Public Sector Information Resources in the Coming Millennium: A Management Imperative

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Abstract

In the coming millennium organizations will continue to witness the strain of escalating customer demands. In an effort to address increasing expectations, theorists predict that organizations will evolve into a "continuous improvement" paradigm. The paradigm espouses flattened organizational structures, proximity to the customer, and decentralization of assets and resources. These organizational characteristics provide the ability to continuously improve services to meet shifting customer preferences. Because of its ability to quickly capture, isolate, array, and communicate service delivery information, the effective use of information technology is pivotal to the continuous improvement organization. This paper considers the role of managing information resources under the continuous improvement paradigm. Specifically, the paper examines the critical role that general managers and business executives play when implementing technological innovations under a continuous improvement paradigm.

Sweeping changes in organizational life are occurring in tandem with the arrival of the next millennium. Caught in the shift from an industrial to an information centered economy, many of today's public and private organizations are transitioning to meet the demands of tomorrow's knowledge-based society. Purportedly, service goals will be met through a "continuous improvement" approach to organization (Mechling and Fletcher, 1996; Drucker, 1996; Martin, 1995). According to proponents, the continuous improvement model allows organizations to meet escalating and evolving customer expectations. The continuous improvement paradigm espouses flattened organizational structures, proximity to the customer, and decentralization of assets and resources -- techniques that allow a rapid response to shifting customer desires.

Public Administration & Management:
An Interactive Journal
5, 1, 2000, pp. 67-85

Through its ability to store, forward, retrieve, and distribute organizational information, information technology provides a critical support structure for the continuous improvement paradigm. As early as 1969, Peter Drucker forecasted that information and its requisite technology would become "the central capital, the cost center, and the crucial resource of the economy" (p. 264). Twenty-five years later Drucker (1995) continues to speak to the important role information technology (IT) plays in supporting organizations in their quest to adopt a continuous improvement approach to providing products and services. A recent Department of Commerce (1997) report on information technology sales and occupational growth rates tends to support Drucker's assertions. Between 1988 and 1995 IT sales grew 14 percent in constant dollars (Department of Commerce, 1997). G2 Research (1998) forecasts that total annual spending on information technology will top $500 billion by the year 2000. Recent statistics indicate that the computer industry comprises roughly 10 percent of gross domestic product in the United States and is larger than auto, steel, mining, petrochemical, and natural gas industries combined (Tapscott and Caston, 1993). Based on the current growth rate, the Department of Commerce predicts that one million new IT workers will be needed before the year 2005 (Department of Commerce, 1997). Boettinger (1984) claims that by the turn of the century 66 percent of the United States work force will be dedicated to information related professions.

Seeking to explain the factors that undergird the continuous improvement philosophy, researchers point to technology as a catalyst for improving service delivery. Yet, for many organizations, technological innovations do not come easily. While the benefits of technology are often touted, more rigorous evaluations suggest that technology projects typically experience high failure rates (Cats-Baril and Thompson, 1996; Keil, 1995; Davis et al, 1992). As a point in case, in a recent study the Standish Group (1995) found that only 16 percent of information technology projects are completed on time and on budget. According to the Standish Group study, roughly fifty percent of IT projects exceed original cost estimates by 200 percent. Furthermore, in 1995 alone, $81 billion was spent on canceled technology projects (Standish Group, 1995). While, investments in information technology can yield high returns, they too often involve assuming unacceptably high levels of risk.

To date, previous research has focused on the critical role of management commitment in adopting technology initiatives. After begging the question "Whose responsibility is information technology management?" Boynton et al. (1992) claim that system development efforts are best led by line managers who thoroughly understand the business operation. They go on to claim that senior managers must carefully allocate responsibilities among technology managers and general managers if they are to achieve the benefits of information technology. While studies have illustrated the importance of management involvement, few have isolated the actual role of the general manager in the technology adoption effort. Complicating matters further, many general managers feel ill-at-ease in assuming responsibility for information technology efforts. In a recent survey of 85 senior executive service employees only seven percent (N = 6) stated that they felt comfortable with having responsibility for a technology initiative (Brown, 1998).

The focus of this research is to examine the role of the general manager as it relates to information technology efforts in a continuous improvement organization. The discussion that follows centers on the instrumental role that general managers play in technology innovation. Specifically, the paper provides insight on why continuous improvement organizations will look to general managers to support technology initiatives. Further, the paper will also discuss how these managers, many of whom lack technology expertise, can leverage their talents to mitigate the problems often encountered in technology adoption. In short, organizations that successfully mitigate the risks associated with implementing technological innovations will thrive in the coming millennium, and those that do not will experience disintegration and decay. Organizations that thrive will do so by taking advantage of the talents that general managers can provide to their information system adoption and implementation efforts.

The Next Millennium: The Shift Toward A Continuous-Improvement Paradigm

Contemporary scholars predict that, due to the competitive advantages that technological innovations allow, organizations will adopt a

continuous improvement approach to providing products and services (Drucker, 1995; Tapscott and Caston, 1993). Many researchers point to the rise in technological innovations as the primary catalyst for the shift to the new paradigm. According to these theorists, innovations in computer and communication technologies are stimulating competition in two fundamental ways. Technological advancements have expanded the scope and size of the market, and increased market expectations (Davenport, 1993; Keen, 1991; Martin, 1995).

Ongoing advances in information systems and communication technologies allow organizations to achieve greater levels of productivity, efficiency, and service delivery. Information technology also allows organizations to enhance productivity, gains which are often passed on to the customer through improved service delivery. Through technology, task cycle times are reduced by eliminating intermediaries, or steps in the work process (Dawes et al, 1997). For example, one electronic mail message replaces the dictation of a memo which is then typed, copied, and distributed. Electronic work flow processing allows operational reports to be stored and forwarded to appropriate units for follow up without a host of manual intervening steps.

Further, because of technological and communication innovations, geographic boundaries that once defined a customer service jurisdiction no longer apply. The move toward distance learning provides an excellent example of how organizations are no longer restricted to, or guaranteed the market base of, a contained geographic boundary. Many universities have begun offering courses over the internet. Students who were previously restricted to regional state university offerings can now pursue a degree from these on-line universities irrespective of where the student resides. Given the advances in communication technology, students and universities alike are no longer regionally bound.

The continuous improvement approach argues that organizations in the next millennium must incorporate technological and structural arrangements that facilitate change and innovation. To respond more quickly to changes in customer needs, continuous improvement researchers stress the importance of flattened hierarchies and autonomous decision structures. A high degree of decentralization is needed because decisions must be based on accurate information generated from close customer

proximity. A close market proximity and a relaxed decision authority structure promotes the opportunity to innovate, change, and improve products and services on demand. Organizations are under increasing pressure to maintain a prosperous market presence by exploiting the benefits that technology can offer to meet escalating customer expectations. Rising pressures spurred by technology and driven by a competitive dynamic marketplace are largely responsible for the shift toward a continuous improvement paradigm. Proponents contend that the continuous improvement paradigm will allow organizations to compete effectively within an information centered, knowledge-based society.

For example, in a recent interview, a chief executive officer for a health care alliance stressed the importance of the role of information technology in the continuous improvement organization. The CEO stated "we need to know at the precise moment when infants in our geographic jurisdiction are dying and why. . . we need to be able to communicate that information to our practitioners in the field so changes can be immediately implemented to prevent and troubleshoot future occurrences. We cannot afford to wait until we receive monthly or even weekly reports to recognize the beginning of a deadly problem." According to the CEO, timely information is required on an ongoing basis. And the information needs to be communicated throughout the organization irrespective of any given employee's work site so procedures can be immediately altered to meet customer needs. Organizations that thrive in the coming millennium will excel at developing technology that provides the information and work processing support needed to meet customer requirements (Martin, 1995; Davenport, 1993).

The continuous improvement paradigm challenges general managers to refine and perfect current roles and responsibilities on how technological innovations are adopted and managed. According to Cleveland (1985), all organizational activities are driven by data, information, knowledge, and wisdom (p.21). The sole purpose of the executive and management function is to mobilize and activate resources and support structures to make something happen, to produce a good or service. The difficulty is often in determining which resources to leverage to produce the desired results. In considering recent resource expenditures, executives and managers are apparently relying heavily on technological innovations for meeting their organizational needs.

Information Technology: The Current State of Affairs

If expenditures in the information technology arena are any indicator of expectations, then organizational leaders anticipate substantial gains from technology adoption. In the 1980s investment in information technology grew from $55 billion to $190 billion, an annual growth rate of just under 15 percent (Keen, 1991). By 1992 the computer industry comprised 10 percent of gross domestic product in the United States and was larger than auto, steel, mining, petrochemical, and natural gas industries combined (Tapscott and Caston, 1993).

From a very simple perspective, managers employ technology for two primary purposes: to improve the productivity and/or efficiency of work processes, or to advance decision making capabilities. Yet, despite the investments identified above, many contend that computer technology has not met managerial expectations for improvements in productivity, performance, or decision making (Northrop et al, 1990; Anthes, 1996; Brown and Brudney, 1998). While there is a feast of technology choices, there appears to be a famine of technology benefits.

As early as 1981, Feldman and March called into question the benefits achieved from information and technology. They claimed that "organizations seem to invest in information and information systems, but their investments often do not seem to make sense. They gather information and do not use it. They ask for reports and do not read them. They act first and receive requested information later, and do not seem to be concerned about the order" (p. 173). Two reasons are cited for the failures: information overload and ill defined systems. The information provided is either inadequate, incorrect, or insufficient: there may be a great deal of information (data), but it is not information that can be used (knowledge).

At the same time that Feldman and March were questioning the benefits of information technology, Turner (1982) drew attention to the high failure rate associated with technology adoption. He stated that "after more than two and a half decades of experience in implementing computer application systems a surprisingly large number of them still end in failure" (p. 207). In another early study on the implementation of information

systems, Thayer *et al.* (1982) found that over 30 percent of the 60 large computer projects examined were abandoned prior to completion.

More recent empirical work continues to support these earlier assertions. Keen (1986) contends that managers often complain that the reports typical systems produce are too limited, too late, and too narrow in focus. Reports generally relate historical financial figures rather than up-to-date operating indicators that can help managers anticipate potential problems instead of finding out about their consequences after the event. He goes on to state that "claims about the almost deterministic relationship between investing in office technology, personal computers, and information systems and getting improved productivity have produced too few proven results. It is as if there is some missing ingredient" (p. 83).

In a more recent analysis of public and private sector organizations, The Standish Group (1995) validates these earlier assertions. According to a study of 365 public and private sector information technology executive managers, one-third of all information technology projects were canceled before completion. Moreover, only 16 percent of the projects were considered successfully completed on-time and on-budget. Over 50 percent of the projects exceeded their original cost estimates by almost 200 percent and roughly one-third of the projects experienced time overruns of 200 to 300 percent. The Standish Group estimates that American companies and government agencies spent $81 billion on canceled information technology projects in 1995 alone. In another study, Cats-Baril and Thompson (1996) claim that 20 percent of all the projects studied were scrapped before completion -- and 80 percent of the ones that were completed finished behind schedule, over budget, and with lower functionality than originally anticipated (p.563).

While the past two decades have witnessed the proliferation of computer technology, managers are realizing that technology benefits are neither guaranteed nor automatic. For many agencies, ill-defined systems that impede productivity and thwart effective service delivery are the rule rather than the exception. Organizational leaders are finding that information technology efforts are too often plagued by unusually high project failure rates.

Federal GAO reports have documented numerous examples of operational problems due to information technology shortcomings and failures: the outlay of millions of dollars of unauthorized student loans (GAO/AIMD-94-115, p.7), the disbursement of over $1 billion of mistaken Medicare payments (GAO/AIMD-94-115, p.7), the release of highly sensitive computer data on federal law enforcement informants (GAO/AIMD-94-115, p.7), and an $8 billion dollar failed tax system plan (Anthes, 1996). One GAO report cites that "despite spending more than $200 billion on information management and systems during the last 12 years, the government has too little evidence of meaningful returns. The consequences -- poor service, high costs, low productivity, unnecessary risks, and unexploited opportunities for improvement -- cannot continue" (AIMD-94-115). But poor performing systems are not isolated to the federal government. State, local and private sector organizations are also encountering similar problems. Information technology systems that are incompatible, overly complex, and do not provide operational benefits are frequently found in many state level agencies.

According to Drucker (1995), knowledge is the primary resource for individuals and the economy overall -- the challenge for public and private managers is knowing how to best integrate specialized knowledge and information into common organizational tasks to improve service delivery. In essence, managers must develop the talent to be able to assess the operations and needs of the organization and then to identify how technology can support the work efforts. To employ technology to support a continuous improvement paradigm, organizations must correct the current failure rate and demonstrate their ability to successfully adopt information technology. Organizations that are either unable or unwilling to involve general managers in their technology initiatives are likely to experience decay.

Insuring Best Practices: The Role of the General Manager

General managers can help guide decisions that may impact schedule, cost, system performance, and operational benefits. They can assist with examining the potential costs and benefits that alternative approaches may provide in terms of productivity, efficiency, and service delivery. Managers can also assist with controlling implementation and monitoring outcomes to promote system success. Furthermore, they can

play a critical role in managing the risks associated with technology adoption by encouraging staff to adhere to "best practices."

Increasingly, more and more research is focusing on the topic of "best practices" -- factors that relate to successful information technology adoption and implementation. Theoretically, the study of best practices seeks to isolate the critical success factors that can aid the organization in minimizing the odds of information technology failure. Although much has been written on the various factors that contribute to successful initiatives, unfortunately, the vast majority of the findings derive from anecdotal stories and small N case studies. Nonetheless, given the apparent difficulties associated with technology adoption, much can be learned by examining the literature to date and encouraging managers to acquaint themselves with the best practice strategies that have been isolated thus far. By focusing on best practices, general managers can 1) determine whether the efforts are on or off track, 2) examine how the efforts will ultimately relate to operational benefits, and 3) institute acceptable contingency plans to mitigate potential failure. The role of general managers, then, becomes one of communicating how the organization defines project success and continuously improving technology initiatives by adopting, refining, and cultivating best practice strategies through out the innovation effort.

A cull of the literature points to seven best practices for achieving successful technology initiatives (Keil, 1995; Davis et al, 1992; Benjamin and Levinson, 1993; Lederer and Sethi, 1996; Boynton, Jacobs, and Zmud, 1992; Bowsher, 1994; Standish Group, 1998; Davenport, Eccles, and Prusak, 1992; and GAO/T-AIMD-97-38). In short, organizations that have achieved success have done so by focusing on outcomes and engaging in rigorous project planning and management practices. Further these organizations institute risk management techniques and quality assurance procedures. The projects are characterized by high performing teams and they approach contracting relationships from a strategic perspective. Finally, their projects enjoy the benefit of the general manager's involvement and sponsorship. The discussion below provides a summary of the best practices identified to date and an understanding for how managers can influence these practices in support of their agency's technology efforts.

The first best practice underscores the importance of defining technology efforts in accordance with achieving operational outcomes. In

1992 the General Accounting Office published the results of a three year study examining information management at the federal level. After perusing 192 information management reports, the GAO found that technology projects typically experienced massive cost overruns, inaccurate data, and poor system performance (GAO/IMTEC-92-13FS). As a result of this study (as well as several others which identified unacceptably high technology failure rates), the federal government enacted the Clinger-Cohen Act of 1996. The Clinger-Cohen act mandates that all technology investment decisions be based on the careful analysis of relative costs, benefits, and risks. According to the report, "employing an investment approach should allow information technology projects a better chance of being initiated, continued, delayed, or canceled on the basis of mission or operational performance improvements -- the primary purpose of deploying information technology in the first place" (p.1). Organizations that are outcome based focus on the costs and benefits of technology investments in terms of how the system will ultimately stimulate work performance, information availability, and customer service. Information technology initiatives are anchored in mission goals to help insure that efforts meet operational needs (DeSeve, Pesachowitz, and Johnson, 1997). Without the outcome focus, an organization may fail to recognize its true needs according to key stakeholders. Successful efforts require technology investments to be overtly linked to organizational goals and objectives.

Another best practice, speaks to the critical role that project planning and management plays in promoting success. Proponents such as Bowsher (1997), Flowers (1996), and Lucas (1975) recommend the development of detailed operational plans, clear milestones, and easily measured deliverables. They caution managers to limit scope changes and to monitor the progress routinely to help keep projects on track. McLeod and Smith (1996) stress the importance of breaking each task into specific, easily measured, deliverables. Accordingly, resources are attached to each task and achievement toward deliverables are measured and continuously monitored.

To reduce the rising stem of information technology setbacks and failures, risk assessment and management techniques are also gaining the attention of managers and researchers as a best practice strategy (Higuera, Dorofee, Walker, and Williams, 1994; Gallagher, Alberts, and Barbour, 1997; Kerzner, 1998). Risk management practices focus on identifying and

resolving problems early, quickly, and cost effectively. After identifying the likelihood and severity of a potential risk or threat, contingency planning efforts are developed to circumvent project derailments. Risk assessment and management strategies are designed to help prevent the problems that can occur during system implementation. Risk mitigation strategies can ameliorate problems by encouraging managers to monitor, identify, and mitigate potential threats throughout each phase of the adoption process. Specifically, risk assessment and management strategies help managers identify and select the best technology innovation, control implementation to ensure success, and monitor outcomes in terms of fulfilling expectations (GAO/OIMC-96-64).

Another best practice focuses on quality assurance programs as a means for identifying defects early in the implementation cycle (Keil, 1995; Bowsher, 1994; Davis et al., 1992). Quality assurance programs can help to identify deficiencies early in the cycle when the cost for repair is minimal. Previous research has isolated that early detection of defects can reduce costs for repair as much as 50 percent (McLeod and Smith, 1996). When deficiencies are identified late in the development cycle, the repair efforts may demand rework in other ancillary areas which can increase the cost for repair. Quality assurance programs designed to continuously monitor development efforts helps to insure that tasks are completed according to the ultimate business need.

A fifth best practice centers on the use of multi-tiered, interdisciplinary, high performing teams (Keider, 1984; Lederer and Sethi, 1996; Regan and O'Conor, 1994). Teams characterized by a blend of strong technical skills, good business knowledge, and effective project management provide the support for insuring system success. System success often depends on teams that are comprised of system engineers, end users, project managers, executive/general managers, and ultimate stakeholders. The system development effort has been likened to a surgical team model. Each member brings their own area of expertise to the system development effort. System development efforts do not thrive without the full compliment of talents acting in unison.

Strategic sourcing is the focus of the sixth best practice (Lacity, Willcocks, and Feeny, 1996; James, 1997; Brown and Brudney, 1998). Purportedly, organizations adopting a strategic approach to outsourcing look to external contractors to provide services while also investing in the

internal capacities required to sustain the innovation after the contract has expired. In a study of 35 geographic information system implementation efforts, Brown and Brudney (1998) found that the relationship between outsourcing and benefit attainment is parabolic in nature. The results suggest that while contracting offers some advantages, over-reliance compromises the implementation and outcomes of GIS adoption. Contractors can be used to supplement efforts, they can provide an infusion of talent at critical points during implementation. However, over-reliance can be detrimental to success. Organizations must look to building the requisite internal capacities needed to assimilate the innovation once the system achieves operation (Lacity et al, 1996).

Among all the best practices, the final seventh one may be the most crucial for organizations seeking a continuous improvement paradigm, and is thus, the focus of this research. Active, ongoing general manager involvement is perhaps the key to mitigating much of the technology failures experienced to date. General managers can provide the leadership direction required to insure success. Projects benefit from a management sponsor who is responsible for providing leadership, mobilizing resources, and mediating stalemates and impasses. These managers can provide the direction needed to insure that projects stay on course and stay directed toward the ultimate operational need (Keen, 1991; Martin, 1995; Drucker, 1995). The talents general managers provide in terms of organizing efforts, coordinating tasks, and instilling a firm understanding for the business need, is paramount to project success. As identified by Mechling and Fletcher (1996) in a study of 650 government practitioners, "poor leadership on information technology issues and initiatives is a significant drag on governmental performance, . . . general managers need to become more directly and integrally involved in information technology issues" (p. 47). Undeniably, managers cannot expect success under situations where technology initiatives are completely delegated to technical specialists (p. 4).

In short, general managers can assist with technology adoption by insuring that operational requirements are defined and well understood, by providing solid planning guidance, by continuously monitoring progress to guarantee that operational needs are stressed, and by lending support in the areas of risk management and contingency planning. General managers can

provide the focus and direction needed to keep technology projects on course and on target.

The Management Imperative

A cardinal premise of the continuous improvement organization is to thrive in a volatile competitive market by providing innovative quality services through human capital and technical resources. The paradigm stresses a "proximity to customer" approach and advocates the need for incorporating a decentralized structure and decision autonomy. The decision autonomy and decentralized structure allows work teams to innovate, to change procedures and service delivery activities quickly according to customer preferences. Technology undergirds the service delivery efforts.

Among the many factors that relate to information technology success, management commitment consistently ranks as one of the most important factors to achieving benefits (Keider, 1984; GAO/T-AIMD-97-38; Boynton et al, 1992). But what exactly is management commitment? And, what might be expected from the general manager in a continuous improvement organization for supporting technological initiatives? In adopting technological solutions under the continuous improvement paradigm, general managers must understand best practices, they must help to identify points of failure, and they must assist with contingency planning. They must be involved in the selection process by assessing the risks and benefits of varying technological solutions in terms of strategic and operational needs, and, they must also assist with controlling the implementation of new technology by defining success, insuring adherence to best practices, and mitigating risk through contingency planning.

Keen (1991) points to the growing frustration between information technology managers and general managers. Historically, there has been a long standing conflict between information technology departments (with finite resources and limited technologies) and users (with urgent operational needs and big expectations), between users (with unique operational needs) and senior management (with enterprise wide information needs), and between senior management (with a business orientation towards systems) and information technology departments (with a technology orientation) (Tapscott and Caston, 1993 p. 293).

Those organizations that thrive in the next millennium will eliminate the conflict by encouraging general managers to develop an awareness of how technology can support work operations, to become motivated and committed to dedicating the time and effort required to adopting technology, and to have the skills and competencies to understand how technology can and cannot support their work efforts. If the paradigm of the future is indeed grounded in a continuous improvement paradigm, then it is imperative that *all* managers play an active role in developing systems that advance and enhance customer service by delivering on the promise of the next millennium: to provide "everything, everytime, everywhere."

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