Making Government Work Better

Second in an Occasional Series

Information Technology:

An Important Tool For a More Effective Government

Computers, widespread and often taken for granted, represent a mixed blessing—while they offer the potential for improving government services in an era of limited resources, they have proven to be very costly to some departments as the result of deficiencies in the state's management of information technology.

This is the second in an occasional series of papers discussing opportunities to make California government work better.

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June 16, 1994

Background

Information technology (IT) is a key component of the state's operational infrastructure. Each year in order to carry out its programs, the state spends over $1 billion on IT—$1 out of every $23 spent on state operations. Without it, many state activities would be cost prohibitive or unable to serve California's growing population.

Given the amount of money involved and the importance of IT to governmental operations, it is critical that the state's IT efforts be cost-effective and that departments have the tools to use IT well. This policy brief reviews the state's IT infrastructure and presents our findings and recommendations.

Findings

While there have been many significant advances in the state's deployment and uses of IT since the state's first computer was installed in the mid-1950s, there remain fundamental problems that prevent the state from realizing a better return on its IT investment. When IT projects are in trouble they typically are experiencing major cost overruns, significant implementation delays, and solutions that do not work as effectively as planned. These problems reflect, in many instances, planning, coordination, and oversight failures that have persisted for some time.

Recommendations

The recommendations presented here generally call for the enactment of legislation or specific actions to be taken by the administration to address the problems identified. These recommendations generally fall in two broad categories: improving state oversight and coordination of IT projects, and enabling departments to use IT more effectively.

How Important Is Information Technology to State Government?

Since 1956, when the state's first computer was installed at the Department of Employment, the use of IT has grown to the extent that it is pervasive throughout state government, costing about $1.3 billion in 1994-95, including telecommunications. Since 1983-84, these expenditures have increased 158 percent as shown in Figure 1. This represents an average annual increase of 9.9 percent.

Without IT, many state operations would be cost-prohibitive or simply unable to meet current service demands.

Thus, it is appropriate to view IT as a key component of the state's operational infrastructure. In today's state government, computers perform a wide variety of functions including aiding in the design of highway systems, providing local law enforcement officers with criminal history record information, and providing citizens with local employment opportunities.

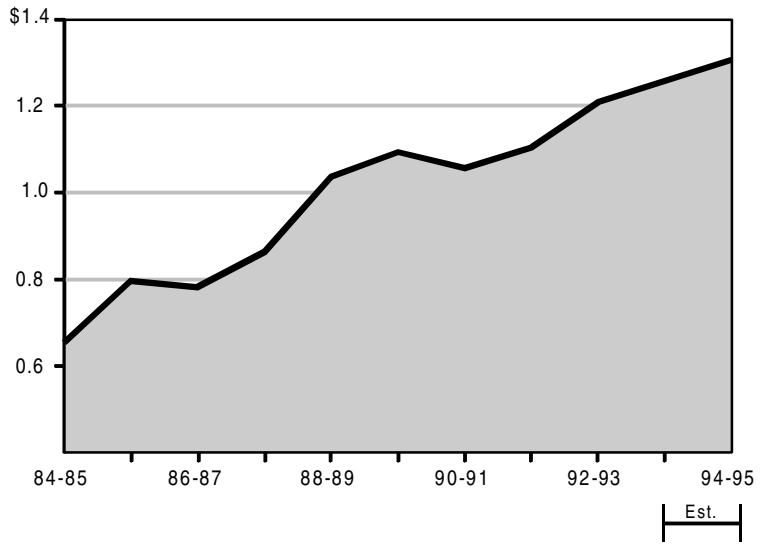
The importance of IT has been recognized by the Legislature, which has established in law both policies governing the state's uses of IT and the Office of Information Technology (OIT) as the organization responsible for overseeing the use of such technology in the state.

"Without IT, many state operations would be cost-prohibitive or simply unable to meet current service demands."

Figure 1

State Government Information Technology Expenditures Increasing Steadily

(In Billions)



WHAT IS THE STATE'S INFORMATION TECHNOLOGY ENVIRONMENT?

The state government computing environment is extensive with a very large inventory of tools and workers, as shown in Figure 2.

The OIT Has Overall Responsibility. Overall responsibility for the application of IT within the executive branch is vested with the OIT in the Department of Finance (DOF). Departments are required to apply IT consistently with extensive and detailed policies contained in the State Administrative Manual (SAM), with all their IT activities subject to the review and approval of the OIT. While the OIT has control over virtually all aspects of IT and some aspects of telecommunications (such as local area networks), the Department of General Services (DGS) has primary control over certain aspects of telecommunications (for example, communications lines and equipment).

Figure 2

Current State IT Environment Is Extensive

- ✔ Several mainframe computers and many departmental computers.
- ✔ Thousands of personal computers and computer terminals.
- ✔ Hundreds of technical staff.
- ✔ Thousands of non-technical "end-users."
- ✔ Numerous databases containing much of the state's information assets.
- ✔ A large number of separately-maintained communications networks, many of them linked statewide and to non-state networks.

Departmental Computing. The current computing environment in the executive branch is one marked by many departmental computing systems, some relying on personal computers (PCs), others relying on terminals linked to a mainframe computer, and some employing combinations of PCs networked to each other and to a departmental data center, which is in turn linked to a state or outside data center. Many permutations exist, and they are growing as the result of developments which have facilitated the networking of computers generally. In fact, the continued rampant growth in PCs has created an entirely new class of computer user, the "end-user," who does not work in a technical classification, but who has access to considerable computing power.

Data Centers. While several data centers exist within the executive branch, only two—the Stephen P. Teale Data Center (TDC) and the Health and Welfare Agency Data Center (HWDC)—are very large, general purpose centers serving multiple clients. The TDC provides services to over 200 state agencies, while the HWDC serves primarily the constituent departments and other units comprising the Health and Welfare Agency. Both data centers operate on a fully reimbursable basis through fees paid by client departments.

"The overall trend in state IT is toward expanding the number of end-users as access to PC-based systems continues to grow."

Technical Staff. The majority of technical staff employed to design, develop, and maintain computer-based applications are, for the most part, in departments using IT. While the data centers employ large staffs, they do not typically develop computer application programs other than for their own, internal needs.

Communications Networks. The many communication networks (typically, communications lines that hook together computers and users) in the executive branch allow state agencies to communicate electronically with each other, as well as to other governmental jurisdictions and the private sector. For example, the HWDC and the TDC maintain separate, extensive statewide networks. In addition, several departments maintain separate networks, with some maintaining more than one. The DGS has implemented CALNET, another statewide network service which the DGS hopes will be increasingly used by state agencies requiring network services. In addition to allowing departments to communicate electronically with each other, these networks also enable public access to government files, an increasing area of interest facilitated by the expansion of the Internet, which we discuss in a separate section.

Information Stored on Various Media. All of the infrastructure described above exists for the sole purpose of facilitating the collection, maintenance, security and dissemination of information. While much of the state's information continues to exist on paper or microfilm, an increasing amount is maintained in computer-based systems. Although a significant amount of this computer-based information is directly accessible by those connected to the particular system housing the information, there are relatively few systems that link information among departments. Consequently, the bulk of the state's "corporate" database is not easily accessible among state agencies.

Procurements. A separate law governs the acquisition of IT products and services because of the highly technical nature of these purchases. Because these procurements frequently result in high-value contracts, formal protests to proposed awards are not uncommon. The DGS, which has overall IT procurement authority, often delegates limited procurement authority to departments it determines to be qualified.

WHAT ARE THE TRENDS IN THE STATE GOVERNMENT'S INFORMATION TECHNOLOGY?

The overall trend in state IT is toward expanding the number of end-users as access to PC-based systems continues to grow. While the administration does not maintain records on the extent of this proliferation of PC systems, the number of PCs can be counted in the thousands. For example, since 1985-86, the California Computer Source, a private sector-managed store, operated under contract with the DGS, has sold state agencies $245 million worth of desktop computing equipment. Figure 3 shows the store's annual sales. This and other trends are summarized in Figure 4.

Figure 3

State Computer Store Sales Have Increased Sharply 1986-87 Through 1994-95

(In Millions)

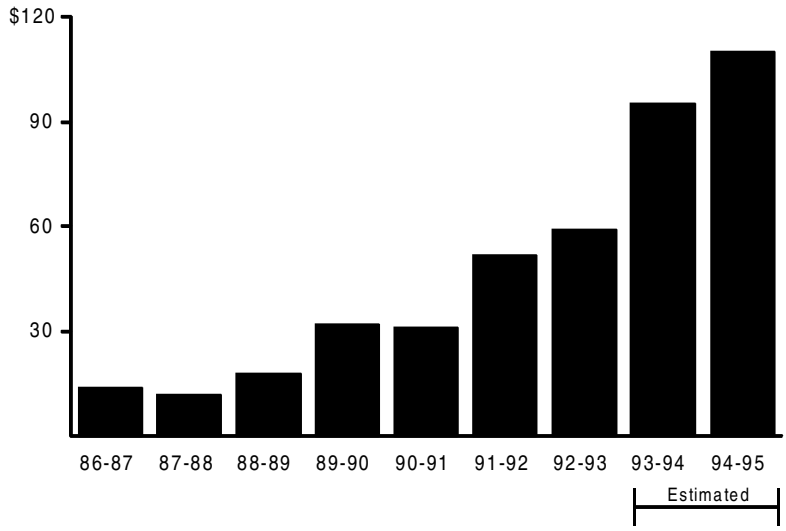


Figure 4

Current State Government Information Technology Trends

- **Continued growth** in the number of state workers using PCs or computer terminals.
- **Further consolidation** of mainframe computing by departments.
- **Public access** to state information maintained in computer-based systems.
- **A growing use** of geographic information systems which facilitate decision-making through the graphical representation of data.
- **Expanded communications** network linkages which increasingly tie state agencies together with each other and with local government and non-governmental entities.
- **Efforts to reduce** or eliminate paper work through the use of enhanced computer to computer linkages.

WHAT ARE THE PROBLEMS LIMITING THE STATE'S EFFECTIVE USES OF INFORMATION TECHNOLOGY?

". . . there remain fundamental problems which prevent the state from realizing a better return on its investment in IT."

While there have been many significant advances in the state's deployment and uses of IT since that first computer was installed in 1956, there remain fundamental problems which prevent the state from realizing a better return on its investment in IT. These problems also contribute to repeated failed efforts to develop computer-based systems on time, within cost, and which produce anticipated benefits. These problems are important not only because the state's annual investment is high, but because they represent delayed or missed opportunities for improving governmental services.

Problems are Not New. In both 1967 and 1973 we reported on the state's uses of computing technology and in each of those reports described problems which needed to be resolved in order for the state to be able to apply this technology in the most cost-effective manner. Subsequently, in April 1983 we published *The Utilization and Management of Information Processing Technology in California State Government*, in which we identified several specific problems which we believed were at that time inhibiting the state's appropriate and effective uses of IT. These problems reflect, in many instances, planning, coordination, and oversight problems cited in the 1967 and 1973 reports.

In our *Analysis of the 1994-95 Budget Bill*, we identify several examples of current problems departments have experienced in applying IT—the most noticeable being the DMV's failure to implement a new database system despite an expenditure of over $40 million. (Please see our analysis of the DMV, page A-54; the Department of Social Services, page C-113; the Department of Corrections, page D-55; the Board of Equalization, page H-71; and the Stephen P. Teale Data Center, page H-110.)

Problems Fall Into Four Primary Categories. The problems inhibiting the state from making the most effective uses of IT fall into four primary categories:

- Statewide leadership.
- Statewide oversight.
- Statewide coordination.
- Effective uses of IT.

Figure 5 (next page) summarizes these problems.

Governor's Executive Order Acknowledges Problems. On May 12, 1994, the Governor issued Executive Order W-88-94, establishing the Governor's Task Force on Government Technology Policy and Procurement. According to the executive order, the task force will, " . . . conduct a review of the state's information and technology procurement practices, and the manner in which the state plans for, manages and oversees the development of information systems." The task force, which will be comprised of individuals who have experience in technology and information system management and acquisition in private and non-profit organizations, is required to submit a progress report to the Governor not later

Figure 5

Major State Information Technology Problems

✔ Statewide leadership

- There is no centralized, effective leadership to chart and guide the state's course for its growing reliance on information technology.
- There is no statewide plan for information technology.
- Statewide standards do not exist in specific, key areas.

✔ Statewide oversight

- There is a redundancy of data maintained in separate computer systems.
- Costly database management systems proliferate and are replicated at various data centers.
- Non-compatible computing systems continue to proliferate.

✔ Statewide coordination

- There is no centralized, effective coordination of the state's many information technology activities.
- The proliferation of separately-maintained computer networks continues.
- There is inadequate coordination of the activities of major data centers.

✔ Effective uses of information technology

- Despite the expenditure of billions of dollars to implement information technology, neither the executive, judicial, or legislative branches of government can easily access the mountain of data stored in the state's computer files and convert it to useful information.
- Departments which are not sufficiently skilled in the uses of information technology are not provided adequate oversight, guidance or help in their efforts to apply information technology.
- There is an insufficient base of state technical staff, and contractual efforts to supplement this staff are inconsistent.

than August 15, 1994. At the time this report was prepared, we were unable to obtain from the administration details regarding the task force. Consequently, it is not known when appointments will be made and when the task force will be in a position to address the state's IT problems.

The Bottom Line: A Questionable Return on Investment. The net effect of these problems is an annual expenditure for IT which is *not* producing an optimum return on the state's investment. In many instances, it's not even producing a reasonably good return on the investment. As a result, funds which could be used to develop new applications are used instead to pay for duplication and costly implementations. The remainder of this report discusses these problems and offers potential solutions.

INFORMATION TECHNOLOGY LEADERSHIP

Role of the OIT—Missed Opportunities

As we indicated earlier, the OIT has overall responsibility for the application of IT in state government. When the OIT was established in 1983, the Legislature stated its intent that the office:

- Identify new applications for IT
- Improve productivity and service to clients
- Assist agencies in designing and implementing uses of IT
- Ensure the appropriate compatibility of systems and interchange of data and information
- Facilitate the attainment of such goals as the one-time collection of data, the minimum duplication of records, and the maximum availability of information at the lowest overall cost.
- Develop plans and policies for the uses of IT as a means of saving money, increasing worker productivity and improving services to the public.
- Approve proposed expenditures for IT projects only if published policies and procedures have been followed and met.
- Develop coordinated plans and polices regarding the data centers, IT personnel and office automation, including the use of personal computing and electronic mail.

"The state has not been effective in overseeing its implementation of PC systems, which have proliferated in the absence of an overall plan."

In our May 3, 1994 *Supplemental Analysis of the 1994-95 Budget Bill*, we concluded that the OIT has essentially failed to carry out the statutory mission established for it by the Legislature. Our findings are summarized in the appendix to this brief.

INFORMATION TECHNOLOGY OVERSIGHT AND COORDINATION

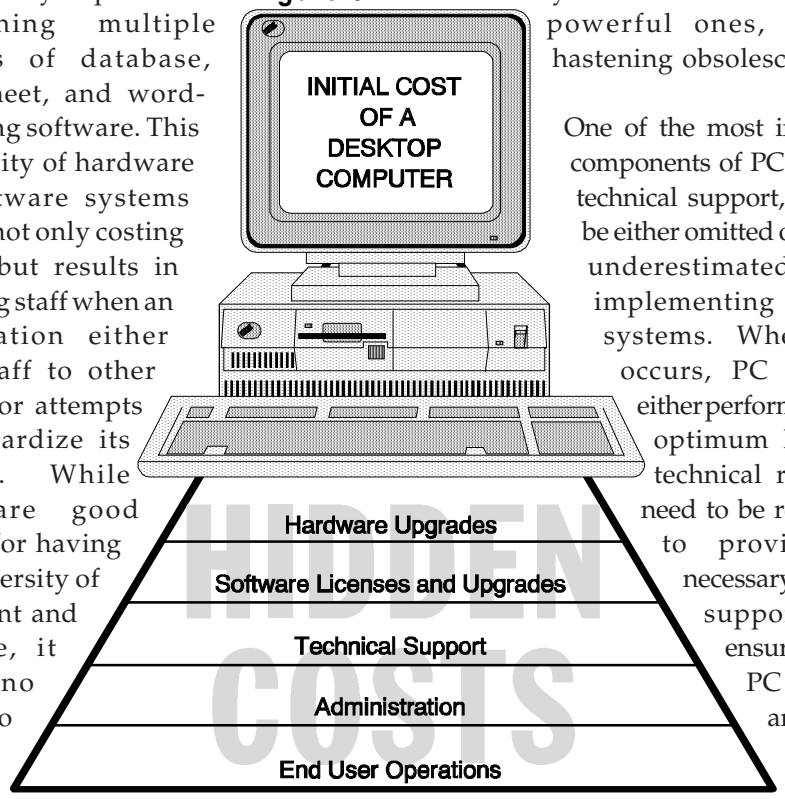
The rapid pace of significant developments in the IT industry offers an increasingly varied array of products and services to state agencies. While this array is frequently appealing, it presents a real challenge in terms of oversight and coordination of the state's IT activities. Addressing this challenge is necessary in order to ensure that the state's substantial investment in this technology provides an appropriate return on investment and builds an increasingly solid base for meeting the needs of state programs and their clients. In this section we discuss areas where we believe oversight and coordination need to be strengthened in order to ensure a good return on investment.

Personal Computers—Lack of an Integrated Approach

Proliferation of Personal Computer Systems. The state has not been effective in overseeing its implementation of PC systems, which have proliferated in the absence of an overall plan. Consequently, many incompatible systems have been installed over the years, often within the same organization. This has tended to inhibit state departments from developing an integrated approach to the management of information. Moreover, a lack of standards has

resulted in duplication, as evidenced by departments maintaining multiple versions of database, spreadsheet, and word-processing software. This multiplicity of hardware and software systems ends up not only costing money, but results in retraining staff when an organization either shifts staff to other systems or attempts to standardize its systems. While there are good reasons for having some diversity of equipment and software, it makes no sense to allow such diversity to be determined in the absence of an overall state plan which will ensure that diversity results in cost-effective computer systems.

Figure 6



Hidden Costs for PCs. Another problem associated with the proliferation of PC systems is that acquisition has often occurred on the basis of cost estimates which do not accurately reflect the actual cost of the systems when all relevant factors are considered. While PC systems may be acquired based on an estimated multi-year life cycle and to perform specific tasks, users frequently want to add hardware and software capability, and these costs are typically excluded from initial equipment justifications. Additional software acquired in response to user demand not only costs more initially, but much software has an annual license fee. Moreover, most users want to upgrade systems to faster and more powerful ones, thereby hastening obsolescence.

One of the most important components of PC systems, technical support, tends to be either omitted or grossly underestimated when implementing these systems. Where this occurs, PC systems either perform at a sub-optimum level, or technical resources need to be redirected to provide the necessary level of support to ensure that the PC systems are used in the most cost-effective manner. Either way, there is a cost to the state. When all the foregoing factors are considered, the assumed cost of a new PC system should be viewed as only a small part of the total, for there will typically be significant added costs. The magnitude of such hidden costs was explored recently by a national consulting group, which estimated that the five-year cost of a single PC, when all costs were considered, was a little over $40,000. Although the administration has developed policy regarding the justification and uses of PCs, it has not adequately overseen the implementation of its policies to ensure that PC systems are justified on the basis of complete cost analyses. Figure 6 illustrates the hidden cost of PCs.

Are Benefits Equivalent to Costs? According to the consultant study referenced above, while the cost of

"At present, there is no meaningful oversight of data center directions in a statewide context, as there is no statewide plan for the data centers."

hardware has dropped steadily, the costs to support and use these systems have increased dramatically. Given this context, it is reasonable to ask whether the state is receiving benefits equivalent to its multi-million dollar investment in PC systems. Unfortunately, the answer is not known. The administration does not track IT infrastructure investment, nor does it assess the return on investment or determine specific ways to reduce the cost of those aspects of desktop computing which can be made more efficient.

Cost of Ownership Can be Reduced. Experts believe the cost of PC systems ownership can be reduced by 45 percent or more through techniques such as (1) improvements in administrative management, (2) automating certain functions, such as the help desk and software distribution, and (3) upgrading software to make the systems easier to use. ***We therefore recommend that the Legislature direct the administration to determine specific methods for reducing the costs associated with PC systems, and to develop and implement a plan which will ensure that the recommended methods are followed by state agencies.***

Data Centers

In recent years the most significant growth in computing power has occurred at the departmental level as a result of the proliferation of PC-based systems. Despite this phenomenal growth, state data centers remain formidable and important components of the state's IT infrastructure. The data centers tend to attract some of the state's best IT talent, because their size and complexity tend to offer better promotional and career development opportunities for IT specialists than can be obtained in most state departments. Consequently, they represent valuable investments of equipment and personnel resources. At the same time, continued changes in IT maintain pressure on the data centers to constantly reduce operating costs and offer new services in order to remain competitive with departmental-based systems. This situation makes it imperative that data center activities be managed from a statewide perspective; however, such management has not been the rule.

Data Center Activities Should Be Coordinated. In addition to the two primary state data centers—the TDC and the HWDC—mainframe-based data centers are also maintained by the Franchise Tax Board, the Public Employees' Retirement System and the Department of Justice. At present, the only coordination which exists among these centers is whatever level they may choose. Consequently, there is a significant level of duplication in terms of hardware and software acquisitions, and the hiring and development of the highly skilled staff necessary to make the hardware and software perform effectively. In some instances, data centers will attempt to compete with one another by trying to develop a service that another developed first. While competition can produce benefits, in an era of dwindling resources it is not good business to allow data centers to act as totally independent entities.

Moreover, as most data centers are now linked electronically, they should be viewed at least in part as a statewide resource, and their activities should be coordinated in such a manner as to ensure the minimum expenditure of

resources to establish a necessary service. For example, the TDC should not be allowed to establish a computer-based kiosk type program if the HWDC has already invested state funds to develop such a program. Similarly, the HWDC need not have investigated establishing a Geographic Information System (GIS) service a few years ago, shortly after the TDC had expended significant effort and funds to establish a statewide GIS service. Competition can be healthy, but it should be conducted based on a statewide, coordinated perspective.

In Which Directions Should Data Centers Grow? In our recent analysis of the TDC, we point out that the data center has focused on mainframe computer growth, and we question whether such continued emphasis is in the state's long term interests. A review of national trends regarding the use of mainframe computers indicates that this technology is in a period of transition. While experts disagree as to precisely how this transition will play out, and predictions of the death of the mainframe have proved to be premature, there is general agreement that the role of mainframes is changing, and that the future is somewhat uncertain. Given the state's very heavy reliance on mainframe computers, especially at the state's two primary data centers— the HWDC and the TDC—it would be preferable to have some external review of data center growth plans, and an overall plan, to ensure that the directions they take are consistent with the state's long term interests. At present, there is no meaningful oversight of data center directions in a statewide context, as there is no statewide plan for the data centers. Therefore, ***we recommend enactment of legislation regarding the coordination of data center activities to specifically include a requirement that (1) data center activities are coordinated in a manner which will minimize the duplication of effort and expenditure of resources and (2) the administration develop a plan to ensure that major data center developments are consistent with the state's long-term interests in maximizing the usefulness of its information systems.***

Communications Issues

Too Many Independent Networks. The proliferation of separate departmental communications networks has been a long-standing issue in the state's uses of IT. When we first raised this issue in 1967, we were concerned about centralized coordination of networks proposed by individual departments. Now there is a situation where not only has the total number of independent networks increased, but a number of departments maintain or buy services from several networks (for example, the Department of Education and the TDC). While in some instances it may make sense to use more than one network, there is still no effective central coordination to minimize the growth in separate networks or contracts with network service providers. Nor is there any meaningful central plan to consolidate the many networks which have sprung up, in order to avoid costly duplication. While the state has invested heavily in CALNET, there is no aggressive program or incentives to get state agencies to move their data communications to CALNET. It makes no sense to invest heavily in a system with statewide capability and continue to invest in many separate systems at the same time, with no firm plan to consolidate these systems. On that basis,

we recommend that the Legislature direct the administration to develop a plan to reduce the number of separately maintained communications networks to eliminate duplication and achieve net savings.

Communications Management Itself Should Be Consolidated. Currently, the responsibility for oversight of IT and communications is split statutorily between the DOF and the DGS, respectively. While this distribution of authority was appropriate when IT and communications technologies were more separate, it should be re-examined in view of the continuing integration of these two technologies. The OIT has acknowledged that this is an issue, but has not taken effective action to resolve it. The increasing critical nature of telecommunications, and the merging of communications and information technologies, argue strongly for a consolidated state approach. For this reason, *we recommend the enactment of legislation to consolidate oversight of state telecommunications with the oversight of the state's information technology programs.*

"The increasing critical nature of telecommunications, and the merging of communications and information technologies, argue strongly for a consolidated state approach."

Electronic Mail (E-Mail)

E-Mail Systems Should be Linked. While many state agencies make extensive use of e-mail systems to improve communication and worker effectiveness, there has been no overall plan for such systems. Consequently, many agencies maintain separate systems, some of which are not able to communicate effectively with the larger body of e-mail users. Considering the power of e-mail to eliminate "telephone tag" and thereby speed the delivery of information, and that over 40,000 state employees are accessible through the most widely used e-mail system, it only makes sense to facilitate communication on a statewide basis, so that anyone with a desktop computer or terminal can communicate electronically with anyone else having an e-mail access. We believe that there is also merit to facilitating electronic communication with local agencies, some of which are already linked to state networks.

No Consistency in Individual E-Mail Address Codes and Addressing Schemes. Because state e-mail systems are currently maintained independently of one another, there is no consistency in the identification codes (that is, their electronic address) necessary to send someone e-mail. This frequently results in time-wasting efforts to determine someone's e-mail address. Inconsistencies in addressing schemes can make it extremely difficult to pass e-mail messages from one system to another. Moreover, these inconsistencies are not easily or inexpensively reconciled. To address the individual code problem, some entities, such as the HWDC , have established a consistent method for users of their system which enables someone outside of the HWDC to determine the proper code if they know how to spell the name of the person they wish to communicate with. Other organizations have no standards and their users have codes which are difficult to use even when they are known. We believe that there needs to be a uniform method for assigning e-mail addresses, and also a uniform and simple method for looking them up electronically when that is necessary (for example, when the name of the person might be known, but the code for the destination computer is not). There also needs to be an effort to resolve the problems associated with inconsistent addressing schemes, because the present situation prevents

the effective use of the state's e-mail network.

Better E-Mail Framework Needed. Finally, we believe that it is important for the state to plan now to replace the electronic mail system which is the primary e-mail system used by state workers. Replacement is important, because the current system is becoming increasingly obsolete when compared to modern e-mail systems. As such, it is not a good foundation on which to build a statewide e-mail capability to improve efficiency and resolve current problems impeding electronic communication.

In view of the problems identified above, ***we recommend the enactment of legislation to require the administration to develop a plan which will (1) allow the state's various electronic mail systems to be linked in a manner which will facilitate statewide electronic communication among all levels of government, (2) provide for uniformity in the individual codes assigned to persons using electronic mail and an effective method for looking up electronic-mail addresses, and (3) determine an electronic mail approach for the state which will provide for the replacement of the system currently in primary use.***

State Expertise Not Fully Utilized

A Helpful Forum Eliminated. In establishing the statutory authority regarding the management of IT, the Legislature authorized the creation of a committee of user departments to assist the OIT in fulfilling its leadership and coordinative responsibilities. This body, known as the California Forum on Information Technology (CFIT), met periodically and helped develop some meaningful programs to further the effective uses of IT. These programs included the establishment of the Data Processing Managers Training Academy to develop future high-level IT managers, and the Executive Institute where state program and IT managers could gather to exchange ideas and learn about developments and trends in the world of IT. In 1993, the CFIT was abandoned based on the DOF's determination that it was no longer needed.

New Body Meets but Has Yet to Deliver a Product. At about the time the fate of the CFIT was being determined, the Governor issued Executive Order W-37-92 establishing the Multi-Agency Information Management Authority (MAIMA), based on a recommendation from the Director of the OIT, to:

- Provide leadership for the identification, initiation and implementation of information management capabilities that are of a multi-agency scope.
- Assess the merits of potential multi-agency projects and initiate those that promise the greatest cost savings and operational efficiency.
- Identify resources to be contributed to multi-agency projects and assign responsibility for the successful completion of projects.
- Assign responsibility for implementing information systems established as the result of multi-agency projects.

The MAIMA, comprised of the undersecretaries of all cabinet level

agencies and the Chief Deputy Director of the Governor's Office of Planning and Research, was required by the Governor's Executive Order to report its assessment of the Executive Order, including recommendations, in October 1993. To date, however, the MAIMA has produced no report, and meetings have been infrequent.

"In retrospect, the administration's decision to eliminate the CFIT has not been beneficial, because no meaningful substitute capability was established in its place."

A Meaningful Advisory Group Needs to be Re-established. In retrospect, the administration's decision to eliminate the CFIT has not been beneficial, because no meaningful substitute capability was established in its place. Clearly, the state needs to improve its IT infrastructure, and a committee of state technology experts can provide valuable assistance in this regard. Consequently, to ensure that significant statewide IT problems are addressed ***we recommend that the administration establish an information technology advisory group to assist in the identification and resolution of significant problems inhibiting the state's cost-effective application of information technology. We recommend that this committee be comprised of representatives of various state agencies, with the chairperson selected by the committee.***

Enabling Departments to Use Information Technology Effectively

Departmental Problems In Implementing IT Projects

The extent to which the state receives a return on its $1 billion dollar plus annual investment in IT is related directly to the ability of state agencies to apply the technology in carrying out their programs. This ability varies widely among state agencies. At one extreme are those agencies possessing considerable IT expertise and resources for its application, and at the other extreme are those agencies which either lack IT expertise or resources, or both. While agencies with expertise and resources are generally in a better position to apply IT effectively, even they can experience problems.

The types of problems experienced by departments are not new. Figure 7 identifies the typical characteristics of troubled IT projects which have come to be well-known in both the private and public sectors.

Figure 7

Typical Characteristics of IT Projects in Trouble

- ✔ Major cost overruns.
- ✔ Significant implementation delays.
- ✔ Solutions which do not work as effectively as planned.

Based on our review, Figure 8 (next page) lists relatively recent and current projects which we have identified as experiencing one or more of the characteristics of projects which have had significant problems. The figure shows that the problems are found in a broad range of departments, both those with and without significant IT expertise.

Why Do Departments Have Problems Implementing IT Projects?

We believe there are several basic reasons why departments frequently experience

Figure 8

Projects Which Have Experienced Significant Problems

Department of Motor Vehicles

Database Redesign—$40 million spent and little to show.

Department of Corrections

Corrections Management Information System—Continued schedule slippage and cost increases ($101 million is the latest estimate of project cost).

Department of Social Services

Statewide Automated Welfare System—Cost increases, delay and reduced net benefits (project cost now estimated at $800 million, to be implemented over 12 years).

Department of Social Services

Child Welfare System—Three years behind schedule with implementation difficulties anticipated to result in a change in project scope and/or a significant cost increase.

Department of Social Services

Statewide Automated Child Support System—Cost increase (from $140.8 million to $152.2 million) and significant schedule slippage.

Student Aid Commission

Financial Aid Processing System—Cost increases and contract management problems.

Board of Equalization

Conversion to State Data Center—Cost increases and delays.

Department of Health Services

Vital Records Improvement Project—Implementation delays related in part to cost concerns.

Secretary of State

Imaging Technology—New system failed and was abandoned.

Department of Housing and Community Development

Mobile Home Registration and Titling—Repeated difficulties over several years in efforts to implement an effective system.

Department of Transportation

New Database Structure—Delays and difficulties implementing a new database structure for departmental applications.

difficulties in implementing computer-based systems, and that unless the approach to IT projects is changed, departments can expect to experience the same costly problems repeatedly. Projects fail to adhere to original cost and schedule estimates, or fail to perform as anticipated, due to a lack of one or more of the following:

"... unless the approach to IT projects is changed, departments can expect to experience the same costly problems repeatedly."

- Sufficiently experienced project managers
- An adequate base of skilled technical staff
- Qualified contract managers
- The ability to determine the most cost-effective and/or practical solution
- The ability to select qualified contractors.

Lack of Sufficiently Experienced Project Management Staff. Most of the IT projects listed in Figure 8 are fairly complex undertakings which require experienced project managers. Yet, we believe there is a general lack of state staff with demonstrated project management skills for *large, complex systems,* especially regarding the completion of major projects on time and within budget. This problem is made worse when a department is attempting to implement a major system, but does not have an adequate base of skilled technical staff to perform the systems analysis, design, coding and testing necessary before a new system can be put into production.

Limited Technical Capability. In some instances, neither the department proposing an IT project, nor the OIT staff reviewing the proposal, has sufficient technical ability to ensure that the selected implementation alternative is in fact the most feasible and cost-effective solution. This generally results from the fact that applying IT to meet state needs is sufficiently complex to make it difficult for state agencies to maintain a level of expertise which will tend to ensure a high degree of success. The long list of troubled and failed projects over the past 20 years offers mute testimony to this fact.

Lack of Skilled Contract Management. The inability of governmental agencies to properly manage contracts with the private sector is a universal problem. Where contract management is not adequate, cost overruns and schedule delays can be more frequent, with the state generally ending up paying more than it would have had an experienced contract management team been assigned the project. Although the SAM requires that contract managers be experienced, there is no teeth to this requirement, and the state has paid the price for this oversight. One method of alleviating this situation is to have less-skilled contract managers work with the more experienced contract managers on major projects.

Difficulties in Determining Cost-Effectiveness and the Practical Solution. Under current practice, an IT project is approved on the basis of a feasibility study report (FSR) which, while addressing the feasibility of alternatives, does not address the actual ability of the department to implement the project successfully. Moreover, FSRs do not necessarily result in the identification of the most feasible and cost-effective solution.

Difficulties in Selecting a Qualified Contractor. An additional significant

problem occurs when a department realizes that it does not have sufficient expertise to ensure the successful implementation of an IT project, but it is ill-equipped to select a qualified contractor to provide assistance. State records of actual contractor performance on state IT projects, both superior and deficient, are virtually nonexistent. That poor and exemplary performance are not documented and made available to all agencies makes it more difficult for a department to select a truly qualified contractor to perform its critical IT work.

How to Increase the Likelihood of Project Success

Figure 9 summarizes the methods we believe can help to increase the chances that the state will achieve a higher level of success in its efforts to apply IT.

Certify Departments. Departments should not be allowed to embark on the implementation of an IT project when there is no assurance that they have the ability to ensure a successful

Figure 9

How to Ensure Better Information Technology Project Success

- ☑ **Certify** departments as to their ability to implement a proposed IT project.
- ☑ **Train** and certify project and contract managers.
- ☑ **Document** poor and superior contractor performance and maintain a central, on-line computer file regarding such contracts accessible by state agencies.
- ☑ **Require** independent, qualified review of complex projects, including FSR review, bid proposals, the selection of contractors, and project and contract management assistance.
- ☑ **Require** that FSRs identify the need for outside assistance and include the associated costs in the FSR.
- ☑ **Where** practical, fund major projects only through a pilot or prototype phase, so that full implementation costs, schedules and benefits can be more accurately projected.

"Certifying departments as to their ability to implement a project should end the current practice of allowing departments to put themselves at risk when implementing projects."

implementation. It makes no sense for the OIT to approve an FSR and then leave to chance the matter of whether the project will be successful. It *does* make sense for the OIT to ensure that a department is properly equipped, whether with its own staff or outside staff, or a combination, such that project success can be better assured. Certifying departments as to their ability to implement a project should end the current practice of allowing departments to put themselves at risk when implementing projects. Certification could be done by the OIT, a committee of state experts, or an outside contractor.

Identify Need for Outside Assistance. Whether they admit it or not, departments often need assistance in the areas of selecting the best technical solution, writing technical specifications, hiring contractors, and managing projects and contractors. Consequently, there should be an up-front acknowledgement in the FSR of the need for outside assistance, with an identification of the associated costs, and a mechanism should be put in place to ensure that such assistance can be obtained. One way to facilitate providing such assistance is through the establishment of master agreements with qualified outside contractors.

Certify Project and Contract Managers. No significant state IT project should be implemented without proper project and contract management oversight, and state managers should be trained and certified before being assigned these tasks.

Identify Poor and Superior Performing Contractors. Although current law provides for identifying contractors who fail to meet contractual requirements, state agencies seldom volunteer documentation pertaining to poor contractor performance. Both poor and exemplary performance by any contractor should be documented and made available to any agency which needs contractor assistance, so that an agency can be informed as to a potential contractor's performance record. This information should be maintained in a computer-based file, so as to facilitate access and reduce manual search efforts.

Do Pilot Testing. Given the frequent underestimating of project costs, schedules and benefits, it would be preferable to have a process which favors pilot or prototype projects, thereby enabling refinement of full implementation costs, schedule and benefits. This approach, with appropriately designed and conducted evaluations, should help to end the repeated instances of projects which are sold to the Legislature on the basis of an economic justification, but which change quickly and drastically as implementation occurs.

In view of the above, ***we recommend that the Legislature direct the administration to develop and implement a policy which will provide for (1) certification of departments as to their ability to implement IT technology, (2) training and certification of project and contract managers, (3) documentation and reporting of poor and exemplary contractor performance, and maintenance of this information on a computer-based file made accessible to state agencies, (4) requiring that Feasibility Study Reports identify and include costs for any needed outside assistance, (5) requiring that, wherever possible, project cost, schedule and benefit estimates be refined through a***

pilot or prototype project, and (6) ensuring that departments are able to obtain competent outside assistance wherever needed to implement IT projects successfully.

OTHER INFORMATION TECHNOLOGY ISSUES

Facilitating Legislative Review of Information Technology Projects

At present, FSRs and Special Project Reports (SPRs) concerning major IT projects generally do not facilitate legislative review because important cost, benefit, and schedule information tends to be buried in these documents. In addition, information regarding problems with the project is often presented in such vague and general terms that the reader has to read between the lines to get any indication that a project is experiencing difficulties. The problem is especially acute regarding SPRs, which are supposed to inform the reader as to significant changes in approved projects. Instead of providing an up front summary, in a consistent format for all SPRs, critical information is often spread throughout the document, or provided in such vague terms that it is difficult, if not impossible for a reviewer to draw an accurate conclusion regarding the status of the project.

Legislative review of FSRs and SPRs would be greatly facilitated if these documents had concise tables in consistent formats placed at the front of the document. In the case of an FSR, the costs, benefits and schedule of considered alternatives should be displayed, with the recommended alternative clearly identified. For SPRs, the summary should disclose, in a chart format, the original project cost, benefits and schedule, the last revisions to each of these, and the latest revision proposed in the SPR. Also, the SPR needs to clearly identify and discuss current problems encountered by the project. Government Code Section 11734 requires the Director of the OIT to establish procedures facilitating legislative review of state projects. ***Consequently, we recommend that the administration modify Feasibility Study Report and Special Project Report formats to contain consistent formats, with original and revised cost, benefit, and schedule summaries at the front of these documents, so as to facilitate review and oversight.***

Procurement Practices

State Can Better Leverage Its Purchasing Power. State agencies spend significant sums of money annually to acquire IT equipment, services and software. Our review of state IT practices indicates that there is significant room for improvement in terms of leveraging the state's purchasing power so as to reduce the total amount spent by various agencies for the same types of goods or services, thereby maximizing the return on the state's total investment. For example, until the HWDC negotiated a master agreement for services provided by a major consulting group, departments within the Health and Welfare Agency had negotiated their own, separate contracts. By negotiating one master agreement, the HWDC was able to obtain a better return on the agency's investment (that is, more services). We believe that this kind of procurement should be looked at from a statewide perspective, as other departments outside of the Health and

> *". . . it is inappropriate to ask departments which approve an action to rule on a protest which challenges that action."*

Welfare Agency continue to buy the same equipment, services and software on an individual departmental basis. We believe improved coordination can be accomplished without slowing the acquisition of goods or services appreciably, particularly if the administration establishes a computer-based method of coordination. Consequently, ***we recommend that the Legislature direct the administration to establish a process to ensure that state information technology equipment, services and software purchases are coordinated so as to maximize the return on the state's expenditures.***

New Method for Resolving Procurement Protests Is Needed. IT-related procurements tend to be time-consuming and costly, and often result in formal protests filed by competing vendors. According to information provided by the DGS, thirty-six formal protests were filed in the 18-month period from June 1, 1992 through November 15, 1993. It took an average of 88 days to resolve protests filed in 1992-93, and 76 days for protests filed in the first six months of 1993-94. Protests not only consume time and money, they also deny a department the goods or services it needs to perform its work.

The current method of resolving procurement protests includes a hearing before an administrative hearing officer, who then makes a recommendation to the Board of Control for a final decision. The DGS, which has a seat on the Board of Control, is the same department which approves procurements resulting in a formal protest. We believe that it is inappropriate to ask departments which approve an action to rule on a protest which challenges that action. A more appropriate method of resolving protests would be to establish a process whereby bidders could elect to submit a dispute to binding arbitration, conducted by a hearing officer or panel mutually acceptable to the state and the bidders. To discourage frivolous protests, which may occur now in some instances, it would be reasonable to require that a losing party pay the cost of the arbitration. A bidder who did not elect arbitration could pursue the matter in the courts. This is an option they currently have, but under present policy can do so only after they have gone through the current protest process, which, according to DGS data, they are likely to lose. Consequently, ***we recommend the enactment of legislation to establish a new process for resolving formal protests of proposed information technology awards, to provide for voluntary, binding, impartial arbitration or such other method of resolving protests as the Legislature finds preferable to the current method. We further recommend that any new procedure specifically preclude from the decision-making process any department which played a role in approving the award being protested.***

Current Procurement Practice Does Not Ensure Good Business Decisions. Current law requires that IT procurements be conducted so as to provide the most cost-effective solution to the state's requirements. The law also provides that the determination of the most cost-effective solution be based on evaluation criteria which are specified in the state's Invitation for Bid or Request for Proposal. Administrative policy also requires that all costs to implement a solution be considered in the evaluation.

In our 1994-95 *Analysis* of the TDC, we discuss the procurement of a mainframe computer where the data center has paid too much. Yet, the Board of Control, responding to a formal protest by a competing vendor, upheld the state's procurement decision, primarily because the data center's evaluation criteria did not include certain items of cost the protesting bidder argued should be included.

In enacting procurement law, the Legislature never intended that the state end up with a costlier computer solution simply because the bid evaluation criteria failed to include certain costs. This situation needs to be corrected to prevent the state from making poor business decisions when procuring IT solutions. ***We therefore recommend the enactment of legislation to clarify legislative intent regarding information technology procurements so as to ensure the most cost-effective solution to the state's requirements.***

Limitation on Master Service Agreements for Technical Services Should be Removed. The DGS has negotiated Master Service Agreements (MSAs) with private sector firms for technical personnel needed by state agencies for their IT efforts. While the MSAs have been well-received by state agencies, DGS currently limits the state's use of a specific individual under an MSA to nine months within a 12 month period. This causes problems for state agencies which need help extending beyond nine months.

By contrast, departments can obtain greater than nine months of help from specific individuals through separate contracts, such as those frequently let with consulting organizations. Accordingly, we see no reason why the DGS should not find a means to allow the same level of service via the MSAs. Consequently, ***we recommend that the Legislature direct the DGS to ensure that Master Service Agreements for information technology personal services not include a nine-month limitation on the use of such services.***

Feasibility Study Reports

FSRs Should Address Future Costs. State policy requires the approval of an FSR prior to the implementation of an IT project. Although an FSR must provide cost and benefit information over the life of the project for the alternative implementation methods considered, there is no requirement that an FSR address the future cost implications to upgrade or replace the solution recommended by the FSR. We believe that this is a significant oversight, because what may appear to be the most cost-effective alternative now may end up being more costly over time. Information technology changes continuously, and it is important that trends be considered when evaluating alternative approaches. For example, in evaluating which mainframe to acquire, a data center's FSR should address the likely relative costs to upgrade or replace each mainframe being considered, because some will provide a less costly and more effective path to future upgrades than others. While it may not always be possible to develop an accurate assessment of future costs, we believe that this could be done in many situations. The determination as to whether to assess such costs could be made by the administration as part of the normal project proposal process. Requiring that, where practical, FSRs address future cost will help to ensure

"A problem with the current Feasibility Study Report process is that there is no requirement for an expert, independent validation of the recommended solution."

that the state realizes the best return on its IT investments over the long term. ***We therefore recommend that the Legislature direct the administration to establish requirements to ensure that Feasibility Study Reports for information technology projects address, where practical, the future cost implications of each alternative evaluated.***

Proposed FSR Solutions Need to be Independently Validated. A problem with the current Feasibility Study Report process is that there is no requirement for an expert, independent validation of the recommended solution. In some cases, the OIT does not have sufficient staff expertise to validate that the recommended solution is either technically viable or the best available solution. In many cases, the department proposing the solution is least capable of ensuring that the best solution has been selected. While some departments have contracted with a qualified contractor for an independent validation of their recommended solution, this method is not employed for all major projects. We believe that requiring an independent validation up front, for projects determined by the administration as warranting such validation, while admittedly costing additional funds, will help to prevent more costly corrective measures during the implementation period. In this regard, an investment in an independent validation should be viewed as a relatively minor and reasonable insurance premium. ***Consequently, we recommend that the administration adopt procedures requiring an independent validation of recommended solutions contained in Feasibility Study Reports for projects determined by the administration to warrant such validation.***

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APPENDIX Problems With OIT's Handling of The State's Information Technology[a]

Failure to implement information systems effectively

- Several departments have had major, costly difficulties in implementing IT systems.

Failure to lead the way with emerging technologies

- The impetus for applying emerging technology has come primarily from individual departments.

Focus on procedures and policies, while more difficult challenges remain unresolved

- No strategic plan, with an implementation component, for state's uses of IT.

Standards for state's use of IT not established

- E-mail systems are disjointed.
- Costly geographic information systems are established independently.

No plan for the Internet

- Despite cost and security implications, state usage is growing in the absence of a specific policy and guidelines.

Inadequate Access to Statewide Data

- Despite the investment of billions of dollars over the past 20 years, neither the executive, judicial, or legislative branches of government are able to tap into a state "corporate" data base of information via a computer system.

Inadequate Oversight of Projects

- OIT approved the Teale Data Center's acquisition of computing equipment to support a major DMV project without understanding the real costs of the project to the data center and its other clients.

Lack of Assistance in Finding Solutions

- Departments failing to obtain OIT approval for a proposed technological solution to their needs are frequently left with no solution because OIT does not help to implement solutions.

Oversight Requires Intervention

- OIT has not intervened in questionable information technology activities it is aware of because intervention was not specifically provided for in policies it established.

[a] This appendix summarizes findings in our *Supplemental Analysis* on the Office of Information Technology, May 3, 1994.