Eight Imperatives

for Leaders in a Networked World:

[A Series of Guidelines for the Year 2000 and Beyond]

Imperative 1:

Focus on How IT Can Reshape Work and Public Sector Strategies

The Harvard Policy Group
on Network-Enabled Services and Government
John F. Kennedy School of Government

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"The time is ripe for public leaders to engage information technology issues more deeply, directly, and successfully."

PREFACE

As we enter the new millennium, everyone from futurists to the general public has observed that information technologies are changing our patterns of social, commercial, and political interactions. These changes raise profound opportunities and threats for people everywhere. It is a revolutionary period, with many issues not yet fully understood, let alone resolved.

Throughout this period our public leaders—including elected and appointed officials and their overseers in all branches of government—have too often ignored technology issues or have delegated them to others. The conventional wisdom has been that technology is either not very important, or requires technical expertise rather than leadership, or is simply too risky for leaders to get personally involved.

These views are changing, however. Due primarily to the astonishing growth of the Internet and e-commerce, technology is now widely acknowledged as a critical force in shaping the future. The need for skillful and committed leadership has become obvious.

But the risks are still there.

As a result, public leaders—often under enormous and competing pressures–remain uncertain about how to successfully engage technology-related issues.

In response to these developments, Harvard University's John F. Kennedy School of Government assembled a group of distinguished public leaders to explore what was being learned about computer networking and its impacts on the roles and responsibilities of government.

The Harvard Policy Group on Network-Enabled Services and Government (HPG) includes legislative and executive leaders, private-sector and public-sector leaders, technology managers and general managers, and public officials from federal, state, and local governments in the United States and Canada. Working over a three-year period, the HPG concludes that the time is ripe for public leaders to engage information technology issues more deeply, directly, and successfully. To improve the quality of engagement, the HPG has developed a set of eight imperatives for those who seek to lead in this critical period. Each of the individual imperatives addresses a significant leadership responsibility and is the subject of a separate paper (for a list of the papers, see the back page). Taken together, the HPG papers provide a framework to guide those who seek to develop successful information age leadership strategies.

The report you are reading explores imperative #1: *Focus on how IT can reshape work and public sector strategies.* It addresses how public sector leaders should apply core concepts of organizational strategy and structure in a world of powerful computer networks.

The HPG was made possible through a partnership among the Kennedy School of Government, American Management Systems, Cisco Systems, and IBM's Institute for Electronic Government. The views in these papers are those of the individual members of the HPG and not the institutional views of their home organizations or project sponsors. But it would have been impossible for the group to learn and to produce what it has without the opportunity provided by this partnership to meet together and to share insights over an extended period of time.

We sincerely hope that these papers will prove helpful to leaders and to the public at large.

THE HARVARD POLICY GROUP ON NETWORK-ENABLED SERVICES AND GOVERNMENT
CAMBRIDGE, MASSACHUSETTS
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JERRY MECHLING, JOHN F. KENNEDY SCHOOL OF GOVERNMENT
LYNDA APPLEGATE, HARVARD BUSINESS SCHOOL

The year 2000 has ushered in a new millennium, a presidential election, and continued problems and opportunities as we pick up speed in the transition to a knowledge-based society. We are at a turning point, with leaders confronted with dauntingly complex and changing issues, including technology issues.

Given all the turmoil, it is essential for leaders to focus on the right problems. On one hand, as a leader you can no longer ignore technology or delegate it exclusively to the IT community. On the other, you cannot personally solve every technology problem, and it is clear you should not even try. Your problem is not technology per se.

As a leader, your fundamental problem remains—as it always has been—to help the people you are leading succeed. What is new is that success now requires helping your people to adapt their strategy and structure to a world of powerful computer networks.

Focusing on strategy and structure can make admittedly difficult IT leadership problems more manageable. The purpose of this paper is to explore how and why this is so, and what you should do about it.

Values

"People are confused, people are conflicted, and societal values are very much at stake."

TRANSITION TO THE KNOWLEDGE-BASED ECONOMY: PROBLEMS OF DISTRACTION AND DRAG

The knowledge required to succeed with IT is complex and rapidly changing. On the technology front we face hardware choices: new processors, displays, printers, scanners, digitizers, routers, gateways, wireless networks, data storage devices, and more. We also face software choices: new operating systems, office suites, geographic information systems, relational databases, data mining tools, voice recognition, encryption and digital signatures, application service providers, and more.

Related to technological issues are organizational issues: personnel issues, budget issues, security issues, job development issues, equity issues, trade issues, legal issues, political issues, and more. People are confused, people are conflicted, and societal values are very much at stake.

Given the tug and haul of constant change and conflicting interests, leaders find it difficult to focus or to take decisive action. Distractions abound and hesitation is natural in an environment defined by uncertainty and complicated tradeoffs.

Distractions are especially severe in the public sector, where organizations cannot simplify decisions by focusing on a single market niche. Public organizations are mandated to spread their attention across incredibly complex, contested, and interrelated problems such as crime, poverty, and the environment.

Organizational drag compounds these difficulties. Given the large size of many public agencies—along with the checks and balances designed to foster debate and deliberation—governments tend to grow cautious and inwardly focused. They find it extremely hard to innovate at the pace required today. In the tumultuous shift to a knowledge-based economy, with digitized information and globally interconnected networks, governments are finding it increasingly difficult to cope.

To succeed, governments need leaders able to focus on the right IT-related problems long enough and effectively enough to make a difference.

Technology

"If a shallow no to technology is dangerous, so is a shallow yes"

WHAT TO AVOID: EXCESSIVE DELEGATION AND MAGIC BULLETS

In the public sector, significant change is difficult, and failed change is often punished strongly. Little wonder that many leaders have tended to sidestep the work involved in using information technologies, or have delegated it to others. Not so long ago, delegation was a safe answer—and probably good enough.

But it is clearly not good enough now. Excessive delegation forces organizations to respond to IT issues without the full complement of experience, authority, and judgment required for success. Since organizational change is the core problem, those with authority over personnel, finances, and other resources must be fully engaged. You cannot take your hands off the steering wheel just as your vehicle enters a dangerous stretch of the road.

But an equally wrong answer is to view technology as a magic bullet. If a shallow no to technology is dangerous, so is a shallow yes. Leadership to help the organization adapt to information age challenges requires commitment and work from all quarters, not just directives from on high. Leaders must be engaged, and must keep their staff engaged.

Do not be misled: there are no magic bullets, no quick-and-easy solutions to information age challenges. As has long been the case, success requires visionary and committed leaders to blend a variety of specialties and skills together. The difference now is that technology skills are an essential part of the blend.

Rewards

"...the job of the leader is first to understand the risks and rewards of IT-enabled workflow, then act."

OPPORTUNITIES FOR NETWORK-BASED COORDINATION OF WORK

Figure 1 below suggests how information technologies can be used to coordinate work more productively. In the figure, the numbered boxes represent steps in a workflow or production process. For example, the six-step process at the top of the figure might represent the traditional workflow for determining eligibility for a social welfare program or for delivering financial support as authorized by such a program.

Note that the steps in such work processes are not executed by a single person operating alone, but by a variety of specialists: case workers, accountants, office support staff, and others. For most tasks, specialists are more productive than generalists. However, dividing tasks among many people makes the challenge of assembling finished products or services more difficult. Handing off work from one person to another often causes delays and other problems, even when workers are trying their best to cooperate.

To resolve these problems, organizations have developed elaborate hierarchies of managerial authority. Rules or "standard operating procedures" assist in coordinating the flow of work, with the scope of assignments for a given worker based on the number of procedures that the worker can learn to apply. If a worker cannot resolve a problem using previously learned rules, work is pushed to someone else, since searching through paper-based files for guidance usually takes too long. Conflicts and ambiguities are resolved by managers (represented by gray boxes at higher levels in the figure) with the authority to interpret rules and keep the work flowing.

Information technology can be extremely helpful in managing and coordinating such workflows. Computers operating on properly structured sets of rules can quickly look up guidance for the next step. Thus, the scope of work and/or the span of control can be increased, reducing the need for workers to hand things back and forth. Workers answering customer service calls, for example, can look up answers to questions in real time rather than telling callers to go elsewhere or call back later. Bureaucratic barriers or "stove-pipes" are broken down, and customers receive better service.

Even when the work must be handed off, IT networks can still improve efficiency. Often, steps in the workflow do not have to be completed in sequence. Networks enable workers to reorganize work and undertake steps in parallel, even sharing work across organizational boundaries or outsourcing it to another organization. Network-enabled work also allows workers and clients to work at a distance—no longer spending valuable time traveling to meet—and to work from less expensive locations. For some work, interactions may not require participants to engage one another at the same instant. Email or voice mail systems allow users to send and receive messages at whatever time is most convenient. Such "asynchronous" communication reduces interruptions that would otherwise disrupt concentration.

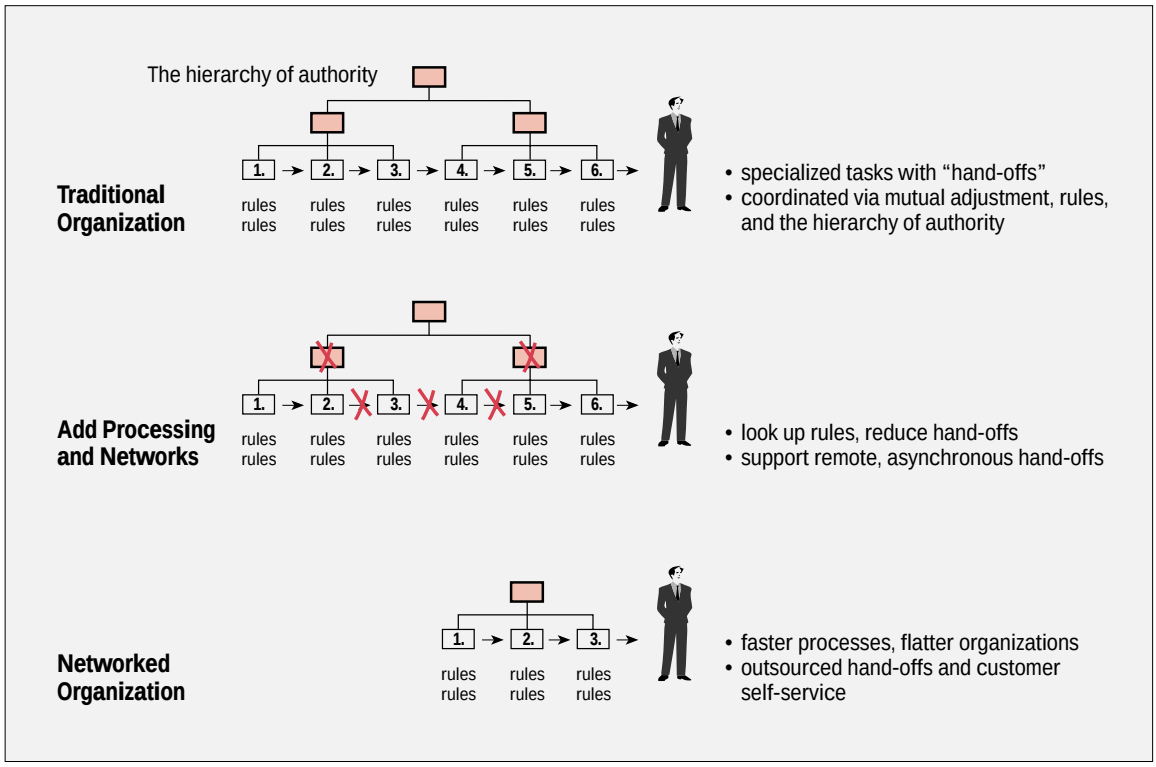

Figure 1: The Move to Net-based Work Coordination

The biggest efficiency gains from network-based work coordination are often derived from self-service models. Pushing steps in the workflow from staff to customers not only saves staff time, it can also improve service quality. With online permitting services, for example, rather than receiving a completed permit application in the mail or taking a request over the telephone, government workers can receive the required information electronically as entered by the applicant at a time convenient for the applicant.

In these and other ways, IT can improve productivity and enable the organization to offer highly customized services that are also widely accessible. To gain these improvements, however, organizations must invest in information assets (computers, data, and networks) and endure the pain of shifting from one pattern of work to another, and from one organizational structure to another.

In resolving these challenges, the job of the leader is first to understand the risks and rewards of IT-enabled workflow, then act. What is at stake is not only the organization's productivity, but also its strategy or position in the world. "Strategy," in this sense, is the pattern of relationships the organization establishes (with whom it interacts, what it offers and receives, and how it pursues those relationships).

The long-term impacts of computer networking on work and strategy are becoming clear—and will prove to be crucial. Efficient communication allows more of the organization's work to be coordinated through voluntary market-like exchange, and less through command-and-control structures. Efficient communication also facilitates innovation. As social relationships become more complex and interdependent, the challenge to governments is to "steer more and row less."[1]

Networking

"The need to focus on **strategy** and structure is not **new** in itself, but the ways in which both are shaped by computer networking is very new—and very **powerful**."

GUIDELINES FOR FOCUSING ON HOW IT CAN RESHAPE WORK AND PUBLIC SECTOR STRATEGIES

To help your people succeed in a knowledge-based economy, you need to focus on how information technologies can be used to change strategy and structure in public sector contexts. But how can you make this advice operational? Consider the following seven guidelines as you develop your personal agenda.

1. Develop a personal network of information, advice, and support

Problem. Leaders get their information more from talking to others than from written reports. Unfortunately, many public sector leaders have failed to assemble a circle of advisors with the depth and breadth required for responding effectively to the challenges raised by information technology.

What to avoid. Do not be without a Chief Information Officer (CIO) you can trust as a competent and loyal advisor on issues of policy and operations, as well as on issues of technology. At the same time, do not make your CIO your only advisor on technology issues.

What to do. Develop an effective and broadly-based professional relationship with your CIO. Also develop a circle of other technology-savvy advisors. Some of these people might serve on an informal "kitchen cabinet." Others might be assigned more formal and public responsibilities. You might also find it worthwhile to serve personally on one of the advisory groups that are more or less continually being developed on behalf of governors, mayors, professional associations, and others.

An Example. The Canadian Information Highway Advisory Council. As the government of Canada began to develop their national IT strategy, they assembled an Advisory Council of respected individuals from outside the government. This group explored IT issues from the perspective of the entire society, not just the government. About 30 in number—and able to fit around one large table—the Council met approximately once a month for two years to produce a public report, with analysis and support provided by government staff. The Council's charter was then extended another two years to assess the progress made (and not made) on their original recommendations. While blue-ribbon panels such as the Advisory Council are sometimes unproductive, they are often better than bureaucratic insiders at educating stakeholders, focusing public attention on important issues, and avoiding the turf battles that can plague government-only projects.[2]

For more, visit the Council's site at strategis.ic.gc.ca/SSG/ih01015e.html

An Example. The Georgia Technology Authority (GTA). The State of Georgia is recognized as a leader in the development of e-government. One reason for their success has been the effective use of advisory boards, which bring a diverse set of experiences to bear. Building on this success, Georgia recently established the Georgia Technology Authority. The GTA consists of a 12-member Board of Directors, and is mandated to bring "a coordinated and comprehensive IT vision to state government by providing agencies with technical assistance in strategic planning, program management, and human resources development." Each member of the Board must come from the private sector, and must have experience in managing large IT enterprises.

For more, visit the GTA at www.gagta.com

2. Use the technology in your personal routines

Problem. The information that organizational leaders find most valuable is often qualitative information from outside ("soft" information), while IT-based systems have historically worked with quantitative information from inside ("hard" information). Recent technology developments counteract this problem by offering a much richer array of data and tools, but many leaders feel too busy or too far behind the times to try them.

What to avoid. Do not get all of your IT experience second, third, or fourth hand. Delivering a few prepared speeches on IT topics is better than nothing, but it will not give you the frequent exposure to IT issues that you will need.

What to do. Remember, users are choosers! Work at least a few digital tools into your daily routines—perhaps web browsing for news and policy research, receiving the Webopedia "Word of the Day" by email, and/or using a personal digital assistant to help with your schedule and e-mail. Learning about technology by using web-based distance learning technologies is another great way to learn by doing. Many executives stay in touch via e-mail, voice mail, and electronic briefings. These activities can be valuable on their own, and they also provide symbolic leadership along with a relatively painless way to keep up with ever-evolving IT-related developments.

An Example. Governor Angus King of Maine. Since coming to office in 1994, Governor King has effectively worked to ensure that Maine's state government is taking advantage of information technologies. According to the Governor, part of the reason he has been able to move so quickly on his technology agenda is the fact that he personally uses the technology every day. In the Governor's own words:

"I had never used a computer before I was 45 years old. Then I started my own business from scratch and I couldn't afford clerical help, so I bought a Macintosh—and it changed my life. I taught myself to do spreadsheets, correspondence, business cards, graphics, you name it. And I became a real believer in the power of this technology. I think part of the reason I have been able to push technology so far and so fast in state government is because it's something that I do and that I am interested in. I have been getting MacWorld magazine for years, and for fun I read about what's out and what's going on out there." [3]

An Example. Prime Minister Tony Blair of Great Britain. Admitting that he and many in his Cabinet are novices in the realm of computers, Tony Blair arranged for himself and several of his Ministers to participate in computer training sessions. After one session, Blair commented, "I should have done this ages ago but I just put it off. I started realizing what it can do, but I must admit I was always a bit scared of the technology. It was an incredible experience and a lot easier than I expected."[4]

3. Develop support in a networked world—the advocacy role

Problem. To succeed with major IT initiatives, public agencies need support from varied external sources including budget offices, accounting offices, regulators, legislative committees, client groups, labor groups, privacy advocates, industry, taxpayer groups, and the press. External support is often lacking, at least partly because bureaucratic cultures have been designed to focus inwardly on control rather than outwardly on innovation and coalition building.

What to avoid. Do not limit your IT agenda to what you can accomplish internally. At the same time, do not underestimate the difficulty of mobilizing external support in a world suspicious of governmental power and performance.

What to do. Leaders must become persuasive advocates for IT initiatives. They need to seek external support early in the process. They need to educate overseers as well as the general public. They need to actively market their plans, explaining why serious change is required, what benefits it will bring, and what costs and opposition may stand in the way. Nothing will erode trust faster than allowing supporters to be surprised by something for which you have not prepared them. Talk about your plans in public forums and listen to the responses you get. Make your plans and progress widely accessible and visible over the Internet or through traditional media. Directly address concerns such as privacy and security. While information about your plans and progress can be used by opponents as well as supporters, it can be surprisingly powerful in reaching and mobilizing supporters who would otherwise not have the time to stay involved. A good marketing campaign can help you build a lot of momentum—momentum that can help you overcome other obstacles along the way.

An Example. Governor Michael Leavitt and State Senator Scott Howell of Utah. These two officials—from different parties in the same state—are ahead of the curve in understanding technology and supporting their initiatives with the kind of hands-on skill and personal involvement that clearly communicates the nature of their knowledge and commitment. We have all seen public officials who can deliver a good speech but cannot handle follow-on questions that probe their level of knowledge. In contrast, Governor Leavitt and Senator Howell are particularly effective in question and answer sessions with all sorts of audiences. They use these sessions to advocate the use of technology as a strategic advantage for the state. Perhaps we do not need every leader to exhibit this level of knowledge and advocacy, but we clearly need more than we have now.[5]

An Example. Mayor Stephen Goldsmith of Indianapolis/Marion County. Under Mayor Goldsmith, the government of Indianapolis/Marion County was aggressive and forthright when presenting controversial ideas for reform to the public. Focusing on how technology could be used as an engine for economic development, the government advocated for investments in technology, while avoiding many of the controversies that can accompany

such investments. The Mayor was also one of the first to use the website as an advocacy and communication tool, fielding electronic complaints and questions directly through his office.

For more, visit Indianapolis' website at www.indygov.org

4. Identify how information technology can be used to add value—the analytic role

Problem. Public organizations find it hard to evaluate and demonstrate the value of their activities, both because they deal with contentious problems and because many of their interactions with the public serve to enforce mandatory regulations rather than deliver discretionary services. Private companies can focus their value analysis on revenues and customers. Public agencies, in contrast, need to assess value on a broader basis, including a diverse array of impacts on taxpayers, public employees, direct clients, and other stakeholders. The analyst role in the public sector is critical but difficult.

What to avoid. Do not ignore questions of value as too hard to analyze, and do not focus excessively on internally generated measures of success.

What to do. Analyze what is going on "out there." Seek especially to understand the perceptions of different stakeholder groups and opinion leaders, and to benchmark how other organizations handle electronic services. Since technology can improve service efficiency, accessibility, integration, and customization, finding out which factors are most important in your own particular situation requires careful analysis.

An Example. And Justice for All. The University at Albany's Center for Technology in Government (CTG) developed a comprehensive guide to help justice officials advocate for integrated information systems. Convincing others of the value of such systems is often difficult. The *And Justice for All* guidebook helps by showing leaders how to highlight and measure the value of integrated information systems. Measures of value include customer satisfaction, cost-efficiency, time savings, dollar savings, improved conviction rates, and quicker case dispositions.

For more, visit the CTG at www.ctg.albany.edu/projects/doj/dojmn.html

An Example. Iowa's Return on Investment Program (ROI). In Iowa, information technology projects are assessed in terms of the benefits to both government and citizens. In addition to analysis focused on "hard" costs and benefits such as hardware and staff time, Iowa's ROI analysis estimates the costs and benefits associated with factors that are more difficult to quantify (and often ignored), including the risk to citizen health, impact on security and safety, and the time/energy of citizens. By calculating the ROI for a project in this way, the Governor and legislators get a more complete picture of the relative value of each project. By analyzing all IT projects in the same way, the ROI process also helps guide policy makers in prioritizing projects and allocating budgets.

For more, visit www.state.ia.us/government/its/

5. Build capacity as a learning organization—the managerial role

Problem. In the Information Age, both public and private organizations need to adapt to continuing advances in technology. While success has always required a balance between continuity and change, the need for change is becoming dramatically more important. Public sector organizations, however, often find change difficult—their capacity to innovate limited by their relatively large size and heavily regulated environment. Leaders in all branches of government must have strong management skills to help their organizations overcome these factors.

What to avoid. Do not conceive of the technology challenge merely as a one-time requirement to catch up; and do not underestimate the capacities of your people to continue to learn and adjust—if you give them the room and leadership to do so.

What to do. Get a CIO who recognizes that the e-government challenge is as much about organizational change as about technology itself. Next, tap into the natural enthusiasm and skills of your general managers and workers by involving them directly in IT projects. Invest in education, especially in distance education opportunities, to show your people how the outside world is using information technologies. Ensure that your Personnel Department is emphasizing the importance of learning as part of everyone's job performance—job descriptions should include an expectation for ongoing education and learning.

An Example. Washington State Digital Government Academy. The state government in Washington established the Academy to bring agency staff, private sector experts, and citizen users together in collaborative efforts to design, build, and launch web-based public services. Conceived as a laboratory for learning, the Academy gives staff a chance to get outside their home environment, and interact with leading-edge industry experts and those who will use their applications on a daily basis. The Academy also promotes organizational learning, disseminating applications developed in the Academy to multiple agencies. Examples include programs to develop "e-form" and "e-permit" applications for use throughout state and local governments in Washington.

For more, visit the Academy at www.wa.gov/dis/e-gov/academy

An Example. City of New York Executive Order No. 43. Executive Order No. 43 contains at least three technology-oriented initiatives to build organizational capacity as a learning organization. First, it establishes a Technology Steering Committee and CIO charged with coordinating, integrating, and overseeing investments in information technology. Second, it creates an Office of Technology and gives it a mandate to identify best practices in the area of information technology, and to serve as a clearinghouse for City agencies. Finally, it empowers the Technology Steering Committee to establish sub-committees, including a sub-committee on staff recruitment, retention, and training.

For more, visit the Committee site at www.nyc.gov/html/doitt/html/tsc.html

6. Pursue investments that scale up: infrastructure, standards, and cross-boundary opportunities

Problem. Computer networks offer huge economies of scale and significant opportunities for process reorganization, but only if data and networks are standardized to operate across a large community of users. Achieving such standardization is often difficult, however, and—if done prematurely or too rigidly—may cost too much in terms of foregone downstream innovations.

What to avoid. The first step in developing e-government services is often letting individual programs and agencies offer their own services over networks, but do not stop there. Program-by-program services alone will fail to reach the bigger opportunities for cross-program integration, standardization, and infrastructure development.

What to do. Pursue options to scale electronic services up to larger and broader communities of workers, suppliers, and clients. This requires massive yet flexible information infrastructures, constructed through cooperation across the boundaries separating programs, agencies, jurisdictions, and even entire sectors of the economy. Cross-boundary initiatives are difficult, to be sure, but will be the most important IT agenda items for the next decade or more.

An Example. North Carolina information infrastructure. For the past twenty years, leaders in North Carolina have supported the development of information infrastructure, especially infrastructure for digital communications. While the state and the Governor have been prime movers, the focus has not been on individual agencies or even on the state government as an entity, but rather on infrastructure for all government work—federal, county, local, and state. The road has not been entirely smooth for leaders in North Carolina. Nevertheless, within this initiative, North Carolina built the nation's first state-wide digital network in 1986, partnered with the private sector to build the first general service broadband network—the North Carolina Information Highway—in the early 1990s, established the North Carolina Geographic Information Co-ordinating Council in 1991, and launched the NC @ Your Service Internet portal in 2000. North Carolina has been the "anchor tenant" in many of these projects, guaranteeing the usage needed to drive down risks and costs so that private partners and local governments could join in, further reducing costs.

An Example. Smart Access Common Identification Card. As agencies began exploring the use of smart cards for physical and digital identification, the U.S. General Services Administration was asked to head up a government-wide effort to explore smart card technologies. As part of this effort, the Smart Access Common ID Card project was launched to develop common application specifications that ensure interoperability across agencies, while also providing a platform for agency specific applications and re-engineering. By ensuring interoperability, the Smart Access Common ID Card project serves as a foundation for future cross-agency process reengineering efforts.

For more on the Smart Access Common Identification Card project, visit smart.gov

7. Reorganize work with fewer and/or remote and/or asynchronous "hand-offs"

Problem. Many public services were designed originally for face-to-face delivery techniques. These techniques have become too clumsy and costly given the realities of new computer networks.

What to avoid. Do not distribute computer-based tools to your organization without a plan and approach for improving the division of labor and workflow.

What to do. So far as possible, digitize the information required for service production so it can be readily shared over networks. Then redesign the workflow to limit the number of hand-offs, take advantage of work that can be done in parallel, and reduce travel and interruptions for government staff and clients. Focus on creating opportunities for "one-stop, non-stop, self-service government" as "self-service" is the most powerful way to capture the efficiency benefits of information technology.

An Example. The U.S. Social Security Administration (SSA). While the SSA has long served clients on a face-to-face basis, it used to require citizens to make multiple trips to a local office. Citizens would wait in line for up to 40 minutes, then be told to return about ten days later, since SSA workers could not retrieve the required paper-based information any faster. To improve service and manage a growing caseload, the SSA has worked to develop computer-based filing in support of its local offices. The SSA now offers one of the world's largest and best received 1-800 telephone operations, and has recently added web-based alternatives. Although there have been some bumps in the road—e.g. allowing clients to retrieve their own benefits information via a web-based form was scuttled due to potential breaches of confidentiality—the SSA has shown that agencies can streamline work dramatically through technology-enabled improvements in workflow.[6]

For more, visit the SSA at www.ssa.gov

An Example. San Diego Water Department (SDWD). For years the SDWD recorded all information related to the region's water infrastructure in detailed maps distributed to work crews in huge books that weighed about ten pounds each. Crews marked the maps to reflect any changes that resulted from work being done, and passed these changes to a central location for interpretation, receiving updated maps every 3-18 months. Not surprisingly, the errors and lags that resulted from transcribing the data created significant problems for crews, who often found that facility details differed from their maps. In 1998 the SDWD worked with the San Diego Data Processing Corporation to develop a computer-based infrastructure management system. The new system included portable pen-based computers, complete with Geographic Positioning Systems (GPS) and Geographic Information Systems (GIS). The new system not only informs the crew about the infrastructure at a facility, but also enables them to make changes when appropriate. More important than the

technology, however, is the change in workflow. Rather than scribbling notes on maps and passing them to a data entry center for interpretation, work crews now input the data themselves, uploading all changes on a daily basis. This change ensures that work crews have accurate data when they leave for a job. It also redefines their job by making them responsible for the accuracy of the data.[7]

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To succeed in the public sector, leaders must adapt to a networked world. The need to focus on strategy and structure is not new in itself, but the ways in which both are shaped by computer networking is very new—and very powerful. On a more personal level, leaders must also find ways to keep abreast of new developments. Seven guidelines are summarized in Figure 2.

1. Develop a personal network of information, advice, and support
2. Use the technology in your personal routines
3. Develop support in a networked world—the advocacy role
4. Identify how information technology can be used to add value—the analytic role
5. Build capacity as a learning organization—the managerial role
6. Pursue investments that scale up: infrastructure, standards, and cross-boundary opportunities
7. Reorganize work with fewer, and/or remote, and/or asynchronous "hand offs"

In sum: Develop network-based strategies and structures!

Figure 2: Guidelines for Success in Using IT to Reshape Work and Public Sector Strategies

Next Steps

"You will have to develop your vision, communicate it to those who must share and support it, and get cracking.

NEXT STEPS

What should you do immediately? That, of course, will depend on where you stand on the above and other guidelines. In general, you will have to develop your vision, communicate it to those who must share and support it, and get cracking. For many public leaders, three related agendas will be important.

1. *Your personal agenda.* You will need to develop a vision that inspires and guides you and others. In developing your vision, you will need to analyze and argue about IT issues enough to become comfortable with your stances and with the kinds of support and opposition they generate. Getting time for hands-on experience with digital technologies may be extremely helpful. Getting knowledgeable advisors you trust will be essential.

2. *Your administrative agenda.* You will need to put some early projects and organizational structures in place to generate action. Early steps are likely to include benchmarking and planning studies along with building-block investments in services and infrastructure. Web-based initiatives have been successfully used as confidence-builders. Remember that the most significant value will come from reorganizing work processes. If you have not already developed an enterprise-wide IT strategy, now is the time to get moving.

3. *Your public agenda.* If information technologies are going to be truly strategic for your institution, you will need an external agenda as well as an internal one. How can you communicate and share your vision with others? How can you mobilize support? How can you respond to opposition? How can you develop a strategy that will survive in the long-term? Once you have begun to explore these questions, finding answers is often not all that difficult. Implementation is—of course—usually much tougher, and will be the real test of your leadership. Nevertheless, a good marketing plan can go a long way in building support.

Brief advice for a variety of stakeholders can be found in Figure 3 (next page).

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As we proceed into the 2000s, we need leaders who will engage technology issues effectively. We need leaders who will overcome the distractions and drag of public sector problem solving, and focus skillfully on using technology to improve the strategies and structure of public sector organizations.

This report offers guidelines for meeting these needs. We hope that public leaders—and their many overseers in the public at large—will find these guidelines useful.

Subsequent reports of the Harvard Policy Group on Network-Enabled Services and Government will explore other imperatives for the year 2000 and beyond. Our next report will examine how to use IT for strategic innovation, not simply tactical automation.

Onward!

The President. Building a successful, networked nation depends on long-term, public-private, cross-jurisdictional initiatives. Your leadership is essential for successfully working across boundaries.

Legislators. Start with a technology strategy for your own office—e.g., perhaps use videoconferencing to increase your virtual presence in the home district while simultaneously remaining available for work in the legislature.

Governors. Promote service that is "online, not in line"—or, more inclusively—"one-stop, non-stop." From the very beginning of your administration, seek to gain the cross-agency cooperation you will need to achieve this goal.

Local government leaders. Take advantage of the huge opportunities raised by jurisdiction-wide portals for customer service, and by linking IT investments to economic development.

Judges. The judicial system is ripe for your leadership as the natural conservatism within the legal culture begins to yield to the incredible information-intensity of the work and opportunities involved.

Budget directors. Use your resource allocation muscle to invest in IT-related productivity improvements and enterprise-wide standards for electronic services.

Agency and program heads. You are ground zero for IT-related workflow redesign and productivity improvement; step forward to make it happen, especially through customer self-service.

Chief Information Officers. You have the charter for IT-based strategy, where key moves will often require you to develop portals and other initiatives for enterprise-wide efficiencies and accessibility.

Technology community. Work with others to educate the market, since an educated market will raise all boats.

Associations and interest groups. Document best practices and offer seminars to help agencies learn how to redesign workflow and develop a technology strategy.

The press. Use your flair for human-interest stories to explore where your community stands in relation to others in preparing for global electronic commerce.

The public. Test whether your leaders can stand up—without staff or written speeches—to make a credible case for what they are trying to accomplish with information technology.

Figure 3: Advice for Stakeholders: How to Use IT to Reshape Work and Public Sectors Strategies

Appendix A

MEMBERSHIP OF THE HARVARD POLICY GROUP ON NETWORK-ENABLED SERVICES AND GOVERNMENT

Ms. Kathleen Adams	*Assistant Deputy Commissioner, Systems, US Social Security Administration*
Mr. Reg B. Alcock, M.P.	*Member of Parliament, Canadian House of Commons*
Mr. Russell Bohart	*Director, Health and Welfare Agency Data Center, State of California*
Mr. Mark Boyer	*Senior Manager / Public Sector, Internet Business Solutions Group, Cisco Systems*
Ms. Janet Caldow	*Director, Institute for Electronic Government, IBM*
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Mr. Thomas M. Fletcher	*Associate Director, Program on Strategic Computing and Telecommunications in the Public Sector, John F. Kennedy School of Government*
Ms. Michele Grisham	*Manager / Public Sector, Internet Business Solutions Group, Cisco Systems*
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Mr. Bruce W. McConnell	*Director, International Y2K Cooperation Center; (former) Chief Information Policy and Technology Branch, US Office of Management and Budget*
Mr. Randall Murphy	*Administrator, Management Services Department of Lake County, State of Illinois*
Ms. Jane Smith Patterson	*Director, Office of Technology, State of North Carolina*
Mr. Will Pelgrin, Esq.	*Counsel, Office of Technology, State of New York*
Mr. Alvin M. Pesachowitz	*Chief Information Officer, US Environmental Protection Agency*
Mr. Howard A. Peters III	*Secretary, Department of Human Services, State of Illinois*
Mr. André N. Pettigrew	*Member of Executive Cabinet, State of Colorado*
Ms. Carolyn T. Purcell	*Executive Director, Department of Information Resources, State of Texas*

Ms. Wendy Rayner	*Chief Information Officer, State of New Jersey*
Mr. Rock Regan	*Chief Information Officer, State of Connecticut*
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Mr. Richard J. Varn	*Chief Information Officer, State of Iowa*
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Mr. Terry Wood	*Councilman, City of Jacksonville, Florida*
Mr. Robert J. Woods	*Commissioner of Federal Telecommunication Services, US General Services Administration*
Mr. Gregory Woods	*Chief Operating Officer, Student Financial Assistance, US Department of Education*

Note: Organizational affiliations and position titles reflect the professional status of HPG members at the time of their initial association with the group.

PROJECT STAFF

Mr. Charles Vincent	Mr. Scot Barg	Ms. Stefanie Rosen	Mr. Jeff Brown
Project Manager	*Assistant Director—Research*	*Project Assistant*	*Events Coordinator*

Appendix B

READINGS AND RESOURCES

Davenport, Thomas H. *Process Innovation: Reengineering Work Through Information Technology.* Boston: Harvard Business School Press, 1993.

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Appendix C

GLOSSARY

Asynchronous Communication—A communication pattern in which the two (or more) parties involved are not communicating at the same time. Telephone conversations are an example of synchronous communication—both parties must be on the telephone at the same time. An email message is an example of asynchronous communication—one party can send a message and the other can read it hours or days later.

Broadband—A general term for high-volume, multiple-channel telecommunications capacity available via a single medium (e.g. a wire or cable). While narrowband (the equivalent of one telephone voice channel) is adequate for the transmission of text and numerical data, broadband connections allow the efficient and reliable delivery of voice, data, and video over one integrated network. Because multimedia content is seen as vital to businesses and consumers alike, electronic networks are increasingly moving to broadband, which in turn will have important long-term implications for commercial development and civic life.

Database—A set of data structured to support the storage, retrieval, and analysis of information, often custom-designed for specific business applications. Databases are central to information processing since they allow new and more efficient ways of assembling records and organizing work. A key step in developing databases is implementing consistent definitions or standards so that data can be meaningfully shared among users. Examples include standard charts of accounts for financial data, standard methods of coding geographical information, and standard templates for archiving audio and video material. (See also: Standards.)

Digital—Data that has been created, transmitted, or stored as a string of signals coded as "1"s (on) or "0"s (off). Data in digital form (text, numbers, graphics, voice, video, etc.) can be stored and processed by computers and communicated at high speed over electronic networks with complete accuracy and reliability. Exact copies of digital data can be made in which the nth copy is indistinguishable from the original.

E-government—A term commonly used to describe the interaction between government and citizens over the Internet. E-government has evolved rapidly from merely publishing or disseminating government information electronically, to online interactions and transactions between government and citizens. As governments begin to reorganize and integrate their work processes to take advantage of computer networks, e-government may come to define a new or transformed relationship between citizens and government enabled by networks.

Electronic commerce (or e-commerce)—Transactions where money is exchanged for valuable goods and services with either the money and/or the goods and services transported over computer networks.

Encryption—The act of scrambling information into a form called a cipher, usually to keep it from being read or modified by unauthorized parties. This is achieved through the use of algorithmic "keys" that scramble the information at one end and unscramble it at the other. Computer-based encryption can be used both for purposes that society wants to prevent (criminal and terrorist communications) as well as those it wants to support (private and secure social and commercial communications).

Geographic Information System (GIS)—A set of hardware and software tools used to gather, manipulate and analyze geographically referenced data. GIS are used by many government agencies. For example, transportation departments use GIS to determine the most efficient corridors for highway construction, and housing departments use GIS to help select the best locations for urban renewal projects.

Geographic Positioning System (GPS)—A system that uses satellites and small, portable receivers to determine the physical position of an object or person. Increasingly ubiquitous, GPS are used to track the locations of airplanes, boats, cars, and even individuals to within an accuracy of a few meters.

Hardware—Broadly, the physical components of information technology: computers, peripheral devices such as printers, disks, and scanners, and the cables and switches that link digital networks. The key components of computer hardware are microprocessor chips, which have doubled in productivity every 18 months, as measured by instructions executed per dollar (a phenomenon referred to as Moore's law). (See also: Software.)

HTML—Hypertext markup language. See: World Wide Web.

Information infrastructure—The interdependent capacities and standards for digital communication and data processing (both hardware and software) that support the flow of information, much as a highway infrastructure supports the flow of vehicles. (Hence, the vernacular catchphrase, "Information Superhighway," as a general reference to the interconnected system of computer networks exemplified by the Internet.) The ongoing expansion of this information infrastructure raises vital issues about when and how to establish and refine the technical standards on which it operates, including important related questions about funding, security, privacy, and collective democratic values.

Information technology (IT)—The umbrella term that encompasses the entire field of computer-based information processing: computer equipment, applications and services, telecommunication links and networks, digital databases, and the integrated technical specifications that enable these systems to function interactively. (See also: Information infrastructure.) The rapid development and expansion of these technologies over the last twenty years has ushered in the current historical period widely referred to as the "Information Age" or "Information Revolution," comparable in economic and social magnitude to the Industrial Revolution of the early 19th century. The profound transformations brought about by computer networking have made information processing (rather than industrial manufacturing) the key factor in economic productivity and global commerce, thereby supplanting large segments of the traditional blue-collar labor market with a white-collar force of information or knowledge workers.

Internet—The vast network-of-networks that uses open rather than proprietary standards to support computer-based communications at an incredibly large and efficient worldwide scale. Originally developed by the U.S. Defense Department for use in research in the 1960s, the Internet has become the foundation of our information infrastructure, an ever-expanding universe of network services and applications organized in geographically dispersed rather than centralized form.

Knowledge-based economy—A term used to describe an economy in which the defining factor of production is knowledge. The 19th century saw the rise of the industrial-based economy in which goods were produced in large industrial manufacturing plants. Today, a growing number of people produce, use, and share knowledge in their day-to-day work. Since information can be expressed digitally, computer networks have enabled the rapid growth of the knowledge-based economy.

Leadership—Any act by an individual member on the behalf of a group, with the intent to get the group to better meet its goals. Leadership for previously known problems relies heavily on authority and technical expertise, while leadership for new or adaptive problems relies on getting the group to confront the inadequacies of its old values and routines, and thereby develop more effective solutions. In general, the challenges of the information age (which involve a high degree of confusion and conflict resolution) call for adaptive leadership.

Marginal cost—The cost of the next in a series of products. Typically, first products cost more because of the expenditures required to set up the production process, with the unit cost then falling over time as the volume of activity increases. For most manufactured goods, however, diminishing returns-to-scale eventually cause marginal costs to rise. With information-technology products, by contrast, the dynamics are dramatically different: extremely high set-up costs (hundreds of millions of dollars for some software products) followed by almost zero costs for extra copies and no diminishing returns-to-scale for extremely high production volumes. Pricing policies for information goods are thus markedly different than for traditional industrial goods, and pricing policies in the economy at large are likely to change as the Information Age progresses.

Network—A set of communication paths (or channels) and the points (or nodes) they connect, including switches to determine which channel will be used when more than one is available. Computer networks, like telephone networks, can be thought of as telecommunications highways over which information travels. Networks benefit greatly from economies of scope and scale. Digital networks typically use packet-switching rather than circuit-switching to greatly increase efficiency and throughput. (See also: Switching)

Pen-based Computer—A computer that the user interacts with via an electronic pen or stylus rather than a keyboard or mouse. Most PDAs or hand-held computers are pen-based computers.

Personal Digital Assistant (PDA)—A small hand-held computer that can be carried around by an individual, and that is most commonly used for personal management tasks such as storing phone numbers, reading email, or scheduling. As wireless technologies continue to develop, PDAs are also being used to communicate over networks.

Portal (or Internet Portal)—On one level, a gateway or single point of entry through which the user can access related information from a variety of sources. For example, many governments are launching portals as a single point of entry to government information. It is interesting to note, however, that as governments adjust to the concept of a single point of entry, they are beginning to rethink how they interact with constituents. Rather than organizing the user's experience around agency boundaries, they are breaking down these boundaries to organize information and interactions around the user's needs.

Productivity—The ratio of goods produced in relation to the resources expended in production. Increasing living standards largely depend upon increasing productivity. Production processes that use information efficiently will typically be much more productive overall than older industrial production methods. This is the principal driving force behind the commercial, social, and political changes catalyzed by information technologies.

Public goods—Goods with impacts that "spill over" beyond those directly involved in buying and selling, thus weakening market forces as the mechanism for efficient resource allocation. Computer-based services have the potential of providing many positive spillovers to the public sector, since the marginal cost of IT production over time is virtually zero. One of the paramount political questions of the Information Age is where to draw the boundary between public and private benefits and, therefore, who should pay.

Server—A computer program that provides services to other programs or computers. Also used to describe the computer on which such a program operates. In the "client-server" network model, client programs make requests from servers connected to the same network. On the World Wide Web (see below) a browser acts as a client program, making requests for files or other information from web servers. These servers can be located any place in the world that is connected to the Internet.

Smart Card—A small electronic device or token (often the size of a credit card) that stores information in a memory chip. Information can be added, read, or changed using a smart card reader.

Software—A catchall term for the sets of instructions (programs) used to operate computer hardware. Software production and maintenance today has become a primary determinant in the success or failure of business and government organizations.

Standards—In the context of electronics, standardized technical specifications allow functions to be coordinated by automatically adhering to the set standard. Thus, standards for the voltages used for signaling allow devices to "talk to one another" in a consistent format, and standards for financial accounting allow for the meaningful aggregation and analysis of financial databases. With information technologies there is an inherent tension between the creation of new capabilities through innovation (a few people trying new ways to do things) and the subsequent applications of those capabilities through standardization (many people following established ways of doing things). Determining when and how to set standards is therefore a critical leadership issue, as is deciding whether such standards should be "open" for use by the general public or whether they should be protected by copyright or patent statutes.

Switching—The engineering mechanism that designates alternate channels or paths in a telecommunications network. Historically, telephone networks have used circuit-switching, where an entire channel between two connections is made available for the duration of the communication. Most computer networks, by contrast, have been designed to use packet-switching, which breaks up the transmitted data into individual units or "packets," each of which contains the destination address of the data. The packets are then independently routed through the network and reassembled by the computer at the destination address. Packet-switching allows data from multiple users to efficiently use the same path on the network. Major developments are now underway to enable packet-switched networks to carry digital voice and video more effectively.

World Wide Web (www or Web)—Standardized tools and software that allow non-technical users to find, display, and communicate text, graphics, voice, and video located on the Internet. The Web's fundamental components include HTML (hypertext markup language), pointers or hyperlinks (that rapidly access specific material that may reside on computers halfway around the world), and browsers (software that allows users to display and interact with Web content). Web technology is credited with democratizing the Internet by simplifying and streamlining key networking tools and functions for the general public.

END NOTES

[1]The concept of steering versus rowing was first made popular in a public sector context by David Osborne and Ted Gaebler in *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector.* (New York: Plume, 1993).

[2]For more detail on the Canadian Information Highway Advisory Council, see the Kennedy School of Government case study written by Eli Turk, "Canada's Strategy for the Information Highway," 1999, Case Number: (unassigned).

[3]Brian Miller, "Interview: Maine Governor Angus King," *Government Technology,* March 1996, (www.govtech.net/publications/gt/1996/mar/interviewmar/interviewmar.shtm). Governor King was also quoted as saying "I'm convinced that no leader can lead on IT issues if they themselves don't know the technology works. The fact that I'm a pretty serious computer nut—and everybody knows it—has helped in all kinds of ways. It's helped in terms of leading by example. It's helped because the IT people know I appreciate and understand what they're doing and what some of the issues are. It's also helped me to ask the right questions." Andrew Noel and Shane Peterson, "The Word on Digital States," *Government Technology,* October 2000, (www.govtech.net/publications/gt/2000/oct/WordOn/index.shtm).

[4]Ewen MacAskill, "Blair conquers his fear of IT," *The Guardian*, 30 October 1999, (www.guardianunlimited.co.uk/Archive/Article/0,4273,3922998,00.html).

[5]For more on Governor Leavitt see: www.governing.com/poy/ptleav.htm. For more on Senator Howell see: www.govtech.net/publications.eCommerce/dec98/toc/toc.shtm.

[6]For more detail on the SSA's early attempts to bring services online, see the Kennedy School of Government case study written by Zach Tumin, "Social Security on the Web: The Case of the Online PEBES," 1998, Case Number: (unassigned).

[7]For more detail see the Kennedy School of Government case study written by Ed Barker, "SWIMming in San Diego: Hand-held Computing and Enterprise Systems in the San Diego Water Department," 2000, Case Number: (unassigned).

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