REFERENCES

THE IMPACT OF REVITALIZED
MANAGEMENT PRACTICES
ON THE ADOPTION OF
INFORMATION TECHNOLOGY
A National Survey of Local Governments

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The emergence of new information technologies such as electronic government, virtual workplaces, and electronic democracy has been widely discussed in recent years (Bonnett, 1999; Kamarck & Nye, 1999; Peirce, 1999). This study examines the impact of revitalized management practices on the use and effectiveness of these information technologies, as well as other factors that shape information technology in local government, such as stakeholder pressures and demands, and policies and procedures. In addition, this study examines the effect of information technology on the use of revitalized management practices. Revitalized management practices are defined in this study as those that promote increased openness, mutual support, and risk taking by employees and managers (e.g., Berman & West, 1998; Garson, 2000).

This study is based on a national survey of city managers, in cities with a population of more than 50,000, conducted during the spring and summer of 2000. In addition to the above, it also provides information about the uses of new and established information technologies in local government.

This article contributes to the literature by exploring, in a systematic fashion, the role of management practices that revitalize public organizations. Previous systematic studies have analyzed the adoption of information technology from other perspectives, such as the role of leadership and managerial champions, strategic planning, concern for productivity and improved service delivery, and the external environment, including user involvement and fiscal scarcity (e.g., Bajjaly, 1999; Borins, 1998; Bozeman & Bretschneider, 1986; Ewusi-Mensah & Przasnyski, 1991; Garson, 1992; Standish Group, 1995; Stevens, Cahill, Overman, & Frost-Kumpf, 1994; Swain, White, & Hubbert, 1995; Tapscott & Caston, 1993; Thompson, 1992; Weikart & Carlson, 1998). Researchers have also addressed the reasons behind information technology failures

(e.g., Standish Group, 1998), as well as demographic and structural factors affecting adoption (King, Danziger, Dunkle, & Kraemer, 1992; Kraemer & Norris, 1994; Norris, 1992).

Another recurring area of scholarly interest is the impact of information technology on the public sector (e.g., Brudney & Brown, 1992; Drucker, 1995). Anderson and Danziger (1995) reviewed 20 empirical studies dealing with the impact of information technology on government. These studies explored the effects on capabilities (information quality, efficiency, effectiveness) and interactions (coordination, citizen-government interactions, organizational control). Kraemer, Anderson, and Perry (1994) provide a cross-cultural perspective in their examination of effects, focusing on creation of new institutions (e.g., management information systems departments) and service delivery (e.g., centralization/decentralization, distribution of workers). Others have explored the impact of computer outcomes on individual employees (Chen & Klay, 1994), on interagency cooperation (Garson, 1992), and on human resource management (Jones, 1998).

This research builds on these studies by examining the impact of management practices on information technology outcomes. It first provides a general framework for studying these relations and then reports survey findings along with the measurement and definition of study variables.

Framework

What is the relationship between revitalized management practices, the use of information technology, and organizational effectiveness? This study posits a mutually reinforcing relationship between the use of information technology and revitalized management: Increasing use of information technology makes it more likely that revitalized management practices will be used. Revitalized management practices make it more likely that information technology will be tested/implemented or broadly applied, which then makes it more likely that organizational effectiveness will increase. Examining a mutually reinforcing relationship between information technology and revitalized management departs from traditional scholarly articles that often examine only nonreciprocal relations, and doing so requires nonrecursive statistical estimation techniques that are discussed further. This framework examines the relationships involving information technology, revitalized management, and organizational effectiveness.

INFORMATION TECHNOLOGY

Recent advances in information technology enhance communication and integration. Changes in information technology make it possible for employees to "work together apart" in remote locations (home offices, satellite sites, on the road) via electronic links to their employer's communication system. They also allow stakeholders to access public offices and have real-time interactions (with or without human assistance) without their physical presence. As noted by Allcorn (1997), the new technology associated with the virtual organization includes the following:

Creative combinations of integrated databases; decision-support software and applica-
tions; e-mail; home pages for departments and individuals; news groups for the discus-
sion of organizational events, problems, and decisions; and (employee and other) discus-
sion groups that are spontaneously formed around a variety of subjects. These resources
and activities will be seamlessly woven together by Intranets. (p. 417)

Such opportunities increase "boundary spanning" and enable employees and manag-
ers to share information and work collaboratively, even when they are not physically
able to attend meetings. Many meetings are increasingly "by Internet" in these new
organizations. Writings on new information technology and movement to virtual orga-
nizations tout these developments as contributing to productivity improvement
(Crandall & Wallace, 1997; Swain & White, 1992). Given the labor-intensive nature of
government, addressing productivity through people has been advocated by many
scholars (Cunningham & Sarayrah, 1994; Guy, 1992; Ingraham, Seldon, & Moynihan,
1999; Werther, Ruch, & McClure, 1986) as the most fruitful focus of attention. Adop-
tion of state-of-the-art information technology applications is likely to affect the "pro-
ductivity through people" scenario in many ways: It can enhance the flexibility and
autonomy of the job (e.g., telecommuting), alter the nature of workplace interactions
(self-service kiosks, electronic teams), raise the level of knowledge and skills (regula-
tions on CD-ROM, video teleconferencing), and increase the use and speed of transac-
tions (payroll and benefits applications, financial budgeting software, com-
puter-assisted human resource management).

Although some authors view the utilization of these technologies as inevitable, oth-
ers observe considerable variation in the rate of adoption, use, and nature of past infor-
mation technologies (Barrett & Greene, 2000; Borins, 1998; Martin, 1997). Some
organizations choose to lead, whereas others follow or lag. It may be that some organi-
zations eventually adopt those technologies that are widely popular simply because
their stakeholders start demanding them. But other public organizations have the
potential to lead information technology (such as FAA, IRS, or FBI), and the extent to
which they do depends, in large measure, on managerial and employee actions
(Mechling, 1995, 1996). Management matters: At issue is not only the decision to
aggressively seek new information technology but also the manner in which that is
done. Even the adoption of the most routine communication and e-government tech-
nologies requires managerial initiative, employee involvement and buy-in, and the
allocation of resources. The way in which these management activities are undertaken
is discussed below.

REVITALIZED MANAGEMENT PRACTICES

Revitalized management, as defined in this study, is characterized by management
actions that promote (a) risk taking, (b) openness in decision making, and (c) manage-
rial and peer support to employees. These activities are not limited or defined by infor-
mation technology (including information technology–specific training) but concern
general management practices that affect information technology in the following
ways. First, management actions that increase risk taking and promote productivity
encourage managers and employees to seek out new opportunities for change. They

encourage managers and employees to think outside the box and bring new challenges or solutions to the attention of others in their organization. For example, employees and managers might use information technology in new ways or become advocates for new applications found in other jurisdictions or in the private sector. Second, management efforts to increase openness spur dialogue and consensus-forming about operational and other challenges and ways in which these might be addressed through information technology. Openness also furthers dialogue about problems that are brought about by the use of new information technology, especially matters of implementation. Emphasis on openness improves the climate for cooperation and implementation among implementers. By contrast, organizations that discourage openness or efforts that "rock the boat" cause managers and employees to turn their eyes away from ongoing problems and often sustain departmental and interpersonal rivalries that impede effective implementation of information technology (Mahler, 1997).

Third, management initiatives to promote mutual support increase the problem-identification and problem-solving abilities of employees and managers in using new information technology. Many new information technologies involve challenges that are better overcome when users share their experiences and solutions to common problems. These interactions often involve employees and managers from different departments, fields, or organizations working together in an informal manner. In this regard, many organizations are now increasing supervisory training to help them set a positive tone for encouraging mutual support and openness in their work units. It is important that managerial actions emphasize risk taking, openness, *and* mutual support because the absence of any one of these elements may provide an insufficient ground for effective adoption of information technology. For example, emphases on mutual support without risk taking may result in a social club-like atmosphere, inadequately spurring organizations to seek out new uses of information technology. An open environment without risk taking may focus on problem identification without emphasizing creative problem solving, thereby reducing incentives for new uses. Also, risk taking without mutual support may result in underutilization of information technology capabilities.

This study examines the effect of revitalized management on the use of information technology in organizations, and vice versa. For example, communication through information technology facilitates the dissemination and exchange of information, dialogue, and consensus building. Managers who emphasize openness will find that communication through information technology furthers this. Information technology also helps people identify others who can support them in their use of new information technology, and it often facilitates such collaboration. The impact of information technology on risk taking is less clear, although information technology does increase the volume and timeliness of information that may assist organizations in reevaluating their goals and responding quickly to customer needs. It also increases access to knowledge sources and provides stakeholders additional means to communicate their ideas (and complaints) to public officials—thus opening up the possibility of new actions. Furthermore, the use of information technology is consistent with employee empow-

erment, which often involves increased openness, risk taking, and mutual support (Chen & Klay, 1994).

OTHER CONTRIBUTING FACTORS

Of course, management efforts to revitalize organization are but one of several factors that further information technology in organizations. Previous studies (e.g., Bajjaly, 1999; Chen & Klay, 1994; Ferris, 1998; Swain et al., 1995; Stevens et al., 1994; Stevens & LaPlante, 1986) suggest that interest by senior managers is important because they often establish program priorities and exercise considerable budget discretion to make new technology investments. Also, human resource management is involved when developing Web-access policies or those with regard to the proper use of e-mail, as well as providing information technology training.

Some studies find that the availability of resources is important, as is the availability of a "technology capacity," such as an in-house unit or information technology director (Scavo & Shi, 2000). The scarcity of resources is also said to be a driver, especially when increased demands outrun resource availability, often leading to the formation of partnerships or interorganizational cooperative ventures (Brown, O'Toole, & Brudney, 1998; Weikart & Carlson, 1998). Some jurisdictions contract with the private sector for information technology expertise to launch or extend their move to digital government. Other studies also highlight the role of stakeholder expectations and demands: They note that demands from users of electronic interactions are a driver of new technology in some jurisdictions (Bozeman & Bretschneider, 1986; Danziger, Kraemer, Dunkle, & King, 1993; Newcomer & Caudle, 1991; Stevens et al., 1994). For example, customers have come to expect self-service options (e.g., kiosks) and transaction accuracy (e.g., error-free billing), both of which are potentially enhanced by new information technology. Related expectations and demands are also voiced by elected officials.

In short, the relationships involving information technology, revitalized management practices, and organizational effectiveness are complex. It is important to acknowledge that information technology can create problems for managers just as it provides opportunities. For example, it is possible for "dictatorial" managers to use information technology to enhance their control and stifle organizational creativity. This and other problems need to be anticipated as organizations become more reliant on information technology. Problems encountered in the testing and implementation stage, as well as those experienced when information technology is more broadly diffused, require quick solutions. It is our contention that such solutions are easier to achieve when organizations rely on a team approach, encourage risk taking (e.g., to better serve customers), foster openness and transparency, and encourage friendship, mutual support, and empowerment (flattening of organizations) among its members. These revitalized management practices go "hand in glove" with new information technology initiatives and are consistent with both the quality paradigm and the reengineering thrust so apparent in recent years. It is further expected that such revitalized management practices and information technology applications will positively affect the organizational effectiveness of city governments.

Method

During spring 2000, a survey was sent to city managers and chief administrative officers in all 544 cities with populations of more than 50,000. Responses were received from 222 for a response rate of 40.8%. Respondents were the addressee (city manager or chief administrative officer [CAO]) or their direct subordinates (e.g., deputy or assistant city manager, chief of staff, budget director, human resources director, finance director, employee relations director). The term *senior managers* is used to refer to the sample because of their diverse positions. City managers, as chief executive officers of their organizations, and human resource directors, focusing on people problems, are well-positioned to guide and track the move toward new organizational forms and to assess the effects of information technology efforts.

A profile of respondents shows that 66.0% are men; 33.9% are younger than 45 years, 47.8% are between 45 and 54 years, and 18.3% are older than 54 years. Respondents have worked, on average, 17.5 years in local government. 10.6% of respondents are located in the Northeast, 25.3% in the South, 30.4% in the Midwest, and 33.6% in the West. Seventy percent work in council-manager cities; 67.3% of cities have populations between 50,000 and 99,999; 23.0% of cities are between 100,000 and 249,000; and 9.7% of cities have populations of more than 250,000. We also completed in-depth telephone interviews among respondents in cities that use a broad range of information technology applications and compared their responses with other interviewees who were selected among those in cities with few information technology applications.

Overall, we find that respondents are well-informed of the information technology uses of their jurisdictions. A total of 91.0% state that they are knowledgeable about information technology applications in the workplace. They are also quite knowledgeable about workplace relations in their jurisdictions: 85.8% state that they are regularly involved in shaping policies that affect workplace relations, and 83.8% report that problems of workplace relations are regularly brought to their attention. To test sample bias, we examine whether addressees' (city managers and CAOs) level of awareness of information technology differs from those of other respondents, but no significant differences exist. Neither are there significant differences involving familiarity with workplace relations between these groups of respondents. We conclude that the mix of respondents does not affect the results reported below. The findings reflect respondents' perceptions, and all results are caveated in this regard.

Findings

HOW MUCH INFORMATION TECHNOLOGY?

Table 1 shows the use of various information technology applications in local government, which reflect well-established applications (such as inventory software), as well as those that received recent interest (especially in connection with creating "virtual workplaces"). The items are indicative of technology applications that are important and that have broad applications, and interviewees agree that these are currently significant applications.[1] As noted by one respondent, "How important are these technologies (in Table 1)? On a scale from 1 to 10 . . . about a 50."[2] Table 1 shows that more

Table 1.   Information Technology Applications in Local Government (in percentages)

	Tested or Implemented (A)	Applications Involving > 25% of Workforce[a] (B)
A. Technology applications		
Financial budgeting software	76.5	51.9
Payroll and benefits applications	66.2	40.1
Inventory software	52.9	23.6
CD-ROM collection of municipal regulations	44.1	24.5
Telecommuting	39.9	10.4
Electronically connected teams	31.9	23.1
Video teleconferencing	25.8	9.4
Computer-assisted human resource planning	23.0	12.3
Self-service kiosks where workers can access their files	7.0	5.7
B. Frequency distribution		
All items	0.9	0.0
8 items	4.2	0.0
7 items	5.2	0.5
6 items	8.5	1.4
5 items	18.9	3.8
4 items	17.0	7.6
3 items	13.7	10.9
2 items	11.3	19.0
1 item	11.8	19.0
0 items	8.5	37.9
Total	100.0	100.0

Note. Cronbach alpha of column (A) = .71; Cronbach alpha of column (B) = .75.
a. Respondents identified which of the following information technology applications affect more than one quarter of their workforce.

than half of all cities have tested or implemented financial budgeting software (76.5%), payroll and benefits applications (66.2%), and inventory software (52.9%). Somewhat less common is testing or implementing computer-assisted human resource planning (23.0%) and using CD-ROMs for storage and dissemination of municipal regulations (44.1%). Fewer than half of cities have tested or implemented "virtual workplace" applications involving telecommuting (39.9%), electronically connected teams (31.9%), video conferencing (25.8%), and self-service kiosks where workers can access their files (7.0%).

Table 1 also shows the extent that these applications affect more than one quarter of the workplace—a measure of technology diffusion. Although not all applications are relevant to all workers, they could affect at least one quarter of the workforce. On average, 22.3% of these technologies involve more than one quarter of the workforce, slightly more than half of the extent to which they have been tested or implemented (40.8%). The most widely diffused applications are financial budgeting software (51.9%) and payroll and benefits applications (40.1%). Other applications are less widely diffused, such as CD-ROM collection of municipal regulations (24.5%), inventory software (23.6%), and electronically connected teams (23.1%). Telecommuting and video conferencing technology applications affect few workers (respectively, diffusion of 10.4% and 9.4%).

Two index variables were developed based on the summation of responses shown in Table 1.[3] The index measures encompass a mix of recent and established information technologies but vary with regard to the level of utilization: The measure of "testing or implementing" includes any level of utilization (column A), and the measure of application "involving 25% or more of the workforce" is a measure of broad utilization, only (column B). Based on the index measure of testing or implementing, it was found that very few cities failed to test or implement any application (8.5%) and that one third (36.8%) of cities have tested or implemented up to one third of the applications listed. Another third (35.9%) have tested or implemented about half (four or five) of the applications shown, and 18.8% have tested or implemented at least two thirds (6 or more) of the applications. However, very few cities have tested or implemented all or nearly all applications (5.1%). Also, very few cities have adopted a broad number of technology applications in ways that affect at least one quarter of their workforce. Specifically, more than one third (37.9%) have not diffused any application broadly, and almost half of cities (48.9%) have only diffused up to one third of applications in this manner. Fewer than one in seven (13.3%) cities have broadly diffused more than one third of these applications, and no city has broadly diffused all or almost all applications. Further analysis shows that 60.1% of cities have tested or implemented one of the four virtual workplace technologies identified above, but only 31.3% have adopted at least one of these in a manner that affects one quarter or more of the workforce.

These findings are supported by interviews. Very few respondents consider their cities to be *very* high users of technology. Among interviewees, about half feel that their city is lagging behind, as evidenced by such comments as, "There is much more information technology that can be implemented, our rate of absorption is low," and, with regard to using virtual technologies, "barely using it at all." However, other respondents feel that their city is doing a good deal, or at least making progress: "Although we are more advanced than many other communities, there are still several areas that are in need of updated technology," and "We are working on improved connectivity to our neighbors and citizens," but also, "Technology moves so rapidly that once it is absorbed it has become obsolete." Few respondents indicated that considerable progress had been made: "Yes, our organization is doing quite a bit in the area of information technology," and "We have implemented measures that allow our employees to work from remote locations and be connected to resources on the city's network."

Regional and other differences exist in the use of information technology. Cities with populations of more than 250,000 implement or test more technology applications than cities with populations between 50,000 and 100,000 (30.8% versus 23.4% of items in Table 1, $p < .01$, using Bonferonni tests), but there are no differences in broad diffusion among cities of different sizes. Cities in the Northeast test or implement significantly fewer applications than cities in the West (respectively, 29.5% and 45.8%, $p < .05$), and cities in the Northeast also implement them less broadly (respectively, 10.6% and 26.5%, $p < .05$). No significant differences involve cities in the South or Midwest.[4] Cities with a council-manager form of government implement a broader range of applications than cities with a mayor-council form of government (18.5% versus 13.0%, $p < .05$), but they do not test or implement more applications.

Interviewees provided numerous other examples of technology applications, and those who did often were managers of cities with high rates of testing or implementa-

Table 2.   Local Government Intranets (in percentages)

Does your city have an Intranet site? Yes: 53.2%	
If "Yes," . . .	Yes[a]
Do links allow viewers to navigate Web pages and sites quickly?	81.7
Does the home page design encourage viewers to scroll down the page?	82.6
Is the Intranet site up to date?	73.0
Does the site have site search capability?	58.3
Does the Intranet site have a bulletin board?	50.0
Does your Intranet site convey a clear strategic vision statement for the city?	50.4
Do all employees have online access to their files and records on the Intranet?	15.8

a. The scale is 2 = Yes, 1 = No, 0 = Don't Know.

tion, thus providing some validation for the above measure as an indicator of technology utilization. Examples provided by interviewees include applications for tracking recruitment efforts, imaging software for record keeping, advanced GIS applications, use of electronic signatures in zoning requests; integration among financial, budgeting, and human resource management software; paperless council meetings; and specialized customer applications. Table 2 examines one specific technology application in further detail, Intranets. These are positively associated with testing or implementing a broad range of technology applications ($t = 3.16, p < .01$). Intranets are internal Web sites that allow employees to communicate and share information. About half of the cities in the sample have Intranet sites (53.2%). Most Intranet sites have features such as links, bulletin boards, and search capabilities. Among cities with Intranet sites, about three quarters (73.0%) state that their Intranet site is up to date.

REVITALIZED MANAGEMENT AND OTHER FACTORS

Although it is interesting to examine the use of information technology in city government as a benchmark of the current state of the art, it is also important to understand factors that are associated with its use and diffusion, especially the role of revitalized management practices. Table 3 shows the role of revitalized management practices and other factors affecting the use of information technology. Respondents agree or strongly agree that they promote a climate of openness among staff (84.4%) and encourage employees to act friendly toward each other (83.3%). Training is provided to promote positive relations among employees (68.8%), and friendships among employees are common (79.3%). Managers emphasize team work (77.5%) and encourage employees to seek each other out for support (71.2%). Employees are encouraged to take risks (47.6%), and are empowered to make important decisions (68.2%). The measures shown in Table 3 (Part A) are used to construct an index measure of "revitalized" management practices (alpha = .79). Further analysis of this index measure suggests that revitalized management practices are "common" in 46.0% of cities, defined as, on average, agreeing or strongly agreeing with the above statements, and implementing action items in at least half of the departments (see Table 3, note 3). The measure of revitalization is significantly lower in the Northeast compared with the West ($p < .05$) but does not vary across other regions, city sizes, or forms of government.

Table 3.   Management Practices and Information Technology

	Association With[b]		
	Agree or Strongly Agree[a] (%)	Testing or Implementing (A)	Applications Involving > 25% of Workforce (B)
A. Revitalized management practices			
We promote a climate of openness and friendship among staff[c]	84.4	.228*	.127*
We encourage employees to act friendly toward each other[c]	83.3	.189*	.135**
It is common to find employees working out problems in their mutual collaborations	83.2	.195*	.161*
Friendships among employees are common in most departments	79.3	.100**	.059
We emphasize the use of teams	77.5	.175*	.163*
Office layouts include space for staff to mingle	72.4	.155*	.098**
We encourage employees to seek each other out for support[c]	71.2	.193*	.191*
There is training to promote positive employee relations[c]	68.8	.211*	.163*
Employees are empowered to make important decisions	68.2	.212*	.137*
Employees receive ethics training	52.6	.222*	.115**
Employees are encouraged to take risks	47.6	.254*	.076
B. Nonrevitalized conditions			
Most departments have a strong hierarchical structure	62.4	.009	−.066
We lack interpersonal training	37.1	−.206*	−.187*
Employees are careful what they say around here	31.4	−.028	−.131**
Employees have so much security, they do not have to earn their rewards	30.3	−.070	−.084
Supervisors receive little training	26.3	−.144*	−.148*
There is a lack of professional norms among staff	17.5	−.154*	−.176*
Employees just act busy, rather than doing meaningful work	10.2	−.133**	−.064

Note. Cronbach alpha measure of internal reliability of the index "revitalized management practices" is .79.
a. Responses are on a 5-point Likert scale, ranging from 5 = strongly agree; 4 = agree; 3 = don't know or can't say; 2 = disagree; 1 = strongly disagree.
b. Index measure of items shown in Table 1. Tau-c measures shown, *p < .01; **p < .05.
c. Shown are the percentage who agree that items occur in at least half of the departments.

Is there an association between these management practices and the use and diffusion of information technology? Table 3 shows that these items are all significantly associated with testing or implementing information technology and that most are also associated with a broad level of information technology diffusion. The index measure is significantly associated with both (respectively, tau-c = .325 and .217, both $p < .01$). Among cities in which revitalized management practices are common, 31.7% test or implement six or more applications shown in Table 1; by contrast, only 6.6% of cities with lower levels of revitalization implement the same level of information technology ($t = 17.1, p < .01$). For example, the use of teamwork is significantly associated with

testing and implementing information technology (tau-c = 175, $p < .01$), and many interviewees commented on the importance of working together: "It is very important that people work together when implementing new information technology. It is essential to learning how to adapt," and "When people don't work together the end result is disaster." Some interviewees also commented on cooperation among departments to stay abreast of changes in technology, to stay abreast of the needs of the organization, and to ensure adequate integration among systems.

Encouraging risk taking is also significantly associated with implementing information technology as expected (tau-c = .254, $p < .01$). Interviewees also commented on the importance of employees and managers proactively identifying new opportunities: "Employees and managers know better than anyone what areas of operations can be improved with technology and which applications benefit their operation. . . . We strongly encourage our people to try new things, to be cautious in implementing them but not being afraid to fail." Table 3 also shows that employee empowerment is associated with increased use of technology, presumably because it makes employees proactive in the search for technology solutions. Ethics training is also positively associated with using technology. Although this may appear spurious, such training encourages people to do the right thing and take responsibility for their actions—values that are highly appropriate to new technology, too. Conversely, the lack of professional norms, as perceived by respondents, is negatively associated with information technology, as is the lack of interpersonal training. It is increasingly believed that interpersonal training is important to establishing a common culture that promotes openness and dialogue and allows people to address risk taking and productivity.

Although these results show that using information technology and revitalized management practices are associated, they do not address the issues of causation, which are examined below. What factors in addition to revitalized management practices are associated with the use of new information technology? Table 4 shows other factors that affect the use of new information technology. Part A shows the role of stakeholders. It is interesting that although many respondents feel that the city manager (95.4%), council persons (80.8%), department heads (94.0%), and mayor (74.1%) are interested in information technology, none of this interest is significantly associated with its use. The percentage of city managers and department heads who are interested is very high, and thus little association would be expected. Several interviewees commented that although the role of these stakeholders was important, "in the end, the customer is most important." "The reason we exist is to provide services and to meet the needs of our citizens." Table 4 shows that such stakeholder expectations are significantly associated with the use of information technology. Having a chief information officer (CIO) is also associated with testing or implementing technology. Having a CIO signals the importance of information technology to the organization, and the CIO is also a focal point for new technology initiatives.

Finally, Table 4 shows a variety of other conditions that affect use of information technology. The presence of technology-related policies is significantly associated with using information technology, specifically, procedures for handling complaints about inappropriate online conduct and having a legally sound e-mail policy (both $p < .01$). These might be considered necessary prerequisites for broad use of information

Table 4.   Other Factors Affecting the Use of Technology

		Association With[b]	
	Yes[a] (%)	Testing or Implementing (A)	Applications Involving > 25% of the Workforce (B)
A. Stakeholders			
The city manager is interested in information technology	95.4	.038	.046
Department heads are interested in information technology	94.0	.063	.015
Council persons are interested in information technology	80.8	.066	.087
Mayor is interested in information technology	74.1	.042	.053
A chief information officer exists	73.4	.101**	.025
Stakeholders expect electronic interaction	64.3	.219*	.111**
B. Policies and conditions			
Demands for improved city services have increased	94.4	.017	−.028
Information technology is available in-house	90.8	.055	.005
We are under pressure to reduce costs	78.3	.000	.028
A procedure exists for handling complaints about unauthorized or offensive online conduct by employees	74.8	.253*	.278*
A legally-sound e-mail policy exists	73.6	.175*	.157*
Demands for self-service options have increased	70.1	.043	.105**
Demands for transaction accuracy have increased	66.0	−.043	−.014
Partnership between human resource and information technology professionals has increased	64.8	.084	.139*
Most employees have Web access	61.3	.121*	.086
Information technology expertise is outsourced	34.6	.208**	.150*

a. Scale: 2 = Yes, 1 = No, 0 = Don't Know.
b. Index measure of items shown in Table 1. Tau-c measures shown, $*p < .01$; $**p < .05$.

technology. Outsourcing of information technology expertise is also associated with the use of information technology ($p < .01$), but not the availability of in-house expertise. This suggests that in fast developing markets for information technology, it is increasingly necessary to rely on consultants and contractors for expertise. Results also show that increasing partnerships between human resource management and information technology staff is associated with the diffusion of information technology. This is consistent with above findings concerning the role of training and support. However, other factors are not associated with the use of technology, such as being under pressure to reduce costs or increase demands for self-service. Although increased demand for services is also not associated with the increased use of information technology, the very high level of such demand might explain why little association can be found. Indeed, many interviewees stated that the need for increasing efficiency is an important driver of new information technology.[5]

Table 5.   Assessing Impact of IT on Organizational Effectiveness

	Association With[b]		
	Agree or Strongly Agree[a] (%)	Testing or Implementing IT (A)	Revitalizing Management Practices[c] (B)
A. Organizational effectiveness (IT specific)			
"In our city, the use of information technology has . . ."			
Improved service efficiency	82.0	.172*	.162*
Provided a greater variety of service delivery methods	74.1	.142*	.085
Led to wider use of knowledge sources	72.5	.148*	.181*
Improved satisfaction of stakeholders	72.1	.150*	.170*
Increased employee job satisfaction	71.8	.092	.134**
Enabled service comparisons with other jurisdictions	47.9	.158*	.140*
Decreased paperwork	45.8	.042	.026
Strengthened organizational culture	44.1	.148*	.174*
Increased complaints from those desiring human assistance	19.0	.041	−.063
Led to employee layoffs	3.2	−.014	.009
B. Organizational effectiveness (general)			
"In our city, employees and managers . . ."			
Are committed to serving customers and clients	93.9	.203*	.197*
Are committed to increasing their productivity	85.2	.153*	.171*
Are driven by a sense of accomplishment	78.9	.190*	.324*
Are highly motivated to achieve their goals	70.4	.214*	.302*
Are committed to being accountable	66.8	.262*	.466*
Are committed to seeking and using feedback	60.6	.281*	.395*

Note. IT = Information Technology. Cronbach alpha of Organizational Effectiveness (general) = .82.
a. Responses are on a 5-point Likert scale, ranging from 5 = *strongly agree*; 4 = *agree*; 3 = *don't know or can't say*; 2 = *disagree*; 1 = *strongly disagree*.
b. Index measure of items shown in Table 1. Tau-c measures shown, *$p < .01$; **$p < .05$.
c. See Table 3 note for definition of *organizational*.

ORGANIZATIONAL EFFECTIVENESS

Table 5 examines the effect of information technology on organizational effectiveness. Part A shows that many respondents state that the use of information technology in their jurisdiction improves service delivery (82.0%), increases delivery methods (74.1%), leads to a wider use of knowledge sources (72.5%), and improves the satisfaction of stakeholders (72.5%) and employees (71.8%). Somewhat fewer than half of the respondents feel that information technology has decreased paperwork (45.8%) or strengthened organizational culture (44.1%). Very few respondents feel that information technology has lead to employee layoffs (3.2%). When asked, interviewees frequently commented on how information technology applications perform functions faster than manual approaches and thereby improve services to customers: "Without information technology, you can't do your job well."

The impact of information technology on organizational effectiveness is also examined in Table 5, Part B. In a two-step process, we first ask respondents to assess the gen-

eral level of organizational effectiveness in their jurisdiction and then correlate these responses with the use of information technology.[6] Respondents agree or strongly agree that employees and managers in their jurisdiction are committed to serving customers and clients (93.9%), committed to increasing productivity (85.2%), driven by a sense of accomplishment (78.9%), highly motivated to accomplish goals (70.4%), committed to being accountable (66.8%), and committed to using feedback (60.6%). Although positive, most respondents agree, but not strongly, with these statements: The ratio of these responses is 4.7:1. Column A shows that all of these responses are strongly and positively associated with testing or implementing information technology (all $p < .01$).[7]

The practical significance of these findings is as follows. Among cities that have tested or implemented at least two thirds of the information technology applications shown in Table 1 (that is, the top 18.1% of all respondents), 48.7% strongly agree that employees and managers are committed to serving customers and clients; by contrast, only 26.6% of other respondents strongly agree with this statement. The respective percentages for those who agree or strongly agree that information technology has improved service efficiency are 70.0% and 49.1%. Among cities that have implemented *fewer* than one third of applications, 27.3% disagree that employees and managers are highly committed to achieving their goals; by contrast, only 2.5% of those that implement at least two thirds of the information technology applications feel this way. Similarly, among cities that have implemented fewer than one third of applications, 29.2% disagree that employees and managers are committed to being accountable; by contrast, only 2.6% of those that implement at least two thirds of the information technology applications state the same.

Table 5, Part B, also shows that revitalized management practices are significantly associated with organizational effectiveness and, often, quite strongly. Revitalized management practices are strongly associated with employees and managers being accountable (tau-c = .466, $p < .01$) and being committed to seeking and using feedback (tau-c = .395, $p < .01$). An index measure of organizational effectiveness is based on this part of Table 5 (alpha = .82). The index measure of revitalized management practices is strongly associated with this index measure of organizational effectiveness (tau-c = .360, $p < .01$).

Figure 1 examines the relations among information technology, revitalized management, organizational effectiveness, and factors affecting these variables. The model is nonrecursive, estimating simultaneous effects of information technology and revitalized management on each other.[8] The reported model shows theoretical and structural integrity, and the goodness-of-fit measures are all within appropriate ranges. With regard to the latter, the chi-square goodness-of-fit test shows that the model's assumptions with regard to its moments (variance-covariance matrix) are consistent with those of the sample (chi-square = 48.3, $df = 39$, $p < .146$). Also, the root mean square error of approximation (RMSEA) is 0.038 ($p < .69$), well under the acceptance maximum of 0.05; and the normed chi-square statistic is 1.24, well within the acceptability range of 1.0 to 3.0. The Adjusted Goodness-of-Fit Index (AGFI) is 0.91 and the Tucker-Lewis Index (TLI) is 0.96 (both above 0.90 recommended minimum thresholds). The Goodness-of-Fit Index (GFI) is 0.95, which approximates the "perfect" value of 1.0. Finally, the stability index is 0.031 (within the acceptability range of 1.0
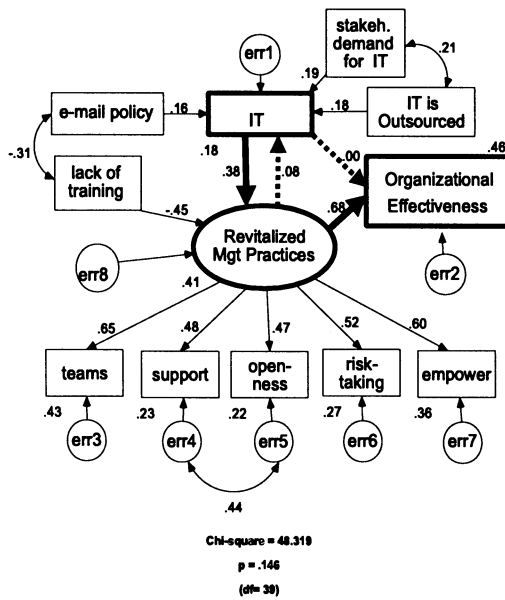
Figure 1. Impact of Revitalized Management Practices on IT and Effectiveness (AMOS)
Note. IT = Information Technology.

to −1.0) and the maximum Modification Index is only 4.27. Although other models also meet criteria for statistical acceptability, Figure 1 is shown because it balances the competing criteria of statistical acceptance, theoretical integrity and purpose, and parsimony.

Figure 1 consists of a measurement model and a structure model. The measurement model shows a latent (unobserved) variable ("revitalized management practices") that is based on five (observed) variables that are also shown in Table 3, Part A. These five variables are chosen to reflect the theoretical content of the latent variable. The scores show the factor loadings and their squared correlations.[9] "Information technology" and "organizational effectiveness" are index variables based on the items shown, respectively, in Table 1 (column A) and Table 5, Part B. The Cronbach alpha measures of reliability are, respectively, .71 and .82. The structure model shows the relationships among the variables in the model (specifically, among information technology, revitalized management practices, organizational effectiveness, and the variables affecting these relations). The scores along the arrows are standardized regression coefficients (betas) and the scores associated with each endogenous variable are squared multiple correlations.[10] All relations are significant (at $p < .01$), *except* the impact of e-mail policies ($p < .05$) and the impacts of revitalized management practices on information technology, and of information technology on organizational effectiveness (both insignificant). The latter relations are shown, however, for purposes of theory testing.

The following conclusions are drawn. First, information technology is a significant, positive determinant of using revitalized management practices. As posited, informa-

tion technology assists managers in their use of teams while furthering openness and risk taking, which is consistent with empowerment and increasing a climate of support. Information technology supports revitalized management practices.[11] Second, revitalized management increases organizational effectiveness: clearly, support, openness, and risk taking are consistent with customer orientation and increased productivity. However, controlled for revitalized management, information technology is *not* directly associated with increased organizational effectiveness. The impact of information technology on organizations is thus mediated through revitalized management. Although many interviewees commented that, for example, "(technology) provides new ways for fulfilling the public's insatiable appetite for information" and reflects "important values of efficiency, effectiveness, responsiveness, and timeliness," these outcomes are seen to require management. Third, there is also no direct impact of revitalized management on information technology. The level of information technology used in organizations is affected by other factors, such as having an e-mail policy, stakeholder demands for information technology, and outsourcing information technology. These factors, too, require management, but not concerning revitalization.

We also tested the robustness of these findings in several ways. First, changing the number or composition of the variables in the measurement model does not alter the above conclusions. Second, "reverse" paths from organizational effectiveness to information technology and revitalized management are also examined but were dropped from the model for reasons of path insignificance or decrease in model fit. Likewise, the use of other exogenous variables did not materially alter the above conclusions. Third, we also consider the use of the diffusion of information technology (Table 1, column B), but this too does not alter the conclusions.

Clearly, this nonrecursive model helped substantially to clarify the nature of the associations reported in previous tables. Such models are more rigorous than piecemeal testing of recursive or single multiple-regression models because they control for all relationships in the model and provide overall goodness-of-fit measures (e.g., Berman, 1999). Although results from various multiple regression models are in many ways consistent with the findings reported here, the greatest difference is that multiple regression leads to the erroneous conclusion that revitalized management practices increase the use of information technology.[12] The nonrecursive model offers a more rigorous test of these relationships by controlling for reciprocal effects and concludes that revitalized management does not affect the level of information technology use.

Conclusions

This study examines the nature of a mutually reinforcing relationship between revitalized management practices and the use of information technology. It finds that cities significantly vary in their use of information technology and that information technology, in turn, strengthens revitalized management practices by increasing new opportunities for risk taking (that is, identifying new ways for meeting customer needs and improving productivity), enhancing open communication, and providing opportunities for showing mutual support. However, information technology is found to be only indirectly associated with organizational effectiveness; information technology

improves organizational effectiveness through the use of revitalized management practices. Results also show that although revitalized management practices do not further information technology, other management activities are significantly associated with information technology.

This study suggests that although the use of information technology is not affected by revitalized management practices, the organizational impact of information technology is. Thus, information technology experts cannot ignore the role of management if they wish to leverage the effectiveness of their information technology efforts. Indeed, information technology officers and program managers often are frustrated by the lack of cooperation and support in their information technology implementation efforts. Organizations characterized by openness, support, and risk taking cannot be assumed but must be shaped and maintained by managerial actions. A need exists to establish the necessary conditions for the effective use of information technology. Technology officers, middle managers, and senior managers each play an important role in the planning and implementation of information technology.

Technology officers often need to combine their technical expertise with management savvy and understanding of public organizations that enables them to work across multiple departments and functional areas to achieve strategic objectives, operate within budgets, and improve customer service. They help shape and maintain an open, supportive, and risk-taking environment. This goes far beyond their role in providing technical training to end-users. Creating open information technology boundaries and effective linkages between technical personnel and those in municipal operating departments is a challenge they face. To meet this challenge requires development of interpersonal skills such as active listening, trust building, information sharing, and conflict management. Mutual support can be cultivated by building and nurturing a service culture focused on problem solving and satisfying customer needs. Information technology issues are so complex, fast-changing, and pervasive that risk taking and learning from trial and error are crucial. Technology officers can act as coaches overseeing and advising as departments experiment with new technologies. Responsible risk taking can be promoted by guiding the change process so that technology-related decisions (e.g., acquisition, training, work incentives) are directed at achieving high quality and responsive service at a reasonable cost.

Middle managers play an important role because they must understand the technical aspects of new information technology and work to align this with the organization's strategic objectives. This is a diverse group that probably includes those who are computer literate, computer semiliterate, and computer illiterate. Developing an understanding and appreciation of the potential of information technology is a necessary first step. Once this is accomplished, they can perform a valuable bridging function between the information technology experts and the less technically sophisticated operating department staff. This bridging function is best accomplished if middle managers are conversant with the language and skills of the technician and the unique workplace requirements where applications will occur. They can coordinate and facilitate the organizational change process by doing their part to create an open, supportive, and risk-taking environment receptive to informational technology applications. One way this can be done is by helping to ensure broad-based participation and healthy dialogue with regard to technology-related decisions and soliciting feedback to identify

and quickly solve day-to-day operating problems. Enlisting the support and involvement of the technical staff in adapting information technology to the particular needs of their organization and functional areas is an important middle-management task.

Finally, senior managers can play a leadership role in the transition from traditional to e-government, but they must first understand information technology and its possible uses. Then they can openly articulate the strategic mission of the city and point out the relevance of information technology to the achievement of this mission. Resources must be allocated if new technologies are to be acquired and implemented; these decisions are often based on the recommendations of senior managers. Reward and recognition programs can be established to provide visibility and incentives to those who support new information technology initiatives and engage in responsible risk taking by embracing new technologies. Aligning organizational philosophy with organizational behavior is a crucial function of senior management, a special challenge in the ever-changing technology field. But senior managers can become overly enamored with the promising benefits of new technologies and turn a blind eye to their limitations. This should be avoided. Indeed, a relatively recent report issued by the U.S. General Accounting Office (1996) cautions, "Introduction of newer, faster, cheaper technology is not a panacea for flawed management practices or poorly designed business processes" (p. 5). Findings from this study are important for senior managers because they suggest that revitalized management practices of openness, mutual support, and risk taking help shape the environment for information technology innovations and, ultimately, for improved organizational effectiveness.

Notes

1. Table 1 does not intend to list all possible applications, nor does it focus on applications such as word processing, spreadsheets, or e-mail, which are now standard throughout the economy. Neither does Table 1 focus on relatively rare applications or those that involve highly specialized applications within individual local government functions, such as law enforcement agencies that use advanced electronic background checking systems of criminal suspects and the like.

2. Many other respondents agree that the applications listed in Table 1 are important. Comments include the following: "I believe these are important applications," "very important," and "Without them, you can't do your job well." Also, "these applications improve communication," "they perform functions and provide information in a fraction of the time it took previously," and, simply, "they are a fact of life and necessary to carry out business."

3. The Cronbach alpha measures of internal reliability of the index variable of testing or implementing is .71, and the Cronbach alpha measures of the index variable of broad diffusion is .75. These are acceptable, albeit modest, levels of reliability.

4. The rates of testing and implementing for cities in the South is 40.6%, and for cities in the Midwest 39.7%. The respective rates for broad diffusion are 19.2% and 23.3%.

5. Some typical comments are "They are important because they enable us to effectively manage resources, and to deliver services to customers that are convenient and timely. In a time of scarce resources and competing demands, technology applications enable our organization to be more efficient."

6. This approach is more stringent but not totally bias-free. Respondents who implement more information technology in their jurisdictions might feel that the level of organizational effectiveness ought to be higher, thus providing a more positive assessment of the level of effectiveness.

7. Five of these relations are also associated with the diffusion of technology at $p < .01$, except "employees and managers being committed to productivity" (not significantly associated with the diffusion of technology).

8. The model is estimated with the AMOS 4.0, marketed by SPSS, Inc. Some readers may be familiar with LISREL. Both programs are used to estimate structural equation models of the type shown here, but AMOS has some important graphics advantages over LISREL. The AMOS Web site is http://www.smallwaters.com/.

9. See later comments with regard to the robustness of the model.

10. The single-headed arrows are causal relations, whereas the double-headed arrows are covariances. The two single-headed arrows between the variables information technology and revitalized management show the hypothesized mutually reinforcing relationship.

11. Note also that the squared multiple correlation is considerable, .41. So, too, is the squared correlation of the variable organizational effectiveness, .46.

12. Also, the effect of organizational effectiveness on revitalized management practices is not significant and, hence, not shown in Figure 1.

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