3. Findings and Recommendations

The findings and recommendations concerning information technology are presented according to the specific area reviewed.

Organization

This portion of the assessment focused on determining the appropriateness of the structure, business interface, and resource profile for the IT organization.

Finding: *Existing state personnel policies and funding processes inhibit the recruitment, training and retention of skilled technical employees required to manage IT.*

The complexity and sophistication of IT require specialized skill sets and expertise for employees at all levels. The state's existing personnel practices do not support attracting and retaining the best talent to support this critical area.

A common concern in the B&CB technology staffs, as well as in agency IT staffs, is the difficulty in attracting and retaining technical employees. The IT leaders interviewed all voiced the opinion that the state salary scales are below the private market for skilled IT professionals. This prevents the state from competing with local employers for recent college graduates and for experienced IT professionals. The classification system compounds the problem by limiting the grade and salary levels of top technicians. This prevents career growth in line with the private sector. Many technicians are forced to seek supervisory or managerial positions to obtain salary increases.

The state currently has shortages in a number of key skill areas. One is a major need for experienced COBOL programmers. This skill will be required to effectively deal with the state's Year 2000 problem. The other gaps identified included PC technicians, LAN technicians and client server application developers.

An important element in attracting and retaining IT professionals is technical training. The state appears to invest less in IT training than the private sector. According to a 1996 Gartner Group survey, the average company spent 1.8% of its IT budget towards training of their technical staff. While the state's IT training costs are not directly tracked, they appears to be well below the private sector.

Recommendation: Evaluate the state's compensation policies and practices for IT technicians and technology managers to ensure they are competitive.

The market for IT managers and staff is extremely competitive. Best performing technology organizations hire, retain and develop people with certain key attributes. These attributes include business savvy; technical competence; ability to change quickly

with emerging technologies; provide and assume leadership; possess a team-orientation; an obsession with quality, service and continuous improvement; innovation; self-motivation; an entrepreneurial nature; proactive approach; consultative skills; and excellent communication abilities.

As discussed in the Personnel and Benefits portion of the Management Systems performance audit, the Office of Human Resources should conduct and periodically update a salary/compensation study for its IT classifications. The state should continue to closely monitor turnover in its IT positions as well as estimate future IT staffing needs on a coordinated basis. The staffing assessment should account for the Data Center Consolidation (DCC) project as well as the state's growing use of newer and more powerful technologies. Based on these analyses, the state should annually update its IT compensation, recruiting, mentoring and training policies and programs.

Recommendation: **Technical IT training must become a funding priority.**

Technical IT training must become a priority in order to attract and retain employees and to ensure optimum utilization of new hardware and software. The state must have employees skilled in the use of new technology that will be deployed as part of the DCC project and departmental initiatives. The increasing importance of technology to the state will require highly skilled and trained employees to ensure proper utilization and operation of its resources and high levels of customer service.

Many organizations use skills-based management programs (SBM) to improve technical competencies. These programs compare current skills to the organization's forecast of needs and implement steps to address competency gaps. These programs can aid in the recruitment and promotion processes and can help to ensure outside contractors possess the skills required for a particular project.

Finding: *Management oversight for IT in South Carolina has, by design, moved toward a more decentralized perspective over the past several years, without requisite attention being paid to interagency information exchange.*

Management oversight of the acquisition and use of information technology in South Carolina has historically been more centralized than it is today. Predecessors to ITPM exercised strict control of all IT matters. In the early 1980's, IT oversight was decreased and in 1995, the central office approach was further modified with the publication of *Systems Analysis of State Government Accounting and Other Financial Systems*, which recommended the deletion of a number of enabling provisos and regulations, and a reduction in the level of control the central office exerts over agencies. The role of ITPM was changed from one of regulator to that of facilitator, and consultative.[1]

---

[1] Budget and Control Board memo, 10/20/97.

While there is a process in place to provide centralized planning and oversight through ITPM and OIR, the reality is that the individual agencies have considerable latitude over technology direction and decisions. This has resulted in "stovepipe" systems which appear to have not fully considered consistency, interoperability and the overall needs of the state. Interviews also indicated a general consensus that the state's oversight structure and procedures for information technology contribute to the perception that use of technology in the state is not optimized within or across all state agencies.

While on paper, ITPM is posed as a central point of accountability, in reality it has performed more of a procurement approval/disapproval role as opposed to a central planning function. The ITPM group assesses all agency technology requests over $10,000 with a goal to reduce duplication and the inefficient use of technology. Unfortunately this group does not have the proper number of analysts and the direction and authority to ensure that investment dollars are used wisely.

Recently, Governor Beasley established the IRC, which consists of private and public sector individuals, to help create a state wide IT vision, plan and strategy. This is a "best practices" concept that has been instituted in over thirty states. It is the state's intent to utilize the IRC to develop a strategic vision that maximizes its investment in IT resources and focuses on efforts that will meet the needs and desires of taxpayers and the demands placed on state government. There are six IRC committees with several sub-committees focusing on specific issues. Their role will be to create IT vision, strategy, policies and guidelines for the state. It is anticipated that the sub-committees will be instrumental in implementing the recommendations. With one exception, all participants are part-time to the IRC. At this time, the state has not defined the relationships between the IRC, ITPM, OIR and individual state agencies to promote implementation. There is also no "champion" to market, demonstrate, and promote the usage of the innovations that the IRC will recommend.

Recommendation: **Consider organizational changes to aid in the promotion, coordination and implementation of policies, standards and "best practices" deriving from the IRC.**

IT experts agree that a centralized approach to strategic IT planning and management is necessary. The establishment of the IRC is a critical step for the state to achieve a common technology vision. The staffs of the three offices of the Budget and Control Board charged with oversight of IT (ITPM, OIR, and MMO) should serve as support staff to market, demonstrate, and promote the usage of the innovations that the IRC will recommend. In addition, the ITPM group will require changes in order to be more effective in supporting and promoting the vision that will be created by the IRC. ITPM's role should be expanded to include:

- Supporting statewide IT planning, technology standards and policies
- Establishing strategic relationships with key IT suppliers
- Coordinating the use of technology between agencies

- Encouraging data sharing and access between agencies.

Additional analysis must be conducted to determine the proper organization and governance model required for the ITPM group. It appears as though a leader and additional staff well versed in newer technologies is required.

An additional model to consider that may aid the IRC is the B&CB's concept of the Center for Applied Technology in Government (CATG). Although time and scope constraints of the performance audit did not permit a comprehensive evaluation of this concept, this is a proposal that bears more in-depth exploration and consideration. A similar entity, the Center for Technology in Government, has been developed and implemented by the State of New York at the State University of New York in Albany.

South Carolina's CATG is envisioned as one of the work groups functioning under the IRC standing committee on Science and Technology Research, and would be structurally located within the Budget and Control Board. The CATG would provide a "technology incubator" learning environment and involve broad participation and cooperation across state agencies, institutions, and local government. It would also permit vendor participation and partnership in developing and demonstrating practical applications of leading edge computing and communications technologies for the public sector. Many of the resources necessary to establish the CATG could come from reallocation of current state government resources, although additional government and/or private sector resources may be needed for full implementation.

Finding: *The end user computing support structure is fragmented across state agencies, creating non-standard delivery of desktop support services to customers.*

A common finding in discussion with most agency IT directors interviewed is that most have their own units that deploy, support and maintain desktop computing for their agencies. This function includes PC configuration, moves/adds/changes (MACs), user help desk, backup and recovery and network administration. Many agencies with remote sites, utilize an IT liaison located at that facility. Their role often involves configuration, installation and first level hardware (HW) and software (SW) support. Problems out of their realm are then referred to the help desk of the central IT organization of their agency. In some cases, users install and manage computing resources, sometimes duplicating services available through the IT organization.

Most IT directors agreed that providing the appropriate level of desktop support was one of their most critical issues. The inhibitors included the proper level of staff, difficulty in hiring and retaining skilled employees and the diverse locations some are asked to support. Many of the agencies employ different desktop HW and SW standards. The lack of standardization increases the demands on support resources, costs and user productive time.

Recommendation: **Consider the creation of a single entity in the B&CB responsible for support of the end user desktop computing infrastructure, particularly in geographically dispersed areas.**

A common infrastructure support group for the state should be considered to streamline desktop computing support. It is likely that significant cost savings and service improvements will result. However, it will require a detailed study to fully understand the costs and savings. This proposed organization should be responsible for standards, procurement, installation, training, maintenance and retirement and replacement of HW and SW used in this environment. This organization should evaluate outsourcing alternatives for both local and remote support requirements. Many "World Class" companies employ alternative sourcing strategies to acquire new skills and competencies, reduce costs and limit risk. This organization may be physically dispersed in key metro areas, but should share a common set of standards, direction, problem tracking and resolution system, and follow a single, documented process for change management and problem resolution. Such an organization would allow for the migration to service a more sophisticated end user. End user computing skills and tools experience must be mature to support the distributed environment that will be required by the state. The support staff must be qualified, trained and their performance should be measured.

Strategic Issues

Following are findings and recommendations regarding technology issues of strategic importance to the OIR IT organization, as well as all technology organizations within state government.

This portion of the assessment focused on determining the existence and appropriateness of IT plans, technology standards and policies, and the leveraging of technology investments across the state. One strategic item, the Data Center Consolidation project, because of its significance, is covered in a separate section.

Finding: *Current funding methods do not promote an enterprise view of technology nor do they consistently help select projects with the highest value.*

As in many states, funding for technology infrastructure projects is difficult to obtain. In addition, multi-year projects are extremely difficult to plan due to constraints in the current budget process. It creates the "use it or lose it" syndrome, which conflicts with the need to plan and execute lengthy and sometimes costly projects.

Recommendation: **Consider using innovative strategies to fund enterprise-wide and multi-year technology projects.**

Many states have implemented innovative funding strategies that encourage enterprise-wide strategic investments. In Massachusetts, bond bills are used to start enterprise-wide

technology projects. A centralized group is responsible for overseeing these projects and ensuring all agency technology projects conform to state plans. A similar performance audit in Louisiana recommended utilizing a "Technology Innovation Fund" to finance technology investments that demonstrate strategic value and a high benefit to cost ratio. These examples utilize pooling of a portion of technology dollars to fund projects that are prioritized to meet both state and agency goals. South Carolina should have additional incentives built into their process to ensure and encourage cross-agency collaboration on technology efforts in areas such as financial management, personnel, procurement, and Geographic Information Systems (GIS).

Finding: ***Most IT organizations are not strategically aligned to their agencies.***

In discussions with IT directors, many IT organizations pursue their own understanding of agency priorities rather than those based on priorities from the agency business leaders. In most cases, there are no IT steering committees to set IT direction and policies. Often, there are no formal initiation and prioritization processes to ensure IT is working on high value projects. Implementing the best practices of prioritization imposes discipline while avoiding bureaucracy. Critical components of an effective process are both on-going and post-completion reviews of projects relative to attainment of their objectives. An effective scoring model should be simple to apply with a few standard key criteria such as:

- Financial value added
- Current financial cost
- Implementation costs
- Strategic fit
- Time to realize benefits
- Implementation risks
- Cost/benefit
- Intangible benefits
- Impact of lost opportunities
- Productivity improvements

Such decision models offer the ability to identify and compare the benefits and costs of technology projects relative to one another. It also brings greater objectivity into technology decision making. Such models can be utilized by the individual agencies, OIR, ITPM and the IRC committees.

Recommendation: **Create an environment where IT unit priorities and resource allocations are aligned with agency strategic plans, goals, and objectives.**

High performance technology organizations have realized that alignment to business functions involve people, measurement and governance. This allows for leveraging of technology to provide significant value to its customers. These organizations utilize staff to develop opportunities and educate users about the use of IT. They measure their

success in agency terms and report on their performance and successes. They strive to communicate to all users and bring them into many facets of the project life cycle. Leading IT organizations are utilizing parallel career paths, one for technical and one for management. Their performance measures reflect not only technical performance but also consider leadership and business skills. This focus provides opportunities to further align the IT organization with the agency business units they support.

The agency business units must have a clear business strategy while the IT organization must understand it and strive to support this strategy in accomplishing its role. If a business strategy does not exist, the IT organization must work with business leaders to develop the components that will drive the IT strategy.

Finding: *The strategic planning process in state government fails to address the issue of interagency communication and information exchange.*

OIR has produced several documents that discuss their vision and strategy for individual technology components such as voice and data communications. Some agencies have produced a three year tactical plan that was a requirement of the annual budget process. However, KPMG did not identify comprehensive IT strategic plans for either the state or the individual agencies. As a result there may be technology initiatives that are out of alignment with agency or B&CB goals. Technology investments should be consistent and based on agency vision, goals, strategies and tactics.

Recommendation: **Institute a comprehensive IT planning process that presents a cohesive and concise vision for all centralized and decentralized technology organizations.**

The IRC plans to create a statewide IT vision and plan by July 1998. IT planning will play a key role in helping the state and agencies fulfill their missions and support the state's technology vision. IT planning will help ensure limited IT resources are properly utilized to meet the projected and ever increasing demands for information. A common process for creating, approving, and maintaining technology plans should be developed. These plans should be developed by the central IT organization (OIR) and all agencies that have IT organizations. The ITPM group should have an integral role throughout the IT planning process in terms of creation, review, approval and deployment.

Strategic plans should contain three basic elements. The first element is the *vision* that outlines what the direction is. It should be a combination of agency and technology visions. The second element is the *strategy* that depicts how they will attain the vision. This section typically includes a description of the technical environment, goals, sourcing strategy and IT objectives and major projects. The third element is *implementation*, which describes what will be done and when. It typically includes the operating plan and budget.

Finding: *Few statewide or agency technology standards and policies exist.*

OIR has created some statewide standards as they relate to both data and voice communications. There are no statewide standards that pertain to desktop software, hardware, LAN components, Database Management Systems, application software, application development, operating system software or data architecture. Some agencies have their own standards in place for desktop and LAN components, E-mail and application development. The lack of standards may result in missed opportunities for cost savings, a lack of system integration and data sharing, need for manual intervention, decreased productivity for users, and increased demand for support resources.

Recommendation: Establish statewide IT standards, policies and guidelines.

The IRC plans to create statewide standards and policies. KPMG believes this should be a high priority. Due to the open nature of newer hardware and software, some standards should be flexible and treated as guidelines. The areas with the most potential impact include:

- Administrative systems such as personnel, payroll and the various financial systems
- Operating systems and third party software (mainframe)
- Back-up and recovery
- System development standards
- E-mail and office automation software

Finding: There is a need for greater access to electronic documents and enabling technologies to make government more accessible to its constituents.

The B&CB produces an inventory of innovative technology applications. Its purpose is to serve as a catalogue to facilitate sharing between agencies. It is important to recognize that many agencies have utilized technology to solve individual problems. These technologies include:

- Electronic Commerce
- Internet
- Document imaging
- Kiosks
- Voice systems
- Video services

Most taxpayers who interact with state government need to acquire licenses, permits, information or benefits. Typically they have a sense of urgency for the timely completion of this request. Our findings in this area are that:

- Not enough is being done to facilitate electronic access to information by taxpayers, the private sector and other public institutions

- Many current client interactions are manual and paper intensive

- Access to information is generally inconvenient and costly to the requester

- A state "home page" on the Internet exists, but is still developing and is not heavily utilized

- Access to and from government information is driven by each agency which often results in asking or giving the same information multiple times to multiple agencies

- The disparity in state databases and technology infrastructure prevents sharing of common information and utilizing new technology to automate client needs

- Availability of enterprise data to end-users (desktop) is almost non-existent

- Most state agencies utilize E-mail to some extent. Since there are different systems utilized at some agencies, not all employees can readily communicate with each other

Recommendation: **OIR should supplement the current technology infrastructure to establish improved customer access to information and services.**

The IRC has proposed a committee that will focus on citizen access to government information and services. KPMG believes information resources should be committed toward deploying an infrastructure that allows customers of the state to meet their needs for services and information through a single electronic interface. An example of this capability is an information kiosk located in strategic positions to provide multi-agency services. The Department of Parks utilizes kiosk technology at some of their welcome centers. Other uses of this technology could include:

- Driver's license renewals
- Vehicle registration
- Hunting and fishing licenses
- Voter registration
- Employment opportunities
- Tax and benefit information

Another example of this capability is state service centers that would establish centrally located state offices where citizens could perform multiple transactions with many state agencies. These transactions can be more complex than those handled at kiosks. This option has the potential to reduce office locations and real estate costs.

One approach to simplify this challenging issue is to adopt an approach similar to the "affinity group" framework that is beginning to be utilized in the Commonwealth of Pennsylvania. This framework encourages the Commonwealth to take an end to end view

of the customer rather than one limited by agency boundaries. They utilize five groups that consist of Economic Development, Education, Public Safety, Human Services, and Enterprise Wide Services. This framework increases the focus on the customer, facilitates cross-agency integration, drives synergy through common technology investments and facilitates the use of IT across agencies.

Recommendation: Provide increased access to information and technologies that can improve employee productivity and customer service.

There are many examples of how specific agencies in South Carolina are utilizing newer technology to solve specific agency problems. Document imaging is a technology that has the potential to eliminate tremendous amount of paper used and stored by the state. In addition, it can be utilized to streamline manual activities and reduce the number of employees required for manually intensive functions. The state retirement system is utilizing this technology to automate some of their functions. The Department of Natural Resources and the Department of Commerce have very sophisticated geographic information systems used internally and for the private sector. The Department of Revenue is utilizing electronic data interchange to simplify tax filing. These are three examples of technology used at the agency level that could benefit many other agencies. They require standardization, coordination and direction from the IRC.

The IRC should consider establishing an enterprise wide "Intranet" platform that would further enable interagency communication. This platform could be utilized for sharing of electronic mail, multi-media and high quality graphics.

Systems and Data

This portion of the assessment focused on determining issues associated with the technical and functional quality of the states different computer systems and data components. It is important to note that due to the large number of systems supported in the state, this effort was done via a sampling method. The sample was limited to key applications at OIR and eight other agencies. KPMG utilized a standard set of tools and techniques to perform this portion of the evaluation. The results of these diagnostics provided input to the recommendations in this section that can help bring the state's application portfolio more in line with "best in class" standards. Following are findings and recommendations regarding data and computerized systems utilized at OIR and are relevant to all agencies involved in this study.

Finding: The Year 2000 problem will affect the software portfolios of state agencies and may require a significant amount of effort to correct.

The state has invested a great deal of time and money in its mainframe applications. More than 50% of existing systems are over 10 years old. Many programs perform date computations using a two digit date field. For those programs, the year 2000 would be read as 00 and be calculated as 1900. Many of these applications will cease to function by

the year 2000, and in some cases, even earlier. This problem requires enormous time and resources to solve. OIR is leading an effort to consolidate their requirements as well as those from all state agencies who support applications. They expect to issue a report to the Legislature with the assessment results in January 1998. They are also reviewing software products that help to identify the code and, in some cases, automate the changes.

The Gartner Group has estimated the Year 2000 issue represents a problem exceeding over $100 billion worldwide. Given the demand, IT staff and consulting help are very difficult to obtain. Obtaining resources to address this issue was a common problem noted by the IT directors interviewed during this audit. Of the twelve agencies interviewed, six (DOT, DHEC, ESC, OIS, DOE, DSS) are performing a manual Year 2000 assessment, six (SLED, DVR, DMH, OIR, DPS, DDSN) have completed the assessment and are beginning to make coding changes and one (DNR) has completed the changes required.

Recommendation: **The state should pursue an aggressive and comprehensive program that will identify and manage the resources necessary to correct Year 2000 system problems across all agencies.**

Considering the age and size of the state's application portfolio and the limited time to correct Year 2000 problems, an aggressive approach is recommended.

The state should establish a Year 2000 project office to work with and manage this process across all state agencies. The project office leadership, working with the B&CB and state agencies, should be responsible for developing a detailed and formalized plan, confirming priorities, and obtaining the necessary resources. One of the first decisions to be made after the B&CB's assessment is whether to replace, eliminate or rewrite each system. The project office team must then determine the number of staff available and determine state and contractor resources required. The state should develop a plan to utilize contractors or assign dedicated staff to the Year 2000 project office to effectively manage, monitor, obtain resources and help perform this effort for all agencies.

Staffing costs for experienced programmers to make the modification currently range between $70 and $100 an hour and are expected to increase in 1998. Costs to complete this project will not be known until the assessment is complete and the number of programs and lines of code affected are determined. The average cost to change a line of code is $1.00 in 1997.

Another related issue that the state must grapple with is acquiring the necessary hardware resources required to code and test the changes. This includes determining CPU cycles and disk space required. It will be difficult to test these changes at a central site due to the variation of hardware and software platforms at the agencies.

In addition to mainframe application programs, the Year 2000 issue can affect other computerized components. They include system software, desktop applications, HW,

voice, data, desktop, mobile and LAN devices. They must be reviewed with the vendor to ensure internal code issues with the Year 2000 do not exist.

Addressing the Year 2000 problem will likely be a massive undertaking. Highly effective program and project management tools and practices will need to be used by all affected agencies to schedule, budget, and monitor specific projects and their relationships. The state as a whole and individual agencies will have to prioritize their Year 2000 and other system projects to avoid competing for limited, costly resources.

Finding: *The information required to manage and perform agency business functions have not been consistently defined across all agency units.*

The surveys conducted indicate that some agency departments do not have information or systems which support their processes. Management reporting of enterprise data is not performed in a meaningful and effective manner. Data modeling tools and techniques have not been used to define business information needs; there are minimal data flow diagrams or data dictionaries in use. The database management systems in use include Adabase, IDMS, Sybase, Oracle and Progress. Unfortunately these systems do not share data easily and require different skill sets to support. Most applications have been developed to address specific requirements within a business function, with little consideration for data re-use across the enterprise.

Recommendation: **Agencies should invest in relational databases and related tools to understand information needs and provide access to data.**

The state should use relational databases whenever possible for the development of all new systems. Relational databases offer high performance and offer the flexibility to support data analysis and decision support. There are powerful tools available that allow users to access the data directly. This results in less dependence on programmers and quicker access to data. The "affinity group" framework discussed in the previous section is a tool in simplifying this effort.

There are several technology approaches that can be utilized once the information needs are defined. One is data or information warehousing. Information warehousing is an approach that provides the means to bring data from disparate systems and make it easily accessible by business users. By using off-the-shelf tools, users are provided with the means to analyze, drill down, and answer business questions quickly and easily. The warehouse is designed and optimized specifically for query and analysis and is totally separate from the production systems that generate the data. Combining data will better serve citizens and other stakeholders and reduce data redundancy.

Finding: *A number of core systems lack all of the current functionality required by agencies.*

The results of the systems assessment show that many key systems are quite old but still provide needed functionality. Over 50% of the systems surveyed were over ten years of age, were written in second generation languages (e.g., COBOL), use older databases and are not integrated with other related systems. Over 85% of the OIR systems run on a mainframe. The charts below graphically depict the situation for the systems sampled in OIR and the twelve other agencies involved in this study.

- Very few agency applications are written for the PC:

Mainframe 85%   PC 15%
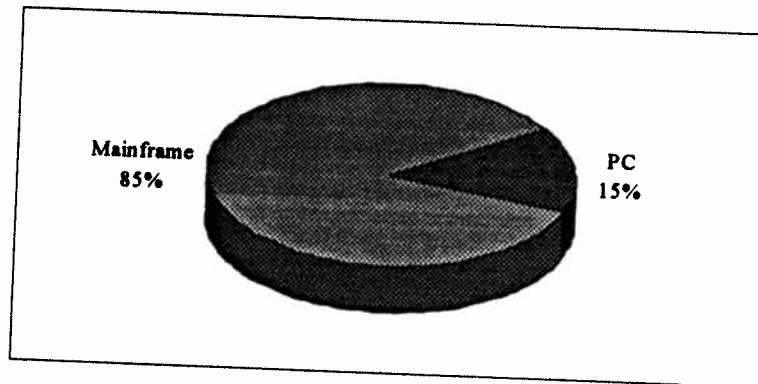
- Very few of OIR's applications are written for the PC:

Mainframe 83%   PC 17%
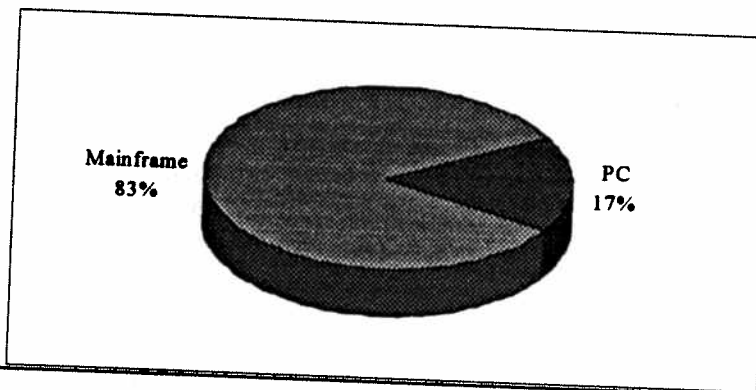
Finding skilled people in these technologies is very difficult and costly. These systems will likely need to be replaced or reengineered over the next five years. Most experts believe the useful life of an application system to be between seven and ten years. As systems age, they become more difficult to maintain as documentation and experience become weak links. Fragile and inflexible systems often result. This typically results in backlogs of maintenance requests.

Most of the agencies interviewed had their own and different administrative systems to support the financial and human resource needs of their agencies. For example, of the 13 agencies involved in this study, only two were actively using GAFRS for financial processing. The remaining agencies utilized 6 different systems to perform the same functions. We also found over 50 different procurement systems and numerous different

human resources systems in use in the state. This results in high costs to purchase, maintain and support these packages.

Recommendation: **Agencies should develop a five year plan and resource requirements to replace or reengineer outdated systems across all agencies.**

Just as physical assets need to be renovated or replaced over time, so do software assets. As part of statewide strategic IT planning and the Year 2000 project, details regarding the functional and technical quality must be developed. It is clear that systems over 10 years old will require significant investment in their replacement or reengineering.

Recommendation: **Utilization of off-the-shelf software packages should be considered for system replacements or as new development requirements arise.**

The state should strive to utilize software packages to solve business problems instead of looking at customization as the only viable alternative. The benefits include reduced employees to support, improved standardization and quicker implementation periods.

Recommendation: **The state should select standard financial, human resource and procurement systems and assist the agencies in their migration.**

Although a separate study on costs would be required, it is likely that the savings of migrating to common financial, human resources, and procurement systems would be significant. The savings would be from reduction in software costs, vendor maintenance, and several people at most agencies to support these systems. In addition, common systems would allow for simplification of these processes, improved controls, processing time, reporting and sharing of data.