explains the content of the exhibit.

A

Forces in Selecting a CSI Approach

In response to external pressures (e.g., competition, regulation changes, etc.) or a strong desire to realize the benefits of the information systems investment, organizations are planning and executing major development efforts at an increasing rate.

A majority of these projects are completed by in-house staff, but many are contracted to vendors with SI capabilities. The contracting decision rests on many factors, some of which are listed in Exhibit II-1.

A key force in the decision is the strong belief held by users that projects can be successfully completed. While their own in-house managed

project development efforts have, typically, been negative, users believe that, with the right vendor, projects can be executed in an exemplary manner.

Further, users believe that, when a project is contracted, the chances of a successful project are increased when the solution comes from, or is the responsibility of a single source. There may be other third-party vendors involved as suppliers, but they are usually transparent to the user.

A user-vendor partnership is sought as a means of establishing a relationship that will ensure users that the vendor is working for them and that the vendor will offer a solution that will be technologically progressive and not lead to the closed-ended, inflexible systems users have purchased in the past.

Consultants are frequently the first outsiders to be contacted about the problem. These consultants may be instrumental in introducing the approach to the buyer and fueling their acceptance.

EXHIBIT II-1

FORCES IN SELECTING A CSI APPROACH

- Expertise is Limited or Experiences Negative
- Single-Source Solution is Preferred
- Vendor "Partners" are Desired
- Solution is Not Pre-Conceived
- Consultant Recommends It

B

CSI Vendor Selection Criteria

The selection criteria represents the customer's values as much as they do the project requirements. A typical valuation of items is presented in Exhibit II-2.

EXHIBIT II-2

CSI VENDOR SELECTION CRITERIA

FACTOR	WEIGHT (Percent)
Technical Credibility of the Solution	40
Risk Avoidance	
- Experience/Capabilities	30
- Project Management Approach	10
Cost	20
Service Orientation	Not Scored

Since the vendor is usually not required to demonstrate a solution prior to award, the vendors response to an RFP is carefully scrutinized for the "reasonableness" of the proposed solution. That is, does the proposed solution properly address the need? Further, does the proposal reflect any vendor understanding of the client's business, the industry, the company's culture, the IS environment?

The risks of change, compounded by an unknown change agent, demand that buyers give considerable attention to the vendor and to the proposed change process. Buyers must be convinced that the vendor has all of the capabilities required to complete the project, that the vendor has in place those methodologies and tools that are required during major projects, and that these resources have been successfully exercised in previous projects.

Cost is an all-important factor, but is not usually the pivotal one. Buyers value cost by first identifying the differences between the items composing the lowest bid and each other bid, then determining the importance of these differences to the success of the project, and finally, by assessing whether the added value of these items is comparable to the positive impact these items will have on the project.

Vendors are carefully reviewed for their service orientation. That is, buyers want to determine how helpful the vendor will be; what additional resources they will provide, hopefully free; and, the extent to which the vendor can be perceived and treated as a partner.

C

Vendor Structuring Strategies

Vendors have increased their level of operation for a CSI capability and are moving from handling CSI opportunities as exceptions to handling them as routine. This movement has entailed several strategic thrusts (see Exhibit II-3).

EXHIBIT II-3

VENDOR STRUCTURING STRATEGIES

- Establish Influential Relationships with Top Management
- Engender a "Full Service" Image
- Develop and Promote Proprietary Technology
- Develop Project Management Capabilities, Techniques
- Implement Mechanisms to Leverage All Resources
- Identify Required Skill Sets, Staff Organization

The opportunity for account control, vendors believe, begins with influential relationships with top managers. In these relationships vendors seek to engender a positive, can-do image that includes demonstrations of technical capabilities, resources, proprietary technology, and the like.

Further, vendors are structuring to offer full service, one-stop shopping that frequently includes proprietary technology. This not only enhances the relationships, but preempts the competition and leads to greater account control.

Vendors have completed less effort in establishing and implementing strategies for risk management. Early attempts have focused on identifying criteria for target project selection (i.e., industry, application, size of project, etc.). Productive, effective risk management methodologies, including tools to support such methodologies, have had less attention.

CSI vendors are planning for, but not yet implementing, strategies that will allow them to leverage all corporate resources for the SI business. "Gearbox" organizations are in place in several large vendor firms as a first attempt to place each project of interest in the right part of the organization, but few vendors have the mechanisms to "borrow" resources from other profit centers.

D

User Needs vs. Vendor Solutions

The development of a "win-win" strategy where the process and result of an SI effort satisfy the user needs and vendor desires has room for much improvement from today's early stages of the commercial SI market. As depicted in Exhibit II-4, user needs and vendor solutions are not entirely in synchronization.

At the heart of the problem is the discrepancy between what users perceive their needs to be and what vendors offer as solutions. Users think they are unique both in culture and in information systems requirements. The project effort they face will require creativity of design, if not of development, and an alliance with the vendor that breaks down the buyer-seller roles. In short, their idealized model of the process begins with a blank sheet of paper and a partner who, almost coincidentally, can make the process work.

Vendors do not appear to have this same orientation. Rather, they seek to align the needs with products/services that they have or can make available; products vendors want to sell their wares and services providers want to sell their people skills.

Related to these two discrepancies is a third: that of focusing on the result and not on the process. While both parties are guilty of this error, vendors in particular have not been responsive and sensitive to buyers' concerns for the project management aspects that will support the process and lead to a well-planned and well-executed project.

EXHIBIT II-4

USER NEEDS VERSUS VENDOR SOLUTIONS

USER NEEDS	VENDOR SOLUTIONS
Unique Solutions	"Customized" Packages
Successful Project Process	Methods and Tools Not Displayed
Vendor Alliances	"We'll Do It All" Approach

E

Recommendations

The results of this research indicate several changes that must be made in vendors' strategies to effect the business results they hope to achieve.

The pre-award process is long and full of decisions that will shape the effort, including those of vendors who will be asked to bid. Vendors must be prepared to invest time and money early on to increase their chances. They should determine if the project is likely to be contracted, if it can be done, whether it will be worth the vendor's effort, and if the project represents an activity in which they care to engage.

Each project involves much more than the functional or technical specifications that appear in the RFP. The culture of the organization and the vendor concerns the organization has developed in their pre-qualification are just two of the critical implicit aspects. Vendors should seek to identify and understand what is not said in the RFP and be responsive to these items.

Organizationally, vendors are struggling with the implementation of an SI business as a stand-alone enterprise or an overlay on other enterprises. While solutions are likely to evolve as vendors gain experience and generate investment capital, they should initially organize in such a way that they can bring the full capabilities of the organization to bear on the

business. Many of the vendors entering the business have massive corporate strength that could be applied to SI but unless these capabilities are harnessed, those vendors will lose much of the early advantage they have.

EXHIBIT II-5

RECOMMENDATIONS

- Commit to Early Start and Long Pre-Award Investment
- Assess Project Opportunities Carefully
- Bid Responsively to Explicit AND Implicit Specifications
- Leverage ALL Corporate Capabilities

User Views of CSI Implementations

III

User Views of CSI Implementations

A

User Forces Driving CSI

American business enterprises are increasingly relying on information systems support to not only maintain profitability (or cost effectiveness in non-Federal government segments), but, in some cases, to sustain themselves. Forces, both external and internal, now impinge on the organization at a growing rate and demand change in the support environment.

While the external and internal forces are interrelated and can become indistinguishable, the external forces (e.g., competition, regulation/de-regulation, etc.) require a reaction while the internal forces represent opportunities. Accordingly, the urgency of the change requirements may be more intense when the forces are primarily external and the reaction assumes more of a defensive posture. The urgency of pro-active, offensive-oriented changes that result from internal forces may be more a function of affordability.

The focal point of the planned investment (i.e., near-term or long-range) is a key to the customer's perceived value of the project and provides the vendor with a benchmark for project pricing. The kinds of forces and their impacts are described more fully below (see Exhibit III-1).

1. Environmental Forces

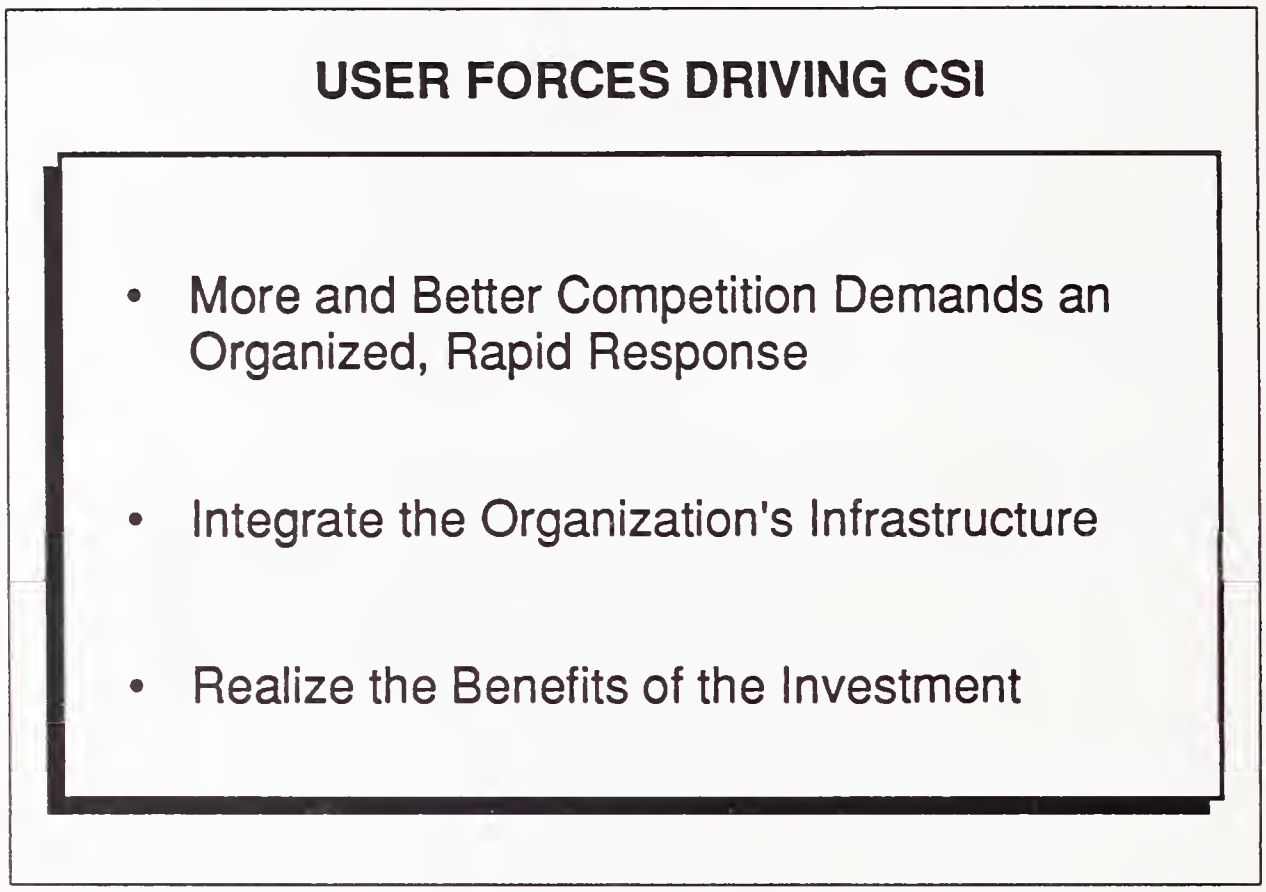
The environmental forces differ between for profit companies and not-for-profit organizations. The former are beset with forces (e.g., competition, regulations) that may impede their ability to achieve or maintain profitability, while the latter are pressured for efficient support systems in response to additional requirements stemming from new regulations or in response to tighter public funds. These efficiency issues are discussed under internal forces.

In the for-profit organizations, the competition is, first of all, more intense due to the sheer number of competitors.

- The de-regulation of industries, for example, has given companies to

new markets. Financial services, once the province of banks and savings and loans, are now offered by insurance companies and retailers. Telecommunications carriers are moving into manufacturing and information services.

EXHIBIT III-1



- The current balance of trade deficit bespeaks the number of foreign entrants into U.S. markets.

- To grow the top line and, hopefully, the bottom one as well, in a slow growth economy, corporations are becoming more diversified. Manufacturers are moving into retail, service companies are moving into manufacturing, and so on.

Not only is there more competition, but it is better competition. Discounts, special offers, and the like are introduced on a seemingly daily basis. To win – even compete effectively – businesses must rely on their ability to automate and manipulate the competitive variables. The competition in airlines' frequent flyer programs and interest rates on credit cards are just two examples of attempt to seek the competitive advantage.

Finally, the basis of competition are not static, but constantly changing. Rapid process change to gain a competitive advantage is now very frequent.

In short, to compete in the market, organizations are now relying on information systems that integrate the organization, operations, customers, and technology suppliers.

2. Internal Forces

At the same time there are internal forces that compel organizations to seek changes in their information support systems. Users are looking for savings that will accrue from more efficient systems that perform more of the work of the organization.

Customers are looking for cost savings that will accrue from a more efficient system that does more of the work of the organization. Organization management do not feel that they are fully benefiting from their investments in information technology. One reason is that these companies have not completely developed the infrastructure and architecture to achieve their business goals. They have yet to complete the integration of products into systems and then focus these systems on processes to achieve their business goals.

There is increased emphasis throughout the organization on making better use of the equipment already installed. Management is demanding a demonstration of the bottom line impact of the systems, products, and services. They want to see the strategic applications of hardware, software, and communications.

But, they are too often focused on solving old problems. Over the years the installed suite of information systems has become obsolete. While still functional, these systems do not afford the opportunity to grow with the ever increasing demands of the business. Speed, volume, and flexibility have become key issues. For example, software that has become heavily patched over its life is now difficult to maintain. And, migration paths to future technologies are non-existent.

- The growing body of end users has placed an emphasis on the real time availability of information contained within existing networks and systems and in the interconnection of these systems.

- As the end user community grows, so does the demand for local capabilities and the need to provide end users with applications that are easy to understand, use, and maintain.

- A part of the issue here is productivity. By moving the systems and support from a centralized information service to the point of work, management hopes to avoid some of the non-productive time spent searching for resources and duplicating the efforts of others.

- With many previous efforts done piecemeal as a quick response to pockets of automation, major SI projects are almost a reaction. Customers want to consolidate these previous efforts into a consistent whole.

While the specific application targets are as varied as the number of organizations undertaking major projects, there are some common threads (see Exhibit III-2).

- Customers are looking for integration of applications among multiple vendor hardware. This need is particularly important as organizations begin to consolidate products, systems, and processes.

EXHIBIT III-2

CSI OBJECTIVES

- Integrate Multi-Vendor IS
- Disseminate Management of Technology
- Develop Flexible Systems
- Establish Connectivity

- Better databases, responsive systems, and flexible decision support are sought. Management and ownership of the technology is being disseminated throughout the organization. In this scenario, the IS department is the in-house utility for integrating data and communications throughout the organization.

- A key benefit sought by these SI efforts is future expansion capability. The new system should be open-ended and not leave organizations at the same dead end place the older systems did. The ideal system will also benefit the organization by being easier to maintain and easier to modify so that the cost benefit does not denigrate as rapidly.

- Organizations with network integration projects generally have environments that include multiple resources in multiple physical sites and a need to utilize these resources via access from any of the sites. For example, a university contains many computer facilities housed in various departments. Students and faculty want to access the computer resources from their classrooms, offices, or living quarters. Frequently the communications are multi-media: voice, data, graphics, and/or image (e.g., educational cable television in the campus environment).

B

Preparing for a Solution

1. The Project Decision

The problems with the old system or procedure become recognized throughout the corporation. Usually there is not a single advocate but a "ground swell" of recognition. At some point, depending on the style of the organization, the issues become documented and are passed up through managers. At each step, if the manager feels a higher manager needs to be involved, the issues are recast and sent to the next manager. Because of their size and criticality, CSI-type projects eventually reach the executive ranks.

New start agendas may come from within the user community (e.g., users requesting on-line access to non-existing corporate databases) or from the executive ranks (e.g., acquisitions, mergers, new products or lines of business, etc.). In either case, the IS executive and/or the chief operations executive becomes the focal point deciding whether user requests should be recognized or how executive requests can be implemented (see Exhibit III).

EXHIBIT III-3

PRELIMINARY STEPS TO AN SI DECISION

- Recognize the Problem
- Establish an In-House Task Force
- Contract with a Consultant
- Conduct Feasibility Study
- Prepare Specifications
- Prepare Report
- Recommend Approach
- Seek Approvals

Generally, the decision to undertake a major development effort is made at the highest levels of the organization. Typically, this is a committee of the CEO, an operations executive who takes the lead in the effort, a chief information manager who acts as procurement officer, and a chief financial officer who may be a supporter, but is not a buyer.

The managers who decide to invest in a development effort are usually the first to outline requirements. The "Catch 22" of this is that, since the project has become a focal point of top management, many requirements are included at their request even though they may be secondary to the mission of the system. The functional requirements, even at the outset, may be very unrealistic.

Typically, the next step is to operationalize this top management directive through an in-house task force charged with the responsibility of assessing the problem, identifying alternative approaches to a solution, and preparing a preliminary cost/benefit statement.

- The task force is usually composed of representatives from senior management, the in-house IS organization, and the end user organization. A planned mix of disciplines (financial, operations, engineering) is likely. While senior managers control the task force, the details of the functional specifications are left to a task force composed of the other members. Frequently, senior management establishes ground rules both in terms of the scope of the project (systems to remain intact, systems to be developed, interfaces required, costs, time frames, approaches, etc.).

- In some instances, the in-house development group has developed such a bad reputation for delivery that they are specifically excluded from the task force.

- The task force frequently relies on the efforts of non-competitive companies in similar industries as a source of information. It is not atypical for one organization to approach another to get guidance on the approach taken, results, suggestions, and even possible vendors.

  - After establishing some preliminary specifications, a consultant may be brought in to work with the task force in conducting a feasibility study, recommending project direction, and developing the first draft of the functional specifications.

  - While contracting with a consultant may be a competitive process, in most cases it is not. The selected consultant is typically known and frequently used by the customer. This consultant is selected because he or she knows the client's culture and support environment and the customer feels the consultant will present an objective position that is in the best interest of the customer.

- It is frequently the case that the consultant is retained as the customer's representative throughout the selection, contracting, and implementation processes. This is especially true in situations where the customer has little expertise (e.g., a complicated network acquisition) or lacks the staff (e.g., state and local government).

- In non-government organizations, this consultant is free to bid on the job as well. Because of conflict of interest issues, this practice is less common – but does occur – in state and local government.

• There can be problems, even at this step. In one case, the in-house organization did not like the consultant's methodology. They threw out the results and spend a considerable amount of time on a second effort using their own methodology.

Because individual projects take place in an on-going environment it is sometimes difficult to slow down planned implementations that will dictate the future course of the specific project. Hardware required for other purposes may be acquired according to some planned schedule and be incongruent with the thrust of the project.

The work of the task force or consultant results in functional specifications of the desired system(s). Functional, as opposed to technical specifications, are specified as customers believe that to achieve the "best solution" customers must turn away from technically-oriented acquisitions in favor of functionally-oriented ones using outside contractors to guide and shape the ultimate solution. Because an integrator's knowledge becomes a competitive tool in bidding on functionally-oriented specs, the client not only benefits from the knowledge of what is possible through the synthesis of technologies, but receives the integrator's best possible price.

2. The SI Decision

A key decision made by the task force, or in some cases, the consultant, is the selection of the "best" approach to take to realize the solution. The decision to take an SI-type approach hinges on many factors (see Exhibit III-4), some of which may be political or personal and never fully understood by the vendor. In this research, customers with SI projects mentioned the following reasons for selecting this approach.

Some clients feel that SI is not new in concept but rather a different approach to achieving the good solid project management and design that in-house organizations have been unable to achieve since projects have, typically, not been well planned, managed, or executed.

In many instances the problem requires and/or the customer desires a unique solution. When this unique solution involves multiple components, it makes sense to customers to place one vendor in charge of the

EXHIBIT III-4

SI DECISION FACTORS

- Achieve a Well-Planned, Managed, Executed Project
- Create a Unique Solution of Multiple Components
- Establish "One-Stop" Shopping
- Share the Project Risks
- Cover In-House Lack of Expertise
- Establish Vendor Alliances

effort and make that vendor responsible for integrating the components into a transparent whole.

- As the number of technological approaches to an information system problem increases, so does the risk that a given system will not achieve its full potential at a reasonable cost due to problems with standardization, interoperability, and compatibility. An SI contractor reduces that risk.

- SI is particularly viable in areas where there is a high payback if the project is successful, but little impact if it is a failure. This R&D-type view is most applicable to new technology areas with low levels of urgency.

Desire for "one-stop shopping" is a frequent decision factor. While few of the projects analyzed for this report involved more than one vendor, it can be the case that an SI approach is taken as a means of limiting the interfaces and risks inherent in contracting with multiple vendors. In fact, this very reason tends to drive customers toward vendors who can "do it all."

The project need not be unique for the risks to be large. If project risks are large, the responsibility of the system can be passed on to the vendor. (The risks associated with the business consequences of a project failure are always with the customer.) The assumption of project risk on the part of the vendor provides incentives to get the right job done right and, from the customer's view, gives some assurance that the vendor will provide his best effort.

The customer may not have the in-house expertise required for the project. Since projects represent cyclical needs, it makes sense to hire top notch people for the duration of a project rather than trying to maintain a stable of in-house experts.

Perhaps the most interesting reason for the SI decision is the desire to establish productive alliances between the customer and his product/ services supplier.

- Clients are frustrated that vendors are offering reworked versions of old, off-the-shelf solutions without appreciation or knowledge of the clients' industry, their culture, or their user needs. They desire to form alliances with vendors to build, on a one time basis, vendor sensitivity in hopes of receiving unique solutions. They view SI as a means of building cooperative relationships that will lead to innovation, especially in mixed vendor installations.

- Some customers would like to think of the vendor as an extension of the IS department's resources. They speak of a "managed partnership" where each has roles and responsibilities. This can, of course, be taken to extremes, as when a client hires a vendor not only to get help on a project but to use the vendor to tutor in-house staff. One company contacted by INPUT expressed this very idea, insisting that the client be the project manager and the vendor an "ego-less" provider of expertise.

  - The ploy is to have the vendor as an extension of in-house resources until such time as the vendor is not needed. For the customer mentioned above, the SI contract is avoided since it means a long relationship with the vendor without the possibility of the client taking over the effort when they are sufficiently trained.

  - In this situation the client starts with control and little technical expertise. When they know more they can shape the project and, eventually, remove the vendor and take over the effort.

- In this partnership, at least from the users' perspective, should be included a technology trade-in program over the life cycle of the system to ensure that technology does not out pace project development.

  - Naturally, vendors balk at this approach. It is not so much an "ego

trip" as a protection of salable capabilities. A better strategy may be to shift in-house personnel to strategic roles and leave the technical expertise to the vendors. Clients can use their time to examine the costs and benefits and evaluate the tradeoffs. In this way they can act as the business manager of the operation.

- Users would also consider, and in some instances are practicing, joint development efforts in which the vendor markets the new product and the client gets royalties.

- This partnership is designed for the long-term. Vendors may become impatient if they don't see early payoffs. A requirement of this partnership is disclosure of directions on the part of vendors to ensure that current plans have a planned migration to future developments.

3. The Contracting Process

At intermediate points (see Exhibit III-5), in the development of the specifications and the Request for Proposals (RFP) there are project review and approval meetings. It is at these meetings that senior management has an opportunity to review the progress and guide the project with respect to financial considerations. Depending on the style of the organization, the authorized dollar limit of the project manager and so on, the plan may go to the CEO or Board of Directors for final approval. Formal financial reviews are conducted and, if approved, the project is fit into the budget cycle.

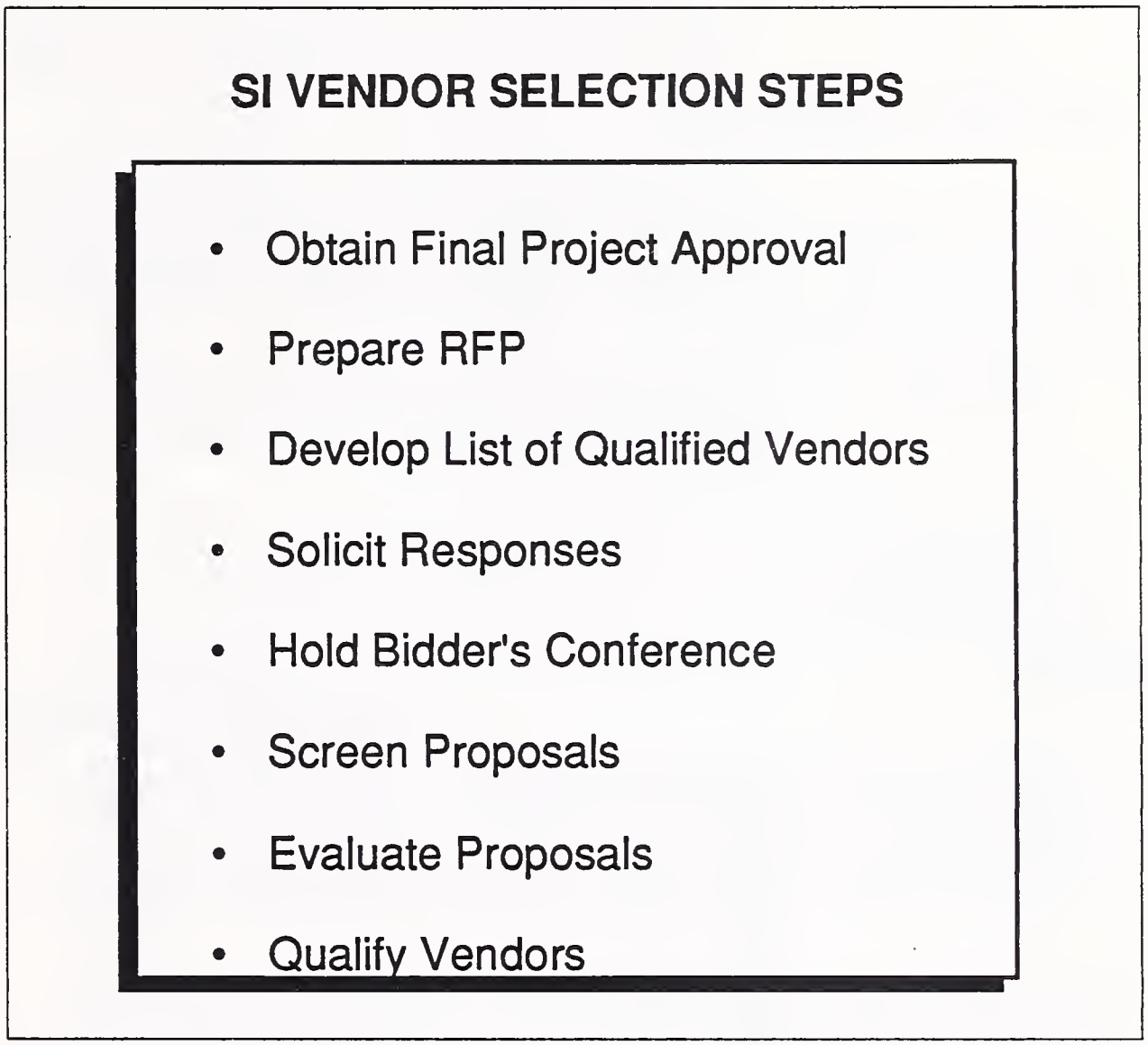
If an outside consultant is involved in the early stages of the project, they are most likely to be assigned the development of an RFP. If there is no consultant, the RFP is done in-house. While the RFP may present technical specifications, more likely they are functional in nature. As mentioned above, in SI projects the customer hopes to invite creative and cost effective proposed solutions.

The extent of the solicitation effort depends on the requirements of the customer. In state and local governments the need for competition prompts the customer to advertise the solicitation in trade presses. Non-government companies may want to assess the competition and seek out alternative solution so they advertise in these same places as well as solicit responses from lists of vendors. Frequently, the customer believes that only a few vendors could satisfy the requirements and, in this case, restricts the solicitation.

Many parties show interest in the proposal but far fewer respond. For the cases included here more than one hundred RFPs were mailed by customers in some instances. But bids in these same cases were submitted by less than ten vendors.

The vendor response - customer feedback loop may be "one shot" if the customer receives an acceptable proposal in the first pass. There are

EXHIBIT III-5



instances where selected vendors were asked to re-bid based on the customer's view that the vendor was acceptable but the proposal off target.

- A Bidder's Conference meeting at which interested vendors may ask questions of the customer may be held. Or, individual meetings may be held with each of several vendors under consideration. Only in the case of state and local government are the minutes of these meetings made available to other bidders.

C

Selecting a Vendor

The selection process consists of several steps:

- Screening – Does the proposal meet the minimum requirements of specified in the RFP? Proposals that do not meet minimum qualifications are immediately discarded.

- Evaluation – What is the technical soundness of the proposed solution? Are the associated costs in line with the proposal? With other proposals?

- Qualification – This includes an attempt to learn a little more about the vendor. References are checked, sites are visited, oral presentations are made.

The evaluation process tends to be formal with checklists for rating proposals and even computer programs for scoring individual checklists. In most cases, the final award decision is in the hands of the senior management committee members, some of whom may have participated in the evaluation.

Selection criteria represent the customer's values as much as they do the project requirements. These values and the resulting criteria are discussed below (see Exhibit III-6).

EXHIBIT III-6

SI PROPOSAL VALUATION

FACTOR	WEIGHT (Percent)
Reasonableness of the Solution	40
Risk Avoidance	
- Experience & Capabilities of Vendor	30
- Project Management Approach	10
Cost	20
Service Orientation	Not Scored

1. "Reasonableness" of the Solution

- The proposed solution evaluation is a critical ingredient in the selection process, typically constituting up to 40% of the vendor's score.

- Customers want to determine if the vendor understands the client's business, the industry, the culture, and the IS environment. Then, they want to determine if the proposed solution is reasonable and workable. Customers quickly reject bids that smack of political cleverness (telling the customer what they want to hear rather than what they need to know) or reflect the biases of the vendor.

  - Sometimes this involves additional questions on the part of the client and second or third bids on the part of the vendor. "Best and final" bids used in the Federal Government have not appeared in the commercial arena but may as the problems and their solutions become more unique.

  - There is a great reliance on the technical expertise of the vendor's marketing personnel. Separating the realistic from the hyperbole of the vendor is tough. Clients have become very weary of "vaporware," the promise that the desired technology will be available "any day now."

  - To avoid empty promises clients ask to see running installations. If acceptable, the client buys the system for starter code and offers a time and material contract to the vendor for development of their unique applications.

  - Some vendors are unable (or unwilling) to work within the constraints presented by the in- place equipment. But, for customers, this is critical, unless the project calls for a complete revision.

  - Live test demonstrations (LTD), while less frequently required, provide a practical means for evaluating proposed solutions composed of different technologies and limiting the risk of attractive, but unworkable, solutions. LTDs also encourage the inclusion of off-the-shelf technologies as they reduce the time lag between demonstration and award.

- Customers also consider the extent to which the proposed solution helps them avoid obsolescence. With technology changing rapidly and major projects requiring several years to complete, there is a good chance that the technology of the proposed solution will be obsolete before the project is completed. Clients seek some assurances that the vendor will not let this happen.

  - A related fear is that of asking the integrator to build a new technol-

ogy only to find a very acceptable solution commercially available.

- One solution is to use modularized "standard" components that can readily be replaced. This is a means of ensuring a migration path to newer technology as it is developed.

- Another solution is to structure the contracts so that the central core of functionality is likely to have the greatest longevity. A CPU, for example, should be carefully planned to avoid becoming quickly outdated. Peripherals, on the other hand, are more easily replaced and can be upgraded as technology advances.

2. Avoiding Business Risks

Customers seek assurances in the evaluation process that they are not unduly exposed to financial or general business risk. They look at two general items: the experience and capabilities of the vendor(s) and the proposed management approach. Typical weights are 30% of the evaluation and 10%, respectively.

- In terms of experience and capabilities, customers seek some comfort level that the vendor can, in fact, do what they are proposing to do.

- What specific industry and applications experience does the vendor, and the vendor's personnel have? RFP's may call for resumes of key personnel, especially project managers in order to evaluate the experience of the proposed personnel against their own perceptions of the kinds of skills that will be required to successfully complete the job.

- While the type of vendor (e.g., computer manufacturer, telecommunications company, professional services firm, etc.) does not appear to be a key factor, many customers are concerned as to whether the vendor is setting the standards or following them. Clients reason that there is more risk of the project resulting in outdated products and procedures if the vendor is a user of technology rather than a creator.

The major issues involved with project management are whether the vendor has proposed a workable plan and whether there is a track record of on-time, within-budget delivery of similar systems. Of critical concern is how vendors propose to handle vendor-vendor relationships.

- A good reputation for on-time, within budget development is essential. The customer wants to see an ability to carry out the terms of the contract.

The cases included in this report include a variety of vendor relationships including sole source proposals, joint ventures, and prime-subcontractor. Customers generally have no objections to any of these types of arrangements so long as the proposal clearly spells out the responsibilities of the

vendor(s), the project management that will ensure the customer is not caught in "finger pointing" between vendors, and the plan for compensating the customer if the project is not a success.

- To be sure, there are clients who believe that joint bids are the "kiss of death" because of the complexities that are added by second, third, and fourth vendors. Customers with these perceptions seem to be the exception.

Financial solvency, while not scored as such, is another key consideration. Clients with large projects are reluctant to contract with vendors who do not have the financial wherewithal to handle the risk of project failure. For them, it makes no sense to contract with a $10 million company for a $30 million project. Financial statements of the vendor's latest fiscal year are frequently requested in the proposal.

- Customers also attempt to avoid undue risks by imposing performance guarantees on the contractor. These may be spelled out in the RFP and evaluated, but more likely are contract terms negotiated with the winning vendor. In several cases investigated for this report, the customer went so far as to require the SI vendor to guarantee the performance of equipment that was not a part of the SI vendor's contract. For example, in one case the vendor took financial responsibility for a $3 million project even though 50% of the money had been spent by the customer to buy the computer hardware before the project started.

3. System Life Cycle Economics

Respondents reported that the economics of the proposal were secondary to other issues, but in INPUT's opinion this consideration is generally 20% of the evaluation. The focus does tend to be on the upfront implementation costs as opposed to the total life cycle costs or even price performance.

- Cost is an all important factor but is not usually the pivotal one. That is, low cost is a necessary, but not a sufficient condition. This relationship tends to be mitigated somewhat in the state and local government arena where appropriate expenditure of the taxpayers' dollars is under the constant eye of nearly everyone.

- In more than one case customers were not sure what type of contract they wanted. The choice was either left to the bidding vendor or, in one case, both fixed price and cost plus bids were required.

  - Fixed price contracts are generally the rule. Fixed prices help the client avoid cost overrun surprises and give the contractor an incentive to deliver the product at the lowest possible price rather than the highest defensible cost. In only one instance was there a cost plus award and that award had performance incentives included. Penalties

for late delivery are the exception but do appear in some fixed price contracts.

- Posting of a proposal bond is usually required with the bid as a sign of good faith and firm bid. This is usually a nominal ($30,000 - $50,000) amount. The successful vendor is also required to post a performance bond that is some percentage (1% - 20%) of the total contract value. This bond serves as a guarantee of delivery, installation, and operation.

An interesting twist to proposed financial relationships is occasionally presented. In this scenario the vendor offers to develop the system in conjunction with the customer at a discounted rate for the rights to market a similar product based on the effort to other customers. Royalties to the original customer are a part of the agreement.

4. Service Orientation

A final, unweighted consideration is the service orientation of the vendor. For the most part the customer desires to establish a working relationship with the vendor that fosters the partnership alliances discussed earlier.

Long-term support is key. The client wants assurances that the vendor will provide training and maintenance for a specified period. When multiple vendors are involved in the project, the respective roles of the vendor in providing support must be clearly delineated. Clients do not want to become party to finger pointing among vendors. This is one of the reasons that clients have opted for "full service" vendors.

D

Managing the CSI Implementation

A key to good management is communication between the respective parties (see Exhibit III-7). Both sides must have good communicators and knowledgeable project managers. Team spirit is also essential. When both parties feel they are on the same side, the chances of success are increased.

The customer generally supplies subject matter experts, analysts, and programmers to work alongside the contractor.

The customer is responsible for periodic inspection of the vendor's work to ensure full compliance with the agreement.

The customer must have an ability to make decisions on a timely basis, avoiding the conservative management by consensus that is frequent in large organizations. Only then can the customer keep up with the progress of the project being run by an entrepreneurial vendor who is willing to make rapid decisions.

EXHIBIT III-7

KEYS TO MANAGING THE CSI IMPLEMENTATION

- Knowledgable Personnel
- Team Spirit
- Defined Roles
- Decision Authority
- Formal Project Reviews
- Established Testing Procedures
- Defined Performance Criteria

Prototyping before rushing to production is a key in large projects, although this practice was infrequently observed.

Installation, testing, and acceptance are typical project tasks. The client must control the acceptance testing, conducting a rigorous test that is much more than the formality frequently undertaken. Testing and acceptance, while not as rigorous as in the Federal market, is required and is formal. Generally, the tests are not spelled out in the RFP, but the performance levels are.

E

Unresolved Issues

While user interest in SI-type approaches to large projects [TO] is growing, there are several issues that constrain the market. Because of the nature of the issues vendors may not be able to directly impact them, but should make every attempt to understand them and deal with them indirectly.

1. Cultural Concerns

Clients consider their information processing requirements unique. Clients believe that vendors frequently do not have the level of understanding required of the operations.

EXHIBIT III-8

UNRESOLVED IMPLEMENTATION ISSUES

- User Perception of Uniqueness
  - Vendor Can't Know Subtleties
  - Vendor Can't Be Trusted
  - User must Be in Control
- User Culture is Inflexible
- Risks of SI May Be Severe
  - Business Liabilities Retained by User
  - Change Control Process Ill-Defined
  - Requirements Unstable

- When the development effort is the integration of systems the knowledge base required is so severe as to call into question whether the vendor could ever develop a sufficient level of knowledge to build the interfaces. In large organizations this deficiency can be compounded when numerous operating divisions, each with their own unique systems, are involved. Only the client has the necessary knowledge base of systems in their own user community to form project teams. Furthermore, if these systems are manual, commonalty across organizations is further reduced, frequently to a level of reporting formats and schedules.

- Because of these perceptions of their own uniqueness, clients frequently do not have faith in the ability of outside vendors to come in and solve the problems.

  - Clients with these perceptions feel that vendors' project development is not very good, perhaps worse than the in-house group. In this perceived scenario, the vendor's costs are even more than the in-house group.

  - The cultural bias also dictates that the client not share proprietary information with these vendors whom they do not trust. Part of this attitude seems to stem from the reluctance of the client to show their "warts" to outsiders.

- Clients also have a need to justify the size of their in-house staff. Having a thousand people in systems and then contracting with an outside vendor for a development effort raises questions on the part of management.

- Client organizations frequently have corporate policies prohibiting use of any system for which the client does not have 100% control in terms of maintenance. Under these policies, escrowing the source code, a frequent vendor practice, is not acceptable. Clients fear, among other things, that if the company goes into bankruptcy, the client may never get the code.

- To make SI successful in large organizations that have little experience with outside contractors, there must be a commitment to changing the way the client builds its systems. But some customers with large projects prefer to find a flexible vendor rather than deal with the organization's culture. To receive the level of service desired, some clients opt for smaller, independent firms that need the client to survive and are willing to go the extra mile to maintain a satisfied customer.

2. Risk and SI

Clients are concerned that the financial risks passed to the vendor in the SI project do not offset the business risks to the company for missed schedules. These business risks are never passed on.

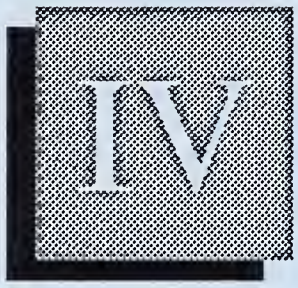
- During the bidding process, customers must have a firm understanding of their own requirements to be able to guide the vendors to appropriate responses. Further, for smooth negotiations the customer must know how to manipulate the variables of what they want and when they want it to maximize their position in the negotiations.

- The change control process is one key to managing risk. Unless the vendor and client agree on what is really included in the project and

when the project will be done, contractual hassles can ensue, causing chaos in the client organization. These negotiations may be difficult for sales-oriented vendor representatives.

- Control of resources needs to be clearly established. The vendor is unwilling to assume the risks and responsibilities unless they have control over the resources and the specifications. But clients want to have the ability to make changes. So, contracts that spell out the responsibilities of each party may become difficult to develop.

- User involvement from the start of the project is critical if requirements are to be definitive. Users must feel they are a part of the effort and every attempt must be made to get their input before the specifications are finalized. Nothing threatens a project like a dramatic change in user specifications.



Vendor Views of CSI Implementations

IV

Vendor Views of CSI Implementaitons

A

Vendor Forces Driving CSI

Traditional information service vendors as well as vendors not readily known as IS providers are posturing within the CSI market. Both the threat and the opportunity of CSI are at issue.

The market positions of traditional vendors are under attack. Vendors are concerned about the impact of the objections large companies have to outside contractors. They are anxious to figure out how to sell big systems to these attractive buyers. They believe that companies are anxious to buy products/services that meet the clients' unique needs and, if their cultural objections are overcome, their products/services will more readily be acquired. But to do that vendors need to have products/services that meet the needs and then convince the prospective buyer that the vendor does, in fact, have acceptable solutions. CSI offers a means of accomplishing both requirements (see Exhibit IV-1).

- Vendors realize that they cannot purport to be all things to all customers. Product lines are incomplete and, for the most part, not available as integrated architectures. Further, their professional services that bridge these holes lack the vertical, applications, and specific technical expertise for an array of customers. A CSI capability provides a vehicle for filling the gaps. In essence, a fully implemented CSI capability makes several statements:

  - "We know what we do, and we know we do it very well."

  - "We also know what we don't do very well but we know who does, and further, they will be on our team for this project."

  - "We are so confident of our own expertise and that of our team members vis-a-vis the project requirements that we will assume full responsibility for delivery of an acceptable solution."

EXHIBIT IV-1

CSI ANSWERS THE THREAT TO REVENUE

THE THREAT	THE ANSWER
Incomplete, Unintegrated Products	Multi-Vendor Products Under Integrator Umbrella
Packaged Products that Don't Fit	Services that Build to Specifications
Increased Competition	SI Distribution Funnel

- To address the cultural issues vendors are embracing CSI as a means of stating:
  - "We realize that you have unique needs and that "packaged" products or services may not provide the fit you desire."
  - "Rather than having a "one-size-fits-all" mentality, we want to work with you, focusing first on the problem and then designing and implementing the best solution."

Obviously, vendors are not so altruistic as to want only to solve customers' problems. They are very concerned that there is more competition for the IS business, that it is better competition, and, for the most part, that each contract enhances the development of longer term relationships, and perhaps, additional account control.

- The attractive growth of IS user expenditures (18% from 1985 to 1986) has invited both expanded offerings by IS vendors and new entrants. "Body shops" are now offering vertical or applications experts, packaged software vendors are customizing products, professional service vendors are selling packaged solutions, computer manufacturers are offering professional services, and so on. New entrants include the Regional Bell Operating Companies and other telecommunications

companies, management consulting firms, and even engineering and consulting firms.

- Many of these vendors are responding to the customers' cries for integration. Each wants to leverage his position with the client and in the marketplace to provide more of the products/services acquired by the customer. Full service, one stop shopping is claimed by many vendors. Under these conditions, to remain a "mom and pop," single offering type of firm is to ensure little or no growth.

- With systems integration acting as a very large distribution funnel, vendors cannot afford to remain outside the pool of suppliers.

- The CSI contractor(s) will influence large amounts of user expenditures and dictate specific acquisitions. To the extent that the funnel replaces normal distribution channels, vendor sales can suffer.

- The notion of "integration" suggests that users will be establishing a coherent direction, perhaps even an in-house "standard," that will limit the scope of future acquisitions. The sphere of integration could become very powerful. For an IBM, this means selling lots of hardware; for an EDS, lots of facilities management-type services.

- Vendors that can establish their own CSI capabilities and preemptive alliances stand a good chance of gaining the type of partnership with clients that is sought by both parties and ensure for themselves a long-term, profitable relationship.

Offensively, the CSI market has the potential for being a high growth, large margin business (see Exhibit IV-2).

- CSI contracts tend to be large in dollar value and are likely to grow larger as clients move more of their systems under the same integration umbrella. Five million dollar projects are becoming commonplace and the $100+ million contracts are no longer rare.

- The value of the project, however, may be just the tip of the iceberg. Project add-ons do occur and it is the case that the successful CSI contractor is at the head of the line when additional business unrelated to the original project is available. While it is still too early to quantify the "serendipitous" portion of contract awards, there are some early indications about future business resulting from the SI projects.

  - Approximately 60% of the respondents interviewed by INPUT had no add-ons, believed there would be none, had no projects planned in the near future, and/or felt that any future project would be competitively bid.

EXHIBIT IV-2

HIGH GROWTH, HIGH MARGINS FROM CSI

- Growth
  - Large Contracts
  - Opportunity for Add-On Business
- High Margins
  - Risk Assumption Premiums
  - Value Added of Integrating

  - Three projects led to good potential for additional sales; in one case because the user recognized the integrator, IBM, as the choice on other acquisitions, and in the other two because the CSI project will result in a product for which IBM has distribution rights.

  - In one case, the SI project was the add-on. The user was so impressed with IBM on a $400,000 assignment that they awarded IBM a $12 million SI project.

  - In one-third of the cases the CSI project has led (or will lead) to additional business with IBM. In two instances, the integrator is likely to get a second CSI project as large or larger than the original. In two other cases, the system developed as the SI project will be installed in other locations; so, a $3 million project could lead to $50 million and a $20 million job will lead to approximately $35 million.

- When a project leads to another project for the customer, not only is there additional revenue generated but also security for personnel and the ability to maintain a constant level of qualified staff. In today's market where capable technical employees are hard to find, it is very important for vendors to be able to retain staff. Further, with staff longevity comes additional value in the knowledge base through skill development and application.

- CSI is also attractive for its potential high margins from risk assumption premiums, high value added, even markups on third-party components financing.

  - None of the case studies appeared to have a high risk premium, although some projects were of strategic importance. Beyond the nature of the project, the premium is held in balance by competition. This may change as the projects become more central to the business and as CSI vendors build up clearly superior skills.

  - The value added component was clearly present. Vendors were selected first on what the customer thought they could do, and only secondarily on cost. That is, customers, even state and local buyers, were willing to pay a higher dollar for their vendor of choice. Obviously, the cost differential between the price of IBM of choice and other vendors could not have been large, but it was present.

  - Vendors that were willing to report margins reported sizable ones for their own offerings, but much smaller markups on products/services of third-party vendors. These results seems to be a function of good management of vendor capabilities and, at the same time, an inability to achieve sufficient economies of scale and buying power for third-party components. INPUT continues to believe that the typical margins on individual components (i.e., hardware: 30-50%, programming: 10-15%, consulting: 15-20%, packaged software: 40-60%) can be achieved in this marketplace.

B

Positioning Strategies

Current and would-be CSI vendors are now operationalizing in response to these driving forces. They are seeking product/service offerings to meet and beat the competition, methods to manage the risks, and targets on which to focus. These positioning strategies are discussed below.

1. Meeting and Beating the Competition

The potential for account control, to be realized, demands, first of all, a credible and viable business that is positioned to influence the buying process. The goal is to "get in early and stay late" (see Exhibit IV-3).

Establishing and maintaining long-term relationships with clients are critical aspects of this influence. Accordingly, vendors are seeking access to top management who hold the key to larger jobs and bigger opportunities. While this means a longer, tougher sales cycle, it affords the opportunity of influence over larger corporate-level issues, as opposed to data processing-oriented issues. Sales in this regard are not so much targeted at specific applications as they are to the business processes or the application of technology to these processes.

EXHIBIT IV-3

VENDORS STRATEGIES TO BEAT THE COMPETITION

- Develop a Solid Relationship with Top Management
- Engender a "Full Service" Image
- Invest in In-House Expertise
- Develop Proprietary Technology
- Act as Channel of Technology

- At this level vendor credibility is as important as vendor capability. The focus is on understanding and responding to the client's values and then offering the security attached to being a quality provider. On this latter point, a solid track record of highly visible projects is important. The vendor must not only engender a positive, can-do image, but must demonstrate these capabilities through their facilities, their proprietary technology, and through their third-party relationships.

- Since long-term, influential relationships are most easily established with existing clients and traditional strengths, vendors are busy inventorying both of these aspects.

A positive image with top management is a necessity, but not a sufficient reason for clients to allow the influence vendors seek. This image must be backed up by a "full service" capability and by methods that preempt the competition.

- The notion of a full service offering not only suggests the ability to offer a variety of products/services, but also that these offerings are or can lead to a fully integrated set of products, systems, and processes.

This is the competitive difference; the ability to deploy specialists and leverage experiences.

- Vendors must invest in in-house expertise to develop the skills that will be required and must know how to transfer expertise from one part of the organization to another. The key issue in this regard is where this expertise should be held. In a corporate organization (e.g., R & D)? In the SI operations group? Or both?

- Vendors are also developing proprietary technology that provides a tangible integration component. The question is, how close to the leading edge to be? The "Catch-22" is that while clients definitely want the vendor to know where the edge is, they may be unwilling to buy such technology.

  - This is the goal of a customer-by-customer orientation: Be the best in a horizontal product/function. This moves the company away from totally individualistic solutions. This should cut costs. But vendors must educate the customer about the benefits of off-the-shelf and functionally standard products for this strategy to succeed.

- One resource that contributes to the full service capability is a strong network of development and integration centers. EDS, for example, believes the international arena can be successful for them. They have established their methodology in several countries and are using well-trained locals; U.S.-caliber work is done at local rate.

- EDS also has eighteen centers with 3,500 MIPS and a network currently carrying thirty million transactions per day to 500,000 terminals.

In addition to offering their own technology, vendors can reinforce their position by acting as a channel for the technology of other vendors. By establishing and leveraging third-party relationships an SI vendor can, essentially, preempt those vendors.

- The full service notion demands that vendors have such relationships to cover products/services that are unavailable in-house. Hardware manufacturers, for example, must have a strong professional services capability. Interestingly, these are being established. Tandem is partnering with Coopers & Lybrand on factory automation projects and has signed a similar agreement with Arthur Young.

- These agreements not only expand the availability of solutions, but also expand the marketing power of both vendors beyond the limits of their own sales force. The terms and conditions of such agreements are becoming standardized in terms of market coverage, price, etc. to the point where they are easy to establish.

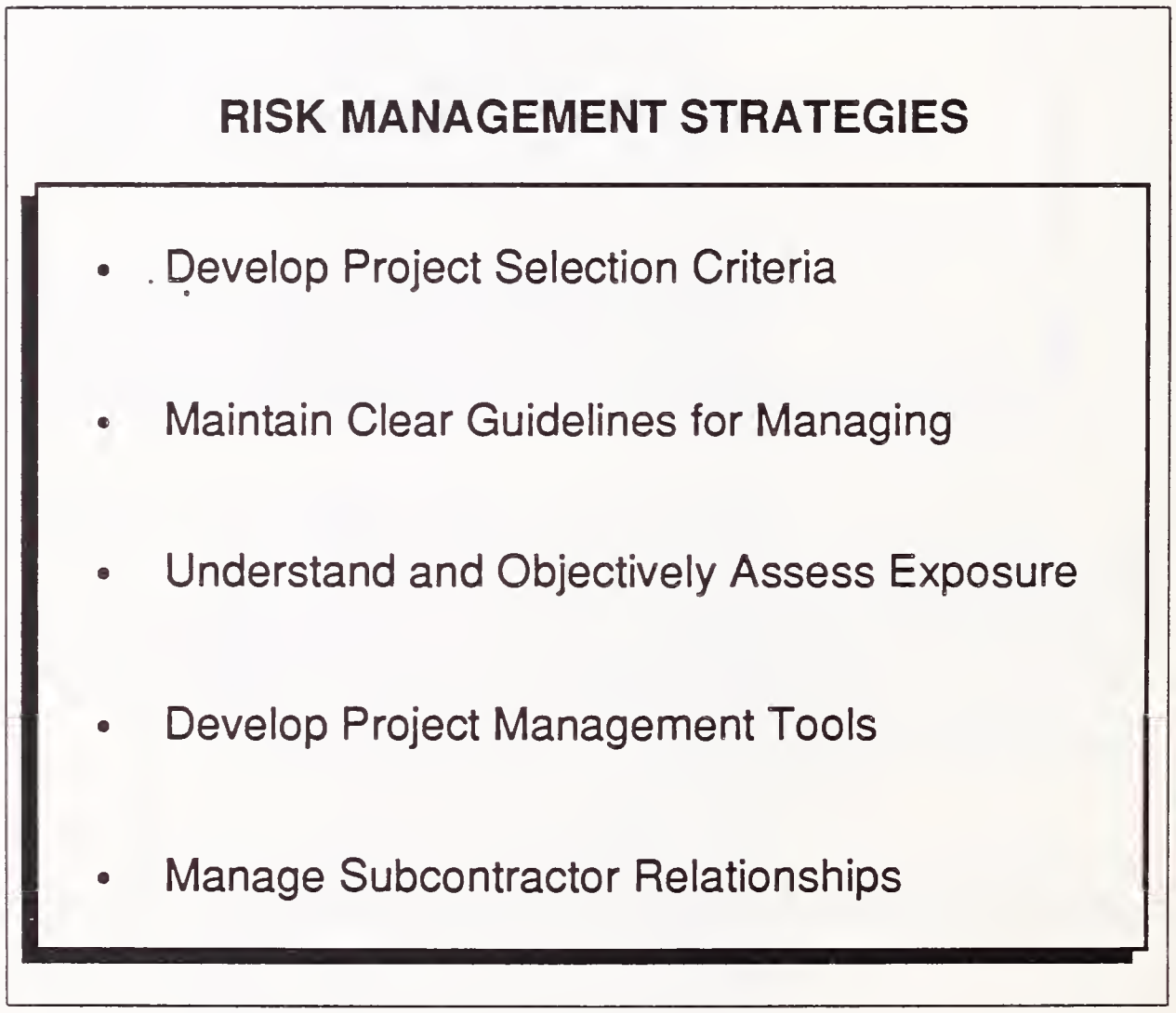
2. Managing the Risk

The assumption of total responsibility for deliverables is a second positioning strategy (see Exhibit IV-4), that has far-reaching implementation consequences.

- Each vendor must decide what constitutes a high risk project and then whether such projects are to be avoided. Some companies, such as EDS, want to take their business to systems management which entails incorporating whole work loads on major data centers and networks.

- Vendors are also implementing risk containment procedures. Generally, these procedures involve the establishment of clear guidelines for corporate involvement, project management capabilities, subcontractor management methods, and the like.

EXHIBIT IV-4



- As discussed below, the operational organization must have a clear sense of the direction and extent of corporate commitment. What corporate-level support functions will be established? What funds are available for bidding and funding projects? What level of exposure on the original project is the vendor willing to accept for a "shot" at the add-ons? What re-insurance is available?

- Project management capabilities must be established. These include productive, efficient tools and methodologies for contract preparation, job reporting and accounting. A bid review process not only helps to ensure a successful bid but also helps to determine the opportunities, the projects, and what should be bid.

- Still another aspect of managing the risk involves subcontract management. While vendors may feel comfortable with the assumption of risk involving the application of resources over which they have control, the SI business demands that the contractor assume risks involving resources over which they have little control. Subcontractors represent this category. If vendors are to manage this risk, they must manage the subcontractor and care for the relationship that underpins it.

3. Target Industries And Applications

A third positioning strategy for CSI vendors is to target industries and/or applications. This is direct response to the realization that the SI vendor must have demonstrable capabilities in the markets they wish to pursue. A variety of qualifiers are being used to select these opportunities. Some of these qualifiers are discussed below, although the order is not indicative of the weights vendors are placing on each qualifier (see Exhibit IV-5).

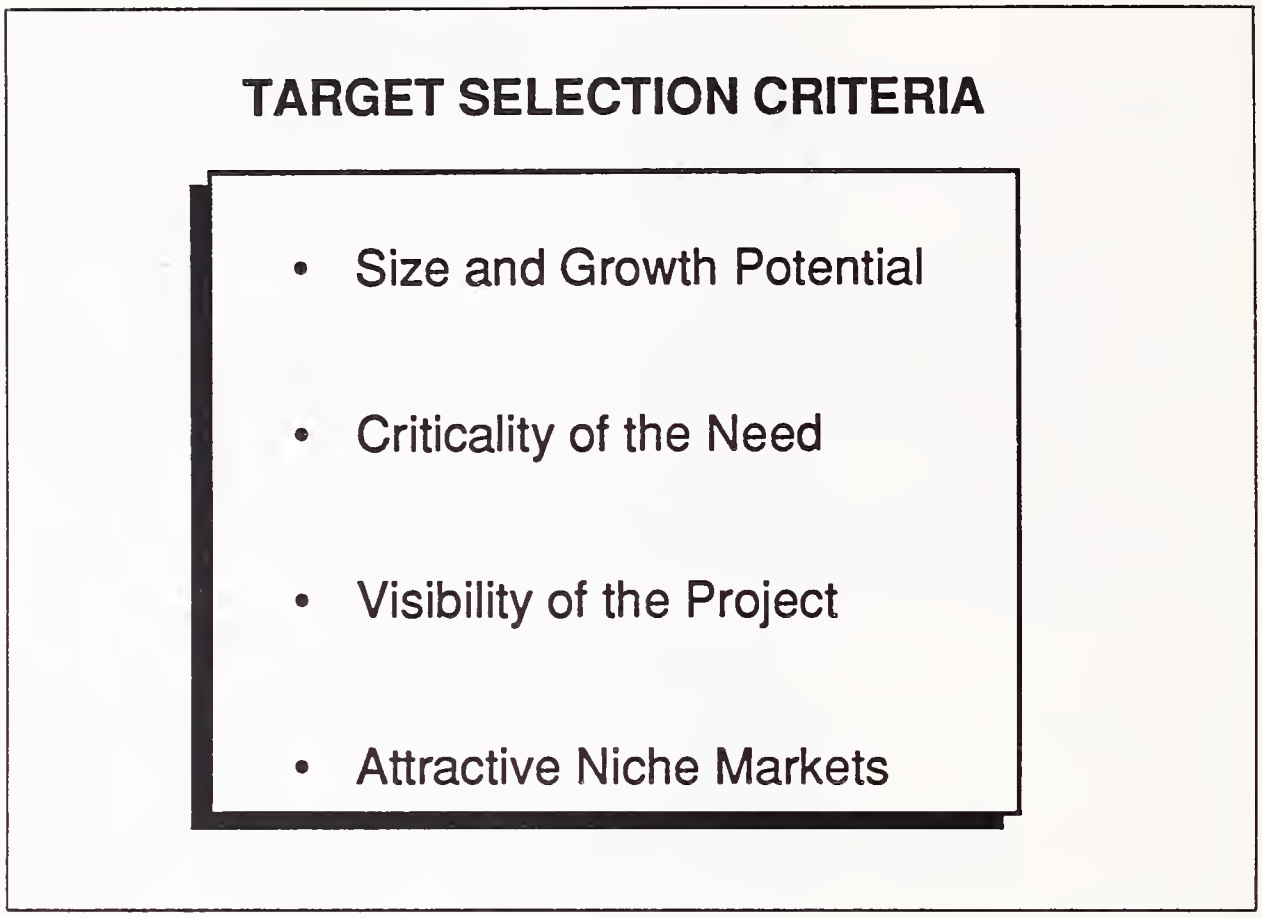
a. Sheer Size And Growth Potential

- One qualifier is to identify industries/applications where the current or projected volume of business is high. The notion here is simply that the larger the opportunity the more likely it is that any given vendor can share in the marketplace.

- A corollary to this thinking is that in these most attractive industries, the potential for significant first-time and add-on business will be greater as these industries have the largest concentration of high potential clients.

- Within the context of growth there has developed considerable concentration on segments where substantial market share is available. Obviously, a fast growing market without clear market share leaders is quite attractive. A perfect example seems to be in the office information systems arena where many vendors have the necessary capabilities but

EXHIBIT IV-5



are coasting right now as users are overwhelmed with PCs and other OA and WP technology.

b. Criticality of the Effort

- Still another qualifier is to focus on industries/applications where the information systems needs are "mission critical." While every user would describe their systems development needs with this phrase, vendors believe their value will be enhanced in the eyes of the client if the SI project is at the very heart of the corporation. This is most visible when the dynamics of the business are such that the client is in a "life or death" competitive struggle; when the delivery of information is critical in content or in timing; or, when there is any other significant benefit or payback of the system.

- This notion of perceived value that makes cost a secondary consideration must be tempered with the vendor's ability to establish a profitable business. If the economics of critical mass are not present it is unlikely that vendors will find even the "priceless" project to be attractive. For it is only when the vendor can leverage resources, both his own and those of third-parties, that cost proximity can be achieved. With integration adding 30-50% to the cost of components, vendors are opting for projects where the added value of integrating the components is significant.

c. Visibility of the Project

- In establishing a credible SI business vendors seek to enjoy a certain amount of visibility among users. Therefore, projects that are strategic to a company or to an entire industry are of much interest to vendors.

d. Niche Markets

- Because SI bids are more complicated to prepare and involve significant investment of time and money, contractors tend to look for new business in fairly narrow markets. Unix-based solutions, networking with security as the value added, billing systems, network management, and so on all provide niches of opportunity where a vendor can become THE vendor.

- The inherent limitations of establishing a large share position in a small market niche has been a cause for vendors to consider horizontal market targets. This is a frequent point of interest for vendors with product knowledge rather than professional services expertise and is especially true where the vendor's capabilities are more in line with the application of advanced technology. Large-scale data management systems, leading edge optical storage, image processing, voice/data/image telecommunications and even parallel and neuronal processor technology lead in the list of capabilities of some SI vendors. Taken to its extreme this approach resembles cutting edge R&D efforts that the vendor hopes will result in packaged, off-the-shelf products.

C

Staffing a CSI Implementation

1. Staffing Requirements

A critical consideration in organizing a CSI capability is the staffing requirement. To this end it is instructive to review the user case studies were actual data is available.

- For a $12 million criminal justice system SHL Systemhouse is using:

  - 1 Project Manager
  - 1 Data Base Administrator
  - 1 Data Communications Specialist
  - 1 Systems Development Program Manager
  - 6 Software Development Team Leaders (1 for each of 6 applications)
  - 4-6 software developers for each of the 6 applications

- A $20 million (50% hardware, 50% services) POS network for K-Mart being developed by EDS requires:

  - Phase 1 – Install terminals, packaged software; develop interfaces

1 Project Manager
5-6 programmers for 9 months
3 programmers supplied by the packaged software vendor to modify the packages
3 K-Mart managers to oversee the project

- Phase 2 – Put prototype into operation and build interfaces at headquarters

1 Project Manager
3 Programmers (EDS)
1 On-site Engineer for test site
25 K-Mart staff (managers and developers)
Freelance programmers (count is unknown)

- A General Public Utilities (PA) energy management system (contract size was not disclosed but believed to be around $50 million) required 110 people

- CSC, while they would not report counts by function, did indicate that a "typical" $10 million job requires around thirty people, while a $110 million job requires 200.

Considering all of the above examples, the head count per job is surprisingly consistent at two to three persons per million dollar value of the project.

- There is a not-so-surprising trend for smaller jobs to require more "bodies" per million dollars of value than larger projects. On the assumption that larger projects may have a heavier hardware content, this trend is not unusual.

- However, these figures are out of line with what one would expect a staff member to generate in terms of revenue. With an average project duration of two to three years and a fully-burdened average staff expense of $150,000 per year, each staff member is doing little more than paying for him/her self, especially on the smaller projects. If these assumptions are accurate, each member should be generating at least $300,000 in revenue per year.

- At the very least, the indication is that vendors have not learned how to leverage their personnel. This issue warrants close scrutiny in strategic planning.

2. Skill Sets

In addition to fixing the number of staff, it is critical to know what skills the vendor has available from the current staff. INPUT recommends the

conduct of a skills inventory to make this determination if such a survey has not already been completed.

Along with this, the vendor should plan and operationalize a training program that provides for technology transfer among the staff. The SI professional staff needs to remain technologically up-to-date. A national training network that ensures up-to-date skills may be a means around the central-vs.-local office dilemma discussed above.

From the data INPUT has available, the following project-specific skills seem to be required (see Exhibit IV-6).

- Strategic Planning – CSI requires that the vendor become a consultant to the client. Some vendors (e.g., Arthur Andersen) are likely to consult on "process change" at the top level of the organization. They want to change the way the client conducts his/her business and then implement the technology that supports that strategy. THE VENDOR, on the other hand, will likely stick to consulting at the tactical level. That is, your focus will be on achieving productivity through automation, regardless of the viability of the business structure. If this is the case, these consultants need some skills in the business aspects of vertical industries, and concentrated skills in the application of technology to these business aspects. Further, with clients complaining that they do not want closed-end solutions, these planners must be visionaries in terms of general trends in the vertical industry and in terms of the direction of technology vis-a-vis these trends.

- Technical Architecture Planning - This is a support group to the strategic planners and a leadership group to the developers. They function as the chief architects of the specific system. Hardware, communications, and software skills in design, integration, and engineering are the requirements. These planners must be very conversant with the architectural aspects of the products of other vendors and be able to function in a multi-vendor environment.

- Systems Engineers - Skills in this group are typically those of systems analysts and programmers. This group may be the largest and could include experts in software development methodology as well as experts in database design and industry-specific products and procedures.

- Project Managers These are critical skills in that each project manager must be prepared to assume total responsibility for all deliverables. Managers will need an understanding of and direct access to subcontractor managers, contract administrators and legal support, etc. Control and communications skills are important to carry out the roles of job scheduling, reporting, and accounting.

- Proposal Developers – At the core of each proposal development effort should be a small team of individuals who have, above all else, business

EXHIBIT IV-6

PERSONNEL SKILL SETS

- Strategic Planners
- Technical Architecture Planners
- Systems Engineers
- Project Managers
- Proposal Developers
- Contract Administrators
- Supplier Managers
- Education/Training Specialists
- Documentation Experts

and communications skills. They need the business skills to know what to bid, how to bid, how to assess the competition, and the tradeoffs between the risks and the rewards.. The communications skills are critical in that they must elicit the technical aspects of the projects from the technical people, the political and marketing aspects from the sales/ marketing people, the legal aspects from the in-house and third-party contracts people, and then communicate these to the client in such a way as to engender a positive response.

- Since bidding is both art and science, bidders need to develop skills on two fronts.

- To accomplish the science aspects you need sophisticated estimating tools and a firm understanding of your own capabilities, those of your partners, and those of your competitors. On this latter point, bid preparation activities should include the development of a bid for the most likely competitor by an independent in-house group. Only when

you can beat the group's simulated bid, do you have a chance of winning with your actual bid.

- The art of bidding includes a realistic estimation of the value of the award in terms of future business and an understanding of management's willingness to break even, or even lose, money, for the opportunities that MAY BE down the road.

- Art also includes an understanding of the buyer's values. In the commercial market the lowest bidder does not always win. Rather, the award goes to the vendor most responsive to the buyer's needs while still being close to the lowest bid.

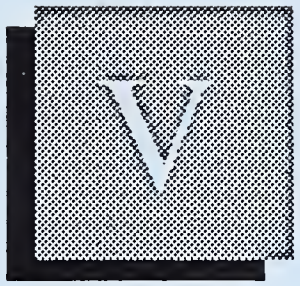
- Contract Administrators – These skills involve legal, detail-oriented activities that seek to minimize and contain the inherent risks. They review in-house proposals and contracts and establish formal relationships with suppliers.

- Second- & Third-Party Supply Support – These individuals know what products are available internally and externally and have established relationships with these suppliers (hardware, software, communications, etc.). It is important that these individuals understand the business dynamics of THE VENDOR's CSI efforts and the "generic" needs of the target markets/applications to ensure that relationships are established and "well greased" before they are required.

- Education & Training Specialists – CSI projects demand education of the client's staff during the project and on-going support after completion.

Rather than skills in technical writing, these individuals need to be able to prepare and deliver instruction that could involve multi-media.

- Documentation Experts – Developed systems require full documentation. Skills involve an ability to communicate with the technical people and translation of technical materials to usable written form.



User Case Studies

V

User Case Studies

Detailed analysis of several SI projects were conducted during the course of this research. These projects, summarized in Exhibit V-1, are explained below.

A

State of Alabama Super Computer Authority

1. Profile

The Alabama Super Computer Authority was formed by executive order of the Governor to implement a supercomputer system at Huntsville and a data communications network to provide access by universities within the state, selected departments of the government, and selected industry participants. The system will also give some catastrophic back-up capability to the State's data processing operations involving law enforcement and human resources (Food Stamps/Public Assistance) (see Exhibit V-2).

2. Background

At the present time, if any of the state agencies or the universities need the capabilities of the supercomputer, they must go out of state to buy time. The connect time that they do get is over low speed lines that are not very economical.

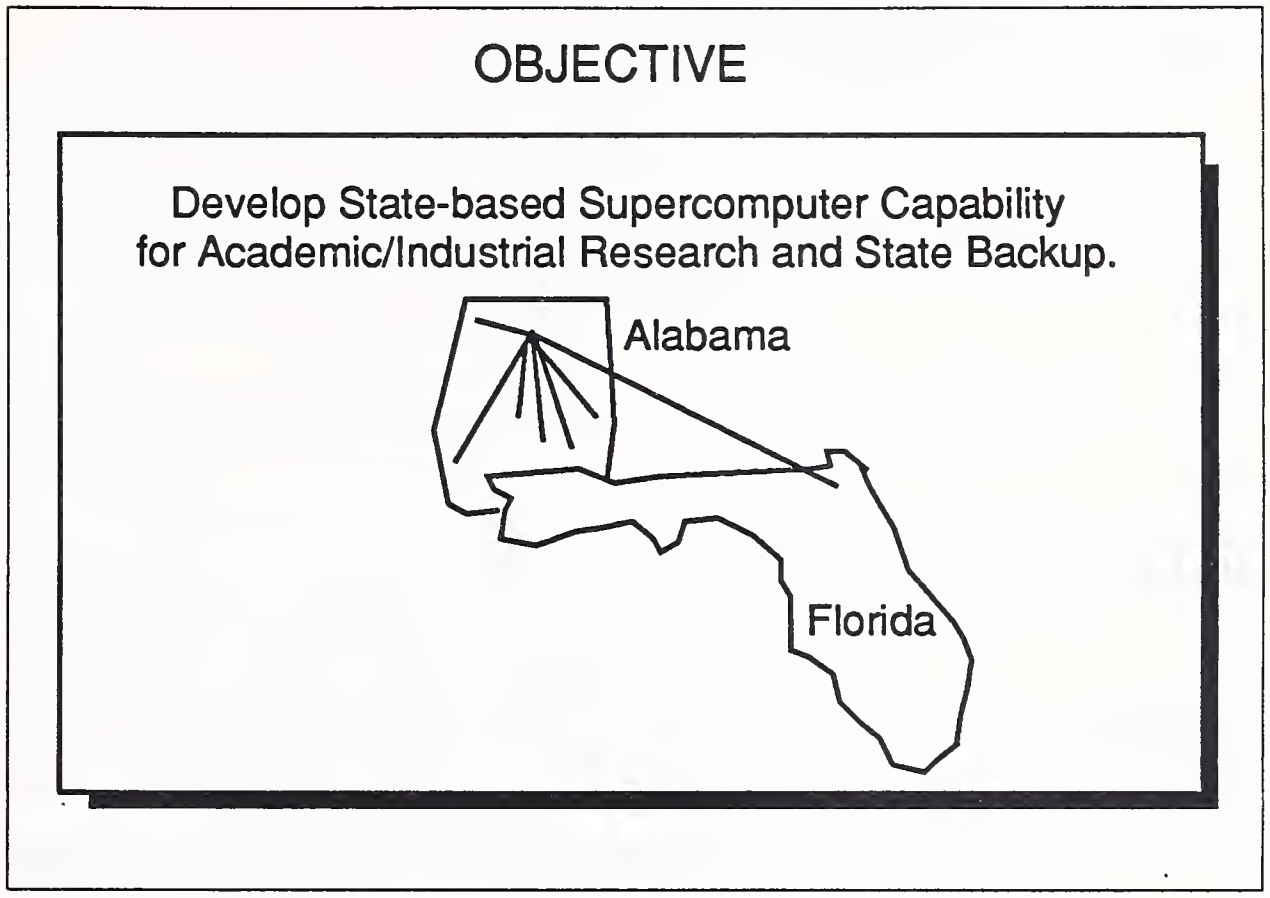
The supercomputer network will be used as a research tool for the universities and some of the industries in the area. These industries are conducting research in super conductivity and simulation exercises.

EXHIBIT V-1

PROJECTS ANALYZED

Client/Project	Vendor	Value ($ Millions)
Alabama/Supercomputer	Boeing	38
General Public Utilities/EMS	CDC	32
"Retailer"/Distributed Processing	Cancelled	30+
New York/Medical Eligibility	First Data	22
K-Mart/POS EDS 15	EDS	15
Los Angles/Criminal Justice	Systemhouse	12
Contel/Billing	EDS	11
Western Michigan/Network	Universal Communications	9
Columbus (OH)/Library	Systemhouse	3
Human/Medical Management	Health Data	3
North Carolina/Education Administration	IBM	2
New York/Hospital Network	Sytek	1

EXHIBIT V-2

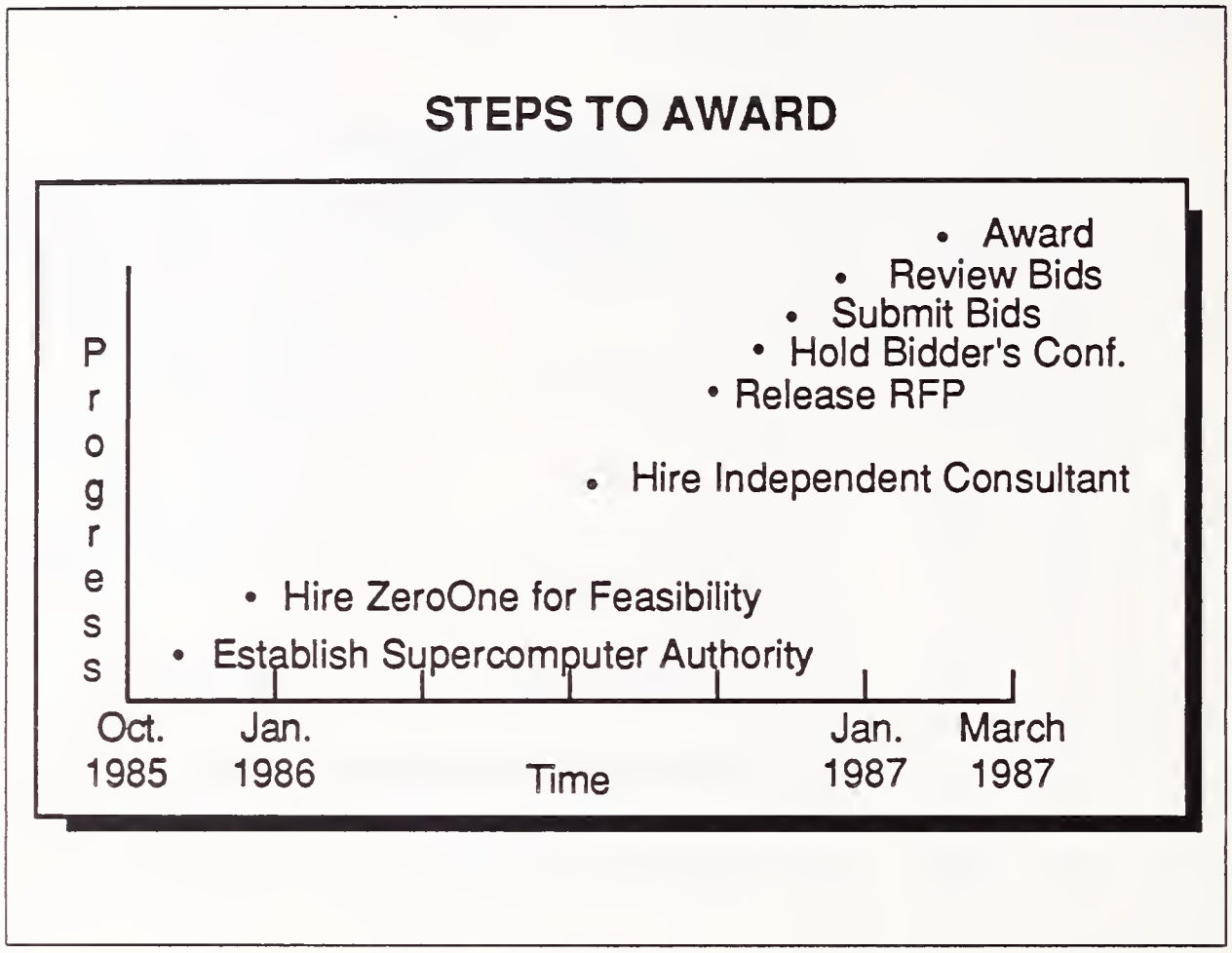


A recent example is the wind tunnel simulation of the Ford Taurus. Under normal wind tunnel conditions, new cars are actually only tested once in the tunnel. With the aid of the supercomputer, the designs for the car can be tested many times to optimize the design.

3. SI Approach

The Super Computer Authority (SCA) retained ZeroOne Systems to conduct a feasibility study and recommend approaches to effect successful implementation of the project. After ZeroOne submitted their final report, the Authority formulated a functional plan for the network and developed the RFP for the project. They also retained Dr. Sidney Fernbach to act as an independent consultant to review the work of the successful contractor(s) and to help with various other aspects of the project. When the news of the RFP was released,vendors started contacting the state purchasing department to register to receive the RFP when it was ready for release (see Exhibit V-3).

EXHIBIT V-3



The specifications for the project were:

- A central processor capable of:
  - Supporting the interfacing of remote and local nodal hardware and software through network communications facilities
  - Transferring information at 50 Mbits/sec to and from the network communications facility
  - Performing concurrent actions on arrays of information
  - Achieving a peak computational rate of 250 MFLOPS, according to commonly accepted benchmark practices
  - Supporting the doubling of performance through the addition of hardware and providing further upgrades after five years
  - Supporting a minimum of 4 million 64 bit words of physical main memory
  - Providing T1 links to six land-grant institutions and 56Kb/sec to three other locations.
- Implementation of software packages (MSC NASTRAN, SAS, IMSL, DISSPLA) and capabilities of adding other software (ANSYS, SPSS, and DI-3000) in the future.
- Direct access storage minimum of 15 gigobytes.

- Source network and processor with the ability to disconnect the processor from the nodes to make classified processing available on an assigned time basis.

- At each remote node analyze site, make recommendations, provide equipment, installation, and maintenance. The host institution must approve all regularly assigned personnel.

- Provide processing capability at each nodal site to gateway to the supercomputer to effect an efficient pass-through of data.

At each university, a node will be created with a DEC 8250, attached to the campus network. This will give the campus network direct access to the Cray X-MP/24.

The node at Huntsville will connect to the National Science Foundation supercomputer site in Florida for the south east area.

Basic ground rules for the vendors included the following areas:

- The successful vendor is required to accept complete responsibility for the delivery, installation, training, and maintenance of all equipment, software, supplies, and contracted services.

- Since the State was not sure what type of contract they would award, vendors were required to provide a fixed price bid as well as an itemized cost plus maximum fee bid each of six fiscal years. The State wanted the ability to analyze and choose between the two methods of payment. To ensure reasonable cost estimates, the State planned a sliding fee schedule based on cost containment. For each fiscal year, the State will reimburse the vendor for all legitimate documented costs up to a maximum of 1.5 times the proposed cost, plus a fee which is a fraction of cost. The closer a vendor's actual costs were to proposed cost, the higher the fee, up to the maximum. Conversely, if the cost exceeded 1.5 times the proposed cost, the fee becomes negative and the vendor's reimbursement is less than actual cost.

At the option of the state, there may be an acceptance period of thirty consecutive days at which the site must operate at a level of 95% effectiveness. If, after ninety days, the site does not meet the standard of performance, the State may terminate the contract without incurring liability.

- The successful vendor must be capable of obtaining the proper security clearances for all employees who may need access to sensitive information or areas.

- Each vendor must submit with the proposal a proposal bond for $30,000 to the State of Alabama as a sign of good faith and firm bid for ninety days.

- The successful vendor may be required to post a performance bond of 30% of the first year's cost as a guarantee of the delivery, installation, and operation of the equipment.

- Financial statements of the firm's latest fiscal year must also be included with the proposal.

A bidder's conference was held at which the interested vendors could present questions and items that they felt required clarification. Approximately 20 vendors were represented. The State later published a list of 64 questions and answers that were discussed at the conference. One of the questions discussed was directed at the very specific requirements for the central processor. The characteristics seemed to be based on the CRAY XMP/24. The vendor inquired if this was the intention of the State to acquire a CRAY. The State replied that all vector processors that meet the mandatory requirements will be considered.

4. SI Award

Six vendors later responded with bids. Some of the other firms that bid on this project were EDS, Falcon Systems, Grummann, IBM, and ZeroOne. Other firms that attended the bidder's conference but apparently did not bid were Amdahl, ETS Systems, Control Data, AT&T, DEC, and CSC.

Through the state government the bid was awarded to Boeing Computer Services (BCS) for a one year contract with five one-year options, totalling $38M over a six-year time span. The site is to be operational in February, 1988.

The components of the contract include these areas (approximate):

• Hardware	$11.0 M
• Communications hardware	1.0 M
• Software products	.5 M
• Professional Services	16.2 M
• Communications Services	6.0 M
• Data Processing	3.0 M

BCS was awarded this contract on the basis of cost and the experience that they brought to the project from other projects, particularly the supercomputer effort they completed for NSF.

The bids were evaluated on the following criteria:

- The cost and associated fees for the project.
- The evaluation of the vendor's experience, ability to carry out the terms of the contract, quality of the equipment proposed, and financial stability.
- The technical soundness and completeness of the proposed solution.
- The evaluation of the completeness and coherence of the vendor's experience with personnel of the classifications proposed.
- The evaluation of the schedules proposed for site availability and for personnel.
- The evaluation of proposed marketing support and marketing services, should they be required to market the supercomputer resources to users.
- Responsiveness to the needs of the external paying users of the proposed system.

5. Results

BCS is in the process of conducting the node meetings. They are meeting with the people at each location and examining the physical site itself. BCS is drawing up the requirements for the site in terms of the electrical power requirements, heating/air conditioning, and the physical layout of the floor plan. They are making other recommendations to optimize the network at each of the nodes. They are in the process of hiring the analysts that will support the nodes, the first one will be starting July 1, 1987. They are also working closely with a separate contractor building the facility at Huntsville.

BCS has also been busy creating BCSLIB on the CRAY. This consists of routines that the users will be able to use to facilitate programming.

FASTSTART is another program, consisting of training and computer time, that BCS is creating for intensive users to utilize BCS's CRAY located in Seattle until the location in Huntsville is operational. In con-

junction with this program, BCS is holding seminars to tutor the users and help them become more proficient before their system is ready.

6. Observations

Because this project is being handled by a state government, they are under the state guidelines for procuring vendors for projects. They are obligated to go out to open bid for all projects.

Any additional work that might have been done in conjunction with this project would have been added on to the contract in the form of an addendum. There are no addendums to the present contract with BCS, any additional work will have to go out to open bid.

The Super Computer Authority feels that it was extremely beneficial to talk with other locations that had supercomputers operational. They also enlisted the expertise and services from ZeroOne by means of a service contract to gain more knowledge in the area of supercomputers. They felt that they had to talk to the experts in the field and pick their brains to avoid costly mistakes or reinventing the wheel while putting together the project. They visited as many sites as they could to determine their requirements and what to look for in a vendor for the project.

B

Columbus and Franklin County Library

1. Profile

Columbus and Franklin County Library (CFCL) is a public library system serving residents of both Columbus and Franklin Counties, Ohio, through its main branch in Columbus and twenty-one local branches. It is through the main branch's data processing center that the library system tracks all circulation, book ordering, renewals, reserves and fees for overdue accounts for the 1.5 million volume library, which has an annual circulation of 5 million.

2. Background

Back in the early 1970's, CFCL used the Gaylord System, a batch system devised by Gaylord Brothers, a large library supply house. CFCL was hooked up by remote to New York, and via two PDP 11's, would dial up to the host computer every day and down load all transactions. This system was in use for about five years, until the late 1970's.

The next system, VTLS (Virginia Tech. Library System) was selected on the basis of software first and then finding hardware that would run it. It was necessary to find a system that could handle MARC - a standard format for library records. This system, currently in use on the HP 68, had caused problems from its first day of operation due to its inability to either handle the large number of transactions or to expand as the work load increased.

With an annual growth rate of 10% in usage of the library the problems of the current system have increased, with response time slowing to intolerable levels. In addition, CFCL wants an on-line cataloguing system to replace the microfilm version currently in use, but such a system cannot currently be supported.

3. SI Approach

An in-house team comprised of DP staff of CFCL, the Manager of Operations, and Director of Information Systems discussed the current situation, evaluated past and current library systems (pros and cons) and tried to anticipate future needs. No outside consultants were used at this stage.

CFCL recognized that the major problems of the current VTLS was were not so much in the software, but in limited hardware. They determined that they needed hardware that:

- Could expand modularly.
- Could support MARC, the standard format for library records.
- Would be transaction-oriented, i.e., handle high volume of on-line transactions.
- Would network to library branches and other systems (e.g., accounting system for book and materials ordering).

Three hardware companies were considered: Digital, Tandem, and NCR.

A turnkey solution was considered first. A company in Colorado that had a turnkey system that had grown out of an academic research library was contacted. By the time the list of changes was written, it was realized that the code would be so "chopped up" that it would be a major problem to maintain. In addition, the turnkey solution was based on a very hierar-

chical system. This was a problem, as there were too many steps one had to go through to access a record or file. With a public library system, "one has to go directly to where one wants to be." So, even though this would be less expensive than bringing in a system integrator to custom-build the system, the committee decided too much "customization" and rewriting of software would have to be done, without a guarantee of full functionality.

Ultimately, CFCL decided on a Tandem computer, believing it best met the criteria they had established. To develop the specification Tandem recommended several vendors, including Systemhouse, as they had experience with Tandem systems and with the MARC library record system. When the list of criteria was distributed to vendors only Systemhouse was willing to talk with CFCL, so there was no bidding process.

Systemhouse sent two analysts, who spent about one year at CFCL on contract, to do an analysis of CFCL's situation. They agreed that Tandem was the best hardware to use. Systemhouse selected the specific Tandem hardware (amount and type of Tandem equip- ment) and said, "we can make the system work if you buy this equipment."

While Systemhouse was analysing and preparing the functional specs, CFCL kept reminding Systemhouse that they would be competing with other vendors regarding implementation of the system, even though they would be using Systemhouse's specifications. CFCL did admit that because Systemhouse was writing the functional specs, they "had a big leg up on the other vendors." But, "if your price is unreasonable, we'll (CFCL) have to go elsewhere."

They had yet to decide on which system and who would do the job . CFCL established a list of criteria that included:

1. A guarantee of functionality.

2. A performance guarantee that the system could perform with a certain response time under X amount of load.

3. Making the source code available.

4. Providing a service contract for five years.

5. Providing a letter of credit; if the vendor failed to meet performance

criteria, CFCL would be reimbursed, not only for software development, but also for hardware cost.

4. SI Award

The contract ($1,401,832) was awarded to Systemhouse for software development and installation of hardware. The cost of Tandem TXP and XL8 was $1,421,984, for a total system cost of $2,823,816. The Tandem system will totally replace the HP 68 system, except for the terminals. CFCL is keeping the HP terminals which they claim are, "very durable, well built."

The major reason for selecting Systemhouse as an SI was the time factor and manpower. CFCL could not afford the time, manpower or financial risk if the system did not work. CFCL had not used an SI approach before. The project will run eighteen months, and is due to be completed by the Summer of 1988.

5. Results

Systemhouse developed a mock system at their facility (based on the functional analysis), and assumed full responsibility for success of the project. Systemhouse will also spec the communications link and will present three alternatives to CFCL. CFCL is writing only the software to produce reports on the system. Monthly meetings are being held by Systemhouse with Data Processing Management at CFCL.

C

Catalogue Retailer

1. Profile

A retail catalogue store has a chain of 193 retail catalog showrooms nationwide with headquarters in Virginia.

2. Background

As a catalog oriented retailer, the following sales processing procedures are followed:

- Customer looks in the catalog and fills out an order slip for purchases.
- Customer takes order slip to a sales assistant who operates a CRT that is on-line to Amdahl computers at the corporate headquarters.

- Operator keys in item numbers and customer information.
- Terminal accesses the main data base to check the availability of the item in the local store warehouse.
- The availability and current price information are sent back to the operator through the terminal.
- Operator confirms the availability and price with the customer, the order is placed or rejected by pressing the proper key on the terminal.
- If the order is placed, the computer at headquarters directs the printing of a pick-ticket to the printer at the store warehouse. At the same time, that item number is placed in the inventory transaction file to be put against the inventory file that night to relieve the store inventory of the item sold.
- Customer picks up the item and the ticket, and takes them to the cashier.
- Cash register, also on-line to headquarters, rings up the sale, adds the information to the sales transaction file to be processed that day after closing.

After the store closes for the day, all of the transaction files are processed and the store data bases at corporate are updated. When all of the store information is updated, the daily information is uploaded to a corporate data base for nightly processing and reporting.

Restocking takes place when the buyer at the central distribution warehouse looks at the store inventory reports and makes the decision to reorder merchandise. The adding of inventory to the store data base is done at corporate headquarters when receipt confirmation is received from the store warehouse.

The chain is currently handling all of their information processing between the stores and the main office on-line to an IBM mainframe. The system handles the point of sale processing, the pick-ticket printing for the warehouse, inventory control, relief of inventory, restocking reports, and management reporting on sales.

The current computer system in Richmond consists of an IBM 3090-200 that does the corporate processing for management reports, purchasing, payroll, and accounting. There is also an Amdahl 5860 and a 5880 that run the store data bases.

Management has had a driving desire to develop a distributed processing system at each store to handle sales and inventory for the following reasons:

- They are on-line to the 193 stores during business hours. The cost for these dedicated lines is approximately $200,000 per month. This is $2.4M per year for communications with the stores.

- When the corporate system goes down, all of the stores are inoperable until the central computer goes back on-line. This is a great inconvenience to the customers and results in lost sales.

They tried to implement this project in 1978-1979, but abandoned it, believing that available technology was not advanced enough at that time. The proposed store-level Honeywell Level 6 computer and Data Term point of sales system that they tried to put together could not be interfaced. It would have required advanced training for operators at the store to use the system. Management did not want to raise the expertise level of their cashiers to that which the system would have required.

3. SI Approach

In 1984, they started a new development effort (see Exhibit V-4). This time they had a better idea of what they wanted from the new system. Since the existing system is well documented and works very well for the functions that are required, management decided to emulate the same system at a store processing level. Management wanted the current system brought down to a store-based processing system that would be on-line to the central computer only for a short time at night during the daily uploading of information for batch processing.

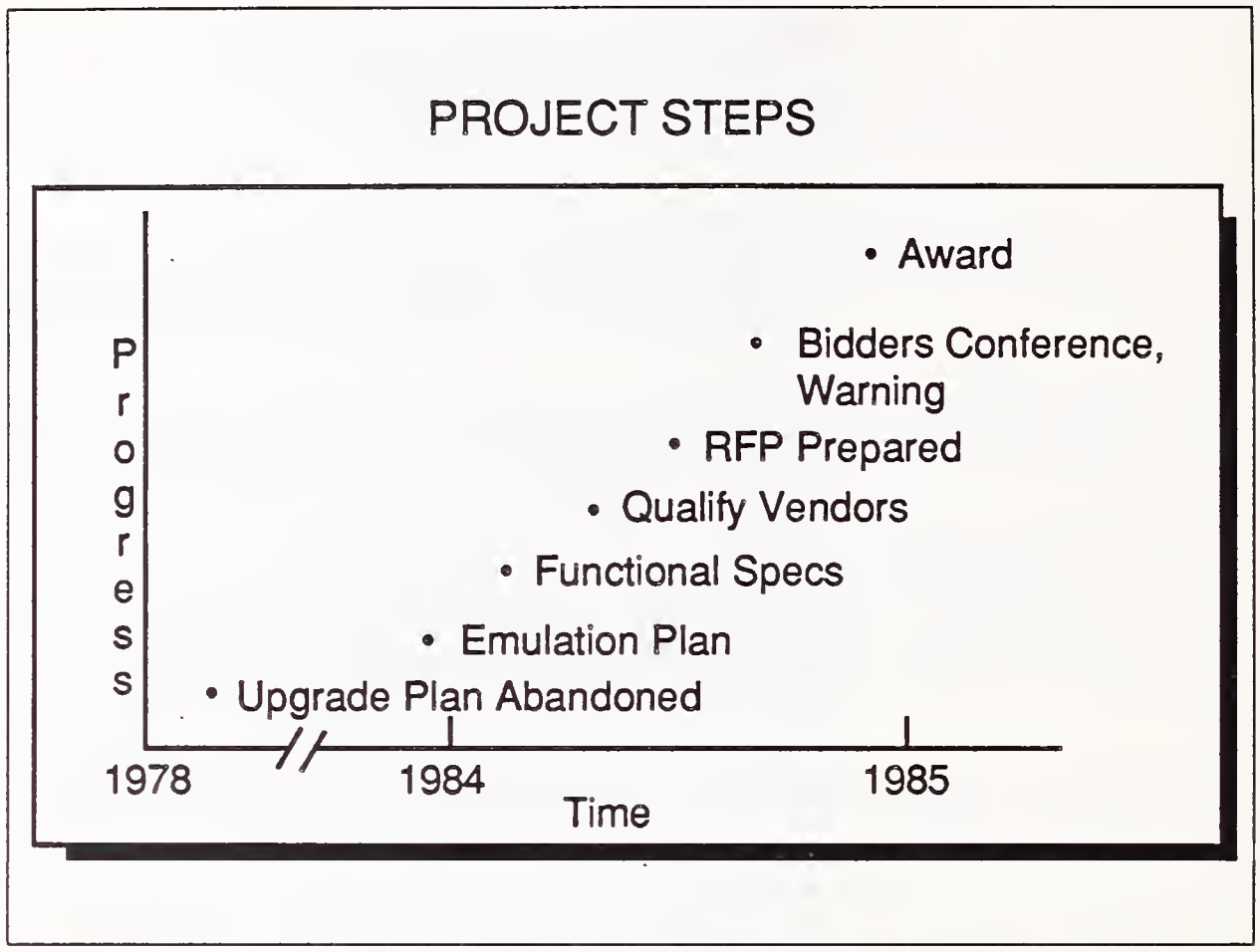
They developed functional specifications and prepared an RFQ. The RFQ described the current system and the processing that it handles and the needs and goals of the company for the new system. The RFQ was sent to selected vendors whom they thought would be interested in this type of project. After the RFQs went out to this list of vendors, more companies contacted the chain requesting a chance at the project.

Vendors' proposals were evaluated on the following criteria:

- The technology of the proposed system.

- The proposed software that would emulate the current system at a store level.

EXHIBIT V-4



- The maintenance that would be required for the new system.
- The cost of the system.
- The reputation of the vendor and their available resources to complete the job in a reasonable amount of time.
- The expertise of the vendor that would contribute to the success of the venture.

A bidder's conference was held. During that conference, prospective bidders were warned that the system was not as simple as the RFQ documentation made it look.

4. SI Award

When the bids were evaluated ATT/EDS was chosen for the following reasons:

- AT&T/EDS would share prime vendor status, providing additional

insurance against project failure. The resources and reputations of the vendors were quite attractive.

- The proposed hardware/system software suite of AT&T 3B series 2 and Series 5 with Unix looked good.

- EDS had chosen a software package that came very close to the software that was currently being used. The belief was that, with minor modifications, the package could provide a good workable solution.

When AT&T/EDS started writing the technical specifications, they found that the system they had proposed would not be powerful enough to handle the project.

- Based on the functional specifications, judgments were made by AT&T and EDS without a thorough knowledge of the current operating system. The required system was much more complex than they had expected. The required configuration needed to be much larger than the one they had proposed.

- The software package that AT&T/EDS proposed was not able to handle the requirements without extensive modifications.

By the time they finished the technical specifications, the time frame was extremely optimistic. Everyone realized the system that had originally been bid would not work. Given these results, the vendors asked to repropose.

The retailer agreed and AT&T/EDS came back with a new proposal for the system, with a much higher cost than the original $20M-$30M.

The retailer felt that this new, larger proposed effort was too large a project to undertake at that time. The project was cancelled by mutual consent. ATT/EDS was paid for the work they had completed.

The retailer is now re-thinking the concept of distributed processing in the stores. They currently have dedicated lines that are being used for the authorization of credit card purchases. If these same lines can be used to connect to the central computer at Richmond, they can use the system that they are currently running at a much lower cost.

5. Observations

The advice that the retailer has for any vendor in the future is:

- Research the prospective client company to a point where the business needs and support environment are well understood. The RFQ and functional specifications may not tell the whole story.

- Thoroughly investigate the project before bidding on it. Plan on the worst possible case when putting together proposals.

- If the vendors have not previously bid projects together, they must work out their relationship before proposing solutions to clients. For example, this was one of the first projects on which AT&T and EDS planned to work together. There may have been a lack of communication before properly bidding the project.

D

General Public Utilities

1. Profile

General Public Utilities (GPU) is a holding company for three autonomous electric companies: Pennsylvania Electric, Metropolitan Edison, and Jersey Central Power and Light. Through the operating companies, GPU provides electrical power to residents of New Jersey and Pennsylvania.

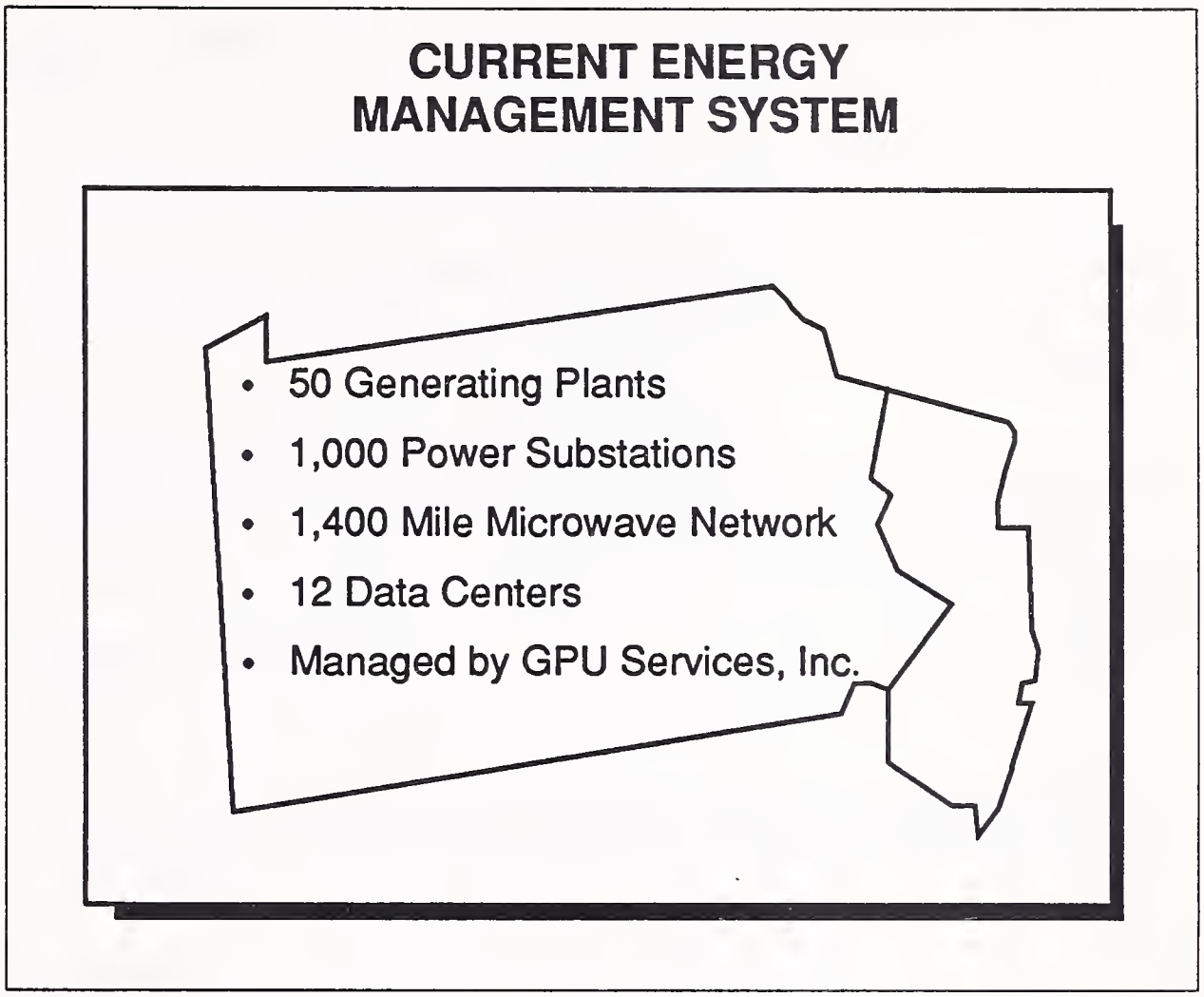
2. Background

GPU Service, the in-house computer and engineering service organization, is responsible for the Energy Management System (EMS). EMS is a computer system used to regulate the power system network that includes control of the substations and the governor motors of the generators in the power plants. This power system controls all feeder circuits and the flow of power throughout the power grid. The network includes 1,000 remote units in the two states. These same specialized computers are used for general business purposes: accounting, data acquisition, and monitoring functions (see Exhibit V-5).

The in-place suite of computers, XEROX Sigma 5s and a series of special TRW minicomputers at twelve locations, was designed and implemented in the early 1970s. While the EMS system still functions well, there are problems with it.

- XEROX no longer makes this specialized type of system and maintenance is a problem.

EXHIBIT V-5



- The general purpose applications on the system are written in hard-to-maintain code formulated especially for the equipment.

- The time and space resources of the current suite are quite degraded due to constant changes over the last ten years.

- GPU wanted to upgrade the technology several years ago, but the Three Mile Island nuclear plant disaster forced a long delay in starting the project.

GPU wanted to move the control to four general processor-type computer systems. These tightly connected and centralized systems would be located at the three company headquarters and GPU corporate. This move would also allow them to use standard code for the general purpose applications. While this thrust is toward centralization, GPU felt that a single system would be so large as to be unmanageable, especially in terms of communications.

3. SI Approach

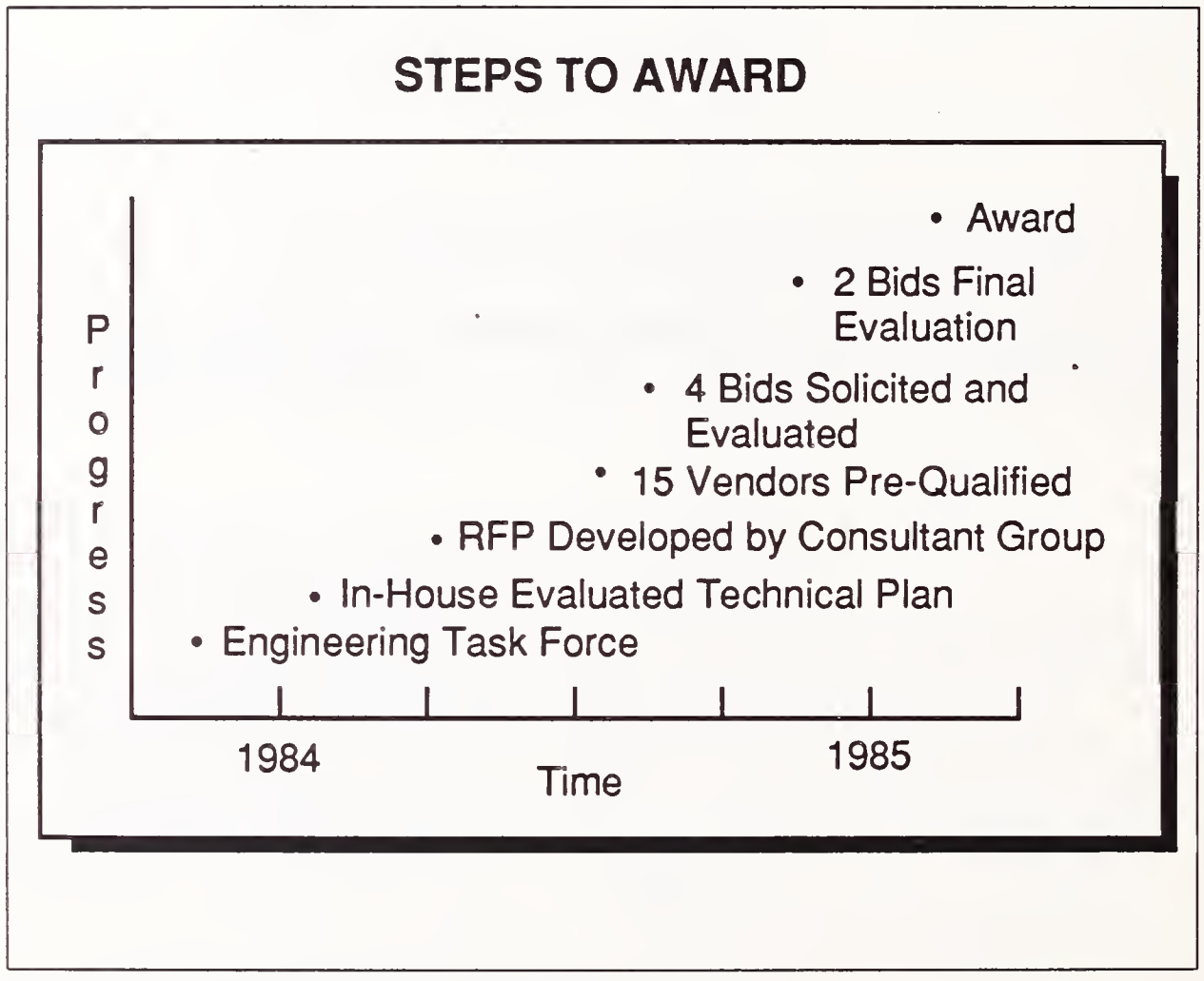
In 1984, the Engineering Task Force was formed to conduct a feasibility

study and establish the overall direction of the project. This task force included representation from each power system, communications managers, computer science personnel, and engineers (see Exhibit V-6).

From this management group,a working team was formed to evaluate the technical aspects of the plan.

A statement of work, detailed functional specifications, and the RFP were developed with the aid of Macro Corp., a frequent consultant to GPU.

EXHIBIT V-6



GPU conducted a pre-bid analysis of possible vendors using GPU's previous experiences with vendors and general information on vendors claiming EMS capabilities. Fifteen vendors were initially contacted including; Westinghouse, Northrop, Stagg Systems, SCI, Control Data, ESCA, and Ferranti International.

The list was quickly narrowed to four interested and, from GPU's perspective, capable vendors (Stagg Systems, SCI, Control Data, and Ferranti International). "Capable" vendors were those with the technical expertise and financial strength to undertake the project. These vendors

were provided a RFP that included a detailed design of the desired systems.

Complete evaluations were conducted on each of these four vendors in early 1985. A second, closer analysis was completed on the two finalists, CDC and Ferranti, in mid-1985. Vendors were evaluated by a committee using a weighted evaluation on technical, financial, and contractual basis. Specific selection criteria used to evaluate all of the vendors included:

- Size of the organization. ESCA (Seattle, WA), for example, was perceived to be a talented group, but too small with only 30 people and $8 million net worth. Their ability to handle the financial risks of a project of this size posed too much of a concern for GPU.

- Vendors with general, as opposed to specific, processors and capabilities.

- Vendors able to handle the processing of the applications, some of which required 10 MB of operating core and mass storage in the gigabytes range.

4. SI Award

CDC won the fixed price award for $32 million on July 1, 1985. Of this $32M, approximately 50% is for hardware and the rest is for software and services. The project is scheduled for completion during the second quarter of 1988.

CDC is providing all of the software specified in the contract. (GPU plans to develop several additional enhancements after they take over the system.) All applications are being rewritten in generalizable, Cyber-based code that will afford easy transport to other processors should GPU have that future need.

CDC scheduled over 100 people to work on the project.

5. Results

GPU will be acquiring dual CDC Cyber 850 processors for the corporate headquarters (Reading,PA), one serving as a backup for the other. In addition to controlling the generation and transmission of power, the Cyber 850 will handle all administrative applications. A Motorola 6820 will serve as the front end processor to the Cyber 850.

- The other three company headquarters locations will have a CDC Cyber 830 dyadic processor, one processor backing up the other.

- CDC will supply GPU with 150 remote terminal units; 147 to interface with the substation equipment (eg.transducers) and three connected to power plants.

- GPU will be getting approximately 90 front end processors, with full graphics capability, to communicate with remote terminals in the field.

To facilitate the GPU network reduction from twelve sites to four, CDC will be increasing the speed at which data is transferred between sites, as well as re-routing the flow of data between the 50 generating plants and the 1000 substations. The data flow will be done via CDC-NET, an inter-processor communications network.

CDC will supply the modems, other network hardware, and the interface software for GPU's communication network. This network consists of an intricate microwave system, based in Reading, covering over 1400 miles, and leased/rented lines from local telephone companies.

Maintenance through 1990 is included as part of the original contract. The Cyber equipment will be maintained by CDC on a year-by-year basis.

E

New York State Department of Social Services

1. Profile

The Operations Division of the New York State Department of Social Services administers the validation of people for Medicaid services. The current program consists of 50,000 providers, serving 2.2 million New York State Medicaid recipients. (A provider is a person, organization, or institution that renders medical or related services.) Providers may not necessarily be located in New York State.

2. Background

In the past, the person on Medicaid was given a paper card to prove that he was eligible to receive care. These cards were mailed to all of the eligible people in the state monthly. This card was good for the entire month. If the person became ineligible during the month or before the

card was mailed, services would still be provided. This amounted to the mailing of 1.1M cards every month. The expense just for the mailing of the cards was over $3.5M per year. In 1984, the Medicaid program cost was in the area of $8.4 billion.

Some of the problems that have been found with the paper card system include:

- There is a high incidence of the cards being lost or stolen during the mailing process. This causes undue hardships for the people that are eligible and need the health care. And the misuse of the card by unauthorized personnel is prevalent.

- Due to the great numbers of cards that have to be printed every month on the paper cardstock, many of the cards are difficult to read when they are new at the beginning of the month. By the end of the month, they are practically illegible.

- Eligibility changes occur on a daily basis. A paper card system just cannot keep up with these changes. A prime example of this is a person that is eligible on a "spend down" basis. The person is on a fixed income, slightly above the poverty level. When they have particularly high medical expenses for that month, they become eligible for assistance. The paper card could not accommodate this situation. The new system will turn on their eligibility for the days that they can get assistance and then turn it off the following month.

- There is up to a five to six week time lag under the paper card system between the time that a person becomes eligible for the program and receipt of the card. By the time they get their cards, they could be ineligible for assistance.

- There are some administrative savings in producing one card for a participant and turning on and off the eligibility.

3. SI Approach

The new Electronic Medicaid Eligibility Verification System (EMEVS) will consist of a plastic card, similar to a credit card, with the recipient's name, ID number, and picture of the recipient or head of household. The recipient gives the card to the provider at the time of service. The provider runs the card through a credit authorization terminal to receive information on the eligibility of the recipient and any other information on restrictions or third party insurance carriers. All pertinent information will be on-line for provider access 24 hours a day, every day. This will

allow providers to check the eligibility of the recipient on-line to the central data base. This day specific eligibility is expected to save the state an estimated $17 million annually.

Every health care provider has to be able to access the system and retrieve information. The large providers are given terminals and all other providers are able to access the data base via touch tone phone. For the people that do not have the capability of touch tone phone service, there is a small tone emitter that will produce the tones that the computer can understand.

When the decision was made to examine the possibility of a plastic card system, a task force of DSS management, telecommunications representative from the department, and consultants was assembled. The RFP and performance requirements were put together by the in-house committee while the consultants looked over their shoulders.

The task force decided to go outside for the project because of the complexity in putting a project of this magnitude together. State governments also have difficulties staffing short term projects like this one. Outside vendors have the capability to put all of the necessary staff on a project on a demand basis.

The task force wanted one vendor that would be completely responsible for the project. If they had decided to work with multiple vendors, they would have had to develop a separate RFP for each part of the project. They would have had to coordinate the specifications for all of the pieces, and deal with any problems in the implementation.

The RFP was sent to 130 vendors that requested the RFP or were recommended by consultants. A bidder's conference was held to discuss the RFP and respond to any questions regarding the project.

The state invited bids on this project at the same time as it was reprocuring a fiscal agent for the Medicaid Management Information System (MMIS) system. Contractors were invited to bid on either project or both. The RFP for the MMIS system had to be requested separately from the state.

The contractor's responsibilities under this project were to provide the following:

- Design, develop, and implement a network that will handle 55 million inquiries per year. Providers are in New York State as well as other states or Canada.

- Design and produce 1.5M magnetic strip MEV ID cards to be used to prove eligibility. Approximately 40% of the cards will have the head of household picture on them.

- Design, develop, and implement the software required to access the central data base for information and all of the network interfaces that are needed.

- Provide the Credit Authorization Terminals (CAT) for high volume providers. Touch tone phones are to be provided for all other providers and tone generators for those that do not have touch tone service. Training must also be provided in the use of these items.

- Design, develop, and implement a disaster recovery plan for the system and all subsystems. Time not on-line is measured in seconds not minutes that the system is down. Reports are to be put out regularly on the system down time.

- Training is to be provided for the Local Department of Social Services on the system, detailing its operation, and how to explain the system to new providers and recipients.

- Provide staff for the operation of the system until it is turned over to the Department or to a subsequent contractor.

- Design, develop, and implement an information storage system that will hold all information regarding requests for service on-line for one day and store information on tape for two years.

- Develop an information brochure in English and Spanish to explain the EMEVS system to new recipients.

- Design and develop a full plan for the turning over of the completed system to the Department or another contractor.

Firms responding to this RFP had to demonstrate capability and experience to develop and design a telecommunications system of this size. They also had to have an annual average of over $3M gross sales over the last three years. A performance bond for $4M was required.

Basic ground rules for the project were that the Department of Social Services owned the system and any software that was acquired for it and

that the contractor is liable for any payment made to providers due to business errors of the system.

The state reserved the right not to award the bid to the lowest complying bidder.

The initial screening of the proposals was done by the Offeror Evaluation Committee (OEC). They checked for the financial strength and stability of the offeror's company and assets and the completeness of the proposal.

The proposals passing the first prescreen went to the Technical Evaluation Committee (TEC) for the technical evaluation. At the same time, the Cost Evaluation Committee (CEC) checked the reasonableness of the proposals.

After all of these prescreens were completed, the full OEC evaluated the proposals and checked references. Site visits, oral presentations, and benchmark tests were required at the discretion of the OEC.

The OEC summarized all of their results and presented proposals to the Offeror Selection Committee (OSC) that made the final determination.

The evaluation process yielded two vendors that met all of the requirements of the project: General Instrument and First Data Resources.

4. SI Award

The project was awarded to First Data Resources for $22M over five years. They were able to meet the requirements of the designing and developing of the new system and processing the new cards at the lowest cost.

Approximately 25% of the cost can be attributed to professional services (developing the components of the system and training), another 65% is for operating the system after implementation, and the remaining 10% is the cost of providing terminals to the providers that require them.

5. Results

The scenario for the new system follows this format.

- The person goes to the local office and is determined to be eligible to

participate in the program. The local operator keys the required information to a transaction file. The participant is assigned an identification number and given a temporary letter of eligibility.

- The information in the local transaction file is transmitted to the vendor system for a nightly batch updating to the central file.

- The names of all the people that became eligible for the first time that day are transmitted to the card processing file.

- The next day after application those eligible are in the data base, with all of their pertinent information in the central file.

- That night during the vendor's production cycle the orders to print a card are issued.

- By the next evening a card is made and mailed.

- An official plastic card is in the person's hands within six days, instead of the previous six to eight weeks.

The expected benefits of the new system are:

- Recipients will have ready access to services and providers can operate with greater facility and fewer denied claims. The providers will have ready access to information regarding any third-party carriers that must be taken into account before applying to the state for payment and any other restrictions that are put on the provision of care.

- The state will save approximately $17 million per year through a current data base of eligible participants. Eligibility cards will not be mailed past the date of eligibility and services will only be supplied on dates of eligibility.

- Safeguards will be built into the system to prevent fraudulent use of the card even with prior planning.

The project is now in its last phase of implementation. The EMEVS system is operational in 40% of the state. The system is handling approximately 800,000 inquiries per month. Within the next few months, FDR will be converting New York City, Nassau, and Suffolk counties. The implementation is on time and the project is within budget.

The training seems to have been very complete for the LDSS and the registered providers. There have been no known problems to the providers accessing the system for the verification of eligibility.

They will not have any information for the next two or three months regarding the savings of the day-specific eligibility of the system.

6. Observations

There are not any add on features to the original contract. The State reserves the right in any facilities management contract to extend the contract for a short period of time until a new facilities management contract can be put into effect or a new vendor found.

Others undertaking the same type of project should have a master plan in mind when planning the scope and the way the project will be implemented. Examine the capabilities and functions that would be helpful in integrating the system into a wider scheme. If programs and the type of information used are similiar, they may be able to feed off of the same data bases of information or transfers of funds. If the systems are not similar, do not try to make them fit into one large scheme. Good planning and careful examination of all related systems can pay off with a well-integrated system that can handle many different functions in the future.

F

State of North Carolina Board of Education

1. Profile

The elementary and high school organization of the state of North Carolina includes approximately 140 school districts and 2000 schools. The schools have an average enrollment of 1.1 million students taught by 60,000 classroom teachers. Transportation service for the students consists of 13,000 buses, running over 640,000 miles per day and housed in 100 school bus garages.

2. Background

The Controller's office of the State Board of Education is responsible for the financial management of the public school fund and the Federal and special funds administered by the State Board for the operation of the public school system. It is their specific obligation to ensure that:

- Expenditures are for authorized purposes.
- Payments are made to teachers in an accurate and timely fashion.
- Positions are allotted to the units fairly and equitably to promote maximum compliance with class size laws.

- Pupil attendance is recorded correctly.
- Detailed budgets are properly managed.

In order to fulfill these legal responsibilities, the State Board of Education must have timely, accurate information regarding all expenditures, assignment of personnel, enrollments, and allotments. Specific requirements include:

- State vehicle fleet management
- State and federal accounting
- Federal accounting
- Internal accounting
- Student information management
- Professional certification
- Salary certification
- Budget management

In coordination with the state business office, each school district office is responsible for payroll, accounting, student information management, and other local systems.

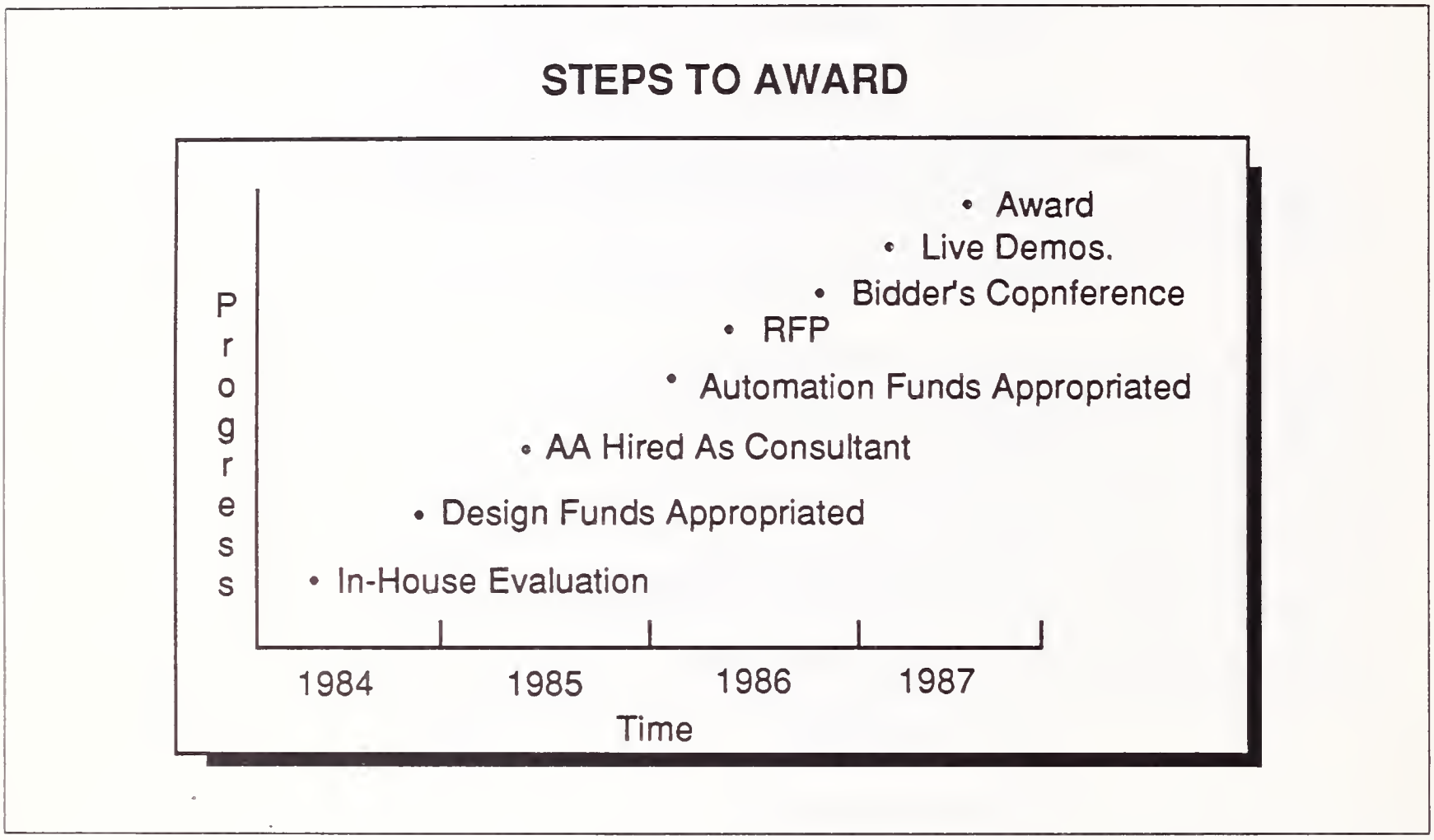
The systems that existed before 1984 to support these information requirements are technologically outmoded, inefficient and unable to provide timely and accurate data for effective management and control.

A development effort eight to ten years ago was piecemeal. Some of the school districts were automated with Burroughs hardware and software. These districts have not been able to communicate easily with the state board. Tapes from these districts have to go through a complicated conversion process to transfer information to the state computer system. Other districts and schools remain without automation.

3. SI Approach

In 1984, as a first step toward an updated integrated information system to meet these needs, the Information Planning Committee of the Controller's office completed an evaluation of the current information system. A plan was developed for improving the fiscal and personnel resources (see Exhibit V-7).

EXHIBIT V-7



In 1985, the Legislature appropriated funds to begin the design and implementation of the key applications required to achieve the long-range objectives of the plan. The Management Advisory Committee of school superintendents, state officials, and Arthur Andersen consultants was established.

Arthur Andersen became part of the planning group by being awarded a contract for $190 thousand to consult with the committee and plan the integrated information system. They were awarded this contract because they were able to meet the qualifications, provide the required references, and complete the project at an acceptable cost. AA has been working with the Department of Instruction on this system for about two years. The first 1.5 years was spent on the initial system and software design. They are part of the steering committee that oversees the resultant phases. Work began in April of 1985.

The committee developed a comprehensive plan of the information and processing needs of the state, the districts, and the individual schools. This plan called for the integration of the information systems and the communication network that would be required to link these systems to provide the management information needed (See Exhibit I-1).

The major components of the system are:

- The Student Information Management System (SIMS) handles the records management, scheduling, and grade reporting of students for the high schools, junior high schools, elementary schools, and union schools (schools that span more grades than the typical schools). This system uses Columbia Computing's School System and Elementary School System software packages. These packages run on IBM ATs or XTs at the local school and district levels.

- The Uniform Education Reporting System (UERS) includes the district accounting system for payroll, personnel, student information, professional certification, and salary verification. Data for this system comes from the local schools by telecommunications or diskette. Data is also received from the state board regarding certified salaries/exceptions, professional certifications, personnel histories, and allotments/budgets.

- The Transportation Information Management System (TIMS) manages the 13,000 school buses in the state. This is comprised of two parts: the digitizing of the street networks and the routing and optimization of bus scheduling.

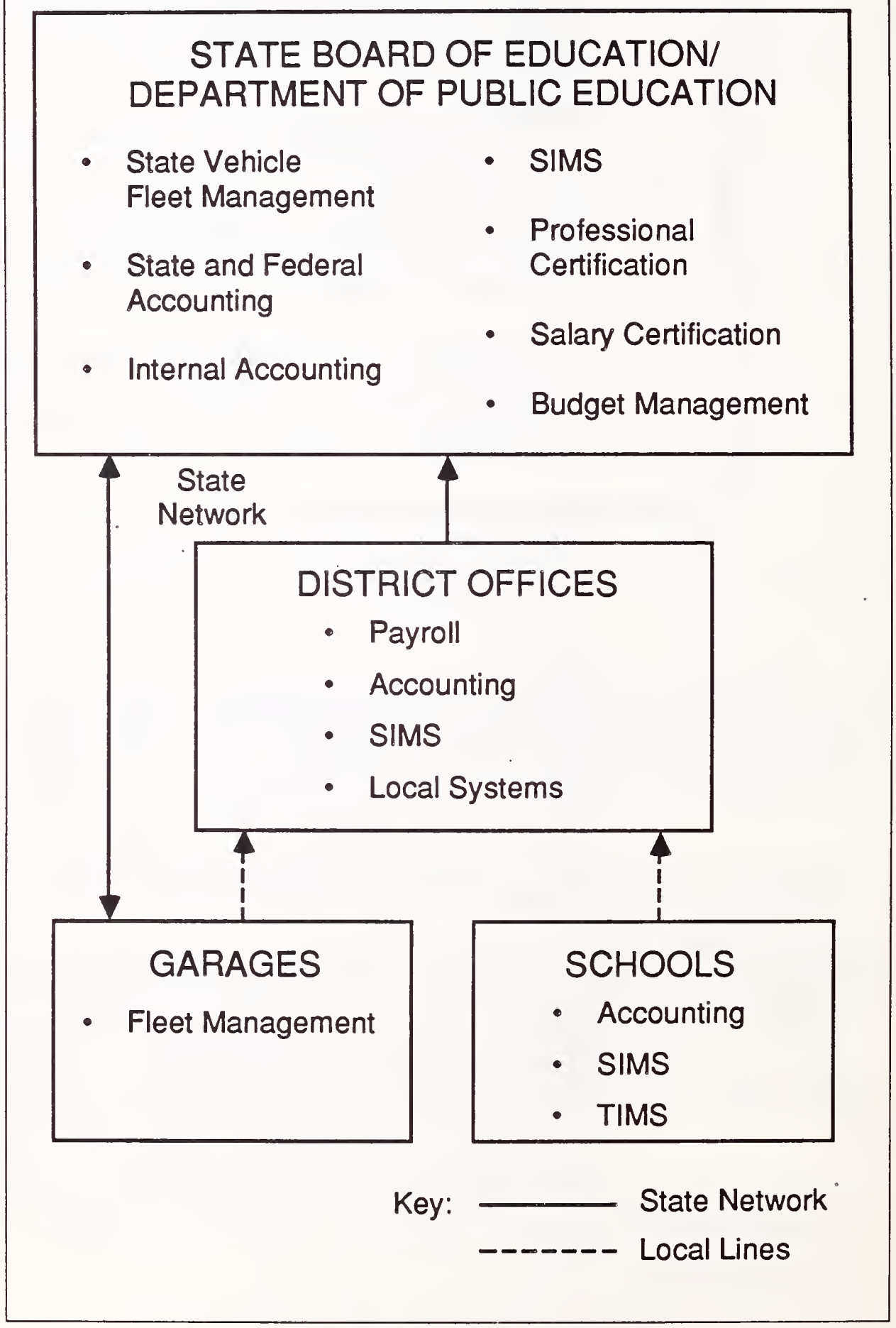
- The Vehicle Fleet Management System contains an inventory control/ maintenance module to control bus garage activities, including the repair parts inventory control and vehicle cost accounting requirements for the 13,000 buses.

The system was designed around the basic premise that all like systems would have the same software, hardware, and capabilities. This would help to avoid any incompatibilities or problems interfacing with other components. All automated schools have an IBM AT or XT, a scanner, and a printer running Columbia Computing's School System packages. The automated districts have an IBM System 36 or small IBM mainframe running a version of SIMS and J&K Financial Management Systems accounting software package (see Exhibit V-8).

In 1986, the Legislature again appropriated money to complete the automating of the districts and to start networking the local schools to the districts and the districts to the State Department of Education. According to the current plan, twenty-eight non-automated districts will automate with the System 36. Districts that are currently non-IBM (primarily Burroughs hardware) had the choice of converting to the IBM hardware, but apparently have chosen not to purchase the System 36 at this time. (It is likely that these districts will be "forced" to convert in the future to comply with the UERS standards by mid-1989.)

EXHIBIT V-8

DEPARTMENT OF PUBLIC EDUCATION UNIFORM EDUCATION REPORTING SYSTEM INFORMATION FLOW AND SYSTEMS OVERVIEW



Because the state did not have the staffing resources to coordinate with and be accountable for a multiplicity of vendors, they sought a prime vendor who would take responsibility for all aspects of the project, including the products/services supplied by subcontractors. Bidders were required to attend a bidder's conference and, at the state's request, provide a live demonstration of all components.

4. SI Award

IBM recently won the fixed price contract for $ 2.3M to complete several of the tasks involved. This contract will run through June, 1988.

- Automate the twenty-eight non-automated school districts to the IBM System 36. This was deemed the standard for the school districts by the comprehensive plan. They will be installing J&K's software packages: Financial Management System (FMS) and Employee Management System (EMS).

- Provide report writing software for sorting, extracting, and analyzing district office information.

- Provide the communications software that will link the twenty-eight districts with the individual schools and the districts and the State Board of Education. Communications software will include validation of information and not just parity checking and be SNA-compatible.

- Provide systems installation support services including hardware ordering, software loading, data conversion consulting, project management, and training and documentation for all district installations. As a part of the support, IBM will be providing "Hot-line" support for any problems that occur during the term of the contract.

- Assume complete project management responsibility and must supply bi-weekly status reports to the Department of Public Education.

An additional requirement of the contract is the availability of a DISOSS-compatible word processing package that is completely compatible with all other components of the systems that are linked to the district. A unique feature of the software is that it must have a check for reading level. For example, a document for fifth graders must contain words that are at the fifth grade level or below.

About 47% of the contract amount is for hardware for the school districts, 3% for communications hardware, 40% package software, and the remaining 10% for professional services.

IBM was chosen because they were able to:

- Provide a proven demonstration of all proposed hardware and software.
- Provide references of working systems for all proposed components.
- Offer the lowest reasonable cost for the system.

5. Results

The project is now mid-way to completion. There was recently a live demonstration of the loading of information to the state computer (an IBM 3090-200) by a tape from the district System 36. After going through over four years of difficult uploads from the Burroughs equipment, the Assistant Controller described the task as "a great relief in his life."

The configuration of the school districts is detailed in the following table.

IBM System 36	INNOVAK	20
IBM System 36	J&K	12
IBM System 38 and mainframes	Various	13
Burroughs	Burroughs	67
IBM System 36 *	J&K	28
Total		140

The legislature is in the process of appropriating another $5M for the completion of the UERS plan. Ten school districts independently went out to vendors and enhanced their system to conform. The remaining 102 districts that automated before the current project are going to have to comply with the overall plan by installing the IBM System and the required compatible software. The plan calls for all of the districts to conform to specifications by July 1, 1989.

The money that the legislature has been appropriating for this project covers the purchase, installation, and training for the required equipment and the payroll and general accounting software. Any peripheral software that is needed has to be purchased by the districts. Many districts are purchasing software packages to do fixed asset accounting, inventory control, and word processing.

The SIMS/TIMS system is installed in approximately 485 schools. The 320 high schools of the state are currently automated with these packages. The Controller's office recently requested another $1.8M to put the

* The project being discussed includes these 28 systems.

SIMS program in the junior high and middle schools during the time period of 1987-1989. They are planning to automate the remaining 1300 schools between 1989 and 1991. Many of the schools are not waiting for state money and are paying for the automation themselves.

6. Observations

Of particular interest to IBM may have been the one open state contract of approved vendors for hardware and software maintained for the schools. The school is allowed to purchase any hardware that they want to run the SIMS programs. However, the SIMS software support team will only support the software on the IBM equipment. The Department of Public Instruction acts as the single contracting agent with vendors on a fixed price, indefinite quantity basis.

- The Controller's office recently offered other vendors the option of supplying a software support person to handle any user problems in supporting the SIMS program and therefore become an approved supported vendor. The vendors declined, stating that they did not want to dedicate any of their people to this one project. This offer would have given other vendors the opportunity to have their equipment purchased for the running of the SIMS program in the 1500 remaining schools. By declining the offer, they also declined to become a part of this very large project.

- With the state contributing $8,500 to each school for the purchase of computing capabilities for the SIMS/TIMS program and each of 2000 schools buying systems for administrative and classroom use from local funds, purchase volume could be very large. IBM's involvement in this project and the state's support of IBM products/services could provide IBM with a considerable amount of account control.

There is a clause in the contract where IBM or its subcontractors must modify the software for continuing enhancements as the State requires for the life expectancy of the system.

For this project, IBM provided people, hardware, and support for a unique business situation. Everything that interfaces with these systems has to be completely compatible. The DPE expects to be spending approximately $4 million for additional hardware to run SIMS/TIMS.

Some of the characteristics that state agencies are looking when they send out bids for projects are:

- Prime vendor concept being used by the submitting vendor. The state agencies do not have the personnel to handle multiple vendors for projects.

- The price has to be competitive with other vendors bidding on the project. They are required to look at the vendor with the lowest complying bid first for the live demonstration of the proposed system.
- The vendor must provide adequate background references on similar projects.
- The vendor must have adequate staffing to handle the project according to schedule. There can not be any last minute problems with not being able to complete the project due to the unavailability of qualified personnel for programming, etc.

G

Los Angeles County Criminal Justice Department

1. Profile

The Los Angeles County, California (LAC) criminal justice department is the seventh largest criminal justice organization in the nation, incorporating forty-six local police departments, as well as the country's largest municipal jail - with a capacity for some 22,000 people. The organization also includes the municipal and superior courts, district attorney's office, public defender and probation offices, and the LAC Sheriff's department.

2. Background

Extensive information support is required to handle the thousands of traffic violations, warrants, court case tracking, etc. Prior to 1984 many of these information needs were manual. A need was recognized for a comprehensive Criminal Justice Information System (CJIS) that would support all adult case and defendant processing. LAC developed a long range information systems plan to accomplish these and other needs.

In order to keep track of and efficiently handle all of the information needs LAC had to:

- automate those existing criminal justice departments and divisions that were currently on manual systems;
- link together all existing systems within Los Angeles county;
- provide for the incorporation of any additional criminal justice systems into this network as they are created;
- reduce redundant data entry and improve data accuracy.

3. SI Approach

The LAC Board of Supervisors authorized CJIS and turned the effort over to a manager of systems development for project management and a supporting contracts officer who handled all contractual terms and conditions.

In late 1983, LAC put out an RFP for a seven-phase project that included a requirements analysis, project definition study (conceptual design and benefits analysis), general systems design, and internal design, programming, systems testing, and conversion and post-implementation audit.

Phases 1 - 3 were awarded to Touche-Ross in three separate bids. Touche-Ross completed the last of these projects in December 1984. The resulting design called for multiple information systems:

- Expanded Traffic Record System
- Municipal Court Information System
- Justice Data System
- Master Index
- Automated Case Tracking System
- County-wide Warrant System
- Prosecuter Management System
- On-recognizance Management Information System
- Defense Management System for Public Defender
- Adult Probation System

The design calls for these systems to be interfaced by a custom data protocol, Proactive Information Exchange (PIX), allowing the Los Angeles County Criminal Justice System to exchange data between all subsystems. The backbone of the system includes two IBM 3090s in Downey, California. In addition, the completed network will interface with fifteen other existing hardware systems, including DEC and Honeywell, via LU6.2. Processing will be distributed among the existing suite of hardware.

Other systems previously completed in-house or under separate contracts with General Electric Professional Services Company and Arthur Young

are to be incorporated in CJIS. Also, three others under current contract for development will be included. The remaining systems and five interfaces were the object of the final phase of development.

In early 1986, LAC put out an RFP for the final phase of the project, internal design through implementation. While LAC considered contracting with a single vendor who would, in turn subcontract for components of the project, they eventually decided to seek a vendor who could "do it all." They found that the many user group interfaces required of the vendor and the multifaceted complexity of the tasks would be exacerbated by a prime contractor and their subcontractors.

Notification of the RFP was made via advertisements in the *Wall Street Journal* and *Computerworld* as well as mailings of a pre-release RFP to some 400 vendors. Of these 400 vendors, 100 requested the complete RFP. Five vendors actually submitted bids: American Management systems: Deloitte, Haskins & Sells in partnership with General Electric; SHL Systemhouse; Touche-Ross; and one other, undisclosed vendor.

LAC evaluated the bids on the following criteria:

- Actual solution(s) to problem 40%
- Management Approach 10%
- Price 20%
- Experience and capabilities..... 30%

For the experience and capabilities criteria, vendors were required to demonstrate:

- Adequate financial resources to meet the commitments.
- Ability to comply with deliverable requirements.
- A satisfactory record of integrity.
- Ability to secure performance bonding and liability insurance.

Vendors were also required to demonstrate extensive experience on the part of the project manager and subcontractors.

4. SI Award

Systemhouse was awarded the fixed-price contract for $12 million, primarily as a result of the lowest dollar bid and the strong feeling of

LAC management that SHL Systemhouse was the single vendor who could apply the most capabilities to the project.

5. Results

The project began March 10, 1987, and will involve fifty people over a period of forty-one months. Systemhouse is developing four of the systems as well as designing and implementing the actual network, which will encompass the other systems. All application software and system networking will be done by Systemhouse; no pre-packaged software will be used. Systemhouse will also supply the required training.

The estimated cost of the entire LAC Criminal Justice System, including all hardware and peripherals is about $52 million.

H

K-Mart

1. Profile

K-mart is a national retail chain of 2,200 stores with annual sales of approximately $22 billion. Currently, about 500 stores are automated for point of sales operation. Another 500 stores have a lesser degree of automation.

2. Background

In the early 1970's, K-Mart was using IBM Series 1 4955 D and F models for administrative type applications. As these models had very limited capacity, K-Mart replaced the older Series 1 4955 computers with the newer IBM Series 1 4956, which had more capacity. The older 4955 models D and F were then made to function as controllers for the point-of-sale system in 390 stores. The point-of-sale system in those 390 stores were using the IBM 3683 terminals. In addition, K-Mart had 500 stores running NCR 1255 terminals which were hooked up to their own NCR processor, but which were not running as point-of-sale terminals. They are connected to the controller on a loop type of system.

Currently, the 390 stores that have point-of-sale terminals are running on outdated equipment and it's becoming too costly to maintain the system. The task facing K-Mart was two-fold: first, to decide how to modernize and upgrade the current 390 point-of-sale stores, and second, to select the best system and most modern terminals to install in the remaining 1800 stores that did not have point-of-sale terminals. Before K-Mart could decide how they wanted to automate the non-point-of-sale stores, they had to deal with upgrading the existing 390 point-of-sale stores.

With the advent of the microcomputer, the Series 1 became a less cost-effective machine. It was primarily for economic reasons that K-Mart

decided to upgrade its 390 point-of-sale stores from the IBM Series 1 to something more cost effective. K-Mart had to find an answer to the question, "How do we rescue our investment of the point-of-sale terminals already in the field?" Some additional problems with the current system were that the IBM Series 1, in addition to being over ten years old, won't run the standard operating system that is currently being supported. Furthermore, the IBM Series 1 is limited to proprietary architecture and K-Mart is looking for a more open and flexible architecture.

3. SI Approach

In mid-1985, an in-house decision was made by a Vice President of K-Mart that the present point-of-sale system should be up-graded. However, this would cost about $40,000 per store. This idea was soon abandoned, as another in-house study indicated that K-Mart could save about $15,000 per store by turning to dual AT-type processors as controllers to run the point-of-sale system in each store.

With this decision, the PC Register Information Systems Manager (PRISM) project was underway. One of the key requirements of the project of converting the 390 point-of-sale stores from IBM Series 1 controllers to dual AT- type controllers (not necessarily IBM brand) was that it must be an AT-type controller, and also it wanted the cost of upgrading each store to be less than $40,000 per store. This was for the controllers only and the development to hook the point-of-sale terminals to those controllers. The additional purchase of terminals did not enter into this figure. When K-Mart would eventually convert to the AT type processors, they were going to junk the older IBM Series 1 Model 4955 D and F.

K-Mart selected IBM ATs for the following reasons:

- IBM did a special bid for K-Mart and gave them a tremendous discount level for the computers;
- K-Mart didn't want to jump into the clone market for something as huge as two AT's for 2200 stores, or 4400 ATs;
- K-Mart was very serviceability conscious, and wanted to be able to have service nationwide.

The second phase involved the selection of a vendor or vendors to supply K-Mart with more modern point-of-sale terminals to hook into the system. K-Mart sent out general functional RFP, as opposed to a technical RFP, to five vendors who deal with point-of-sale terminals, (Fujitsu, Datacheck, IBM, NCR and an EDS venture with AT&T and Olivetti).

By the fall of 1985, K-Mart had a round of meetings with the vendors and then went through bench-mark testing, demonstrations to particular performance specs. In the spring of 1986, K-Mart selected two vendors, IBM and Fujitsu, IBM to supply 4683 terminals, and Fujitsu the 8770 terminals, in about a 50-50 split between the two vendors.

In the RFP to the vendors for the point-of-sale terminals, K-Mart had several specific requirements. A key requirement was that a terminal had to be modular, to allow component parts to be moved around. Secondly, the terminal had to be able to be programmed in a high level language, preferably the C language, which has grown to become a standard in the industry. K-Mart was looking for software commonality. In addition, the C language is efficient, easily compiled and serviceability through a national service program. Finally, the vendors' presentation and communication were important as far as their ability to sell K-Mart on their company. For this reason, Datacheck lost. As K-Mart put it, "They just blew it entirely."

While the original RFP to the point-of-sale vendors was of a general functional nature, there was an emphasis on commonality of a high level rather than of a specific level. That is, it should run on AT-type class devices. As K-Mart saw and evaluated the demonstrations from the vendors on proprietary systems, they decided to make an additional requirement that said, "You've got to run our store software on your AT," which was a real glitch in the way they were trying to sell the systems. In the multi-vendor environment, K-Mart would like a level of commonality between the systems, for training and support and development, to reduce the level of effort required to develop and test new applications.

K-Mart established a base with the AT as the cornerstone, with a set of administrative software on it and then attempted to have the vendors connect, or prove that it was feasible to connect to their terminals for that controller. Looking to the future, K-Mart would like to be able to take the same applications that are running on one IBM machine and interface them to the Fujitsu terminal. If they're in a common language, then just the individual device interfaces would be different; the logic would be the same.

4. SI Award

K-Mart selected EDS to manage the PRISM project. One of the requirements that came about during the project was that K-Mart wanted to be able to run generic software, developed for K-Mart by EDS, on the other system that would eventually be installed in the remaining 1800 stores.

EDS, as the systems integrator for the project, subcontracted with two other software companies: Post Software (Raleigh, NC), whose responsi-

bility was to hook up all the terminals to the AT controller, and AW Software (Mount Laurel, NJ), whose job was to attach the NCR terminals in the stores to the base Post software system.

A major reason for the award to EDS was that K-Mart wanted to put a multi-billion dollar company between themselves and the smaller vendors (subcontractors). EDS is responsible for all the different combinations.

Out of the 2200 K-Mart stores, 390 stores are running point-of- sale terminals with IBM 3683 terminals that will be converting from the Series 1 computer to the dual AT's. About 500 K-Mart stores are using NCR 1255 terminals which will have to be linked to dual AT's. The remaining 1310 K-Mart stores will be a split between the IBM 4683 terminals and Fujitsu 8770 terminals.

5. Results

The POS terminals communicate with the dual IBM ATs through a loop controller card, supplied by the terminal manufacturers, installed in the ATs.

K-Mart has a separate $50M contract with GTE Spacenet for a satellite network, enabling intercommunication between the stores and corporate headquarters. This will be accomplished by connecting all in-store processors to a token ring bridged to a packet assembler/disassembler (PAD), which in turn connects to a satellite dish on the roof of the store. GTE Spacenet will install video transmission equipment from Scientific Atlanta.

Currently, about fifty of the POS stores are supported by satellite communications. They expect to have all 2200 stores automated for point-of-sale operation by 1990.

K-Mart has their own team of about twenty-five people monitoring the PRISM project at the various stores, and another team for the common software being developed.

I

Western Michigan University

1. Profile

Western Michigan University (Kalamazoo, MI) is a mid-western university of 20,000 students, facility, and staff. Connectivity among the 126 buildings on the 358 acre tract of land is complicated by a railroad and interstate highway that bisects the campus.

2. Background

WMU found itself with a myriad of isolated voice, data, and video networks. Communication services were limited with each communications system (voice, data, or video) operating essentially as an isolated entity.

The many mainframes on campus were accessible only through stand-alone local area networks (broadband LANs by Sytek, Inc.). In addition to this lack of connectivity, the university found that it was nearly impossible to manage the communications since the only usage information available (e.g., trunk usage) was whatever the local telephone company provided.

To correct the connectivity problems, WMU required an upgraded telephone system, widespread access to the existing data facilities and an upgraded telecommunications system. Additionally, WMU hoped to replace its mainly leased voice system with a wholly- owned system. Specific objectives included:

- Improve the user and systems features of the voice, data and video systems.

- Realize maximum economies of scale savings of owned vs. leased cables, switching and terminal equipment, private vs. common carrier transmission, discount toll service, etc.

- Provide for growth in data communications transmission and access to computing facilities for all WMU buildings.

Zenwe, Inc., a professional consulting firm, conducted an early feasibility study including a general design for the system and a plan for implementation.

3. SI Approach

Three committees (financial, technical, and oversight) were established in 1984 to provide input and direction to the effort. A key concern of these committees and the Board of Education was the limited technical expertise of the in-house staff. While WMU had portions of the technical expertise within their staff, they felt that the perspectives of the individuals were not broad enough to handle the communications system that was needed. The administration also wanted to avoid the delay and expense associated with the employment of specialized staff during the project. Accordingly, the committees convinced the Board that an outside consultant/project manager would be required.

An RFP process was started and the resulting document released in September, 1984. The consultant/project manager, along with the

University's controller were to become the Consultant/Project Management Agency. This agency would have a key role in developing the final systems design specification, serving as the equipment procurer, overseeing installation and acceptance, and providing staff training and initial management and maintenance services.

Over forty vendors responded. Responses were evaluated against a weighted list of criteria developed by the committees. The vendor rating criterion involved ratings on such items as:

- Good understanding of WMU's voice, video and data communication needs (3 items);
- Expertise in PBX, video and data technology (3 items);
- Expertise with projects of a similar size;
- Ability to procure equipment and manage installation of equipment;
- Well-considered (thorough, realistic, etc.) project outline/timetable;
- Adequate training plan for WMU staff and user community;
- Adequate plan for system support in the system specification design, installation and operation/audit phases (3 items);
- Clear, understandable, complete cost estimates (2 items);
- Demonstrable experience and resources to complete project.

On the basis of the evaluations six vendors were invited to the campus for a two-hour presentation to committee members. Using a computer-based version of the same evaluation matrix, a final selection was made that day.

WMU contracted with Telecommunications International, Inc. (Chicago) to provide counsel to WMU on the appropriate design of the systems, systems specifications, prepare the RFP, evaluate vendor bids, and select the winning vendor. After evaluating the current communications systems, TII designed a solution that will link the broadband LANs in such a way that the total communications environment will appear to be a single transparent network. When completed, the system will allow voice mail, data sharing, and provide access to educational cable television programming at every campus apartment, dormitory room, and classroom. Twisted pair wire for voice/data will tap into the broadband network through voice/data jacks at each telephone outlet. In addition, the video link will include a cable television gateway to the data network. A real

time telephone management system to administer the telecommunication resource is an optional aspect of the specifications.

While a variety of approaches to the solution were considered, a systems integration approach was selected as the most efficient; avoiding multiple contractor interfaces and providing "insurance" that the system delivered was satisfactory.

The RFP was released in April, 1986 with a due date of July, 1986. (A bidders conference was also held in the interim).

Nine vendors responded to the RFP, including AT&T, GTE, InteCom, Michigan Bell, Rolm, TelPlus Communications, and Universal Communications Systems. From July to December the bids were evaluated by all of the committee members.

Proposals were evaluated in three phases: compliance with the RFP's general terms and conditions; compliance with technical requirements; and a points earned compliance evaluation. The latter was composed of a matrix of technical, service and financial (purchase price, maintenance and long-term system costs) criteria.

4. SI Award

Finally, in early January, 1987 an award for $8.8 million went to UCS, primarily on the basis of price. (UCS also brought experience from a similar project at the University of Iowa and, interesting, worked with TII on that project as well.)

The components of the contract include the following:

- Two NEAX 2400, with all attendants, and station wiring — 3.9M
- Cable Plant (duct banks, cabling, manholes, and labor) — 2.4M
- Options (emergency phones, Ethernet, additional conduit, additional dorm outlets, broadband for future, and CATV in dorms and classrooms) — 2.2M
- Maintenance (1 year) — .24M

There is no official completion date for the contract. The new telephone system will become operational in March,1988.

5. Results

UCS's implementation calls for:

- Three million feet of cable, including fiber optics and broadband coaxial, that will be placed in outside trenches in the absence of an extensive conduit system on the campus.
- Expansion of the University's Ethernet LANs and other required stationary wiring.
- Two NEAC 2400 Information Management voice/data PBX systems from NEC America interconnected to the network via T1 fiber optics links.
- Other communications instruments as required.

(A computer to handle telephone management was unhooked from the original RFP specification.)

TII is responsible for UCS's performance and, in turn, UCS is responsible for the subcontractors who will work with UCS in implementing the system. WMU has established an Office of Telecommunications to manage the project. Extensive administrative checkpoints are in place to help WMU avoid unnecessary, misdirected, or inefficient activities on the part of all vendors.

J

New York Hospital

1. Profile

New York Hospital (NYH), a 1,000 bed health facility in Manhattan, consists of some eighty-three departments distributed in several buildings connected by underground pedestrian tunnels.

2. Background

Cost cutting measures in the healthcare industry require that NYH have cost effective and productive systems allowing multi-media communications throughout the hospital, including remote physicians' offices and administrative offices. With a variety of independent computer systems throughout the hospital, and not part of any network, NYH needed to be able to transfer information between multiple vendors' systems throughout the hospital's cluster of buildings.

Access to information on admission, discharge and transfers as well as

treatment schedules is needed, even though this data is hosted on various computers, these computers do not easily communicate with the assortment of terminals and micros already installed. Furthermore, multiple vendors are represented in its mainframes, minis, terminals, micros and peripherals. And, while the hospital wanted to make data base information available to all users, this was difficult, since various data bases were hosted on a variety of processors.

The hospital needed a network capable of handling both asynchronous and SDLC-type protocols between the multiple vendors' equipment, as well as have video capabilities. The transmission of video diagnostics information from CAT and Magnetic Resonance Images to any capable video terminal was needed to help speed diagnoses and second opinion formulation, particularly during critical emergency situations.

Additional uses of video include in-service training, security monitoring and distribution of special hospital network programming (received via satellite) around the campus to viewing areas and patient rooms. Furthermore, the broadband architecture of the network should allow for the storage of video images on a read/write laser disk system known as WORM for "write once, read many" times. This capability was critical to ensure that first and second opinion diagnoses are both fast and accurate in emergency situations.

As the hospital wants to integrate its data communications capabilities into the overall system, it plans to install a 6,000 line PBX in early 1988, to replace Centrex services.

One important additional need was for a system which would support an IBM 3278 work station equipped with light-pen, used for admitting, discharge, and transfer processing.

A broadband local area network vendor was needed to integrate the hospital's installed equipment on a LAN, with the system positioned for future expansion as new needs were identified and new systems installed.

3. SI Approach

In early 1985, NYH established a multidisciplinary committee on information management. An RFP was sent to approximately eight telecommunications consulting firms for a telecommunications consultant to help the committee analyze the situation and prepare the technical RFP, with Telecommunications International, Inc. of Denver being selected.

It was on the recommendation of TII that NYH hired a Telecommunications Director prior to the project's implementation. The Director, a permanent staff member, serves as project manager of the current instal-

Several LAN vendors were evaluated, including Sytek, Inc., AT&T, IBM, Proteon and Ungermann-Bass.

4. SI Award

Sytek, Inc., (Mountain View, CA), was selected based on several factors, not the least of which was its willingness to work with the equipment already in place. The project team assigned the account supported hospital IS staff in their decision-making and project- managing process, and this was a critical factor in winning the account.

Sytek offered a flexible, modular equipment configuration which is positioned for future growth. Also, Sytek's architecture saved space in the plant design, an important factor in the cramped environment.

5. Results

Sytek demonstrated excellence in its capability to work with hospital staff to integrate the existing equipment (rather than start fresh, as other vendors had proposed), and committed its resources in engineering support and project coordination to the task. In addition to working cooperatively with hospital staff to manage the project, the vendor subcontracted actual cable installation to another firm.

The products offered were considered excellent and represented the only offering which could support light-pen dependent applications.

The hospital's use of direct asynch links between terminals and processors had cost twice as much as the broadband local area network solution selected, while SDLC-type connections now cost about one-fourth less than the previous links.

The cabling cost approximately $200,000 and the equipment cost approximately $450,000. There was a design fee of approximately $20,000, bringing the project costs to approximately $700,000, not including hospital staff time. Project management tasks were bundled into the overall contract. Software is part of the LAN solution and other application software was already present in the hospital.

The project was completed in June of 1986. The hospital staff was highly impressed that the installation and integration project went as well as it did, and were unable to identify any major problems. All initial applications are up and running and available throughout the network, and plans are underway for further enhancements to the system for new applications.

The hospital is saving money, has control of its internal network, and is well positioned for future needs.

NYH will be calling on Sytek for other additions to the system. These additions may include the purchase of interface units (for biomedical-clinical equipment), network security, and further applications that will allow various sub-systems to reside on the networks at an estimated value of approximately $1 million.

K

Contel

1. Profile

Contel is the fifth-largest independent telephone company with $2.5 billion in sales and operations in thirty-one states.

2. Background

The deregulated telephone industry has forced all telephone companies, including Contel, to not only seek non-regulated businesses, but also to conduct their base lines of business more competitively.

For Contel, deregulation has necessitated changes in their pricing practices to allow them to price both creatively and competitively. This is particularly needed in their cellular telephone business. The supporting databases (tariffs, toll ratings, etc.) need to be on-line for ease of in-house user understanding, usage, and maintenance. Flexibility in the supporting systems is paramount; faster responses to changing requirements could result in a significant cash flow improvement.

Contel has been using Honeywell computers for many years. While the older systems environment served regulated businesses well, the hardware is now technologically outdated and the software patched and difficult to modify. The nature of the applications in this environment made them difficult for end users.

In the Summer of 1984, a group of top Contel executives authorized the development of a new billing system. The executives outlined their functional requirements and a small project team was established and given one week to further develop the specifications and the conceptual design. This project team was comprised of representatives from the various functional departments: Telephone Services, Network Design, Marketing, and Finance.

In the Fall of 1984, a new project team was formed within the Information Resource Group. (Contel's own professional services company,

Contel Data, was not considered because of their reputation for missing schedules and delivering less than top quality work.) Arthur Andersen was engaged occasionally for quality analysis and to review the work plan for reasonableness.

Contel had the in-house capabilities and might have developed the system sooner than the eventual contractor – in fact, the in-house group bid on the project – but management's experience with in-house development was too negative to undertake another effort.

Because of the negative in-house software development experiences, the executives directed the project team to consider a packaged software solution. No acceptable packages were found.

3. SI Approach

AA, while working on five other Contel projects, completed a preliminary systems design for the billing system. When the six designed systems didn't appear to offer operational integration, the in-house members instituted their own methodology, Data Flow Diagramming, and spent the next ten months redefining the conceptual design.

By this time, Contel selected the new hardware for the system: two, possibly three, IBM 3090s. The choice of the hardware was based on Contel's belief that they could more readily find knowledgeable personnel, readily available third-party applications software, and available productivity and development aids for the IBM. The hardware acquisition, purchased directly from IBM, was a Contel activity and not part of the project.

Contel discovered that U.S. West and GTE were also developing billing systems. Each was approached and a joint development effort was pursued with GTE. However, the GTE joint venture proposal was out of line in terms of cost, so this effort was halted. The GTE group was just not experienced enough in non-captive business.

In fall 1986, after the completion of the data flow diagrams and the preliminary systems design, Contel issued an RFP for the development of the system.

EDS, IBM, Arthur Andersen, and General Telephone Electronics (Data Division), on the basis of their respective reputations, were asked to

submit bids. Vendor-client meetings were held to answer specific questions. IBM's early proposal was rejected so they re-bid with Cincinnati Bell.

4. SI Award

EDS won the fixed price award estimated at $5 million in October, 1986. The project is due to be completed in July, 1988. They will develop the system for Contel and retain rights to market the system to other customers.

Though no decision has been made as to the specific amount of hardware needed to run the system, the hardware expenditure is expected to be in the area of $6 million.

Contel evaluated the vendors on the following criteria:

- Prior track record of having worked on systems of equal scope and size.
- Prior experience of the vendor's staff to systems (billings, receivables) of a similar type.
- Ability of vendor to deliver project on time.
- Type of tools used to develop the system that could enhance the efficiency of the system.
- Price

Several other factors influenced Contel's decision:

- EDS has a good reputation for development.
- EDS seemed to best understand the requirements and were able to deal with functional specifications to develop a workable solution. (Some vendors were not able to handle this, opting for what they thought was politically astute or a solution reflecting their own bias.)
- EDS had a good, reasonable, and workable plan.
- EDS bid the project alone, whereas other vendors bid jointly. According to Contel, joint bids are the "kiss of death" if responsibilities are not clearly defined. Contel did not want to confront "finger pointing" when things didn't work out.

5. Results

Formal meetings are held every three months with senior management. Contel's Dallas-based project team meets with EDS daily.

There are several phases to the project:

- Phase 1 - Conceptual design
- Phase 2 - Technical systems design
- Phase 3 - Implementation
- Phase 4 - Acceptance testing
- Phase 5 - Conversion.
- Phase 6 - Interfacing systems

EDS is totally responsible for phases 2, 3, and 4 of the project, which includes detailed design, coding, implementation, and acceptance and performance testing of the system. Any delay in delivery ninety days beyond the schedule will result in a penalty.

A separate RFP went out in early 1987 for phase 5 (conversion of existing data and files to the new system) and an additional RFP will be sent out by summer,1987 for phase 6 (interfacing the new billing system to approximately 30 management reporting systems).

EDS is now working on the project in Dallas. Eight Contel people (systems analysts and subject matter experts) are in Dallas working with them. Contel is writing the "bridges" between the old and new systems and supplying "heavyweight" database experts to work with EDS.

The project is due to be completed first quarter, 1988. After three to six months of acceptance testing, the system will be migrated to regional billing centers over a ten-month period.

Though EDS is not responsible for the conversion of the system, they are responsible for the system successfully processing test data. EDS is not responsible for the system processing the current customer account base.

While the project is proceeding smoothly, there have been cultural differences, as one might expect, between an entrepreneurial vendor and a

conservative, management-by- consensus client. A key to the success of the project, has been changes within Contel that allow them to make decisions on a more timely basis. Contel is also thoroughly inspecting EDS's efforts on a periodic basis to ensure full compliance and a workable solution.

The new system (product) belongs to Contel, though EDS did retain the exclusive marketing rights to the product.

EDS will supply six months of support and, if the system is sold commercially, EDS will support Contel for one year as a "piggy-back" to the support EDS will provide other purchasers of the product.

6. Observations

Based on experiences garnered in this and other projects, Contel has several recommendations for other SI users:

- Client must have a good management committee that will listen to the issues and respond quickly and appropriately.
- User involvement is critical. Users must feel they are part of the effort.
- The client must understand their own requirements to be able to guide the vendor to an appropriate response.
- Client must understand "how" they need it and "when" so that contract negotiations run smoothly.
- The client must control acceptance testing. It must be a rigorous test, not a formality.

There is a good chance that EDS will be awarded future contracts relating to the billing system totalling $5 - $8 million.

L

Humana

1. Profile

Humana, Inc., currently the third largest hospital management company, owns and operates over eighty-five acute care hospitals with a total of 17,660 beds and over 45,000 employees. Revenues for fiscal 1987 are expected to reach nearly three billion dollars.

The changes that have taken place in the health care industry have had an impact on how Humana conducts its business. The federal government, insurance companies, and even large employers are pressuring health care providers to reduce costs.

One regulatory approach undertaken by the Federal Government was to establish Diagnostic-Related Groups (DRGs) of illnesses and then specify the amount Medicare would cover based on the diagnoses and type of treatment. For Humana, with 40% of its revenue coming from Medicare, there was no choice but to shift billing from a cost basis to a DRG-basis.

A DRG-based approach to accounting demands current, on-line handling of patient information. For Humana, this created an additional problem. Their approach to hospital management is to have centralized control over all financial concerns. Instead of having each hospital handle such matters as payroll, purchasing, patient billing and inventory, all financial processing is done at corporate headquarters in Louisville, KY. To receive DRG-based reimbursements, the organization had to develop an end-to-end information system — from the patient's bed in a remote hospital to the accounting offices in Lexington.

2. Background

To handle the additional demands, each hospital currently has Four Phase computers linked via an SNA network to headquarters. While each hospital is responsible for keeping patient records, administrative and financial applications are made at the corporate level.

The communications system is data over voice, using existing telephone wires to transmit and receive data, in a port-contention type of arrangement.

The headquarters data center has an IBM 3090-400 that is used primarily to run the administrative functions of the hospitals and an NAS XL-80 which handles the insurance claims processing. This system also includes an electronic mail application.

3. SI Approach

Humana has been formulating the idea of replacing their outdated hospital system for nearly ten years, but serious action was not initiated until four years ago when DRG pricing went into effect.

During the early years, Humana looked for a hardware vendor that would replace their outdated equipment. Humana planned to develop their applications in-house, replacing existing systems on a one-for-one basis (e.g. replace a charge collection system with a more sophisticated charge collection system). In 1982, a committee consisting of heads of MIS and representatives from end users, sent out an RFP for hardware. Fourteen vendors, including DEC, WANG, Data General, and IBM responded.

About this time, the changes in reimbursements came into effect. The extent of the required changes under DRG forced Humana to abandon the idea of merely replacing one outdated system for a newer one. Humana needed a system that could do more than just capture things, could address other costs, including the accounting of bedside nursing and shift-turnover, as well as the timely reporting of, and access to, patient information. A replacement system just wouldn't suffice.

While the processing of financial matters would still occur at corporate headquarters, the scope of the individual hospitals would increase to necessitate:

- An on-line database of patients' medical records
- The ability to incorporate nurses' notes concerning patients into such a database.
- More accurate tracking of nurses' time for billing purposes.

Though no vendor was awarded a contract, Humana's efforts did result in a list of hardware vendors, acceptable to corporate management and approved for local hospital contracting.

Aware of the scope and complexity of a new system, Humana realized that it would be better to go outside to buy the solution rather than try to develop the solution(s) in-house.

Humana began surveying the marketplace for a vendor that either had such a system, or one that could be developed to run on approved vendor hardware.

Humana spent several months evaluating vendors, either visiting them or inviting the vendor to visit Humana and make a presentation of their capabilities. Among the criteria used to evaluate vendors were:

- The level of congruence between the vendor's products and Humana's needs.
- The vendor credibility.
- How is the vendor capitalized?
- Who is behind them? Who is on their Board?

Among the companies considered by Humana was a company called Health Data Sciences. Health Data Sciences (HDS) is a systems house for the medical industry, providing generic turnkey systems that can be customized for each customer.

HDS had a system that ran on approved vendor hardware (HDS is an approved OEM for Data General).

HDS had been working with the vendor to develop a fairly custom terminal that could support the voice over data communications ability.

HDS had been developing their own version to the ANSI standard Massachusets University Medical Processing System (MUMPS), an operating system, complete with a database and language. This system is widely used in the medical industry.

When they were approached by Humana, HDS was in the process of developing an updated patient care system. While the package needed work (e.g. testing and the development of financial modules), Humana liked HDS's development plans.

Other vendors' systems were too traditional and did not offer the innovations that HDS was incorporating into their system.

4. SI Award

Humana awarded a contract to HDS to develop a new hospital management system as a pilot program to be implemented and tested at Suburban Hospital, also in Louisville.

While Humana knew what they needed from a functional standpoint, they also worked closely with HDS in preparing the technical specifications.

HDS contract was signed nearly three years ago. The $3 million pilot project is 50% hardware and 50% software and services. There is an option for a paid-up license agreement for twelve months allowing Humana to install the system at any of its hospitals.

The new hardware systems configuration includes:

- Data General computers (two for application front-ends and one for data base archives).
- An SNA host gateway to the corporate system.
- A terminal with data over voice capability in every room. HDS is also working with the terminal provider to develop a customized terminal that will include a badge reader for security clearance before allowing the user to access the terminal.

For the software and services portions of the requirements, HDS brought together an operating system of their own design. The operating system has been ported to Data General equipment. There are several applications/features of the planned system:

- Bedside attendants will input reports on-line, via a terminal in each room.
- Perform the traditional processing of capturing changes and preparing bills.
- The current project will integrate the clinical applications such as the pharmacy, radiology, laboratories, etc.
- The ability to back up the data base while it is in use without having to take the system down.

Humana will complete their own installation with a staff of fifty people. They do not want to be totally reliant on an outside vendor. HDS does not have any FM responsibility.

If the system proves to be successful at the Suburban Hospital test site, the entire system of computers and software will be installed in other hospitals in the organization by Humana. Humana will also support the system at the other locations.

5. Results

Even though completion of the pilot program is following a time-line that mirrors the HDS development schedule, the project is not on schedule due to HDS' inaccuracies in estimating the complexities of the project. The development and debugging of the distributed database has been slowed.

They have acquired the four processors for the test site and are ready to test the new system when it is available.

The agreement also calls for HDS to supply Humana with updates to the system.

6. Observations

Be sure of what is real and what is vapor. In this case, HDS was selling more than they had. Make sure that when a vendor promises a capability that it does, in fact, exist.

- They had applications in place to show input/output screen, but little else behind the screens.
- They could not backup the data base while it was in use.

Conclusions and Recommendations

Conclusions and Recommendations

A

User Needs and Vendor Responses

As the three tiers of computing (corporate, departmental, personal) emerge there is a strong need to address both the unique needs of each tier and the needs that cut across the three tiers. Users are interested in integrating their computing infrastructure to realize the benefits of their investments. Vendors must have product/services and strategies to address both sets of requirements.

Information processing and quality must replace data processing and quantity. To do this, applications will need to incorporate knowledge with the information and vendors will need to become data/information/knowledge architects, not just application builders. In other words, vendors must move from being products and services providers to being productivity consultants.

Viewed in the context of the typical multi-vendor environment of the SI buyer, both of these notions suggest that it is not sufficient for vendors to be product-oriented in their SI offerings. Rather they must be service-oriented, selling their interest in and ability to help the client optimize the solution through a well-planned and well-executed project. In short, to realize the opportunities of SI, vendors must develop strategies that lead to "win-win" scenarios.

From the implementations studied by INPUT, there appears to be several specific discrepancies between user needs and vendor responses:

- While users believe they need unique solutions, vendors offer customized packages.

- While users seek credible assurances that a project is doable (i.e., will be completed on time and within budget) by the vendor, the references, staff experiences, and project management tools and methodologies are either not present or not displayed adequately.

- While users seek alliances with vendors that ensure that the proposed solution will not lead to another inflexible, closed-ended, short-lived answer, vendors frequently appear to be unwilling or unable to address the migration from this proposed solution to the next generation of technology.

B

Early User Implementation

As depicted in Exhibit VI-1, the users selection of an SI approach to a problem hinges on the belief that this process will result in the "proper" execution of a project development effort. Users have typically been unable to complete a project successfully. They believe that if they can find a vendor who can truly "put all the pieces together," they will finally reach that goal. The belief in the possibilities of SI is frequently fueled by a consultant who recommends the approach to the buyer.

EXHIBIT VI-1

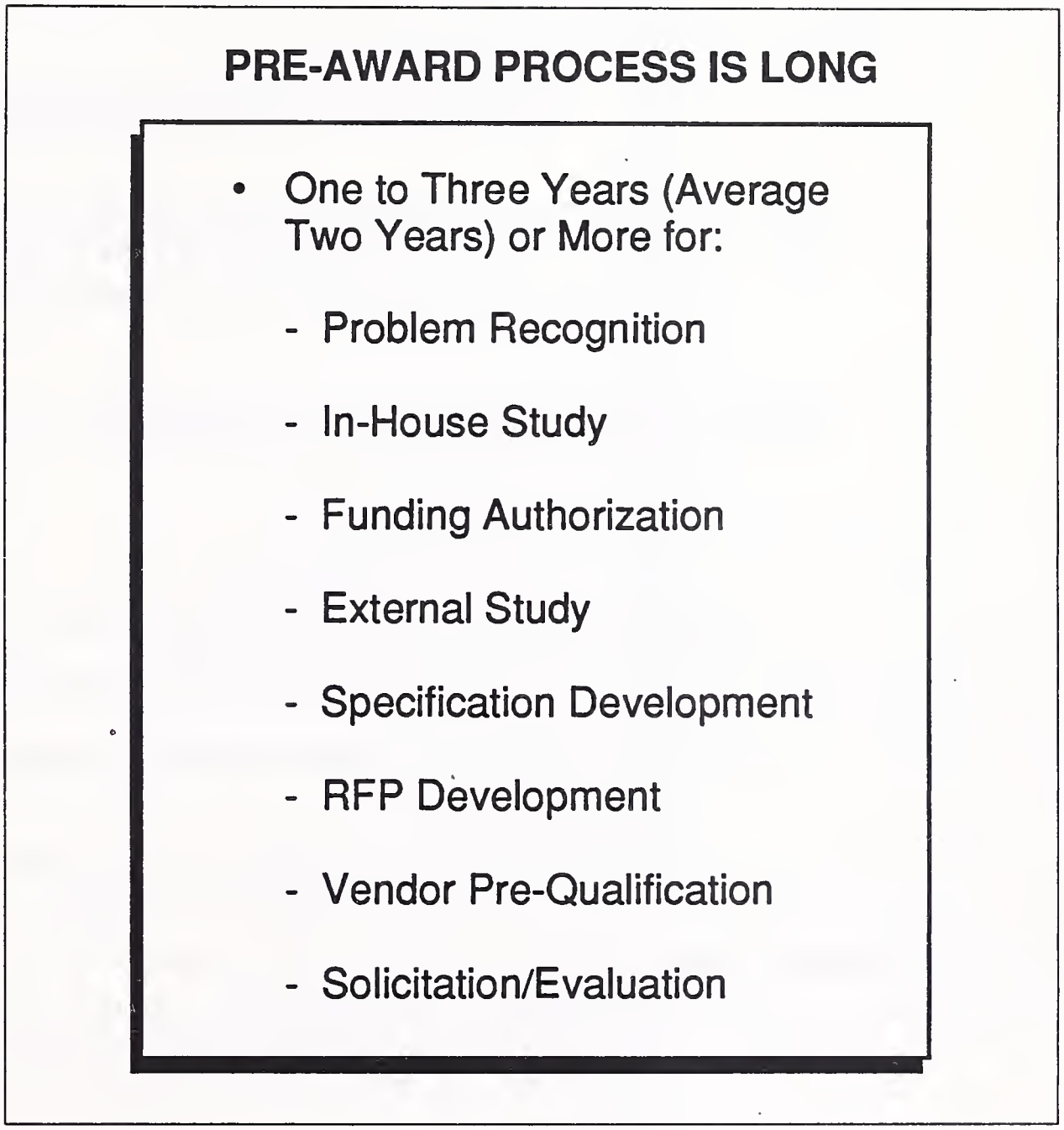
SI IS ATTRACTIVE TO USERS WHEN . . .

- Expertise is Limited or Experiences Bad
- Single-Source Solution is Preferred
- Vendor "Partners" are Desired
- Solution is Not Preconceived
- Consultant Recommends It

The pre-award process (see Exhibit VI-2) tends to be long, averaging nearly two years and ranging from one to three years or more. And, while many of the technical specifics of the project may not have been spelled out before an RFP is released, the buyer is well on the way to narrowing the field of vendors whom he/she believes can do the job. General distribution of RFPs may not occur and, if they do, may only be

an attempt to meet the requirement of an "open" bid or provide assurances to the buyer that they have, in fact, done their vendor pre-qualification homework.

EXHIBIT VI-2



- For vendors, this suggests that they must get in early, assess the prospective opportunity carefully, and, if the project appears to be attractive according to a well-defined set of business criteria, commit the investment required to pursue the opportunity well in advance of the award date (see Exhibit VI-3).

When a proposal is finally solicited, it must be responsive to both the implicit and explicit specifications and to the buyer's need for strong assurances that the vendor can and will complete the project successfully (see Exhibit VI-4).

EXHIBIT VI-3

PRE-RFP WORK IS REQUIRED

- Get in Early on . . .
  - Consultant/Company Relationship Building
  - Understanding of Culture, Requirements
  - Pre-Qualification Demonstration
- Assess Project Carefully
  - Is It "Real"?
  - Can It Be Done?
  - Will It Be Worth the Investment?
  - Is This Our Kind of Business?

- In addition to meeting the basic terms and conditions requirements necessary to have the proposal further considered, the proposal must demonstrate a thorough understanding of the user's technical and cultural environment and the constraints and opportunities that they imply.

- Then, the proposal must be sensitive and responsive to the buyer's concerns that the process that the vendor proposes to follow will not lead to a better result than the buyer has experienced in the past. That is, the proposal and the selling process that surrounds it must convince the buyer that the vendor can, and will successfully complete the project in an exemplary fashion.

EXHIBIT VI-4

BID MUST BE RESPONSIVE TO . . .

- Basic, Required Terms and Conditions
- Implicit and Explicit Specifications (Meet Needs, Don't Sell Products)
- Concern for Financial Strength (Small Vendors Need Brokers)
- Desire for Well-Defined Change Control Process
- Need for Assurances of Dedicated Resources
- Positive Feeling for "Freebees"

C

Vendor Implementaion Issues and Recommendations

While the goals and objectives of a CSI capability may be clear, the implementation of the capability is not. Vendors who are starting a business and, to a lesser extent, vendors who are expanding their capabilities face serious challenges to their growth and margin expectations. Several of these issues are discussed in detail below.

1. Risk Aversion

The overriding concern, of course, is avoidance of as much risk as possible and containment and management of risks that cannot be avoided. Central to this issue is the guarantee of solutions required in CSI. This

requires financial investment as well as corporate commitment and neither is easy to develop, especially when CSI is a start-up business (see Exhibit VI-5).

EXHIBIT VI-5

The CSI investment requirements may be in the form of development facilities and tools; personnel to be hired, trained, and managed; or financing required to sell, bid, fund development of the solution, and finance projects. Access to investment capital is a must.

Not only must there be a corporate commitment to the investment, there must be a commitment to the "style" of the business.

- First, each CSI customer has unique needs and requirements that make a "cookie cutter" business approach difficult. Deal-making is a part of

the business that some corporate managers may find distasteful. The SI group needs to be vested with a considerable amount of authority. SI projects demand rapid — and risky — decisions. If SI management gets bogged down in making decisions because of a cumbersome management process, the SI business will suffer. The measurement and control mechanisms of the SI organization, from top management to sales to implementers, should be carefully evaluated to ensure that these mechanisms are in line with the requirements of a profitable SI business.

- Since the personnel requirements of each CSI project may be unique and since it is unreasonable to think that a vendor could dedicate all of the expertise that may be required to the business, there is a finely tuned method for sharing corporate personnel resources. In some organizations this may pose a problem, in that mechanisms for cooperation across offices have been replaced with local office accountability. Without corporate oversite, any sharing that does take place could be designed to benefit the provider office rather than the corporate CSI business objectives. In IBM, for example, the SI business could suffer if it is used only as a free service vehicle for selling hardware.

- Style also includes the development of corporate-wide standards that ensure a consistent approach to selling, bidding, and fulfilling CSI. Solid standards, enforced at the highest levels, ensure that local offices contribute to, rather than being in competition with, the corporate thrust.

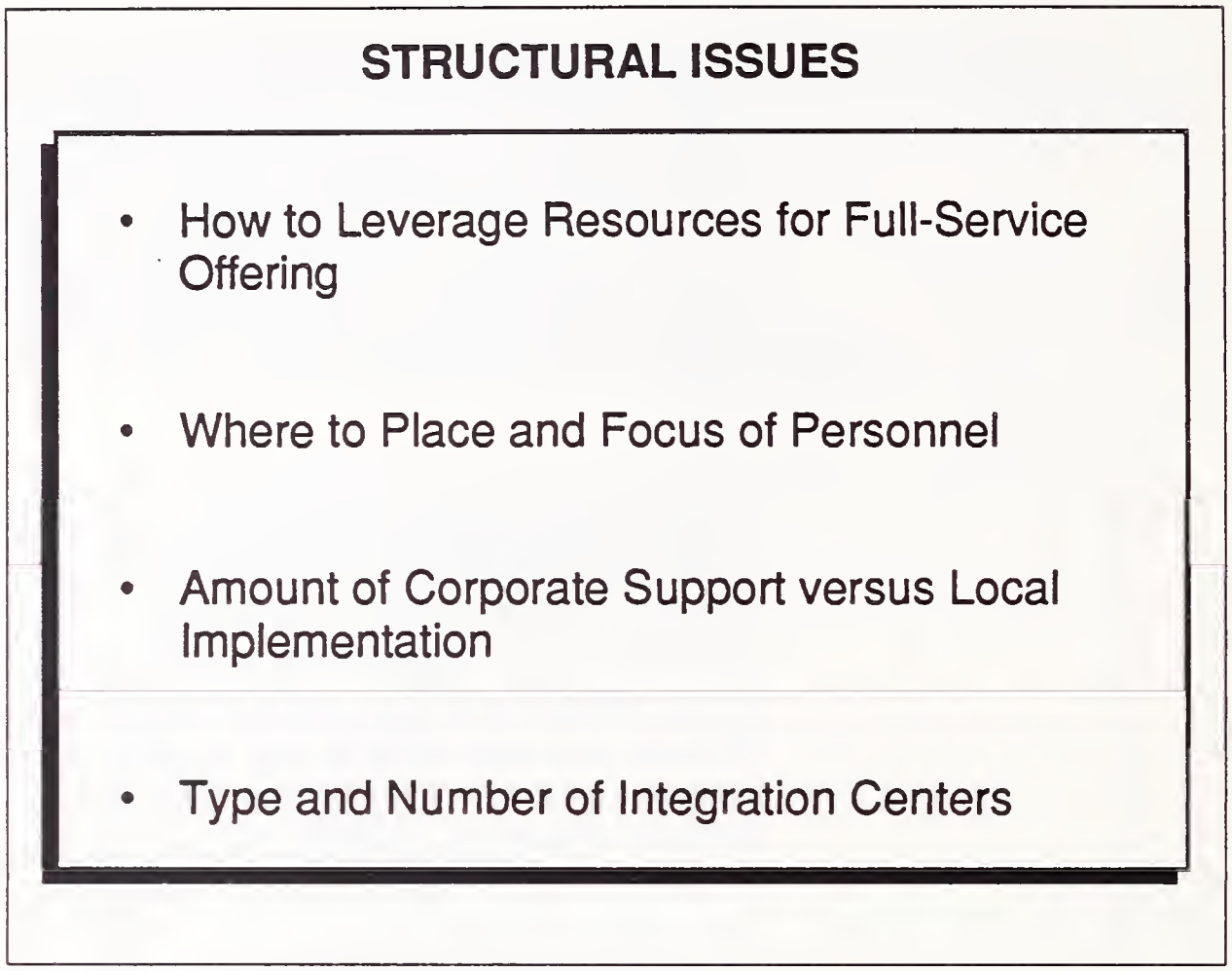
- One of these standards relates to alliance development. While the local office is the most likely group to build a third-party alliance for the completion of a particular office, that alliance should be extended to all CSI offices. IBM, for example, has instituted a practice that makes the terms of any alliance negotiated at the local office level applicable to all IBM offices that require a similar alliance with that vendor.

2. Structure and Administration

SI vendors should design, build, and offer a "full service" capability as defined by the target markets. This does not mean that they must have all the capabilities in-house. Rather, they must be able to supply capabilities as required. Relationships with potential suppliers need to be established long before they are needed (see Exhibit VI-6).

Given the diverse strengths of the larger vendors in the market, it seems prudent to establish this full service through a core group of SI managers with access to this strength throughout the corporation on an ad hoc basis. The core group should have capabilities in the vertical and applications targets, but need not include "one of every kind" of expertise you have available. A mechanism to access this enormous capabilities could

EXHIBIT VI-6



provide a competitive advantage over other large vendors in multiple lines of business. This requires a corporate commitment to SI and changes in management control mechanisms if the vendor is not currently able to tap this vast expertise.

Organizationally, some vendors have organized by vertical market to emphasize selectivity and focus. These vertically-oriented groups provide "hit teams" to attach specific jobs. Other vendors have tried to grow full capabilities at the local office level to emphasize geographic coverage.

There are very practical matters to be addressed here. On the one hand, it is unreasonable to think that each office could have the full complement of capabilities required to perform the specific tasks of an assignment. On the other hand, holding those capabilities at locations other than the job site involves a considerable amount of logistics to get the right people to the right place at the right time.

Perhaps the best strategy is a combination of both approaches. In this organization each function can be performed at the local or regional level with considerable backup at the central level. To ensure that roles are supportive rather than duplicative, there needs to be a clear delineation of responsibilities between office. The functions to be performed at each level might include: strategic planning, sales/marketing support, investment management, contract administration, staff management, third-party relationship development and administration, project management, and

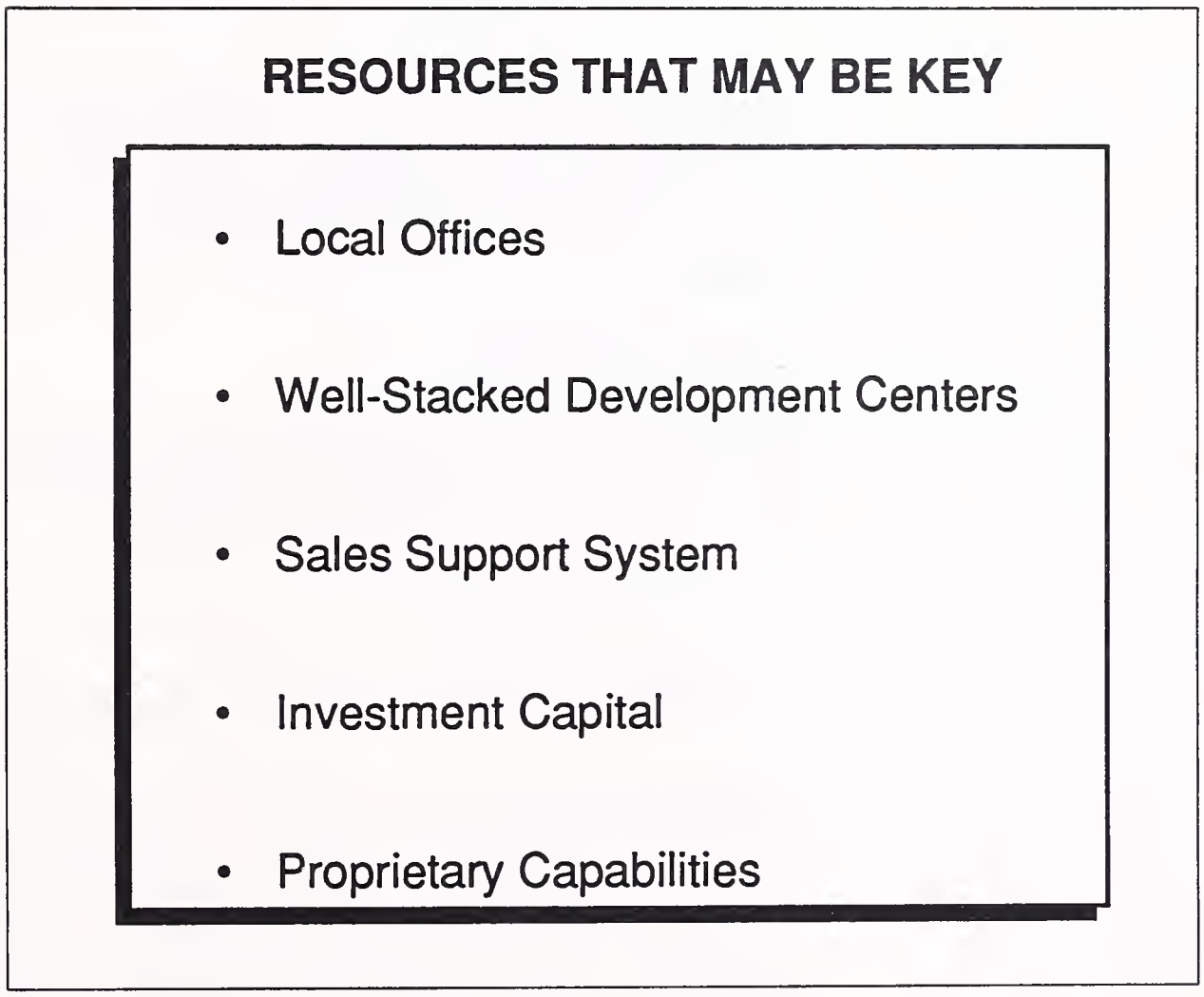
whatever specific skills and expertise are required for the industry/application targets (e.g., process design, technology architecture planning, systems development, engineering consulting, in-house hardware/software supply, facilities management, etc.).

At the very least, THE VENDOR needs to develop a network of development and integration centers. EDS, for example, believes the international arena can be successful for them. They have established their methodology in several countries and are using well-trained locals to provide U.S.-caliber work at local rate.

3. Resources

In addition to the support structure assumed in the above paragraphs, there are specific resources that vendors may need to make available to the SI organization. Some of these are discussed below (see Exhibit VI-7).

EXHIBIT VI-7



Each SI project team needs to be close to the location of the effort. This may require offices around the world or, given an in-place global presence, a video conferencing network that makes the buyer feel the vendor team is "just down the hall." If the vendor can offer this capability and sell it to the buyer, the company will avoid the tremendous expense of offices and travel. This could be a key competitive advantage.

In addition to office space, the SI group needs access to a well-stocked development center for their development work. This information center should have the vendor's products as well as products from other vendors and should include applications generators, fourth-generation languages, computer-assisted systems engineering products, and project management tools. A national or international network could be the repository of this resource. EDS, for example, has eighteen centers with 3,500 MIPS and a network currently carrying thirty million transactions per day to 500,000 terminals.

A sales support system resource provides market and competitive intelligence, bid preparation, market planning, risk assessment, standard estimating and pricing guidelines, and the like.

The SI group will also need access to capital for bid preparation, project start-up costs, and on-going operations. SI does not appear to be a venture that survives under a "fund your own growth" notion. In addition to capital resources, the SI group must have a financing unit that can quickly arrange financing, conduct financial assessments, and arrange risk coverage insurance.

The SI group should have some proprietary capabilities in terms of technology or methodology. This will be both an important sales tool and a means of distinguishing one vendor from another SI vendors. In addition to any list of current proprietary products, a vendor needs to develop credible methodologies for project management and software development.

4. Marketing/Sales

INPUT believes that selling the SI capability involves a special type of sales effort. It is important to be humble with buyers. The CSI sales approach should make two clear statements:

- "We know what we do and we know we do it very well."
- "We also know what we don't do very well but, we know who does and, further, they will be on our team for this project."

Considering that buyers are unwilling to turn over their IS shops to outsiders, it is important to stress the desire to partner with the buyer. Among other things, this means a willingness to work with, even for, the buyer. Develop strategies that will incorporate their personnel as a part of the team. And, be prepared to assume the risks of their errors, even though you will have little control over these resources. In essence, the CSI sales approach should further state:

- "We realize that you (the buyer) have unique needs and that "packaged" products and services may not provide the fit you desire."

- "Rather than having a "one-size-fits-all" mentality, we want to work with you; focusing first on the problem and then designing and implementing the best solution."

Buyers have had bad experiences with dead end architectures and are particularly frustrated that vendors sell them something knowing full well that they (the vendor) will be changing the architecture very soon. As a part of this notion of partnering with the buyer, you must be willing to tell them what is on the drawing board.

Marketing/sales personnel should be prepared to educate top management regarding the benefits of SI. This requires business skills, not technical skills. And marketing/sales personnel should have access to the top levels of the organization. The most lucrative SI decisions are made by chief executives, not operations managers.

Appendix: Definitions

Appendix: Definitions

A

Service Modes

1. PROCESSING SERVICES

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

REMOTE COMPUTING SERVICES (RCS) - Provision of data processing to a user by means of terminals at the user's site(s). Terminals are connected by a data communications network to the vendor's central computer. The most frequent contract vehicle for RCS in the federal government is GSA's Teleprocessing Services Program (TSP). RCS includes five submodes.

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

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

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

- USER SITE HARDWARE SERVICES (USHS) - These offerings provided by RCS vendors place programmable hardware at the user's site rather than the vendor's data center. Some vendors in the federal government market provide this service under the label of distributed data services. USHS offers:

- Access to a communications network.
- Access through the network to the RCS vendor's larger computers.
- Local management and storage of a data base subset that will service local terminal users via the connection of a data base processor to the network.
- Significant software as part of the service.

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

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

2. PROFESSIONAL SERVICES

Professional services include consulting, education and training, programming and analysis, some facilities management, and systems integration as defined below.

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

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

PROGRAMMING AND ANALYSIS - Also known as software development services, includes system design, contract or custom programming,

code conversion, independent verification and validation (IV&V), and benchmarking. These services may also include follow-on and software maintenance.

PROFESSIONAL SERVICES FACILITIES MANAGEMENT (PSFM) - Also referred to as GOCO (government-owned, contractor-operated). The computing equipment is owned or leased by the government, not by the vendor. The vendor provides the staff to operate, maintain, and manage the government's facility. Submodes include:

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

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

SYSTEMS INTEGRATION - Services associated with systems design and integration, and installation and government acceptance of ADP/ telecommunications systems may be provided with related engineering activities such as systems engineering and integration (SE&I) or systems engineering and technical assistance (SETA).

3. INTEGRATED SYSTEMS

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

4. SOFTWARE PRODUCTS

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

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

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

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

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

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

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

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

5. HARDWARE AND HARDWARE SYSTEMS

Hardware includes all ADP and telecommunications equipment that can be separately acquired by the government with or without installation by the vendor and not acquired as part of an integrated system. For the purpose of this report, hardware is grouped in three major categories: peripherals, terminals, and hardware systems (processors).

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

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

- OUTPUT DEVICES - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters.

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

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

- USER-PROGRAMMABLE - Also called intelligent terminals, including:
  - Single-station or stand alone.
  - Multi-station shared processor.
  - Teleprinter.
  - Remote batch.
- NON-PROGRAMMABLE - Also called "dumb" terminals, including:
  - Single-station.
  - Multi-station shared processor.
  - Teleprinter.
- LIMITED FUNCTION - Originally developed for specific needs, such as point-of-sale (POS), inventory data collection, controlled access, and other applications.

HARDWARE SYSTEMS - Includes all processors from microcomputers to supercomputers. Hardware systems may require type- or model-unique operating software to be functional, but this category excludes

applications software and peripheral devices, other than main memory and processors or CPUs not provided as part of an integrated (turnkey) system.

- MICROCOMPUTER - Combines all of the CPU, memory, and peripheral functions of an 8- or 16-bit computer on a chip in the form of:
  - Integrated circuit package.
  - Plug-in board with more memory and peripheral circuits.
  - Console including keyboard and interfacing connectors.
  - Personal computer with at least one external storage device directly addressable by the CPU.
  - An embedded computer which may take a number of shapes or configurations.
- MINICOMPUTER - Usually a 12-, 16- or 32-bit computer which may be provided with limited applications software and support and may represent a portion of a complete large system.
  - Personal business computer.
  - Small laboratory computer.
  - Nodal computer in a distributed data net- work, remote data collection network, or connected network, or connected to remote microcomputers.
- MIDICOMPUTER - Typically a 32- or 64-bit computer with extensive applications software and a number of peripherals in stand alone or multiple-CPU configurations for business (administrative, personnel, and logistics) applications; also called a general-purpose computer.
- LARGE COMPUTER - Presently centered around storage controllers but likely to become bus-oriented and to consist of multiple processors or parallel processors. Intended for structured mathematical and signal processing and typically used with general-purpose, von-Neumann-type processors for system control.
- SUPERCOMPUTER - High-powered processors with numerical processing throughout that is significantly greater than the fastest general-purpose computers, with capacities in the 10-50 million floating point operations per second (MFLOPS) range. Newer supercomputers, with burst modes approaching 300 MFLOPS, main storage size

up to 10 million words, and on-line storage in the one-to-three gigabyte class, are labeled Class IV to Class VI in agency long-range plans. Supercomputers fit in one of two categories.

- REAL TIME - Generally used for signal processing in military applications.

- NON-REAL TIME - For scientific use in one of three configurations:

  Parallel processors.

  Pipeline processor.

  Vector processor.

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

6. TELECOMMUNICATIONS

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

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

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

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

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

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

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

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

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

  Multiple channels through FDM or TDM.

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

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

• MODE - may be either:

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

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

- MEDIA - May be any of the following:

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

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

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

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

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

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

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

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

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

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

BENCHMARK - Method of testing proposed ADP system solutions for a specified set of functions (applications) employing simulated or real data inputs under simulated operating conditions.

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

CENTRAL PROCESSING UNIT (CPU) - The arithmetic and control portion of a computer; i.e., the circuits controlling the interpretation and execution of computer instructions.

COMPUTER-INTEGRATED MANUFACTURING (CIM) - Integration of separately automated factory functions. These functions include MRP II, CAD/CAM, DSS, process control, ATE, and robotics. CIM is a philosophy of operations requiring management commitment.

DECNET - Digital Equipment Company's network architecture.

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

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

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

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

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

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

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

FULL-DUPLEX - Bi-directional communications with simultaneous two-way transmission.

GENERAL-PURPOSE COMPUTER SYSTEM - A computer designed to handle a wide variety of problems. Includes machine room peripherals, systems software, and small business systems.

HALF-DUPLEX - Bi-directional communications, but only in one direction at a time.

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

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

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

INDEPENDENT SUPPLIERS - Suppliers of machine room peripherals—usually do not supply general-purpose computer systems.

INFORMATION PROCESSING - Data processing as a whole, including use of business and scientific computers.

INTEROPERABILITY - The capability to operate with other devices on a network. To be contrasted with interconnection which merely guarantees a physical network interface.

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

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

MACHINE ROOM PERIPHERALS - Peripheral equipment that is generally located close to the central processing unit.

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

MEAN TIME TO REPAIR - The mean of elapsed times from the arrival of the field engineer on the user's site until the device is repaired and returned to user service.

MEAN TIME TO RESPOND - The mean of elapsed times from the user call for service and the arrival of the field engineer on the user's site.

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

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

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

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

ON-LINE - Pertaining to equipment or devices under direct control of the central processing unit.

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

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

PBX - Private Branch Exchange—hardware which provides local circuit switching on the customer premise.

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

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

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

PRIVATE NETWORK - A network established and operated for one user or user organization.

PROGRAMMERS - Persons mainly involved in designing, writing, and testing of computer software programs.

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

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

SCIENTIFIC COMPUTER SYSTEM - A computer system designed to process structured mathematics, such as Fast Fourier Transforms, and complex, highly redundant information, such as seismic data, sonar data, and radar, with large on-line memories and very high capacity throughout.

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

SERVICE DELIVERY POINT - The location of the physical interface between a network and customer/user equipment.

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

SOFTWARE - Computer programs.

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

SWITCHED CIRCUIT - Temporary connection between two network stations established through dial-up procedures.

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

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

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

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

TI - Bell System designation for 1.544 mbps carrier capable of handling 24 CM voice channels.

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

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

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

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

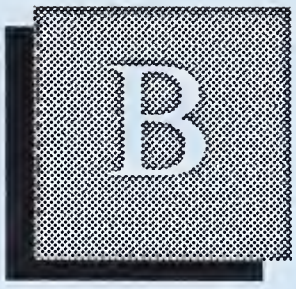
TWISTED-PAIR CABLE - Communications cabling consisting of pairs of single-strand metallic electrical conductors, such as copper wires, typically used in building telephone wiring and some LANs.

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.

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

VOICE-GRADE - Circuit or signal in the 300-3300 Hz bandwidth typical of the public telephone system; nominally a 4 KHz circuit.

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



Appendix: Questionnaire

Appendix: Questionnaire

A

User Questionnaire

Systems Integration – User Case Studies

Good Morning (afternoon). This is _____ calling from INPUT, an international research and consulting firm in the information services industry.

We are currently conducting a study of the use of systems integration by large organizations. We understand that your organization is currently engaged in a major project involving the development of _____. We are anxious to understand more about this project.

The results of the study will be provided to information services vendors. Our objective in conducting this study is to provide information on users' needs and requirements for contracted professional services. We believe that if vendors have a better understanding of what services users want and the constraints users have in contracting with vendors, vendors will be better able to establish meaningful, efficient relationships with their clients.

In return for sharing your insights, we will send you an executive summary of the study when it is completed. The information you provide will be used to provide an actual case example of your approach the a major information systems solution.

What I would like to do is ask you some general questions about this project. May we begin?

1. First, I'd like to get a better understanding of this project. Would you please tell me what functions the new system(s) will perform. (Try to get a complete picture of the system(s), how systems will be tied to gether, etc.)

2. How are these functions currently being performed? (Hardware? Software? Communications?)

3. What are the major problems with the current system(s)? (Speed? Volume? Inflexibility? etc.)

4. What benefits, financial, time savings, productivity, etc. do you believe justify the investment you will be making to develop this new system? (Try to quantify savings)

5. Now, I'd like to step through the major milestones you passed form the time your organization decided the old system was a problem until the first contract was awarded.

   a. Who decided that the old system should be changed? When was that?

   b. What was the first step taken toward a solution? (Hired a consultant? Formed atask force? etc.) What was the result of this action?

   c. What happened next? Who was responsible for it? What was the result?

   Repeat c until the major milestones have been covered. Get vendor names, expenditures, timeframes, tasks, etc.)

   d. Regarding the RFP, who developed it? Did it include functional or technical specifications? How was it advertised? Did you hold a bidder's conference? In general terms, what requirements were included?

6. How many vendors responded to the RFP? Can you tell me thenames of some of the responding vendors?

7. Regarding the bid evaluation, who evaluated the bids? What criteria were used? (get weightings, if possible) Were references required?

8. Who won the award?

a. How much money was awarded? On what specific products/ services will the money be spent? (Go over the list of components)

b. What type of contract? What is the duration of the contract?

c. What were the considerations that tipped the scales to the winner?

9. What specific tasks will the vendor(s) perform?

10. What other vendors will be involved? What components of the solution will each supply?

11. How is this project being managed internally?

a. Who is in charge of the project?

b. What reporting requirements does the winning vendor have?

12. What is the current status of the project?

a. What has been done so for?

b. What remains to be done?

c. What problems, if any have been encountered?

13. Looking back, how would you evaluate the approach you have taken? What have you done well? What might you have done better?

14. How would you evaluate the vendor's handling of the project so far?

15. What advice would you offer other companies looking at similar problems? Similar approaches?

B

Vendor Interview Protocol

- Identifying Information
- Introduction
  - Purpose of the study
  - Definition of SI
- Qualifying Information
  - Are you currently participating in the CSI market?
    - Have you had/do you have SI contracts?
      - In what industries/Applications?
      - As an integrator, prime contractor or subcontractor?
        - With whom?
        - For What?
    - What is your current/planned SI revenue?
      - Revenue Total?
      - Major Components?
        - Hardware, Software, Services, Mark-ups
      - SI Forecast?
        - Revenue?
        - Growth (%)?
        - Growth factors?
- Descriptive Information
  - General Company Information
    - Company ID
      - Name, Address, Telephone
    - Key Officials
      - Name, Title, Responsibilities
    - Organization
      - Chart (1st & 2nd tiers)
      - Employee Count
        - Company Total
        - Information Services (by mode)
          - Development
          - Sales/Marketing
          - Administrative
    - Revenue
      - Latest Year
      - Previous Year
      - Revenue Source(s)
        - Captive/Non-Captive
        - U.S./International
        - Information Services
          - Service Modes & Sub-Modes
          - Industry Sector(s)

- Key Company Events
  - New Products/Services
  - Organizational Changes
    - Acquisitions, Key Positions, etc.
- Systems Integration Activities
  - Organization
    - Chart
    - Key Employees
      - Name, Title, Responsibilities
    - Employee Count
      - Development
      - Sales/Marketing
      - Administrative
- Previous/current/planned client information
  - With whom have you contracted?
  - For what products/services
  - What was the dollar volume involved?
- Key Events
  - Organization Changes
  - Products/Services
- Strategies
  - Organization
  - Targets
    - Industries/Applications
  - Sales/Marketing Efforts
  - Distribution Agreements
  - Risk Containment Procedures
    - Project Management
    - Insurance
  - Key Capabilities ("Features")
- Products/Services Offered (see USER list
  - What are typical margins on these products/services?
- Previous/current/planned teams, partners?
  - With whom?
  - For what?
- What do you believe are your bases of competition?
  - Vendor Capabilities?
    - Type of Vendor?
      - Manufacturer?
      - System-House?
      - Professional Services?
      - Other?

- Experience?
  - Application?
  - Industry
  - General Staff Expertise?
  - Previous User Experience?
- Vendor Reputation?
  - Support?
  - Quality of Work?
  - General Responsiveness?
  - Delivery Schedules?
  - Cost?
  - Project Management?