THE ROLE AND STAFFING OF INFORMATION TECHNOLOGY SERVICES

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THE CHALLENGE

As a department of government, Information Technology Services (ITS) is reaching a "watershed," a critical turning point in its functioning that will mark a change of course. While local governments continue to devote large sums of money to information technology, many fail to maximize the benefits that this technology can bring. More often than not this is due to factors within the organization and how the technology is managed rather than the technology itself. ITS must be the leader in challenging old assumptions about the capture and distribution of information, testing these against current and future needs. ITS must explore and recommend alternative technologies for data capture at the source, and dissemination in traditional and non-traditional venues. It is the ITS Manager who must be able to answer the business questions posed to them by councils, commissioners, and supervisors: What makes what is proposed a good investment? How is it an asset and not merely an expense? What is the 10 year average annual cost for capital and non-capital expenditures for the change proposed, what specific goals are to be achieved, what is the expected timetable for project completion and benefit gained (ROI), and what are the associated risks? Questions such as these put information technology in the proper context, and if the tools are properly used, then lower data collection, capture, storage, program development, and processing costs, and higher levels of service to citizens and taxpayers should be the result. Moreover, wise information technology decisions that enhance the economic and business climate are a critical part of the "spoils" that go to municipalities that can:

- Produce planning and economic information quickly and accurately;
- Create network architectures that links municipalities and private business;
- Provide "value-added" information to citizens, taxpayers, and commerce;
- Enhance the quality of citizens lives by effective management of services;
- Control budgets and tax growth with sensitivity and wisdom.

Governments are in competition with each other for customers, citizens who are looking for qualities of life that are dependent on economic development, municipal and school services, and effective leadership that makes citizens proud to identify themselves with their community. Information technology's impact on government services, experienced first-hand by citizens and taxpayers, include the efficient valuation of property, accurate tax and utility bills, the ability to provide timely information on real property comparables, the ability to receive all fees at "one-stop" so that citizens are not inconvenienced by multiple stops to different locations, the ability to receive and track citizen's requests and enhance employee accountability, accurate and timely dispatching of public safety vehicles, accurate recording of deeds, vital records, and access to the same, and acquiring dog, hunting, fishing, and marriage licenses, to name several.

Government managers must be able to better manage costs, labor productivity, and increase the quality of customer service to citizens, taxpayers, and service clients [i.e., water or electric utility

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customers]. There are clear benchmarks by which government can measure management success. These benchmarks are:

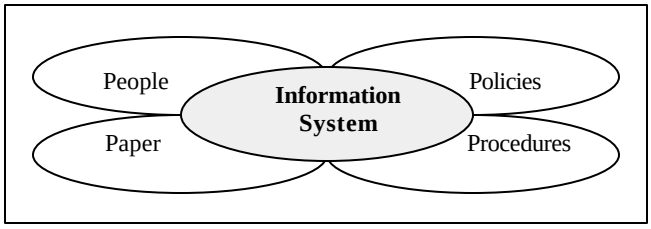
- Cost Containment – increase efficiency and contain or reduce cost;
- Streamline Operations -- increase the productivity of existing personnel and provide policy makers with essential management information;
- Enhanced Service – provide employees with the tools to effectively represent and deliver the tasks of government;
- Accountability – provide clear cost and service justifications for services provided to citizens and taxpayers.

Modern information technology can play a central role in meeting those objectives. Information technology can provide a less costly and more manageable platform upon which communication and information services enable governments to deliver efficient and effective service. Well-designed and managed systems can help government employees to be responsive to the public when they provide information, administer documents, and collect fees. In other words, new technology is the one resource that may be able to increase productivity and enhance and streamline services, yet not increase total costs of providing these services.

Obstacles and Opportunities

One obstacle has sometimes been the managers of traditional legacy (centralized mainframe) systems who often acted as super gatekeepers to information rather than as expert facilitators. In the olden days, as little as a decade ago, end users perceived such managers as masters of mysterious and complex computing. However, the last decade has put the tools of technology into the hands of non-technology department managers, end-users, and customers. These users, in the finance departments, in the records management sections of public safety, in the assessor's offices, in the public work's departments, want the kind of transparency and access to data and reports, and access to the Internet, that they get more easily at home on their personal computers and personal finance systems. In the old model, government employees and customers were often told how difficult or impossible it was to get accurate and timely information. And it often was, sometimes because programmer analysts were egotists, sometimes because they were overburdened with work, but all to frequently because programmer analysts were unwilling to adopt a carefully delimited "customer service" approach. This was a double-edged sword that created a tension between information technology departments and their dependent constituents. Such systems lacked transparency and thus fostered user dependence on the data processing specialist. On the other hand, satisfying user demand for customization set unreasonable expectations, so that customer satisfaction depended on Information Technology Services empires. Although ITS certainly must live day-to-day in the new customer service-driven government, the solution to effective ITS customer service lies not in thinking of the end user as the master, but in designing and managing systems that reflect standards for effective computing, whether it involves hardware infrastructure, operating system environments, or database structures. Such systems can provide authentic customer service because it provides a foundation through which the end user has access and control over content entry and reporting. Wherever we have witnessed the shift from the "data processing model" to the "information systems and support model," it has borne the fruit of cost containment, enhanced services, streamlining, accountability, and end user and customer satisfaction.

A computer system is just one of the information technology systems within an organization. The People, Policies, Paper, and Procedural systems of government must be supported by a viable computer system. Properly implemented, a computer-based information system can be a central and vital component of organizational missions. Through it, the tasks of communication, record keeping, analysis and reporting link the People, Policies and Paper, and Procedural systems that constitutes the life-world of government.



Effective government-wide information technology systems are often ***integrated*** [1] and ***holistic*** [2], that is, they are structurally networked technology systems that provide pathways for increasingly linked application systems that meet the strategic needs of the overall organization and its component agencies. In the modern government, offices with different functions share common applications across the enterprise such as email, purchase requisitions, intranets and the like, and users operating different application modules can expect data to be available from modules from other sources. To provide any level of integration and synergy requires the design and management of networks, data structures, and interfaces, the more so as governments seek to make public data and everyday transactions available to the average citizen via the Internet.

Unfortunately, most information technology systems are neither holistic nor integrated, so that there are a host of incompatibilities, data is entered multiple times, or at best, information is passed inefficiently. In other words, while some agencies benefit, the promise of computer technology falls short in meeting the functional and strategic objectives of the organization. With technology changing rapidly, local government must address long term planning needs without becoming obsolete during plan implementation, and must strive to leverage installed technology with prospective purchases through the a combination of standards and solid management practices. The key to successful ITS efforts is the creation of a collaboratively derived, enterprise-wide strategic technology plan, and carefully detailed management and department needs assessments, including geographic information system (GIS) requirements. Such a plan and related assessments can provide government executives with a comprehensive information technology map that integrates the technical with the vocational, including effective organizational structures and strategies for management of both technical assets and human resources.

Information technology is cost effective if the technology is able to either increase the productivity of existing staff or permit the government to not hire additional staff due to service level increases. Governments will have to invest in information technology, which includes better applications, to avoid having to invest in hiring new employees. Moreover, careful

[1] To make into a whole by bringing all parts together; unify.
[2] Emphasizing the importance of the whole and the interdependence of its parts.

investment in information technology is an on-going process in which information technology components change and users as well as citizens demand more. Prudent and systematic investment allows governments to maintain information technology systems that are as current in year ten as they were in year three. Without putting the procedures and people in place to continue this process undeterred, a government will once again find itself with outdated equipment and frustrated employees and customers.

There is a tension inherent in technology decisions. There are several areas in government where the need is great, and the demand immediate. But these immediacies stand in contrast to the overall demand for careful planning and thoughtful integration. There is never a time to capitulate to hasty decisions to meet immediate demands. Governments should follow a strategic technology and management plan that provides for an overall information technology system and a method for management of that system that meets varied office needs and is manageable without great additional investments in ITS. Such a system might feature streamlining and serviceability, within each office, that could manage consistently designed and applied network systems. Creating consistency at the level of the networks and at the level of each desktop is an example of how governments can effectively manage a portion of its hardware assets with a clear and conflict-free path for servicing and upgrading the system.

For information technology systems to provide the tools for effective management, the system has to work from the *"top down"* and *"bottom up"* simultaneously. Such a strategic plan would include top-down design of local (LAN) and wide-area (WAN) networking, effectively connecting all buildings and offices. The purpose of such a system would be, for example, to streamline communication between "bottom level" offices that interact directly with citizens and taxpayers. Each functional area might share common and useful data with other areas, and pass data "up" to core applications such as Finance for financial information, and to the Geographic Information System for real property, tax (CAMA-Computer Assisted Mass Appraisal), building, planning, engineering and public safety information. Using a distributed networking system allows employees to utilize computers in this way as part of a daily routine.

Integrated "communities of networks" thus often consists of functionally related groups that share sub-system information using common applications. Each office or division may maintain integrity within its own network or within its own data set, but is connected through the communications system to each other, and to the other agencies and offices, and even other sites. Sharing of divisional information is made manageable and provides for more effective government services both within and between offices and divisions. This removes obstacles that prevent practical data sharing and communication, and that ultimately enhance morale, the competent execution of tasks, and the mission of government. A good example of this is the functional integration that is a practical part of any justice system. Warrants are issued, a person is arrested and charged, he or she is arraigned, the court docket is set, district attorneys and public defenders are mobilized, cases are built, and so on. Justice practitioners yearn for a system that would automate these functions so that they could enter data, view schedules, access common case information, and, simply, get the job done with more efficiency and less confusion.

Moreover, the dream of web-based e-government is that a system can be developed that would allow anyone in the government [i.e., employee, elected official or manager] as well as anyone,

such as taxpayers or users of municipal information [i.e., lawyers, realtors, or other persons needing access to municipal data] to have access to public records. This is the great challenge to ITS professionals and application specialists. Many can imagine such a system, especially since today there appears to be a defacto web user interface, but it so far seems out of reach because of cost, and the lack of implementation of standards for data structures. Walk through any modern government and you are likely to see legacy systems in COBOL, recent systems in Paradox, and other systems in Informix. The experienced ITS professional knows how overrated ODBC is in making application systems and data sets work together. ITS will need to stimulate the development of cross-functional systems. The first step is a strategic technology plan that provides for design and management of government-wide information technology.

A significant part of the management of technology will be the "vocational specialists" who provide business analysis and application functions for departments. These specialists, located either in the department or division in which they specialize, or located in ITS, the ITS directors, and the department heads with whom they work, have to be more sensitive to the P issues, that is the Policies, Procedures, Paperwork, Processes, and Politics of managing information. The technologists who used to serve as gatekeepers and owners of technology are evolving to being "peopleologists." As peopleologists, their technology knowledge and management consultant skills segue end-users and managers into the democratic world of organizational ownership of data/information. In addition, technology can contribute to staff accountability for labor time and expenditure of funds, allowing government to be more productive with its limited resources.

The tasks of ITS must be several: It must be a shepherd for user needs and resources, a watchdog for purchasing methods, costs and legal compliance, a clearinghouse for information, a guide to technology futures, a mentor for training, and a visionary of best practice of automated systems. **ITS must be a hub that links the spokes of the wheel that comprise other government offices, within and among governments**. ITS often must manage disparate systems across its own municipal landscape, interface and exchange data with other governments and even private entities, and manage the vendors who service various government offices and departments. ITS must be both responsible and accountable for all information technology plans and decisions.

These evolving changes are bordering on revolution of the new ground-rules associated with technology and the role of government. Four examples may best explain the new phenomenon:

- One government that had a half billion dollar annual budget was processing purchase orders through three clerks using electric typewriters. Management wanted to procure the most sophisticated technology to propel the government into the twenty-first century. Before this government embarks upon re-engineering their technology, they must re-engineer their operations and their mission statements. ITSS managers will either have to become business consultants or they will have to become aware to hire outside business consultants.

- The collision of technology with bureaucracy was evident in a city that required every purchase order to have an additional piece of paper sent to every vendor, in which the vendor had to attest in writing that its invoice was an honest and valid document. The city opted to use modern business computer systems. However, the real processing of

purchase orders and subsequent payments to vendors were processed by clerks who manually controlled the flow of information and its concomitant approvals and unnecessary paperwork. ITS, though staff vocational specialists we call "business analysts" will have to identify the re-engineering problems and become catalysts to upper management to solve problems.

- Conflict erupted in a city owned water utility that was using the electric utility meter readers to read their meters. The water utility now wanted to become more cost-conscience and more business-oriented, but the cooperative electric utility was arguing that it was more important that their meter readers were able to help their elder customers take out the garbage or for them to sit with Ms. Jones and have cookies and coffee with the lonely customer. When the two entities attempted to procure a single information system to process meter reads, billings, and collections, the conflicting management perspectives made agreement impossible.

  In this example the ITS Manager could have become a mediator and guide through the maze of business alternatives. In this case, the ITS Manager was of the more antiquated *"legacy" or "data processing"* model. It is the ITS Manager who must bring a technology to bear that is sufficiently *people, process,* and *end-user oriented*, and who can see the big picture. In this case the ITS Manager might have brokered a management meeting-of-the-minds.

  With hindsight, it is probable that no one could have brokered these two institutions into a common set of values. Rural Cooperative Electric utilities grew up in the rural areas that no one wanted to serve a electric utility providers and they were truly a non-governmental cooperative family-type of institution. In contrast, the water utility board of directors believed they should operate more on the business model of providing the best service at the lowest price. The cooperative board of directors believed that the personal touch of helping older clients with their trash, or keeping a customer company for a cup of coffee, was sincerely part of the service they were providing. Although the business-model of making more money with less people may sound good, there is a very nice feeling with the more family-type model that many rural electrics provide. In this case, the issue of choice of technology was couched in conflicting life-style and institutional values.

- In a County, users experienced increasing dissatisfaction with what they perceived to be obsolete and constraining software applications. As a result, individual County Offices began to purchase their own software systems. Offices hired their own information technology specialists -- a phenomenon that spawned uncoordinated and unmanageable services. ITS staff rarely met for project review or regular planning meetings, and had fallen into a reactive mode, so that it could not get "on top" of all of the issues. This resulted in an enormous amount of redundant activity. For example, while there had been a deliberate attempt to replace terminals with microcomputers, ITS was not the initiator, nor was there an official decision point. There was little attention to negotiating aggressive pricing for systems, nor demanding that the systems be set up by the vendor to County specifications.

Without an aggressive support methodology, there was no way for the user to be able to count on timely support. As a result, offices outsourced support, and did not want to use ITS as they perceived that ITS would mire them in delays. Users reported that it was too difficult to deal with ITS to make a purchase, get the units installed, get the systems networked and get the system up and running and functional.

The proper role of ITS, at the beginning if the 21st century, is to be an information technology agent. The modern ITS department, through its technical and vocational specialists, does its research on information technology and trends, looks for cost/benefits that not only affect the hard costs of information technology but also the client/user's productivity and experience of technology. In this regard, ITS can be a clearinghouse coordinator of information technology planning and development, acquisition, and on-going support. In this role, it can help government to be ***customer service*** and ***customer driven.*** However, this does NOT mean that the department is end-user managed. Under such circumstances, there would never be enough ITS staff to satisfy the voracious appetites of department heads, and ironically, the level of satisfaction would be quite low.

The Integration of Management and Service Provider Models

The challenge to local government, and especially to information services, is the integration of management and service models that can best meet internal and external customer's needs. Typically, overall municipal administration is based on a ***government management model***:

Government Management Model		
Inputs	Process	Outputs
Planning→Funding→Service Delivery→Information Supports→Evaluation		
^----------Feedback----------<		

The government management model concentrates on the fiscal demands of providing services and seeks to be responsive to the electorate. As such, officials are concerned with strategic and budget planning, funding sources, the delivery of public services, and accountability for same, public record keeping and mandated reporting, and effective organizational integration and communication, within and between related agencies.

In contrast, individual programs and offices often use a *public services model*:

Public Services Model		
Inputs	Process	Outputs
Client Intake ----------> Service Delivery ----------> Service Outcomes		
^----------Feedback----------<		

The public services model concentrates on the service needs of citizens. As such, direct service providers are concerned primarily with the citizen and the quality of service provided to and for that citizen. Public service providers frequently believe that elected and administrative officials who implement the government management model do not appreciate what they do or the urgency of their needs. Elected and administrative officials, on the other hand, frequently believe that service providers often over-state their case, or forget that they are not singular in

their needs, and do not appreciate the need to balance services with available funds.

The government management and public services models make clear each point of intervention and enhancement that a *government-wide* and *system-based* solution must have. In the case of information systems, it demonstrates the need for a *public service-centered, service-focused and fiscally capable* information system. This information system should provide for record keeping and reporting that is *unified, integrated* and *multi-user*[3], and *transaction-based* and *report and analysis driven*[4]. The information system should meet the needs of the end-users, provide recognizably enhanced services to citizens, maximize the investment in hardware, and meet the mission and goals of government.

To do this effectively, governments must organize themselves around contemporary technology practices and provides an effective framework for advancing technology to meet ongoing business objectives. As technology becomes more pervasive and penetrates all areas of the government, the opportunity for efficiency and productivity gains grows. The number of stakeholders attached to the technology environment also grows. These stakeholders are becoming more experienced, technically literate and offer a rich source of talent to the organization. This talent should be recognized and appreciated by appropriately including them in the communication, management and decision making processes.

In terms of decision-making, governments must identify the roles, responsibilities, accountabilities and authorities, so that the decision making process provides a level set of expectations. The oversight of technology must shift from centralized command and control to one of collaboration among all interested parties. Because the workforce is becoming ever more technically literate, coupled with the operational knowledge of their individual functions, non-ITS employees offer the ability to view technology as tools to accomplish an objective rather than to automate manual processes. Along with increased user technical literacy comes the responsibility to understand and deal with the consequences that additional latitude brings. Due to the specificity of user technology, no one other than users themselves can be expected to be in a better position to support it. At a minimum, users can prepare for and coordinate support with external providers. However, data in electronic form is the single greatest technology asset of a government. Therefore the government must be the owner of all their data, rather than individual departments. Policies surrounding access, maintenance and technical specifications are the prerogatives of executive management. Departments steward the content under these policies. This allows the government to integrate around its data and mine these assets. A comprehensive and manageable migration to web-based electronic commerce and public access is virtually impossible without such integration.

Governments must distinguish between enterprise (inter-disciplinary, entity wide) and vocational (department specific) technology for the purposes of clarifying the differences between

[3] *Unified* means that appropriate municipal transaction and record keeping services are linked together in the same system; integrated means that users share applications, that data is entered at the point of first contact and passed or is available to others; *multi-user* means that many people can be accessing and posting to the same applications concurrently from different work stations.

[4] *Transaction-based* means that captured data is based on actions or events, stored in a dataset that is *related* to another data set and a master record such as client or employee; report *and analysis* driven means that these related databases are designed to enable relatively easy statistical and historical reporting of events or actions, by client, location, or other master criteria.

centralized and decentralized technology management. This allows assignment of ownership of business and service issues to the entity entrusted with the success of these issues. One example of this is GIS, perhaps the most important technology development on the local government planning horizon. It would be short-sighted to think that GIS can be dumped in the laps of ITS without the usual effect of it becoming a money pit.

The technical architecture, infrastructure and components must be based on current and emerging industry standards. This greatly reduces the risk of obsolescence, dependence on labor skills that are in short supply, and shortsighted investments. The technology stakeholders should develop standard, policies, and procedures in a collaborative environment. Well-articulated, collaboratively derived standards, policies, and procedures provide clear direction to an involved staff. In an integrated technology environment, these must promote consistency, extensibility, scalability and manageability, or little will work effectively.

Collaborative development has its benefits and drawbacks. In the technology environment, some standards, policies and procedures are necessarily be directed top-down to ensure compatibility and operability throughout the organization. The same attention must be paid to training of staff, who are certainly a government's greatest asset. A training plan, providing for ongoing and progressive training is critical to the long term strategy, and everyday success, of technology implementation and use. Such attention to technology tools, human assets, and the value of information will allow ITS to provide the service that internal customers, citizens, and taxpayers now require, and which has too often been sorely lacking.

Some Examples of Poor IT Management

One ITS director stated that he added 15 percent each year to his budget without any justification. He was proud to state that technology just demands more money spent every year. But when he was asked about his plans to spend the money, he further responded that he was too busy to plan. The paradox is that the cost of technology is plummeting each year and the new-technologists must be able to deliver more with less.

In another city where the ITS budget was $2 million a year, the ITS department lead a procurement process in which the city purchased a $2 million dollar software package, but they spent $20 million making it fit their unsystematic ways of doing business. The clincher was that the $20 million in modifications forced them to spend $6 million a year to keep all of the modifications updated for a $2 million dollar "turnkey" software package. Unfortunately, after all of this expenditure of taxpayer funds, the software still did not meet the needs of the city, the taxpayers, or it's customers.

Information Anarchy is too often the rule where there are dysfunctional ITS departments. Many city departments have given up on the power plays of the isolated technologist, resulting in the spawning of departmental networks or procurement of their own mini-computers. The difficulty is that this spawning approach routinely does not take into account the organizational needs, but only myopically considers the limited requirements of each department.

While local governments continue to devote large sums of money to information technology, many fail to maximize the benefits that this technology can bring. More often than not this is due

to factors within the organization and how the technology is governed rather than the technology itself. Sound technology governance practices must be based on the government's culture and prior investments. Examining roles, responsibilities and accountabilities, expectations, relationships and communications, appropriate decision making and support procedures are all critical activities.

A major operating principle as governments move forward to adopt emergent technologies must be "**disaster aversion**." The transition to new technologies is fraught with difficulty that can be minimized by sufficient investment, careful planning, effective reengineering, and deliberate and diligent procurement, implementation, and training.

SOLVING THE ITS PUZZLE THROUGH EFFECTIVE MANAGEMENT

Organizational structures and schema, combined with an effective organizational culture, provide the foundation for effective leadership and management. Today, the shift in the municipal culture's management of information is driven not only by leadership from the top, but also in good measure by the users on the front lines of customer service. Elected officials are more aware of the critical nature of technology in meeting the demands of good government, and the role of ITS is moving center-stage.

ITS as a Customer Service Enabler

ITS professionals cannot sit in air-conditioned technology rooms keeping the users of information at bay. ITS professionals must become customer service professionals as well as information specialists, and put more simply, they must become great managers. The real success of technology is knowing your ultimate customers and servicing their information needs with three criteria utmost in their minds:

Timely, accurate and analytical information: It is critical that ITS and its customers agree on the specific benchmarks that will reflect the service being provided to each specific customer base. These benchmarks not only must be meaningful, but measurable. This must be measurable in a way that reflects the actual targets, and in a way that does not require large amounts of manual data gathering and analysis as a by-product. Several examples illustrate these points:

- In one government, the ITS department responsible for ensuring daily processing of the financial system set targets for on-time report delivery. This was based on specific financial reports being available at 8:30am each business day for pick-up at the ITS distribution desk. While ITS was proud to display their record of near 100 percent on-time delivery, the Finance department was dissatisfied as many of the reports were incorrect and had to be rerun due to parameter errors being entered by the ITS operations staff.

- An ITS department has two technicians dedicated to supporting 250 desktop computers throughout the government. They met with their customer base to determine service levels and found through the process that different users had different needs and different expectations across a wide range of problems from the mission critical to the trivial. In response, the ITS team developed tiers of problems based on severity and response criteria for meeting each. Through the use of an automated help desk system, ITS would negotiate the priority of each call and triage

it appropriately. The system automatically produced statistics each month. These stats were reviewed quarterly with the users and allowed ITS to recognize patterns of problems that when fixed, reduced calls to the help desk dramatically. It also provided a way for ITS to demonstrate its workload and its evenhanded approach to providing support.

- As one local government implemented an extensive wide area network (WAN) to connect its many local area networks (LAN), it found itself relying heavily on the network to conduct an increasing amount of its work. Network instability was the cause of customer dissatisfaction and major frustration organization wide. The ITS department was challenged with ensuring a network availability of 97+ percent and was offered the resources to reach this goal. In response, ITS went out and bought a software program to monitor the network and its health. This enabled ITS to recognize and trouble shoot network outages effectively. ITS, however, did not include the servers in this measurement which were the cause of a large number of the problems, nor did they clearly articulate the bounds of the network. As a result, the users measured network availability from their (own) desktop and ITS failed to achieve its ambiguous target.

Information is available 24 hours a day: The expectation is becoming more frequent that parties who have security clearance to information should be able to access that information round-the-clock. Internets and Intranets make 24 hour a day access to information imaginable. It is unimaginable that when the lights go out in the office at night, data must also become unavailable. Not only will the internal customer not stand for this, but the external municipal customer, the taxpayer and citizen, will expect that access via e-government 24 hours a day.

Demonstrate cost effectiveness: The cost of the technology must be overwhelmingly off-set by the increased value, increased revenues, and decrease costs to capture, manage, and disseminate information. It is not difficult to conceptualize productivity – the indexes are time, human resources, and materials.

It is ironic, then, that there has been so little effective research on measuring the productivity effects of information technology. The difficulties inherent in such measurement should not be the measures themselves, even if we are examining government. What constitutes government staff productivity includes the number of utility bill receipting per hour and day, the time expended producing a payroll, and preparing accounts payable checks. It is the time spent by an attorney in the assessor's office researching a property, and the time it takes an engineer to locate a water main. Of course, it is all these things, but who is measuring? What we have are believable testimonials from payroll clerks, engineers, clerks of court, licensors of dogs, and building inspectors as to the labor savings they have experienced from the implementation of technology. In our experience, most municipalities are fulfilling the responsibilities of government at least at the same levels that they provided a decade ago, with far less staff! Recent research in the private sector is unequivocal that investments in information technology provide a measurable return on those investments. Indeed, IT may be the most significant factor in the decade long economic expansion.[5]

[5] Marianne Kolbasuk McGee, Information Week, April 17, 2000, pp. 42-55.

The benefits that can accrue from the implementation of modern technology are many fold. However, it is important to recognize that although the technology may be a good medium for storing, managing, analyzing and retrieving data -- the majority of the value will never be realized without an initial re-engineering of People roles, Policies, Processes, Procedures, Politics, Paperwork, and Price. If the cultural and business fabric of the institution is not drastically altered to accommodate centralized and democratized information sharing, the potential benefits of technology's enhancements will not accrue. There are many aspects to defining benefits and to the recipients of benefits.

The customers, taxpayers, and citizens deserve the highest value from their governments. With the use of management reengineering, augmented with modern technologies, customer service levels could be easily enhanced, providing utility customers and taxpayers [customers who receive services] with a higher level of service. What is service? The following are a few possible benefits for customers, taxpayers and citizens:

- First, there is the shortening or elimination of waiting lines to pay utility or tax bills. With the use bar coding, and on-line and real-time counter-based systems, customers are able to pay their bills quickly. In addition, customers may have one-stop paying of all municipal bills, such as water, sewer, taxes, parking tickets, and so on. Alternatively, more and more municipalities are availing themselves of low cost lock box processing, in which revenue is deposited directly into the bank, and receipt information is received electronically in batches from the bank collector, effecting cost savings by reducing municipal staff. Customer satisfaction may be dramatically increased if the City can permit 24 hour, seven-day a week inquiries by customers into their accounts and 24 hour payment by use of the internet and credit cards, debit cards or funds transfer.

- Second, there is the cost decrease, or the aversion of increased cost side of the equation. Centralized and humanized democratic systems often permit less paperwork, resulting in reduced costs. Typically governmental mandates from the states, federal establishment, the courts, and other regulatory agencies will be adding five or ten percent of workload onto information gathering and processing for local governments. If through the use of technology governments can avert or avoid increasing staff to keep up with the mandates, then the resulting additional cost will be averted and future costs will be reduced. Using the example that mandates could increase the annual costs to maintain information by 10 percent, it is reasonable to expect that a normal municipal government might grow its clerical staff by 100 percent (or doubling) within ten years. Since labor is a major component of all municipal budgets, this doubling would be a significant cost unless averted with the help of technology.

- Third, there is the increased revenue that is attainable with the use of technology. Many governments and utilities often have difficulties re-billing delinquent accounts. With the advent of instantaneous technology tracking, it could be easier for governmental employees to identify people who routinely pass bad checks, or who are delinquent in their payments, or who move from one location to another and stiff the municipality or the utility time after time. Technology may be able to better identify the recalcitrant, habitual

tax or utility bill defrauders or procrastinators. If someone does not pay the bill within 30 days a predictable late notice may be able to jostle their wallets to keep bill payments current. However, if a delinquent notice cannot be sent for 8 months, then it is normal to expect that the municipality will not see payment for the delinquent bills.

- Finally, there is the efficiency to be gleaned with the use of technology. If paper work can be reduced and the number of steps and people who have to handle every transaction can be reduced, the potential efficiency of processing information may be markedly increased.

Measurement of technology cost effectiveness must be *organization wide*. For this to occur, a coherent funding model and tracking of all technology related expenses is essential. Governments must realize that in some cases technology is an investment on which they seek a return. This primarily relates to infrastructure and common services. These support secondary goals of improving operational productivity and improved quality of services and are best measured at the department level. Consider the following:

- A rapidly growing government was living with a payroll system over twenty years old. The process of time and attendance was manual and paper bound. This required each department to fill out time sheets (weekly) and send them to payroll for processing, including data entry. To address this problem, a new payroll system was acquired which allowed the departments to directly enter the data and eliminated the need for the paper timesheets. While this clearly brought benefit to the government, it discovered two disturbing issues. The first was that not all locations could actually access the payroll system and were still processing payroll manually. This in turn created extra work for the finance department as the old manual methods were still in use. The second related to user distrust and lack of training on the system. Many departments were still processing payroll the old way and then entering the data directly into the system and thereby effectively losing the potential productivity gains the system had to offer.

- A government with legacy technology embarked on a five to seven year modernization program to bring in contemporary systems from e-mail and the Internet to new systems in almost all departments including Finance, Public Safety, and Public Works. The foundation of this program was twofold. First, a large investment was made in the technology infrastructure of the government to provide basic, common services of communication and, more importantly, to enable the distributed use of future systems. Second, a comprehensive cost/benefit model was developed by finance, ITS and the budget office to guide each department through a justification process for each new system it sought to implement. As a result, the departments were required to examine their internal operating procedures, user training requirements and information (paper) flows and modify them to adopt the "best practices" that the new system they were seeking.

The ITS Manager's Role on the Management Team

With the proliferation of PCs in people's homes, it is no longer viable to attempt to limit end-user's access to technology. Nor can ITS managers define the ground rules isolated from the

collaborative environment of its constituencies. ITS must become a member of and be responsive to the management team.

Today's ITS manager must be focused outside of ITS rather than inside. Successful ITS organizations are ones where relationships have been established; there is a common understanding of the government's business objectives and how technology can help advance these objectives. Furthermore, today's ITS executives both educate their customers and are educated by their customers. These managers must both lead the departments into modern technology and *engender self-sufficiency* among them. Similarly, department managers must understand the roles and responsibilities that come with new and distributed technology. Consider the following:

- At the urging of its ITS Director, a Midwestern city determined that it was the proper time to retire its legacy systems and bring in current technology. The City Manager asked that the ITS Director develop a strategic technology plan to provide a blueprint for this modernization program. To accomplish this goal the Director put together a plan to introduce new systems into the city as well as the supporting infrastructure to enable the new systems. The results of his efforts surfaced during the budget process when large sums were requested to fund the program. Neither city administration nor the departments were consulted in the formulation of the plan including the schedule, the choices or its implications. No funds were allocated for the plan. The ITS Director failed to manage a process that required collaboration with the constituent users.

- In contrast, a Southeastern city ITS Director was given the same assignment. To accomplish his task, he convened a technology planning steering committee and invited the departments to send a representative that each deemed appropriate. In some cases management participated, in others technically savvy staff attended. Through this process, the ITS Director was able to gather the city's technology needs, *as perceived by the users*, sell them on the need for their participation, mold technology and technology practices into it, and demonstrate that demand far exceeded supply of available human, financial and support resources. As a result, the committee arbitrated competing priorities and the ITS Director submitted a plan based on management consensus to city administration. Needless to say, it passed.

Governments are requiring a lot from the ITS department. Governments want ITS to assist in the following ways:

- Enhance the productivity of staff in providing quality services and governmental functions. This means increasing the speed of analysis, reporting, and collections in all areas of governmental services, including personnel information, invoice processing, budget query and the like. It should be the task of the procurement process to secure hardware and software that seeks the maximum benefits that can be derived from automation.

- Effectively plan to meet future information needs and incorporate useful technologies. Government information needs are expanding rather than contracting. Ironically, while government is contracting in other areas, record keeping and the administration of

information is becoming an ever more vital aspect of daily life. Information technology is an essential element in a government's ability to keep up with demand, and it must be implemented deliberately and more holistically if it is to be an effective tool. This requires effective database and interface standards.

- Use information technology to enhance the level and quality of customer service. In the face of continued calls for less expensive government and high quality service, the government must meet the paradox of taxpayer demands by implementing a strategic information technology plan that provides efficient and effective service at a reasonable cost.

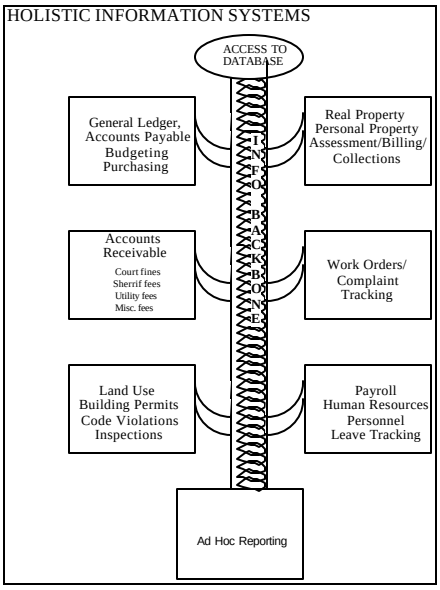
- Use information technology to streamline and simplify information processing to enable staff to focus on higher-level responsibilities. An important goal for the government should be to reduce staff workloads and stress and create a setting that will have a positive influence in attracting and retaining qualified employees. This can be achieved by providing tools that link employees together via communications and software applications, enhancing employee productivity. One way to increase employee comfort levels in the use of these tools is by deliberate training and cross-training, which can provide continuity in operations without excessive dependence on individuals. In addition, the government will save money through re-deployment of staff. Finally, better employee morale will lead to better service to the public, both in efficiency and effectiveness, and a positive attitude that will contribute to positive customer relations.

- Regardless of the software application procured, each application must demonstrate that it will contribute to the streamlining of government functions and activities necessary to support professional, effective, and efficient government. In addition, the elegance of the application programs should be their simplicity, that is, their ease of use and seamless procedural functionality to the tasks at hand.

- Implement systems that make accurate information accessible to decision-makers. A good information system can provide a policy maker with essential management information that helps the organization function efficiently and cost effectively and reduces the cost to process information. In addition, the system can track services and materials so that employees are more accountable for the provision of those services and the use of government-owned materials.

- Support networked communications and enhanced integration within and between all government offices. This should result in reduced paperwork within and between offices, and increased access and distributed access to information. It should be expected that all initial data be entered at the point of first contact, and would be accessible and shared between agencies according to security and clearance. This should help increase the productivity of existing personnel. One important aspect of intra-agency integration is the use of enhanced and sophisticated communications through an *Intranet*, *electronic mail*, and *fax*. Such an integrated environment supporting both internal access, and limited but critical public access might look like the diagram that follows. ITS is specifically responsible for and guardians of the backbone and its tentacles (sub-

networks, desktop PCs, printers and the like), and with its ITS vocational specialists/business analysts, assists departments in meeting the functional objectives that require software applications:



- Where appropriate, management should support public access to government information. Information resources should be more readily available year round for all community residents. Given the current communication technologies, information resources could be available 24 hours a day from any office, school, home or car by dial-up modem to a local server for bulletin board services or via the Internet, cable TV broadcasting, or by touch screen at a kiosk. In fact, public access is the next challenge for local government. Citizens and Taxpayers have rising expectations about the availability and ease of obtaining information. Through Internet access or kiosks in the municipal building, citizens can view parcel data, minutes, resolutions, apply for permits, and even pay tax bills.

- Form should follow function. Information should become ubiquitous and easily accessible to all empowered end-users. The question as to where the technology and the data reside (i.e., in a central information warehouse) is far less relevant today. Information must be universally available, irrespective of which box actually holds the information. ITS will no longer be "owners" of central information repositories, but rather manager/consultants who oversee and assist the elected and administrative management team to establish safeguards and policies to keep the municipally-owned information accurate, timely, accessible, and secure.

Principles of Information System Management

The challenges of everyday government and the management of its information are several. Information technology and information technology applications must:

- Meet the requirements of the law and eliminate any liability issues by reducing errors and being compliant with mandates;

- Enhanced integration between offices, and offices and regulating agencies;
- Reduce the paperwork within and between offices, and offices and regulating agencies, and increase and distribute the access to information;
- All initial data is entered at the point of first contact, accessible and shared between agencies according to security and clearance;
- Enhance communications through electronic mail and on screen fax and storage;
- Reduce the labor and material costs to process information, and increase the speed of reporting and collections;
- Reduce staff workloads, stress, and "burnout " from boring and repetitive work, and match the computer requirements with the comfort level of the employees;
- Secure hardware and software that maximizes municipal functions and helps the organization function efficiently and cost effectively;
- Help increase the productivity of existing personnel;
- Provide policy makers with essential management information;
- Provide continuity in operations without excessive dependence on individuals;
- Shift workload from repetitive data entry to providing necessary administrative support an/or enhanced service to the public.

There are several principles that ITS should consider in designing and maintaining systems.[6] The first area revolves around "**infrastructure architecture principles**," the underlying technological platform that supports data and applications, including hardware, systems software, and communications networks. In these areas, the infrastructure's ability to adapt to user needs is the paramount consideration. The infrastructure should support an environment that allows applications to start small, quickly, and inexpensively.

An adaptable infrastructure provides the capability to add on to the current investment with minimum inconvenience to the user. Adaptability and life expectancy are the major criteria in setting infrastructure standards and selecting components. Solutions that do not demonstrate a growth path and do not support portability run the risk that they will not be maintained or supported in the future. Thus, applications should be able to expand or contract in concert with the demand for services, and the infrastructure should support applications that are flexible and portable.

Open technology/architecture has demonstrated over the last ten years that it enables governments to take advantage of industry trends and future technology. An open systems approach provides for a better return on investment by prolonging the useful life of infrastructure components. It facilitates the portability of applications to smaller or larger platforms without extensive retooling and increased the likelihood that the replaced hardware can be effectively utilized elsewhere in the organization.

[6] The State of Maine Information Services Policy Board, Information Principles Task Force, formalized these principles in 1990. See http://janus.state.me.us/policybd/sysarch.html#principles.

The cost of excluding non-conforming solutions will require governments to grandfather current non-conforming products for a period of time while a plan for their replacement is put in place. In addition, issues will need to be addressed for supporting multi-vendor environments.

The second area revolves around "**data architecture principles**," the foundation that supports the information assets of a government. Municipal data is a valuable resource that has been entrusted to public employees and it must be managed and protected as such. The value of the information goes well beyond the individual application, and provides a resource for program planning and decision-making. Thus, management information is as important as transaction data. In a competitive environment, attention shifts from the technology to the content, quality, use, and value of information. Therefore, information systems are developed recognizing the future disposition of data. Identifying the useful life of data promotes more effective systems and efficient storage of data which should result in lower storage costs, which providing for future requirements. Data should be captured once and validated at the source. Currently, data may be captured and/or re-keyed multiple times through such media as memoranda, forms, and coding sheets.

ITS staff, represented by their business analysts, and department end users should be trained to challenge assumptions requiring the capture of information and testing these against current and future needs. ITS developers will need to develop workflow analysis skills and incorporate them into the systems development life cycle. Successful implementation of systems depends as much on well-designed workflow as on well-designed computer programs. Governments will need to explore and recommend alternative technologies for data capture at the source, such as lap-top computers, imaging, scanners, electronic data interchange, and so on. An improved workflow and simplified work process will reduce the resources needed for data capture and increase the availability of data, which is likely to result in lower collection, capture, storage, program development and processing costs.

The third area revolves around "**application architecture principles**," the methodologies and tools used to translate department requirements into application systems. Applications should be driven by the mission of an organization and not by technology. Effective systems aid the delivery of services, minimize the use of low efficiency resources, and respond to user needs. An effective user can better serve the public. This will require both ITS developers and department staff to look beyond how things are being done and at what needs to be accomplished. Indeed, one of the most critical components of the planning process is GIS. *GIS* is the singular application that can tie wide ranging data together in an application that is useful across the enterprise, whether the interest comes from assessment, police dispatch, engineering, zoning, or planning.

Application systems should be developed using standard development methodologies. Standards must be developed for the systems development life cycle and supporting tool sets. Standard development methodologies increase the likelihood of high quality results and promote reusable components. Moreover, applications that employ common user presentation methods and interfaces increase user productivity and promote interoperability. Also, training and support economies of scale can be realized by using common methodologies and tools. Training is more apt to be offered and delivered in this environment.

Management must anticipate and plan for the replacement of obsolete applications. Every application has a limited useful life span. Beyond this life span, the application becomes functionally deficient and costly to operate and maintain. Planning for the replacement of all applications will reduce crisis replacement and maintenance efforts. Furthermore, older applications become less responsive to changing requirements and inhibit the use of new technology in solving program problems. Systems will need to be managed as an asset and linked to program and budget plans. Department and ITS management must work together in the search for the best possible replacement. Departmental units will have to prioritize the replacement of already obsolete systems.

The fourth area revolves around "**organization principles,**" the people and structures that makes the government work. Department management has the responsibility to make resource decisions within the information architecture guidelines. This clarifies and balances the responsibilities between ITS and the department. Establishment of responsibility fosters ownership and facilitates the decision-making process.

ITS must provide consulting resources to support department information architecture decision-making. ITS management needs to work closely with each department to insure that resource decisions meet department goals. ITS management should participate fully in program planning to maximize department effectiveness. Technology is becoming increasingly important to the successful operation of departments, and is strategically important to the future well being of departments. Business decisions have technology consequences just as technology decisions have business consequences. Joint involvement increases the likelihood of the ITS solution to the business problem being funded and reduces the likelihood of last minute, inadequate application support for the solution.

ITS needs to be recognized as part of and an extension of each department's support team. Financial resources for ITS expenditures must be identified up front, not retroactively. Both ITS and department management must make a conscious effort to educate each other about their responsibilities and requirements. Management must plan for the impact that changes in information technology have on the organization, its employees, and the public.

Practical Implications of Applying the Information Management Principles

There are several conclusions that can be drawn from the above principles. As technology has become smaller, more affordable and the number of solutions has proliferated so that virtually every function can find a variety of suitable applications, the complexity of managing this technology has mushroomed.

While this is much less of an issue for isolated, smaller independent installations (i.e. departmental systems), it is a major challenge in larger, integrated technology environments. Service levels can deteriorate rapidly in an unmanaged, poorly defined environment. Furthermore, industry analysts estimate that sixty percent of the cost of today's technology is consumed by labor and ten percent is the cost of acquisition. Much of this labor is dedicated to learning, troubleshooting and problem solving. Availability of specifically needed skills within the labor pool at large becomes an important consideration.

The total cost of technology ownership (TCO) must be considered prior to acquisition. Furthermore, the sources and oversight of these funds must be well understood and committed to. As such, there must be a holistic funding approach consistent with the areas of governance and management.

The governance structure will influence staffing needs and levels. Staffing for technology necessarily impacts the entire organization. While on-going support is needed to maintain the environment, productivity gains are a desired by-product of new technology implementations. Consequently, both enterprise and vocational staffing must be addressed at the different levels within the governance structure.

Moving forward with open technology/architecture will likely allow governments to take advantage of industry trends and future technology. This will not be inexpensive. The grand fathering of current non-conforming products, while new systems come on line, the cost of conversion of data, and training of users is a formidable task. In addition, depending on the size and budgets of each government, ITS staff may be asked to support multi-vendor environments, and vendor-based solutions. In our view, this is better outsourced to the application vendor who works directly with the department. The migration to vendor-supported systems requires effective and appropriate training. The costs of training, both direct and indirect, must be part of department planning.

Proper planning can reduce the general mistrust and mystery surrounding information systems and thus minimize the natural resistance to change. Without planning for and recognition of change, new systems and technology may inadvertently and inappropriately preserve artifacts of past systems.

Management needs to become more informed about the changing nature and impacts of ITS technology. Organizational change issues must be dealt with in every systems development project. Management must involve all levels of staff, including clerical, in introducing new technology.

For example, a collaborative definition of standards is more likely to result in the change in practice envisioned by the promulgators. Cooperative development will identify diverse needs as standards are developed and anticipate possible exceptions to the standards. Technical standards should recognize individual area's capabilities, characteristics, and needs as well as the common good. Standards are developed and reviewed at least every two years with the participation of each departmental area.

The processes and procedures that humans use to interact with information systems are vitally linked to successful utilization of the information resource. Information systems technology has the impact of reducing the manual labor involved in information processing. The development of successful information systems is a highly complex activity. Tools and techniques that can empower developers, and speed delivery and maintenance of the system, cannot be adequately employed without appropriate training. Employees need to be re-trained to work smarter, not harder. Training is a fundamental ingredient of information systems and therefore, of doing

business. Then, the costs of training, both direct and indirect, must be part of department planning.

Finally, benchmarks of departmental and enterprise competitiveness must include effective cost containment, staff and management accountability for performance and decision-making, the streamlining of operations, and the enhancement of customer service.

Unfortunately, many ITS departments continue to work within a data processing model, where the data is "owned" by ITS, and users have limited access to the data and must request certain reports. As we indicated earlier, this puts the burden on programmers to translate user information needs into usable reports. Moreover, the user is isolated from being able to dynamically query the data, making quick management decisions based on clear data almost impossible. In our view, the government (read public) owns the data and departments are the stewards, having and approving access to the data, controlling entry of data content, and having the ability to easily extract the data for reporting purposes. In order for such data to become more directly accessible by the public in the future, ITS must be responsible for setting standards for data structure, and implementing access controls.

ITS must challenge assumptions requiring the capture of information, testing these against current and **future** needs. ITS departments must explore and recommend alternative technologies for data capture at the source such as lap-top computers, imaging, scanners, electronic data interchange, and so on. This should result in lower collection, capture, storage, program development and processing costs.

In an environment where management users are expected to be pro-active, and for information to signal, alert, and suggest patterns, applications must be dynamic and allow for problem solving. Departmental units will have to prioritize needs for information that will advance management decision-making.

Many ITS departments have been very inventive in supporting automation. But automation needs are in a change cycle that has been accelerating. As a result, ITS departments must be especially vigilant, and provide almost *continuous* consulting resources to support the department in making information architecture decisions. Service and ITS management need to work closely together to insure that resource decisions meet department goals.

Some ITS departments are in a crisis mode, and the burden of maintaining old systems will accelerate. The population of competent programmers for the old languages and platforms is shrinking, and programming services will get more expensive. Users are getting more sophisticated, and they will demand features such as a graphical user interface (GUI), on-line access through ad-hoc query with drill down capability, and sophisticated user generated report writing, the very functions they now use on their home computers! As a result, ITS must play a critical role that it must play in overall municipal program planning.

In the new millennium, governments will have to have their management set the visions, expectations, and the reengineering requirements of the organization's paperwork, process, and procedures. In addition, management will have to secure a realistic expectation of what a full

rollout of their operational plans will cost, and what the concomitant cost of a realistic ITS infrastructure, software, training, implementation, and maintenance will be. Management should not embark on a full-blown technology needs assessment unless it includes a management and operational needs assessment. Technology must not follow the form of buying the latest and greatest technology, but rather it should follow management's expected functions. For example, if a city were planning to reduce costs by $2 million dollars annually, they could accomplish this goal by cutting the services being provided or the quality level of the services. Another approach would be to assume that each year, in our model, there is a $2 million dollar value of staff retiring or leaving the government. If the organization could implement technology as part of this plan, it could increase the productivity of the remaining staff sufficiently to pay for the technology, and thus avert having to replace the exiting employees. Voila!: more from less, and perhaps for less.

A pro-active technology management system versus a passive one is often the difference between lower and higher availability, controlled and uncontrolled labor and support costs, shorter and longer problem resolution times and effective growth planning and periods of degraded service.

An appropriate management strategy in tandem with its overall architecture plan provides a strategy that encompasses the key elements necessary to optimize the operation and include intelligent network control functions, diagnostic tools and problem management techniques, all with the goal of maintaining high levels of customer service.

This approach normally requires extensive re-thinking of the way the government operates. It also THEN requires a rethinking of the way ITS operates. The new model that has become the standard is to have key departments constitute an advisory board to ITS. This model makes ITS much more responsive to the technical and business requirements of government.

Toward a Comprehensive Functional Model of Information Technology Services

Large governmental organizations are developing extensive, enterprise-wide technologies. ITS has the overall responsibility for the enterprise-wide development, management, operation, security, and maintenance of the data centers, wide area network (WAN), enterprise local area networks (LAN) and current and future telecommunications services and support. ITS develops, maintains, and publishes documentation on the network configuration and topology for its constituents use. Such a comprehensive model would require ITS to have the following responsibilities:

- First and foremost enable and encourage user technology self-sufficiency;
- Provide a robust Network (Wide/Metropolitan/Campus Area Network) of sufficient capacity that will link and provide transport for local area networks and operational networks for all constituencies to each other and external networks;
- Integrates wireless and wired technologies;
- Operation and oversight of the government's data centers and enterprise server farm;
- Establishment of bi-lateral service level agreements with customers and mechanisms to measure performance;

- Adoption of standards for network connectivity, security and management;
- Operation and administration of one, and only one, system-wide post office;
- Play an active role in the activities of the technology committee and harness the potential that technology savvy users that the municipal staff have to offer;
- Evolve and manage the WAN cable plant to ensure future capacity, eliminate duplication of networks, maximize the use of financial and bandwidth resources and provide for operational redundancy;
- Security Administration;
- Coordination and management of technology related outsourcers;
- Oversight, stewardship, and management of the government's data assets;
- Sub-network planning and implementation review and assistance;
- Network segmentation definition and oversight;
- GIS Management;
- Web Management;
- Telephone administration and coordination;
- Telecommunications Services and Support.

As regards **budgetary oversight**, the following are sample costs that should be allocated to the ITS budget:

- ITS staff;
- Enterprise network servers, equipment and common software (e.g. web, e-mail);
- Network management tools;
- Internet and Intranet servers;
- Database hardware, software, maintenance and tools;
- Data center equipment, staffing and operations.

Finally, ITS should have the authority and be empowered to:

- Standardize end-user technology to conform to municipal policies. This includes disabling departmentally applied changes that may interfere with compliant operation;
- Develop policies and procedures enabling end-users to request support services;
- Define and develop network standards encompassing hardware, software and protocols;
- Define and develop infrastructure standards including physical connectivity;
- Define and develop local area network standards including network operating systems, security, management tools and client operating systems;

- Set minimum configuration standards for client hardware;
- Define and develop data center operating procedures, policies and standards;
- Define database schema, structure and relationships;
- Fiber engineering and deployment.

Depending on the size of government and the range of services that are housed in ITS, **vocational specialists** will reside in ITS, exist as a separate department, or reside in the user department itself. The latter is especially desirable if self-sufficiency is an explicit goal. Such v**ocational technology services** provide collaboration between ITS and sub-sets of users (for example, the division of Public Safety may include departments such as Sheriff, Jail, Public Defender, District Attorney, Court Administration, Judges and so on who are intertwined and want access to a range of court related information), or users within individual departments that facilitates the satisfaction of each sub-set's and/or department's technology needs. This involves:

- Developing service level agreements with departments that articulates expectations of all involved;
- Maintaining an understanding of each departments "business" and how technology can enable these businesses;
- Coordinating the technical training and scheduling of courses in collaboration with ITS or some other department (such as Human Resources) that services the enterprise;
- Research and identify potential technology opportunities for the departments;
- Guide departments through the technology planning and acquisition processes;
- Work with departments to develop information technology tactical and project plans;
- Assist departments in the acquisition of departmental technology;
- Supports and maintains existing (but not future) departmental applications;
- Be part of the enterprise technology committee.

Whether located inside ITS, or outside of ITS as a separate entity, or tucked into a user department's organization, such vocational specialists, in the role as business analysts, work collaboratively to develop entity specific technology standards, policies and procedures, ensuring that department technology adheres to organizational standards, policies and procedures, arranging for pilot projects within a department, and guiding each to develop the technology on an organization wide basis.

Staffing the ITS Team

Should you have information technology system professionals on your staff? Depending on the size of your organization and user demands, you may choose to "out source" the tasks of setup, maintenance and the like to a vendor, who then acts as the information systems department. However, if your municipal organization is sizable, it may prove cost effective to have an ITS department. The management of higher order tasks will require more highly skilled employees, but unfortunately, the low unemployment rate in the nation is making it less likely that the most skilled will find their way to government. Technology must be installed to provide more of the

thinking that better trained and more competent professionals were able to address in the past. Technology will be able to do more of the mundane thinking such as SCADA systems in water operations which turn pumps off and on, invoice scanners which read the name, address, and billing information, transfer funds to move money from a customer's checking account into the utility account, automatically deposit payroll checks into an employee's account, and the like.

Technology departments will have to bifurcate themselves into the techno-files and the people-files. The manager of ITS will have to be more business savvy, be unambiguously talented as an administrator and manager, and less a technologist. He or she will have a corral of specialists, consultants, and outsourcers with expertise in communications, networking, telephony, hardware, software, and training. The new ITS administrator and staffers will be a shepherd to the end-users, taxpayers, and customers. He or she will be a manager of technology resources, a steward of the government's technology assets.

It is often best to re-engineer an already existing ITS staff since members have considerable institutional knowledge about the operations, the people, and the existing technology. Frustrated management often imagine replacing the incumbents, and look to outsourcing and privatization as the solution. This approach, metaphorically, is throwing the baby out with the bath water. Before panicking, it is prudent for the organization to sit back and take an objective look at the perceived issues, the perceived needs, and the perceived remediations. It may be that current staff members are unable to acquire the necessary skill sets, or not acquire them quickly enough, and as such they will need to be redeployed or dismissed, and replaced. It may be that current staff resist and/or refuse a progressive management solution, and therefore cannot make the migration from the old to new operation's management. Should this be the case, the good news is that there are better, less expensive, and more manageable technologies evolving in the marketplace, and there are better trained ITS technical and administrative professionals graduating from our schools.

However, a common phenomenon that today's technophiles share with those of yesteryear is that their skills are based more on aptitude than on intelligence. As a result, a large talent pool is being developed by community colleges and vocational schools. Additionally, technically savvy students are pursuing non-technical disciplines in college. Governments should not overlook these resources, as their potential is significant. But these resources must be shepherded to effectively tap this potential. A government that is not prepared to emphasize that technology is there to support government rather than vice versa, educate these technicians as to the vocational needs and demands of government, and what government operations are and mean to the delivery of services, will receive little value from these resources.

Many government ITS departments are not only not doing things right, they are not doing the right things. Governments need to closely examine what technical skills they want and need in-house. Consider the following:

- One mid-Atlantic county determined that it needed to augment its ITS staff as it updated and increased its computer applications. In filling its two positions, and although it was purchasing vendor developed computer applications, it recruited two people, one experienced and one not, with strong programming skills [in visual basic and oracle]. While the possession of these skills demonstrated a high level of technical

competency, the hirings were short sighted. First, the skills were not needed in a vendor-supported environment. Secondly, and even more important, the programmers wanted to program and both county and programmers were dissatisfied. Their tenure was short.

- Another mid-Atlantic city seeking to similarly modernize adopted a different strategy. As part of their technology plan, they articulated technical standards common in the contemporary technology marketplace. Their recruitment focused on individuals knowledgeable of these standards. This potential labor pool was larger and less expensive than the one cited above and offered a good fit for both employer and employee.

Organizational responsibilities for the planning, implementation and support of systems vary from government to government. Oftentimes the governance structure is one that has evolved around the specific functions and needs of the different entities. These structures may be central, distributed or, most likely, a hybrid of the two. ITS staffing and organizational issues related to the support and management of the technology environment need to be placed in the context of the future direction and objectives of the government. Each government has a unique culture that is a major contributing factor to its structure and dynamics. In each case there will be appropriate staffing and levels of expertise in supporting and serving the various technologies.

Technology industry experts suggest that the cost of technology over its useful life is 60 percent labor. Whether governments insource or outsource the support of their technology, minimizing labor support costs can prove very cost effective. When you consider that probably the largest, and most fickle, part of any technology portfolio consists of desktop computers, printers and other user appliances, that each of these appliances has a user (labor) and that support of these can be resource consuming (once again labor), it becomes useful to focus on support of these appliances, for when one is out of service, at least two people are affected, the department user in lost productivity, and the ITS technician who must fix it. This does not even consider the impact on service and operations. Clearly, creative solutions are required:

- One southern municipal utility challenged with supporting in excess of five hundred user devices distributed throughout the city spent the money to equip its client/server technology with the tools that allow diagnosis of problems from the ITS technicians desk. The result, the need to travel to the computer's physical location was reduced by 90 percent and the mean time to repair decreased significantly. The moral of the story: shorter outages, higher technician productivity, higher user productivity, and better service.

- A Southwestern city implemented a similar tool that allowed help desk personnel to "shadow" a user from their desks. The help desk was able to see exactly what the user saw and did, and was also able to remotely operate the user's computer while the user could see what the help desk technician did thereby providing on-the-spot training and guidance for the user. Results: Higher user productivity, higher help desk productivity, just-in-time and effective user training.

- One particular city opted to minimize desktop support by imposing a rigid set of standards on what and what not was appropriate for desktop usage. This included the proper placement of city (and user) data and what programs (e.g. word processing, desktop publishing) could or should not be resident on any and all desktops computers. Their solution to misbehaving computers (and users): completely refresh the computers disk to eliminate any "non-standard" configuration issues. This was done over the network and without the need for travel to the desktop site. Results: near total elimination of problem diagnoses; short user outage times; more disciplined users; more self-sufficient users (many opt to not call lest they lose valuable work). Beware! This policy was not without its downsides. The most prevalent being that errant users see their work disappear.

ITS managers must realistically examine what technology support burdens they are willing and not willing to bear. For example, with the plethora of vendor computer applications available to the local government market, municipalities are finding it easy to steer clear of programmers and the need for them. Governments must capitalize on their strengths when determining what profiles of knowledge, skills and abilities they want on staff. These strengths include a commitment to public service, employee benefits and a (more) relaxed work environment. Strengths generally exclude being able to provide technical challenges, affording replacement technology as frequently as may be desirable and innovative implementations of for technology. Local government will never be able to compete with private sector salaries. Rather, governments should focus on standards based and readily supportable technology where vendors and outsourcers can either fill-in if required, or be the primary source of support.

So what profiles should government seek? Perhaps the most important is one where the applicant understands and values the "business" of government. This is a tall order for ITS organizations. This suggests alternative strategies might be more beneficial. One of these is to invert the emphasis on technology support. Rather than focusing on the technical, focus on the *vocational*.

- One Florida county found that, for whatever reasons, its ITS department lacked the wherewithal to support their contemporary technology needs. While this fact was not lost on county administration, it shunned technology and declined to confront the issue. One by one, over a period of five or so years, most departments initiated their own technology projects including the addition of staff to support these projects. In every case, the departmental focus was on their business needs, not on the technology. This produced some unforeseen advantages. One was that technology advanced at a far greater pace than it would have under the auspices of ITS. Another was that since the department's focus was on the business, rather than the technology, so was the hired staff. This produced a technician who was looking for new technology to solve business problems instead of one looking for a new job to whet a technology appetite. The pitfalls of this experience are also evident and instructive. For one, it has been expensive as duplicate costs abound. Another, the county finds itself technology rich with few coherent ways to tap the potential of this technology. Thirdly, technology anarchy is rampant as departments have assumed ownership over their individual "total technology environment" and are loath to cede any oversight for the greater good of the county as a whole.

- After the retirement a long term ITS Director, governments are often faced with the need to recruit a replacement from outside the organization. The common theme throughout this article has been the emphasis on the need for management skills and less so for technical skills. Historically, techies who have been promoted through the ranks into management have fallen short in their management capabilities. Today, an alternative exists for local governments that see technology as a means, not an end. We are referring to that pool of talent that we alluded to earlier, the business or management student, or ones from other non-technical disciplines who, by virtue of their experience and education, have developed an affinity to technology, know how to use it, and understand how to apply it.

  Administrators who have looked within government non-ITS management ranks have found capable managers who understand the business and know how to apply technology. Specific technical skills and knowledge are supplemented and exploited from within the technical ranks. A particular rich source of these nouveau ITS Directors have come from the new crop of MPA graduates. One of their distinguishing characteristics is that management, technology, and business concepts are built in rather than added on.

  This is not a novel idea, however. This is a profile of a Chief Information Officer (CIO) abstracted to a different level. Effective as this approach has been, adoption has been slow. One reason is that many managers without technical skills don't see it or don't believe it. Another has been the position that technicians will not work for a non-techie. And alienating a technical staff for which the government is dependent on is an anathema. This is a specious argument at best. Consider the most widespread complaints among ITS staff to understand why:

  - We (the ITS department) do not get the respect from the organization that we deserve;
  - Customers do not understand us and appreciate what we do;
  - Technical directions are dictated which does not allow me to use my expertise and abilities.

  These are not technical issues, but are basic management issues. While the complaints are often real, the underlying reasons for them come from the leadership and management style of the ITS Director. Alarmingly often, ITS management is fostering these attitudes rather than ameliorating them. These concerns diminish when someone is building relationships and teams rather than technology monoliths.

It is unlikely that government ITS salaries will increase to compete with private industry. Governments should look for staffers who have a strong service orientation, come out of local two and four year college programs, seek to be closer to their local families, and who have rigorous training in specialty areas while showing an aptitude for growth. They must be offered training opportunities and a dependable growth path.

While it is often stated that "information is power," in the private sector, information is *money* or *profits*. For cities located near a metropolitan region, it is often next to impossible for a small municipality to keep ITS staff. Salaries range drastically across the spectrum, but we have seen municipalities with $200 million dollar budgets paying $25,000 to $50,000 for an ITS Director who also is the network administrator. The same position in a metropolitan region could demand $80,000 to $160,000. As a consequence keeping and recruiting ITS staff is becoming very difficult for municipal governments. We had one client that had a staff of 24 ITS professionals. Unfortunately it took two years of training to run through the learning curve for the new ITS professionals until they were familiar with the various municipal-specific systems. More unfortunate was that it seemed that after two years the employees could move twenty miles and double their salaries. This phenomenon meant that at any given time of the 24 full time staff, 12 were in training. Thus, the remaining 12 were spending half of their time training the new hires. The reality was that although there was a staff of 24, the ITS department never had more than 12 F-T-E (full time equivalents) able to support the three hundred users in the city.

Top notch ITS professionals can command more money than the City Manager and virtually any other professional in the government. Therefore, the only people who are candidates would be retirees, young entry level professionals, people who are dedicated public servants, or people who are hometown folk who do not want to leave their local community and family, or people who cannot get a job in the private sector.

The dilemma of technologists who too often are overpriced for the public sector is an evolving crisis. There are several models to address the issues:

1. Outsourcing

More and more it is becoming prudent for a city to procure a turn-key software system from a vendor which specializes in their specific needs [i.e., municipal financials, or parks and recreation, or police and fire software]. Also, specialized services such as WAN or LAN or fiber optic installations, office automation training, personal computer maintenance, hardware and communications maintenance, and endless other areas of specialization may be far more cost effective to outsource than to maintain a staff of highly trained professionals. In general, the procurement of a "turn-key" system or systems that is supported by private vendors is advantageous to balancing the burdens of on-going support of operations with changing application demands. A detailed consideration of outsourcing is considered later in this article.

2. Consortiums

Many governments sign intergovernmental agreements amongst themselves, wherein, a group of governments will share ITS professionals. One city had the County, City, School District, City Hospital, Community College and local University sharing their ITS professionals.

3. Super-users

Another option is for governments to empower super-users throughout the government (i.e., police, finance, parks and recreation, public works, and so on) to operate as distributive first-responders. These first-responders would be the first line of defense for

end-user problems with hardware, software, or communications. Many departmental super users are not fully trained ITS professionals, but through the school of hard knocks they have mastered many of the mission critical issues about the technologies they are using.

4. Succession Planning

All too often the ITS professionals seem to cluster with one half of the staff with 25 years or more, one quarter of the staff with 15 years or more, and the remainder with less than two years at the municipality. What often happens is that within a two or three year period all of the legacy or old-timers retire at close to the same time. Without an on-going planned succession planning and staggering of levels of professionals, an ITS department could be decimated within a two or three year period. Human Resources must provide due-diligence to ensure that this type of predicament does not occur.

Recruitment and Retention of ITS Professionals

Hiring ITS professionals is an on-going challenge for any Human Resource department. It is critical to hire the levels of professional services you need, but not to over-hire. For example, to train a high-end ITS professional to become a network engineer could cost $10,000 to $20,000. The conundrum is that after a person is fully trained and experienced as a network engineer, he/she could possible double or triple his/her salary as soon as they are certified. If outsourcing this level of service is not reasonable in your area, then it may be prudent to train the employee, but have the employee sign a contract that guarantees his/her employment for "x" years or he/she will lose a defined amount of money. This is not without tax consequences for the employee.

It may be savvier to hire a "local" who loves the community and really wants to work for the government, than to hire a top-notch outsider who may only be using the municipality as a stepping-stone to his/her next job.

Imagine asking prospective IS Directors the following questions. What are your current IS Director's ability to answer them?

1. What are the 3 things to which you must pay attention in the migration from:
   a. Prime hardware to UNIX or NT based hardware?
   b. PICK-based application software to more modern software?
2. How would you manage such a project? How would you manage the vendor? What are the internal management challenges?
3. How would you setup and operate a help desk?
4. How would you encourage staff retention?
5. What are the advantages and disadvantages of UNIX vs. NT vs. AS400 systems?
6. What are your key personnel management principles?
7. How might you use existing personnel?
8. Are you a hands-on manager? What does this mean?
9. When you look into the 10 year crystal ball, what do you see for:
   a. Hardware changes?
   b. Software changes?
   c. Personnel requirements?
10. How does a municipality pose different issues for an IS Director who migrates from the private sector?
11. Should IS take charge of telecommunications, copier and other technology areas?
12. How should one proceed with GIS? What steps would you take?
13. Are you customer service driven? What does that mean for the City? How would you know that you have been successful?
14. Should a City satisfy most of its support needs by outsourcing or through in-house staff? What are the issues?
15. Document scanning -- everyone wants it – how would you proceed to acquire and implement it? Who would be first?
16. Describe your strategic planning skills. Describe your ability to plan, direct, and organize.
17. When it comes to support, how do you handle a difficult user?
18. Once the initial project is over, what can we do with the information that is generated?
    a. How can we make the information available to the public?
    b. Should we charge for it?
    c. How do we maintain security?
19. How can we use technology to make it easier for "customers" to do business in and with the city?

The best way to keep and maintain seasoned ITS professionals is the same as it would be for any employee -- that is, to maintain an enjoyable work environment with many opportunities and challenges, as well as, on-going training and development. People who work for government are typically not doing so to get rich. More likely, people who work for government enjoy the hours, local location, security, and predictability.

Great ITS people are those who can see the big picture and can see how technology can complement [not drive] an organization. At the vocational level, designated ITS staff will need to be re-deployed to create a support organization that concentrates on training, support, setting up ad-hoc reports, and service. This will focus the re-engineering and deploying of staff to provide user access to management reports, training, support, and managing vendors to take care of integration, updates, and using data to effect better customer service.

The ITS professionals will serve a crucial role as the technology specialists in this world of quickly changing systems. They will be management advocates asking critical questions such as:

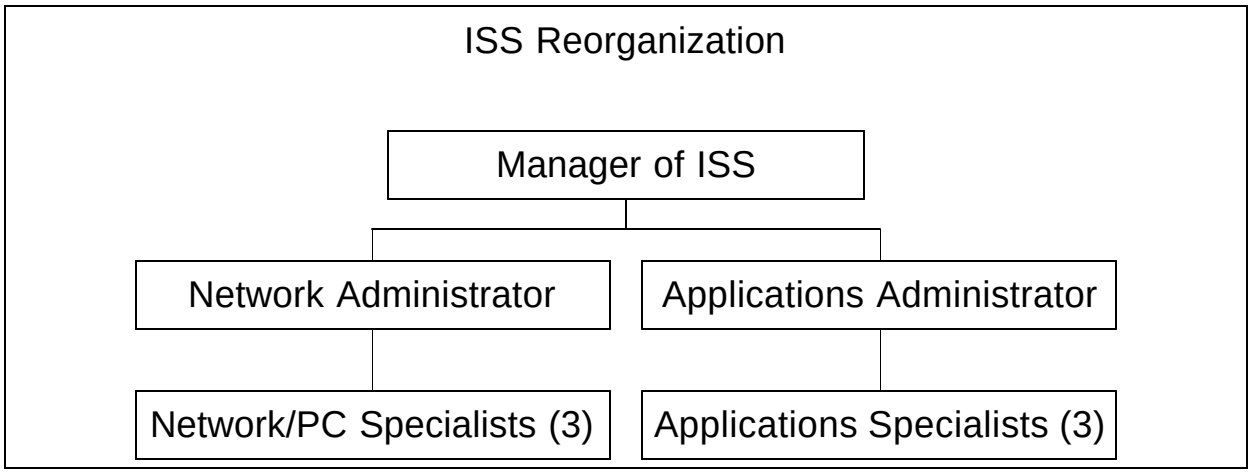
- Can the present system easily and inexpensively meet the demand?
- Is there sufficient back up for the system's protection?
- Are interfaces with other systems required?
- Is source code available to permit making changes in the future?
- Who will maintain the system?
- Are too many PCs being installed without planning and coordinating?
- Are printer speeds adequate for anticipated transaction volumes?
- Is future expansion planned in the areas of memory, disk and peripherals?

One result of the shift from the "data processing model" to the "information systems and support model" is that ITS will have to get out of the programming business as soon as possible and practical. For example, for financial applications, ITS will need to plan, purchase, and migrate to a turnkey, holistic system that include such functions as cost accounting, work order processing, billing and collections, and customer service functions that work, are proven and well-supported.

OLD STYLE DP	**NEW STYLE ITS**
- Command and control DP management	*- Collaborative ITS management*
- System procurement owned by DP	*- System procurement owned by department*
- Remained In the back office	*- Out front in departments*
- Remote communications (memos)	*- Communicative – help desk*
- Operationally-oriented	*- Mission-oriented*
- All technical expertise in DP	*- Technical expertise organization wide*
- Application Programmers in DP	*- Business Analysts in ITS*
- System Programmers in DP	*- Toolsmiths in ITS*
- Home-grown applications	*- Vendor-provided applications*
- Internal application maintenance	*- Vendor-provided application maintenance*
- Systems Analysts in DP	*- Systems Analysts in departments*
- DP controls access to all data	*- User is steward of its data*
- Operator role	*- System Administrator*
- Mysterious and complicated	*- Transparent and simple*
- Closed standards	*- Open standards*
- User Request Reports	*- User Queries and Reports*
- Unminable data assets	*- Databases and datamarts*
- Internal Training	*- External training*

In addition, moving from a "data processing model" to the "information systems and support model" means that when necessary, ITS may recommend outsourcing of new small applications and small sub-systems in programs such as Microsoft Access, or other programs that allow for use of standard query or reporting tools such as Crystal Reports. ITS will need to retrain staff to anticipate future changes such as client server applications, office automation applications, local area networks, fourth generation languages, inter-operable systems, SQL and ODBC databases, and the like. ITS managers will need to re-deploy staff to create a support organization that concentrates on training, support, setting up ad-hoc reports, and service. ITS will have to focus on re-engineering and deploying staff to provide user access to management reports, training, support, and managing vendors to take care of integration, updates, and using data to effect better customer service.

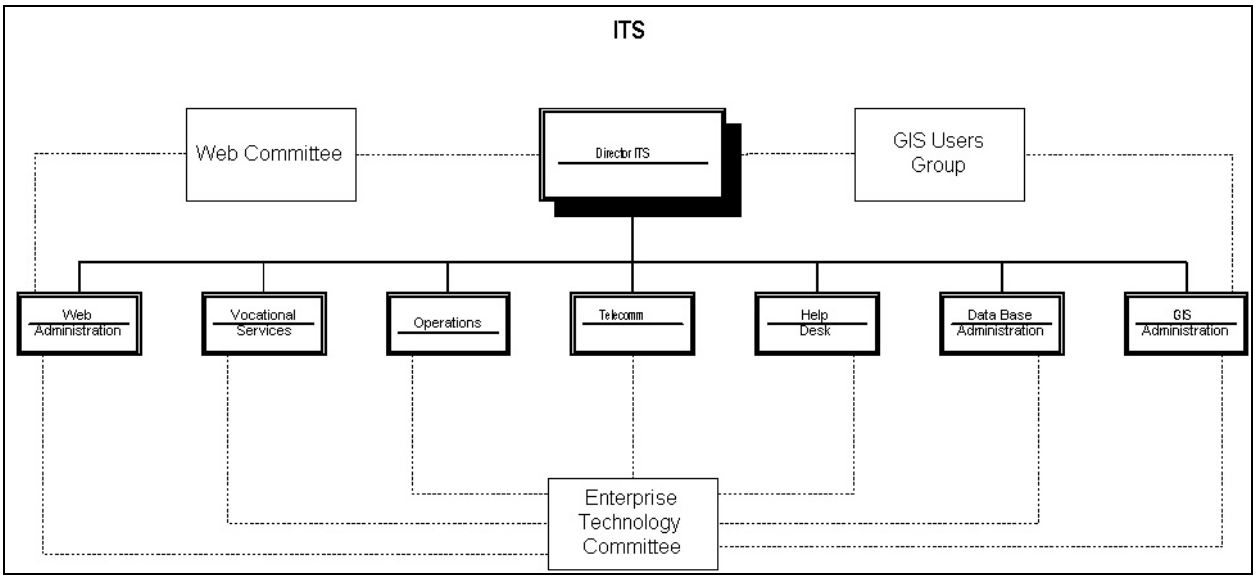
In addition, organizational models are quite contrasting. Smaller municipalities, from 25,000 to 75,000 population, may find it practical to designate staff as technical or vocational, as in the simple, straightforward diagram below that guided a ITS reorganization. Many municipalities are not authorized for nine staff members, and those under 50,000 population make do more usually with two to four people on the ITS staff:



In this diagram, the ITS Department has specialist technical staff to provide service for the municipalities network hardware and desktop units, and the department has specialist vocational staff to provide training and support for the specific municipal application sets used by primary departments. The help desk function rotates among staff members to provide an occasion for a broadening of staff skills and some redundancy of coverage for vacations and absences. It would be highly desirable to have an advisory board, and a GIS users group, to broaden the view of the ISS manager and staff as they organize their work life. Smaller municipalities are likely to eliminate the formal positions of Network Administrator and Applications Administrator, with tasks falling to the few specialists that they can afford. The strategy here is simple: effectively manage the networks and keep the system running, and effectively manage key applications such as finance and public safety.

Note in the next diagram that a large municipality may be able to sustain a more comprehensive organizational structure. In this organizational plan, ITS is advised by a Web Committee and a

GIS Users Group, and each operational sub-set is a member of the Enterprise Technology Committee. The issue, as always, is a balance between function and budget. A commitment to a comprehensive strategic technology initiative always has short term and long term costs.



Regardless, ITS should pay special attention to duties that should include:

- Providing ongoing operational support, serving as the primary interface between the various offices to resolve changes to the database and interface with the software vendor;

- Maintaining the ITS network in proper order to include disk space monitoring, network diagnostics and troubleshooting, Network Planning, and streamlining;

- Evaluating new ITS network products and determining their proper use;

- Providing hands-on conversion and network integration support of the Windows GUI and systems training to users;

- On-site implementation management of distributed databases should include technical support and installation supervision of network vendors;

- Be the quality control professionals within the government able to certify the design, development, and installation of computer programming codes. Non ITS professionals may not sufficiently document, integrate or follow established procedures to maintain new database programs;

- Within each department there should be an ITS liaison for computer and communications functions, such as coordination with user divisions, implementation and support of software packages, and database management and network management. This assignment functions may function within offices as a full time distributive ITS position,

or comprise part-time involvement and "first-line-of-defense" local office involvement. Kalamazoo County, Michigan calls this latter role the "First Responder."

- Additionally, an ITS support and management program should be developed that will contain, depending on ITS size and scope of responsibilities, the following elements:

    1. Standard guidelines for procurement of hardware/software;
    2. Technical support for End-Users;
    3. Technical support for government-wide applications, such as e-Mail;
    4. Criteria to manage disk space, security, and data storage rights;
    5. Training for microcomputer and software application users.

    At the department level, and in concert with the ITS vocational specialists, ITS may be engaged in:

    6. Analysis/design of appropriate office applications;
    7. Approval of forms, data extraction, and data importing.

- Comprehensive Policies and Procedures will be effective in assuring and communicating standards and will be critical in enabling effective operation and reliable performance. A comprehensive Policies and Procedures manual should be created, and reviewed and updated at least annually, to assure compatibility with the new systems, technology direction, and organization and staffing requirements. The following is a possible table of contents for such a manual:

    • Authority/Organization
    • Job Descriptions
    • Backup and Recovery
    • System Security
    • Disaster/Recovery
    • Data Entry Procedures
    • Management of print queues and secondary printers
    • Logging on users from remote locations
    • Library and File Management
    • Retention periods for computer files
    • Job Priority procedures
    • Technical Documentation
    • Software Inventory
    • Wiring drawings
    • Equipment Inventory and Location
    • Training plans/programs
    • Purchasing/Supplies Procedures
    • Operational Procedures and Protocols
    • Hardware and Software Standards
    • Maintenance and Software Change Procedures

Innovation will only come when the administration directs its information system's experts to create an integrated management and information system that is compliant with fundamental and contemporary information architecture and information processing principles. Today's explosion of information technology advancements and changes makes determining the proper direction for the information processing function more challenging than ever. The mission must be to secure a reputation of dependable and effective service and to provide greater function and enhanced productivity tools. These challenges must be met with financial constraints more severe than ever.

ITS must manage an acquisition process that ensures a baseline holistic and integrated system, while supporting and pursuing a rational migration path from existing systems. Only if management insists on an integrated and holistic system will it be possible to manage the information systems more efficiently and effectively. The result will be an ITS that is more cost-effective, efficient, and a productive service office. Information systems must be the backbone to permitting a progressive government to be more cost-effective, more sensitive to serving the information needs of all of the employees and its citizens.

Standards need to be set, the vision of ITS amplified and made consistent, a clear and unambiguous goals and deadlines set. ITS needs to be tracking total capital costs and operational costs, and to be run like a business. ITS needs to aggressively promote training, both for ITS staff and for end users. ITS must be perceived as an asset, not just a necessary expense, and is a key office in efforts to contain costs, streamline operations, enhance the quality and level of services, and promote accountability.

In summary, the change in the professional role from data processing to MIS is opening the door for greater opportunities within the data processing field. In this regard, there are critical questions that an ITS Manager should be able to answer with competence. In a recent hiring, questions such as those in the sidebar were posed to each of the candidates. It was clear that candidates from the private sector would have found the adjustment to the public sector a challenge with its different values and modes of service, while public sector candidates often did not have the business acumen or vast technical experience across platforms demonstrated by the private sector candidates. A sample job description for an ITS Manager might look like this:

JOB DESCRIPTION: MANAGER OF INFORMATION TECHNOLOGY SERVICES

GENERAL DESCRIPTION

Plans, directs and organizes the municipalities information processing, computerization, telecommunication, Inet, and miscellaneous related activities.

ESSENTIAL JOB FUNCTIONS

- Prepares feasibility studies, requirements analyses, procurement, development, implementation and maintenance plans for organization-wide Information Technology Services.
- Confers with departmental officials and directors to determine feasibility of new systems.
- Reviews existing systems and procedures to define any problems and corrective action.
- Supervises application development, computer operations, and system support, networking, telecommunications and personal computer functions.
- Confers with subordinates on unusual and difficult procedures and offers advice and assistance as needed.
- Devises complete computer hardware requirements.
- Develops major areas of operating procedures and schedules workflow.
- Develops standards and procedures for programming, operations, and related information processing functions.
- Assists in preparation of budget estimates for current and proposed projects.
- Writes and administers proposals for procurement of all computer, Inet, and telecommunications systems, and related maintenance services.
- Maintains inventories, solicit supplies, reviews bids/quotations for all computer and telecommunications materials, supplies and consumables.
- These essential job functions are not to be construed as a complete statement of all duties performed. Employees will be required to perform other job related marginal duties as required.

KNOWLEDGE, SKILLS AND ABILITIES

Knowledge of the development of application software utilizing on-line real-time concepts. Knowledge of common business programming languages, operating systems and systems design techniques. Ability to evaluate system requirements and develop methods and procedures necessary to accomplish objectives. Ability to plan, schedule, coordinate, direct, and review the work of subordinate technicians, professionals, and supervisors in a manner conducive to full performance and high morale. Supervisory skills.

- Strong management visionary skills to understand the importance and the requirements of future technology end-users.
- Customer Service experience or business experience in responding to customer needs. A strong "customer" service orientation is critical.
- The individual must have self-starting and self-initiating skills.
- Experience with current technologies [i.e., TCP/IP communications, Novell, NT, Unix, Linux, fourth generation languages and voice/data communications and networking]
- Willingness to be constantly retrained and to have his/her job duties evolve as the then current technology dictates. For example, initially the goal will be for a person who will be preoccupied with computerized information systems; however, as time evolves more involvement with communications, imaging, and other forms of technology.
- Thorough knowledge of and ability to apply rules, regulations, policies, and procedures relative to all aspects of Information Technology Services operations;
- Comprehensive knowledge of applicable provisions of regulating agencies and government;
- Thorough knowledge of the operation of business;
- Ability to communicate effectively, both orally and in writing, with people on all levels;
- Thorough knowledge of contract management and negotiations, budget, purchasing and bidding, disaster recovery, computer technology, project management, personnel practices, and planning;
- Superior ability to effectively and efficiently lead, direct, and manage personnel to achieve the common goal of quality Information Technology Services management;
- Knowledge of and ability to develop a proposed budget, obtain budgetary approval, and to operate within budgetary constraints in conjunction with overt efforts to reduce costs through managerial actions.
- Comprehensive knowledge of Information Technology Services administration as evidenced by a relevant Bachelor's or Master's Degree in Computer Science, or a Master's Degree in Public Administration, and a minimum of five (5) years management and supervisory experience.
- Ability to make appropriate and prudent decisions in a timely manner regarding personnel issues, application of regulations, and financial considerations.

An advertisement might look like this:

Manager of Information Technology Services Government seeks a Director of Information Technology Services who can effectively and efficiently manage the information technology resources of the government. The Director must have expertise to manage the migration from a proprietary system to Unix and PC-based local area networks, and must be able to design and maintain a productive infrastructure of efficient networks with remote access capability. The Director must have a customer service orientation to provide information support and training to the end-user community. The Director must be an innovative manager, an effective leader, possess demonstrable managerial skills, and possess strong analytic and communication skills. While it is desirable that candidates have hands-on experience with support of local area network operating systems, this is not a requirement. Candidates should have at least a Bachelor's degree, and preferably a Master's Degree, from an accredited college or university in computer science, business administration, public administration, engineering, or a related information technology field. In addition, candidates should have at least five (5) years experience in a managerial capacity which included responsibility for supervision and training of assistants, proven project management, and exposure to diversified software and hardware configurations including mainframe, mini, macro, and personal computers and computer networks. Salary $xx,xxx - $ yy,yyy. Please send resume by September 30, 2000 to the Administrator, Government of America. The government is an EEO/AA employer.

On the vocational side, there may be enough demand to have a separate director to manage departmental hardware and software application acquisition and support that are beyond the duties of ITS and its enterprise infrastructure. Such a position might be described as follows:

Director, Vocational Technology Services

General Responsibilities: Collaborates with departments in the acquisition and support of departmental hardware, software, and network beyond the DPOP. Consults with departments on all issues related to departmental application systems.

Specific Responsibilities

- Line manager for department's technology staff:
- Hires, guides, coaches, disciplines and directs departmental technology staff.
- Writes and conducts annual performance reviews for departmental technology staff.

Planning:

- Researches vocational applications specific to the department and develops technology plans.
- Stays abreast of developments in vocational methodologies, strategies and functions and builds them into the departments technology plan.
- Works with department and ITS staff to synchronize internal and municipal-wide planning.

Communication:

- Chief Technology Ombudsman.
- Communicates and collaborates with other department staff and ITS.
- Participates on the enterprise technology committee.
- Provides advice and counsel to department staff on vocational technology issues.
- Maintains and manages relationships with departmental technology vendors and outsourcers.

Service Provision: Provides technology application services to internal and external users of the departments systems and oversees development and maintenance of departmental applications.

- Publishes systems' documentation for systems' users
- Departmental local area network administration.

Technology Administration:

- Ensures compliance with enterprise technology standards, policies and procedures.
- Manages departmental hardware, software and network.
- Benchmarks departmental systems and services against peer local governments.

Technical: Performs technical tasks as required.

Requisite Experience:

- Bachelor's degree in a relevant discipline or equivalent experience.
- A minimum of five years experience with information technology.
- A minimum ten years experience in the related vocational applications.
- Excellent interpersonal, verbal and writing communication skills.
- Three years experience managing technology staff.

Desired Experience: Masters in Public Administration

Finally, it is useful to provide a sample of how a vocational specialist, such as a business analyst, might be described:

Business Analyst

Reports to: Director of Vocational Services or Director, Information Technology Services

General Responsibilities: Departmental system(s) support. Departmental representation and liaison. Business Analysts are the technology ombudsmen of the organization and collaborate with the departments in developing requirements and specifications.
Specific Responsibilities: Planning: Develops internal ITS department plans. Acts as project manager for ITS projects. Develops ITS department plans in tandem with vocational department technology plans.
User Support: Coordinates departmental system plans and priorities on behalf of the municipality. Serves as a member of departmental technology project teams. Assists departments to Identify and document their system requirements, needs and wants. Collaborates with departments and contributes to their departmental system RFPs. Assist departments in researching available, relevant technology.
Communication: Participates on the enterprise technology committee. Acts as liaison between ITS and other departments.
Requisite Experience: A bachelors degree in an appropriate discipline. Five or more years experience with local government application systems. A minimum of two years experience in systems analysis. Above average interpersonal skills.
Desired Experience: A masters degree in an appropriate discipline. RFP development and evaluation. System Development Methodology.

Management and Maintenance of Technology Assets

As technology becomes pervasive, and network attached devices proliferate, a new set of business issues arise which often catch organizations off guard. These issues surround the physical inventory of components down to the desktop, maintenance, software licensing requirements and restrictions, configuration control and management, security and financial management of fixed and leased assets. Labor surrounding the support of a distributed technology base is by far the largest single cost component over the installed life of computing and network assets. The cost of labor and loss of staff productivity in upgrading a single desktop often exceeds the cost of the hardware or software being upgraded.

ITS must have strategies which help to reduce the cost of maintaining large pools of technology assets. To maximize technology investments, Appropriate strategies might include, for example, "promoting" equipment that is unable to meet the demands of its current deployment yet would be more than adequate for less demanding needs elsewhere in the infrastructure. These strategies must encompass the use of contemporary tools and techniques in the management and tracking of these assets.

While some initial network implementations may have been in support of a specific business application or productivity gain, once installed, the incremental cost of supporting, enhancing and extending the technology base pales when compared to its start up costs. As a result, what started out as a work enhancing non-critical office tool has evolved into a mission critical element of the government's operation. Downtime becomes disruptive and intolerable and must be minimized.

In conjunction with technology management strategies, enterprises must prepare for and minimize, and sometimes avoid, outages due to component failure problems. ITS must be able to provide maintenance alternatives to address pro-active and reactive responses to enhance equipment and network performance and availability.

The Question of Outsourcing

In the early part of the last decade, there was enthusiasm for an outsourcing model in which entire ITS operation would be privatized and managed by outsiders. Private marketeers told local officials what they want to hear, that "Private vendors can manage your ITS functions better than local ITS professionals." While this may have worked for garbage collection, the road through ITS has been very bumpy, and in the private sector especially, recent history abounds with failed ITS outsourcing attempts. We are of a generation where the personal doctor was more responsive to a health care patient needs than a managed care provider could be (that is assuming the managed care provider is more interested in managed profits than the quality of care). It is a rare managed care provider who makes house calls for sick children. Similarly, it is a rare privatized vendor who is available 24-hours a day, on-site, to service the system or assist and train municipal users on their information systems. The new municipal ITS Manager will be a manager of service provider assets. Some of the service providers will be in-house technical staff, but many will be outside specialized consultants, or technical service providers, as well as software turnkey providers.

Outsourcing must be viewed from a cost/benefit perspective. Just as leasing equipment (or a car for that matter) is always more costly then purchasing, so is outsourcing. There are appropriate reasons to do so, however. Outsourcing has its advantages and disadvantages. Furthermore, outsourcing need not be to a vendor, it can be to departments within the government. There are appropriate reasons to outsource:

- Acquisition and maintenance of specialized skills;
- Maintain a focus on the business of government rather than the distractions of technology;
- Full time support not needed;
- Internal service levels are wanting;
- Political considerations.

There are appropriate tasks to consider for outsourcing:

- Maintenance of the desktop environment;
- Highly technical network support;
- Help desk support;
- Training;
- Workload overflow;
- One time projects;
- Internet web management and electronic interfaces.

The high risk outsourcing items include:

- Data assets;
- Business functions along with the technology;

- Application services.

Finally, there are specific outsourcing considerations:

- Vendors must be well managed;
- Expectations and deliverables must be clear;
- Spread the work around; do not rely on one vendor;
- Vendors face the same staff recruiting, retention and training issues that governments do.

Governments should examine the costs of outsourcing in the context of value. If governments treated their ITS departments as a business rather than a support function, the costs of running this business would begin to approach the cost of outsourcing. But few governments invest, or can afford to invest, in the training of highly technical personnel, compete for skills with the private sector and acquire the comprehensive set of hardware and software tools required to productively diagnose problems. Furthermore, outsourcing addresses one of the fundamental issues that all internal support organizations face when measured by their service responsiveness and that is the issue of supply and demand. Outsourcers are ready, willing and able to satisfy the service demands of all the government users. The primary difference is that they "charge by the drink."

Local governments who use internal service funds to charge back ITS costs to the users are only deluding themselves on the effectiveness of this highly outdated model. While appropriate to the legacy technology environment, the value of this obsolete model has long passed the point of diminishing returns. In today's distributed technology environment more appropriate allocations exist. Consider the following as they relate to internal service funds:

- The fund amount is fixed, not variable. Therefore the available ITS resources (supply) are fixed while the demand for them is not. For all intents and purposes this makes the ITS resources free;
- Today's resources are allocated to support and not program development;
- Allocation and assignment of resources must be based on severities rather than priorities;
- It is a rare department that believes it is getting value for its internal service fund dollar;
- ITS departments are abused by the attitudes of the users who believe they have paid for the right to demand unlimited services.

In today's technology environment, the internal service fund has been effectively replaced by the total cost of ownership model. Many costs that were indirect in the legacy era can now be accounted for directly. These direct costs appropriately belong in the department's budget. The departments need to fight for the funds through a justification process. Outsourcing then becomes a way to understand, and manage, the total cost of technology ownership. It puts an actual number to the cost of the level of support the government desires to sustain. Perhaps its greatest benefit to local government technology management is that it offers a mechanism to keep the government from over committing to technology it cannot afford to support.

Governments have tried outsourcing with varying degrees of success. Consider the following:

- One government recently decided it wanted to automate the permitting application process by putting it on the Internet. Since it had no expertise in-house, nor the desire to develop and maintain this expertise, it contracted with an Internet application service provider (ASP) to extend these online services to the community. The government quickly learned that:

    - ASP personnel were technical wizards but knew nothing about permitting and the nuances, operational demands and workflow necessary to support the process;

    - That their current automated permitting system would be rendered virtually useless;

    - That the ASP's access needs to the government's permitting data presented security and integrity problems.

- A Southeastern county was deluged by desktop support requests which would have minimally required an additional two full time ITS staff members to handle the growing demand. Rather continue the trend of adding staff to meet demand, the county executive pursued a different strategy. Key elements of this strategy included:

    - Outsourcing hardware support to local vendors;

    - Outsourcing desktop software support to the departments;

    - Retention of responsibility for the infrastructure in ITS;

    - Transforming the help desk from a support function to a triage function;

    - Assigning the costs of the support services to departmental budgets;

    Results included a reduction of calls to the help desk of over 80 percent and greater user satisfaction.

The lesson here is that selective outsourcing must be understood as an asset, and managed well, can help satisfy the voracious and increasing demand of user constituents. The extent of outsourcing is highly dependent on the strategic technology plan, the availability of talent, and the centrality of information technology in the provision of government information services.

Data and Telecommunication Challenges

No longer will ITS departments be evaluated as to how well they send reports to internal departments. The future, here now, is for the information technology to serve the greater community. This will require a careful synergy between the ITS technologists and the department information providers. For example, many building permit systems empower the taxpayer to request a building permit on-line via a computer, or a touch pad of a telephone, or a voice activated system. They the customer can call 24-hours a day to monitor the progress of the various steps of the approval process. Similarly, water and electric utility customers are

becoming empowered to enter their meter readings with the same tools the building permit users are utilizing. Many utilities are eliminating meter readers and replacing them with meter reading technology linked to cable TV lines, telephone lines, or radio frequencies. ITS professionals must plan for the next millennium and provide the most versatile technologies. For example, in many cities 10-baseT communications may be more than adequate to move textual data, such as letters and memo. But in the near future, and in some cases here now, municipalities will have to have more robust technology such as optical fiber to support geographic information systems (GIS), photos of staff, inmates, and city owned swimming pool customers.

On the voice front, there is concern about the quality, functionality or cost of telephone systems and services. ITS Managers are discovering that they are the logical choice to provide or arrange for assessment of telephone bills and operations, and replacement, upgrade and reconfiguration of the currently deployed voice facilities. Modern applications are viewing telephony as a networking application and the ITS Manager must be able to look at alternatives of combining voice with data, video, and audio to reduce costs and leverage government's network assets.

Traditionally, voice, data, and video networks have been considered in isolation of one another. While this approach presents fewer challenges for local governments, it often results in redundant costs and lower levels of capabilities, and the ITS manager must be able to take a holistic look at total networking needs to develop efficient and effective solutions to them in total

Connectivity and access to data have become pre-requisites to enabling both the centralized and distributed technology within the municipal organization. Local area networking must be evaluated from the perspectives of staff productivity and information processing.

Based on the government's sources and destination of data, ITS managers must be able to design and implement functional, reliable, maintainable and sustainable LAN systems. In addition, based on geography and the location of numerous government facilities, ITS managers will be expected to design a wide area networking strategies to link these facilities together. Wireline, cable, wireless and competitive provider alternatives must be evaluated and matched with the connectivity needs of the municipality.

The public demand for wireless services seems insatiable. Virtually any government agency with intelligent desktop workstations, such as PCs, can avail themselves of a LAN where these emerging technologies can be attached and accessed for a much lower price. Multiple LANs within a government are no longer uncommon. And, with the explosive growth of INTERNET access, communication with the outside world of commerce, education, research, other governments, and the community is becoming ubiquitous among even the smallest local governments.

New FCC regulations simultaneously provide a flood of new opportunities to additional wireless services providers while placing restrictions on local jurisdictions in dealing with community impact issues. Local zoning ordinances and architectural review policies are being superseded by these regulations limiting the scope of the local government's authority. Future competition among cable television and local telephone service providers, along with the new wireless companies will place more demands upon communities for physical infrastructure support for radio towers, trenches and utility poles and their rights of way in numbers unforeseen when current controls over these matters were enacted.

Beyond the environmental impact issues, these new demands offer a wealth of opportunities for the governments seeking to include these technologies into their own strategic requirements. Affecting government operations, the ever decreasing costs and increasing advantages of computers implementing client/server and LANs combined with the increased functionality of software and services has led to a proliferation of a variety of LANs, network protocols and distributed systems at the departmental level within local government. This has made the incorporation of core technologies such as imaging, audio, video and fax routine. The individual LANs, however, often have their own administrator and serve the local and parochial needs of the department they serve with many of the support costs hidden. Once limited to specific and special shared functions and, more recently, e-mail, LANs are taking on an expanding role that extends beyond departmental boundaries and encompasses the entire government entity, suppliers, other governments and their agencies and perhaps most importantly, public access.

Telecommunication Alternatives

Governments need to be looking at the following alternatives to enhance their telecommunications effectiveness and reduce, in many cases significantly, its telecommunications related operating costs.

Institutional networks (Inet) consist of government funded, rented, and/or bartered fiber among its facilities, schools, libraries, et al. Not only are the physics of copper cable increasingly unable to meet the data traffic demands of local government, its rental is relatively expensive. On a tour of Bell Laboratories in 1990, engineers demonstrated their ability to send 2.4 billion bits per second (a measurement of bandwidth and more than enough today for most governments) on one fiber [pair]. As of this writing, that number has increased to thirty trillion over the same fiber. In 1990, few if any local governments could afford the network hardware and equipment to transmit 2.4 billion bits. Today, it's a drop in the bucket, yet the glass is the same. What's right with this picture? Bandwidth demand in government is being driven on all fronts. More network users, more applications, more applications per user, higher usage per user, the Internet and the "electronic city hall". These demands pale, however, to those of GIS systems which are becoming both a common and necessary staple of every government.

The case for fiber is becoming more and more compelling, especially for local government. Why? Consider:

- The cost of a cable containing twelve fibers is 37 cents a foot. (Its primary cost is in installation);
- It is capable of sustaining bandwidths in the trillions of bits per second. In other words, it will virtually last forever. However, plan to upgrade electronics every five or so years though;
- Many, many governments own or are in control of their rights-of-way. Where better (and where else) to run fiber?

Various governments look at the cost of fiber deployment skeptically, others strategically, others as an expenditure they cannot justify. Some rent, others trade franchise rights for access to franchisee fiber. A lot depends upon geography. A city is more likely than a county to be able afford its own fiber. Copper is still available and a viable alternative.

- One southern city decided it would spend $69,000 to deploy a twelve-fiber cable between city hall its other five downtown facilities to support its computer networking needs. Shortly thereafter, the city decided to upgrade its telephone systems to provide better external and internal communication and issued an RFP. Two proposals were submitted, one that could use the city's fiber, the other could not. The net present value savings of the fiber over non-fiber proposal over ten years: $140,000.

- Another southern city looking to upgrade its telephone capabilities, examined its wide area networking needs concurrently. While fiber was not an option, they combined voice and data together over copper thus reducing the number of circuits needed and the monthly expense of additional circuits.

Regardless of how far down the technology road a government has progressed, governments in general are now tapping the vast potential value of the intelligent desktop and building wide area networks that touch everyone internally and also are starting to reach external users. In many cases, governments that have multiple distributed systems find that technologies and implementations are different, that few standards have been defined and followed, that the

technologies have become corporate assets but are not managed as such, and that melding the different agency systems into a unified, seamless, inter-operable network is a complex, expensive and sometimes impossible task. At the same time, many governments which have yet to scratch the surface of the emerging technologies understand their value but are unsure how best to proceed with implementation.

Many systems have quickly become integral parts of the operation and demand robust, secure and functional implementations. A government wide architecture plan encompassing design, standards, governance, and operation is essential if various and disparate systems are to seamlessly serve the government as a whole. Now is the time to identify the benefits new utility companies can provide, include them in the technology plans and account for these benefits in the contract negotiation process. These plans must accommodate the integration of the installed technology and current products and allow for inclusion of future technologies as well. With the convergence to all digital object architectures, networks must be ready to handle increases in bandwidth to concurrently transport voice, image, data, audio and video traffic in a true multimedia environment. The need for transmission services between government facilities cannot be overlooked.

Information Technology Services in the 21st Century

In summary, ITS, in many instances in collaboration with their department constituencies, must have the following skills:

- People Skills [management therapists, trainers, consultants, facilitators, sociologists, initiators, and leaders];

- Business Skills [knowledge of the applications and the various business requirements, such as financials, utility deregulations, police or fire dispatch and records, GIS, mapping for engineers, records management, Internet and Web enabling opportunities, handheld data entry and dispatching tools, GPS [Global Positioning System];

- Technology Skills [i.e., telephony, radio, local and wide area networks, personal computer technologies and peripherals, operating systems, various programming languages, point of sale devices, fingerprint ID system, and so on];

- Resource Skills. The new ITS professionals will have to be like head hunters who are constantly checking their resource radar systems to know who is available for software systems, communication systems, training, workshops, and consultants.

By far the greatest enemy of customer satisfaction to both ITS and the users is the lack of a detailed common set of expectations. A close second is the users' belief that they unilaterally can define the services ITS will provide to them, usually at no cost to the departments. Third is a lack of recognition on the part of users that they must assume partial responsibility for managing their technology vendor, ITS, rather than foisting all accountability on ITS! Attacking these and issues like them falls to the new generation of ITS managers. To set about this, ITS departments must:

- Define and publish a menu of services with explanations on how to request provided services and where and how to seek those not provided.

- Set and meet expectations as to the common services ITS does provide to all its customers.

- Collaboratively develop with each customer a specific and appropriately detailed set of bi-lateral expectations, roles and responsibilities that apply to the department and ITS relationship. Review attainment of these expectations and evolve them at least quarterly.

- Facilitate user self-sufficiency by (a) providing guidance and establishing alliances with vendors that the customers can deal with directly regarding support services, and (b) Developing a curriculum and negotiating schedules with qualified firms that the departments can schedule training on generic technology hardware, software and conceptual topics.

In other words, the new ITS Team must think of themselves as entrepreneurial managers. A careful attention to service provision, balanced by smart cost/benefit analysis, and careful collaboration with the user community, will make ITS a valuable asset rather than a begrudged expense.
