# CENTRALIZATION, DECENTRALIZATION, AND THE ROLE OF INFORMATION TECHNOLOGY IN MANAGING THE METROPOLIS*

*Kenneth L. Kraemer*
*and*
*John Leslie King*

> There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. – Machiavelli, *The Prince*

## 1. INTRODUCTION

In this paper we build upon current knowledge about the impact of information technology on the management of city government. The purpose is to construct a picture of the changes in city government that provides us with guidelines for making predictions about the role of information technology in the management of city government in the near future.[1] In particular, we focus on the interplay between the larger context of city management and the opportunities for management provided by changes in information technology. A key theme will be the role of information technology in coping with the age-old tension between centralization and decentralization in organizing and managing city government.

Our analysis will show that information technology will not offer a panacea for coping with many of the difficult issues facing the modern metropolis. Many of these problems are simply too extensive and complicated to be affected by any new technology. Our analysis also will show that information technology will not, of its own, cause changes in the organization and manage-

* The article is based on a paper prepared for the *Progetto Milano* conference on »Technology and the City», June 15–16, 1984, Milan, Italy.

ment of city government. Nevertheless, new information technologies will provide opportunities for improving the management of city government in four areas:

1. Better planning and control over both internal government operations and physical and economic development in the city through centralized planning, coordination, and evaluation of service programs and development policies;
2. Greater productivity measurement, monitoring and control to ensure that street-level bureaucrats meet qualitative and quantitative standards of performance;
3. Greater innovation at the street-level interface between government and citizens in service delivery;
4. Better methods of negotiating and resolving complex issues.

These technological opportunities center on the potential use of information technology for strategic purposes, not only in managing the metropolis but also in shaping its physical form and economic activity (Jacobs 1984). However, the technology merely enables such changes; it does not ensure that they will take place. To exploit these potentials, managers of the modern city – the contemporary »princes» – must take an active and intelligent role in the strategic use of the technology. They can use the technology either to reinforce the status quo, or to help bring about a new and better order. The direction taken will depend on the insights and skills of the modern »princes» and on their willingness to lead the introduction of change. Therefore, it is incumbent upon them to realize the interrelation between the emerging opportunities of the technology and the changing context of city government, and to manage both for the benefit of their cities.

## 2. CHANGING PATTERNS OF CITY GOVERNMENT: A HISTORICAL OVERVIEW

Despite various reform attempts at creating regional and metropolitan governments for managing urban areas, city government remains the dominant political and administrative mechanism for urban governance around the world. Moreover, city governments in most Western democracies are distinguished by a dynamic tension between three basic values that underlie their design: executive leadership, politically neutral competence, and citizen representation.[2] Indeed, the evolution of city government in the United States can be explained in large part by periodic shifts in the emphasis given

these three underlying values. The shifting emphasis on executive leadership and citizen representation, in particular, is strongly reflected in the continuing ebb and flow between efforts to centralize and decentralize city government.

City governments have changed in both functions and structure over the past hundred years. As cities became larger and more complex in social and economic terms in the late 1800's, the functions of government were expanded. Basic government functions such as police protection, trash collection, and roads maintenance were augmented by new functions such as public works, public health, general education and social welfare. Such services had been available earlier, but their provision was private, highly disaggregated, and unevenly distributed. Consolidation of these services under city government resulted in their provision on a more reliable and consistent basis, but also brought new needs for capital and operational expenditures. The city bureaucracy grew correspondingly, and the task of managing city government became more complex for the city's part-time, political managers.

This growth in the functions provided by city government also increased the potential for political abuse throughout city-hall. The many public works required to support the city's growth involved large expenditures that could be appropriated improperly by city officials, thereby increasing problems of political corruption and graft. Also, decisions about where the city's physical infrastructure (e.g., highways, water, sewer) would be built could accrue to great advantage to developers and property owners in the area of such improvements, thus increasing the use of party loyalty, political contributions, and personal bribes to influence public officials to locate the infrastructure to benefit these private interests. Scandals involving misuse of public money and decision power, together with the growing complexity of managing the city, stimulated demands for structural reform of city governments in the early 1900's. The objectives of the reforms were three:

1. To strengthen executive leadership;
2. To instill politically neutral competence in the city bureaucracy;
3. To insure the representatives of city government to its citizens.

Emphasis in the reforms was given to strengthening executive leadership and reinforcing it by instilling professionalism in the city bureaucracy as a means of insuring that executive directives were implemented. The principal reforms included:

1. Nonpartisan and city-wide election of a few political officials to conduct policy making and represent the interests of all citizens (rather than neighborhood election and representation);

2. Strong, professional, executive management to control the city bureaucracy;
3. Management systems such as budgeting, accounting, personnel and purchasing to support control of the bureaucracy by top management;
4. Professionalism of the bureaucracy (the functional departments) to improve the standardness, quality and efficiency of service delivery.

In short, the reforms exhibited a strong tendency towards centralization of power in the executive leadership of the city – the elected city council, mayor and city manager. These changes in city government are illustrated in Exhibit 1., which compares the patterns of city government pre- and post-1900 in terms of executive leadership, political orientation, and citizen representation.

*Exhibit 1. Changing Patterns of City Government.*

| Basic values underlying design of government | Pre-1900 | 1900–1980 | 1980–2000 |
|---|---|---|---|
| Leadership: | Fragmented among elected officials | Consolidated under mayor manager and supported by new management systems | Central control over internal operations and resource distribution, decentral, control over service delivery |
| Political orientation: | Political bureaucracy for party loyalty | Professional bureaucracy for politically neutral competence | Skill bureaucracy seeks autonomy, entrepreneurial in generating and expending revenues |
| Citizen representation: | Large council, elected by district, elected department heads | Small council, elected at-large, citizen participation on boards and commissions | Little city halls and electronic voting |

Centralization, it was hoped, would bring several benefits. First, it would enable the establishment of a hierarchy of authority across the whole government, tying together functional departments that previously had been separate. Such unified executive leadership would provide the basis for concerted

action, balanced allocation of resources, and standardness in service delivery. Second, centralization would reduce the critical »control points», the number of key individuals requiring central management's supervision, thus increasing central management's ability to monitor internal activities. Third, centraliza-tion would enable city government to capitalize on economies of scale inherent in large operations. For example, it would enable the city to obtain better prices on construction contracts, equipment, and supplies because of the larger volume of its procurements. Also, the »networked» infrastructure of the city such as roads, sewers, and water systems could be designed, constructed, and maintained more easily under a centralized structure. Fourth, centralization would increase the bargaining power of city govern-ment vis-à-vis other units such as public employee unions or state and federal agencies.

In recent years this trends toward centralization has begun to change. The evolutionary forces that once made possible the rise of the centralized city hall seem to be working aganst it today (Banfield 1968; Long 1972; Yates 1977). Urban policy problems have come to be seen as metropolitan, regional, statewide, or national problems, and the city's managers have only partial control over them. At the same time, city government has in many instances become too large, and its centralized structure no longer permits flexible, adaptive service delivery to local neighborhoods.

A powerful push toward decentralization began during the 1960's when federal programs targeted toward problems of poverty and inequality enticed city governments to accept federal money and begin providing new services. The geographically targeted nature of many new programs, plus the sheer size and complexity of city government, required administrative decentral-ization by function and by area. Moreover, federal agencies often worked directly with functional agencies in the city government, thereby enhancing their independence from central city management and further helping to build citizen support for the programs that would remain when the federal support disappeared. The federally supported programs intensified existing local tendencies toward decentralization, which grew out of the desire on the part of special constituencies for more localized service delivery, more direct participation in decisionmaking at the neighborhood level, and greater sen-sitivity to their concerns in city hall.

Thus, city governments today face an endemic dilemma: Maintaining sufficient centralization of control in city management that enables oversight, efficiency, and accountability; while providing sufficient decentralization to deal adequately with the problems of size and complexity and the demands of neighborhoods and special interest groups. Several reforms have attempted

to resolve this dilemma, such as the creation of »little city halls» and neighborhood centers to augment the function of the central city hall.[3] However, none of the experiments to date have produced the desired outcome: an effective balance between centralization and decentralization such that the desired effects of both are realized.

## 3. THE ENDEMIC DILEMMA OF CENTRALIZATION AND DECENTRALIZATION

It would be inaccurate to claim that the recent efforts to decentralize reflect an admission of the benefits of decentralization over centralization. On the contrary, this ebb and flow of reforms that centralize or decentralize arrangements simply reveals the great difficulties faced in achieving »balance» between the two. To understand the challenge facing city governments, it is necessary to focus on the powerful forces at work in the centralization/decentralization issue. Stated briefly, reforms aimed at centralization are designed to enhance executive leadership and internal efficiency, and reforms aimed at decentralization are designed to enhance citizen representation and effective delivery of external services. The dilemma in designing a balanced structure of city government derives from the basic expectations for performance put on government in light of the fundamental constraints on how government can be organized.

A simple model helps to illustrate this dilemma. Figure 1 shows a highly abbreviated model of city government, consisting of top executive leadership, functional bureaucracies, service delivery, and the citizenry. City government is conceived as a system in which citizens provide both the resources to deliver public services and demands regarding the services desired. These resources and demands are received by the executive leadership of the government which converts them into formalized programs and projects with general directives for their implementation. Responsibility for carrying out these programs and projects is given to the functional bureaucracies along with resources and general directives for implementation. The functional departments in turn convert these programs, directives and resources into specific services and deliver them to citizens. The citizens receive these services, and express their satisfaction or dissatisfaction with the services through the electoral process and communications with their elected representatives.

To this point, the model is simple and rational. In reality, however, two problems intervene to make the system dysfunctional. First, the resources provided by the citizens in the form of taxes tend to come in large, mono-

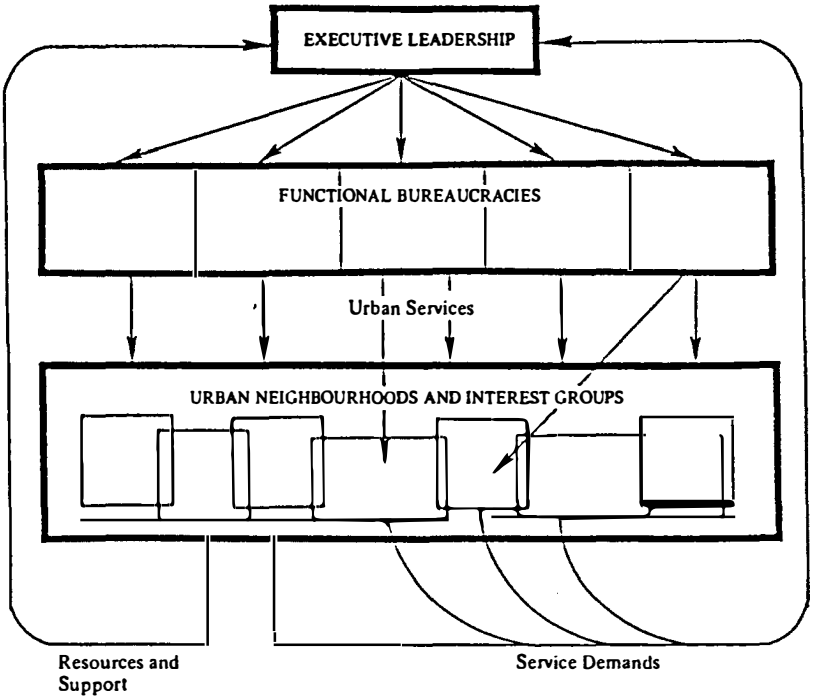


*Figure 1. A General Model of City Government.*

lithic sums that are not tied directly to the services the citizens expect to receive. Thus, there is little a priori guarantee that monies collected from the public will actually be spent in accordance with their desires. At best there can be serious mismatches between the desires of the citizens for certain services and the money available to deliver them; at worst, funds can be improperly or illegally used. The typical remedy for this problem has been to centralize the financial activities of urban government in tightly controlled, professional departments, while establishing detailed policies covering how monies will be spent in functional units. Discretion at the subunit level is limited.

The second problem is that knowing the »will» of the citizens and the genuine needs of neighborhoods requires a clear and detailed understanding by those officials who make the case for public action. This encourages the devolvement of important aspects of urban governance (including decision making power, autonomy, and financial support from the general fund) to

the citizens and the neighborhood committees who best understand local interest – clearly a decentralizing action since the local citizen groups do not fall within the purview of central management control.

Thus, we find that there are continuing pressures toward centralization and decentralization of administrative arrangements, and no simple solutions for dealing with them. The dilemma is a long-standing one, and in its own right is not novel or important. However, a number of major changes have taken place in the past few years that have heightened the tension inherent in the dilemma: the aftermath of expanded services provision spawned by federally supported programs; the cutbacks in funding sources for urban governments in many locales; a generally skeptical and critical attitude of citizens toward government; and a tendency to push an increasing number of responsibilities that had drifted to the state and federal levels back down to the local level. The impact of these shifts for the city's executive leadership is that they exacerbate the characteristic problems of city management. In particular, these shifts affect certain key management problems:

1. *Generating revenues and controlling expenditures.* The shift towards greater local financial responsibility for urban services and the corresponding neighborhood pressures to maintain services is increasing the demand on city-hall to generate new revenues, collect current revenues more efficiently, allocate funds to the functional departments more effectively, maintain tighter control over how the funds are expended, and evaluate departmental performance.

2. *Controlling the city government bureaucracy.* The independence of the bureaucracy, which has been fostered by professionalism and the functionally-oriented pattern of financial support by higher-level governments, is being reinforced by political support from neighborhood constituencies, by the decentralization of administrative units to the neighborhoods, and by the differential ability of some departments to raise and keep new revenues (e.g., those based on user charges). Thus, city management is faced with the need to reestablish its political authority for planning and coordination, and monitoring and control over the more dispersed activities of the functional departments in the city government bureauracy.

3. *Applying information to complex decision problems.* The decentralization of urban service delivery and the differentiation of policy implict within such decentralization has made the problem of determining city-wide and neighborhood policies more complex.

To the extent that information technology has a dramatic impact on the management of the metropolis, it is likely to be in relation to these centralization and decentralization shifts.

## 4. THE ROLE OF INFORMATION TECHNOLOGY

Computers, telecommunication, and management science techniques – the three major components of information technology – will play a major role in these shifts. Computer technology has been applied in the past to aid the evolution of the dominant city-hall with its tendency towards centralization. It will continue to be used to facilitate control by central managers. But computers and other information technologies also can play a major role in the current dual shift towards centralization and decentralization of government. Achieving the technology's potential and avoiding its pitfalls will require that managers:

1. Understand how the technology has fit into the city context in the past and how it will fit into the coming changes in city context and city management.
2. Discern the enabling features of the technology and how these features might fit in or frustrate changes in the context of city management.

The impact of information technology on these changes will be substantial, but predicting exactly what the impact will be is not straightforward. It is helpful here to review the impact other technologies have had on this question of centralization and decentralization. Several examples help to illustrate both how technology can make an important difference to local managers in dealing with the centralization/decentralization issue, and how information technologies in particular provide new and powerful tools to address the issue.

### *Technology and the Centralization Issue*

Sometimes discrete technologies provide opportunities for change directly; other times a package of several technological innovations together make it possible to exploit new opportunities. This can be seen in the case of public safety operations, particularly law enforcement and fire suppression. The most important innovations in law enforcement in the early years of the 20th century were the advent of the automobile and two-way communications. The automobile arrived first, and provided police with a high level of mobility and rapid response in emergencies. This new flexibility enabled police departments to augment foot patrols with back-up patrol cars in case of serious trouble. Officers on foot patrol would call in reports from police telephone boxes or public telephones located throughout city neighborhoods. This opportunity for fast back-up permitted police departments to reduce the

number of officers on foot patrol that had previously been needed to provide sufficient forces distributed across the city. In effect, the telephone and automobile allowed substantial functional centralization in the form of keeping more officers available at precinct houses »on call», without substantially sacrificing the rapid response capability previously provided by the extensive, decentralized system of foot patrols.

The advent of the two-way portable radio further augmented this kind of decentralization. Coupled with increased use of automobiles, most cities replaced the widespread foot patrols with automobile patrols in radio-equipped patrol cars. The nature of radio technology at the time necessitated the establishment of a central radio base for the police operation, which had the effect of centralizing information flow to and from the field: Police management could maintain close touch with patrol officers to direct the forces even in the face of rapidly changing needs. Similarly, the roving patrol enabled a single officer to cover more territory in a given time. The net effect of this technology was that the numbers of officers required to patrol a given part of the city was reduced, without a notable decline in service delivery. Simultaneously, the communications capability provided by radio enabled police departments to maintain a much more effective monitoring of public safety needs and deployment of policy resources accordingly.[4]

Information technology has further affected both police and fire operations in the form of computer-aided dispatching systems. These systems monitor the forces in the field, keeping track of which units are deployed and which units are available for deployment at any given time. Calls for service come in to the contral dispatching office, relevant data are placed in the computer, and the computerized system determines which units should be called to respond. At first these systems were implemented mainly in police departments, but recently there has been a trend toward using the computerized systems to integrate the dispatching function across police, fire and paramedic services in the form of »emergency services» dispatching. This is certainly a major new form of centralization in functions, for it ties together functional units that had for many years been separate and autonomous in their operations. In addition to reducing the costs of maintaining multiple dispatching and command/control centers in police and fire departments, it also provides the opportunity to integrate public safety services in situations where all branches of public safety are needed such as earthquake, flood and other natural disasters.

One other example of the use of new technologies is noteworthy in this context: the development of automated traffic control systems. Early traffic signals were an important technological development for local governments,

because they permitted automation of tasks formerly handled by traffic officers. The next level of enhancement in traffic control was the linking together of signals along major thoroughfares with time-base correctors and controllers to permit integrated control of traffic flow along busy streets. This provided a level of traffic control that not only automated functions formerly done by traffic officers, but also allowed control over traffic flow in a manner not possible before. Recently, entire networks of traffic signals have been linked together into computerized traffic control systems. These systems have three important features: they link together whole grids of traffic signals so that traffic flow can be controlled throughout whole sectors; they provide remote sensing of existing traffic conditions for central traffic control operators; and they allow flexible »tuning« of the signal system in response to special situations such as rush-hour traffic or unusually high traffic volumes resulting from a major public event.

Together, these technological innovations provide a useful gauge of the ways in which technology can influence the centralization/decentralization issue. All these examples have several features in common. First, they all deal with direct service delivery: law enforcement, fire suppression, traffic control. Second, they tend to result in greater centralization and consolidation in service delivery, usually without degradation of local services and often to the betterment of service delivery. Third, they are primarily monitoring systems, in which dynamic information about changing city conditions forms the basis for decisions and actions that are executed by people. The only exception is the case of computerized traffic control systems, which not only monitor traffic conditions but also effect actual changes in traffic flow patterns. Such automated control systems, while sophisticated in a technological sense, deal with relatively straightforward problems that have calculable solutions. These technologies do not, as a general rule, integrate the processes of monitoring and control across a variety of functions.

### *Information Technology and the Centralization/Decentralization Issue*

Information technology applied to the administration of city government is different from the above technologies in important respects. The changes that will be coming in the next fifteen years will result largely from the exploitation of the technology's capacity to provide both precise monitoring and precise control of administrative behavior in the government. These changes will build upon the changes that already have accrued from the use of information technology in managing the metropolis, or those that are

imminent from its use. A brief review of two major eras of information technology use will provide a base for understanding these changes.

The first era, which began in the early fifties and extends to the present, was oriented around the advantage provided by the computer in facilitating the role of government as an efficient manager of basic urban services. Computer technology was applied mainly to the internal operations and decision making processes of government and, in cases like those noted above, to improving the performance of the city itself. Consequently, the effects of the technology on decision making, organization structure, and politics were also mainly internal, and appeared in the form of quicker, more informed decisions, stable government size and structure despite greatly increased service demand, and bureaucratic politics oriented around who would control and who would have access to »computer» and »information» resources.

The impact of computerization on the city's executive leadership was slight. It required them to provide moral and financial support for the introduction and expansion of computers in the functional departments, make

*Exhibit 2. The Role of Information Technology in Government.*

| | 1950–1980 | 1980–2000 |
|---|---|---|
| Technology | Computers | Computers, telecommunications, and management science techniques |
| Application | Mainly internal to the government and focused on operational performance of the bureaucracy | Strategic use of information technology; external focus on relation of government to its clients; internal focus on planning and control by city management |
| Impacts | Productivity in large volume information handling; quicker, more informed decisions about internal operations; stable government size despite greater service demands; bureaucratic politics concerning control of computers and internal use of information | Productivity in shared use of information and direct citizen access to service systems; more and quicker decisions about external services; stable government size despite greater citizen access and increased »tailoring» of services; bureaucratic politics concerning control of systems and external use of information |

procurement decisions about computing equipment, determine where and how the computing activity should be organized within city-hall, settle periodic disputes between the functional departments over priorities for computer use, and handle the complaints from citizens caused by occasional foul-ups in the government's early billing systems.

The second era, which began in the early eighties and will extend beyond this century, is oriented towards the strategic advantage provided by information technology in facilitating the development of new economic activity and new physical form in cities, and in facilitating the management of the city. This era centers on information technology in all its forms, and is particularly distinguished by the opportunities for application of the technology outside government to relationships between government and its citizens, individual and corporate clients, and other governments.

City managers now have the opportunity to use the technology to reinforce the decentralization of service delivery while simultaneously reinforcing the centralization of planning and control over services, to enhance citizen participation in neighborhood decision making while strengthening city management control over city-wide policy matters, and to increase the competence of the city bureaucracy while insuring their responsiveness to clients and to city-wide policy.

### *Enabling Features of Information Technology*

Information technology has always been able to support either centralized or decentralized patterns of organization and decision making. However, several evolving features of information technology are especially enabling:

1. Change in the economics of computers; and
2. Linkage of computers with telecommunications networks, with powerful data management software, and with management science techniques.

Changes in the performance and cost of computers make it economically feasible to distribute the technology more broadly within the bureaucracy thereby enhancing *flexibility with regard to how to organize.* The change in technology is only an enabling factor but critical in what it enables. The changes in size, type and performance of computers, for example from large mainframe computers to minicomputers to microcomputers, means that government now has incredibly greater flexibility in the choice of technologies to do a particular job. Some microcomputers can now perform tasks that previously required mainframes and minicomputers; while mainframe capacities

continue to increase, permitting them to process tasks beyond the capabilities of the most advanced micros and minis.

The change in cost of the technology has probably been the most dramatic feature, and is illustrated by an interesting (though not completely valid) comparison with automobiles. If the automotive industry had experienced cost reductions and performance improvements equivalent to those the computer industry has experienced over the last 30 years, a Maserati would cost $ 2.00 and get 16 million miles to the gallon (one litre per 6.8 million kilometres).

Put another way, studies by MIT and Xerox (Scott-Morton 1984) show that a large mainframe computer costing about $ 4.5 million in 1980 was equivalent to the salaries of about 210 people, whereas a comparable computer will cost one-tenth as much in 1990 and be equivalent to the salaries of about 2 – 8 people (Exhibit 3). This change in the economics of the technology is resulting in a major shift among organizations from investment in labor to investment in capital.[5]

*Exhibit 3. Changing Economics of Computer Technology.*

| | 1980 | 1990 |
|---|---|---|
| Processor model | IBM 3033 | Equivalent |
| Speed in MIPS | 4.5 | 4.5 |
| Cost in millions of $ | 4.5 | 0.10 – 0.45 |
| Labor equivalent | 210 people | 2 – 8 people |

Based on such economics, we conservatively estimate that the number of computers for large scale operations in medium- and large-sized governments will increase from 3 to 5 times by 1990, and the number of computers for end end users will increase from 30 to 60 times (Exhibit 4). Put another way way, we estimate that currently the average ratio of terminals to municipal staff is 1:4, and that the ratio will increase to 1:2 by 1990, and close to 1:1 by the year 2000. Thus, the changes in the overall economics of computing will greatly facilitate the broader distribution of the technology throughout city government.

In addition to these changes in the economics of computers, the linkages of computers with telecommunications networks (e.g., telephone, broadcast television, cable, fiber optics, satellites, etc.) make it possible to extend the technology beyond the bureaucracy and to directly link up to corporate,

*Exhibit 4. Estimated Number of Computers Within the Average Medium to Large City Government.*

| | 1970 | 1980 | 1990 |
|---|---|---|---|
| Operations Computers (mainframes and minis) | 0.75 | 10 | 30 – 50 |
| End User Computers (micros) | 0.0 | 5 | 150 – 300 |

household, and individual clients. These communications capabilities of the technology along with powerful data management software permit collection of data at the point of service delivery, storage and aggregation of the data collections at city-hall, and retrieval of information for referral from virtually anywhere by people with authorized information for access. And, the linkage of computers and telecommunications with management science techniques facilitates the application of information to complex decision problems through analytic aids for group decision making and electronic polling of citizen opinions.

## 5. INTERACTION OF THE EVOLVING PATTERN OF CITY GOVERNMENT WITH INFORMATION TECHNOLOGY

As indicated earlier, the key importance of these features of the technology is that they facilitate the dual pattern of centralization and decentralization that is the characteristic pattern of city government's current evolution.[6] The chief problem in achieving both representativeness and executive leadership in city government involves maintaining control over an increasingly divergent bureaucracy. The city's management are capable of giving only general mandates to the bureaucracy. They tend to make few decisions of sweeping effect. The functional departments make a far greater number of decisions affecting individual citizens in intimate ways. It is these day-to-day decisions and actions of the functional departments in the lower levels that most closely affect individual citizens. Consequently, there are often gross discrepancies between what city management intended and what the functional departments deliver to individual citizens.

The changes in information technology provide an opportunity that previously didn't exist for alleviating this problem. It is an opportunity for decentralizing to increase the responsiveness of the bureaucracy, and in the process, also increasing city management control over the bureaucracy. The economics and linkage enable government automation to proceed in two directions simultaneously: greater breadth and greater sophistication. Greater breadth of automation enhances the competence of staff by providing them with better »tools». It also enlarges the base of data about the functional departments, their performance, and the overall performance of the government in the community. Greater sophistication of automation speeds up the cycle of planning, monitoring and evaluation and thereby facilitates control generally. But it also enhances the ability of city management to »fine tune» performance. Fine tuning is facilitated by:

1. Decentralization of decision parameters to the point of service delivery to facilitate standard delivery of standard services while capturing data that allow detection of exceptions (e.g., budget monitoring systems and information and referral systems);
2. Increased precision with which managers can ask questions and get answers to questions. The chief complaint of city officials is not that the data do not exist in the government, but that they can't retrieve the data, either because it is not organized properly or the lengthy retrieval process makes the data irrelevant;
3. Speed-up of the cycle of planning, monitoring and evaluation.
4. Direct control of operations provided by the automated systems themselves, or by the information in the automated systems. For example, integgrated financial management systems provide immediate, direct control over account balances to the line item level and, therefore, city management can effect change in the financial status of a functional department or all departments overnight. In this case, the system both provides the information needed for control and is the instrument used to effect control. Integrated financial management systems are the key control system in city government not only because they are used to control a key resource – money – but also because control of money is in turn a means of controlling the other key resources of people, equipment and space. In contrast, police/fire command and control systems provide information which facilitates control over deployment of staff and equipment but do not directly effect redeployment. Human intervention and action is required.

However, in providing solutions to the centralization/decentralization issue, the technology also generates consequences for city management. These

consequences can be seen by examining five specific areas in which the new technology is beginning to interact with the evolving pattern of city government:

1. Flexibility with regard to how to organize;
2. Bureaucratic innovation with regard to computer use;
3. Closer linkage of city government with citizen and corporate clients;
4. Flexible response of the operating departments to their clientele;
5. Consensual decision making.

1. *Flexibility with regard to how to organize.* Greater flexibility with regard to organize will facilitate decentralization of government activity to »little city halls» and »neighborhoods centers» without loss of managerial control in the traditional city hall. For example, the delivery of many social urban services is oriented around neighborhood casework. The use of computers in the management of such casework can support decentralized access to centrally shared information about available government services and eligibility requirements that can be used directly by citizens and by bureaucrats in counseling citizens, targeting them through the service system, and tracking their progress. These same data, plus the aggregated data on citizens obtained by the bureaucrats in assisting them, can be used by city management to analyze service delivery needs, the cost of programs, the quantity and quality of services distributed to different neighborhoods (or racial, ethnic, socioeconomic groups), and the relative effectiveness of different functional departments in the bureaucracy. In turn, this information can be used by city management to redirect services as needed.

2. *Bureaucratic innovation with regard to computer use.* Decentralization and broad distribution of the technology within the bureaucracy will result in greater learning about how the technology can be applied to service delivery and decision making, and innovation with regard to its use by the functional departments. Such innovation will make available new information services and products that look good to citizen and corporate clients while also generating new revenues through fees for service, or collecting existing revenues more efficiently.

3. *Closer »linkage» of city government with citizen and corporate clients.* Information technology provides new opportunities for creating stable and mutually beneficial bonds between government and its citizen and corporate clients. An example of the possibility is provided by the way in which commercial airlines have used their reservation systems. The airlines originally developed reservation systems for use by their own ticketing offices but later extended use to travel agencies. This sharing allowed travel agencies to give

better and faster service to more clients; it allowed the airlines to fill more of their flights, to gain a greater share of the market so long as their competitors didn't have such systems, to collect revenues for system use from the travel agents, and to develop stable relationships with the travel agencies. The airlines now use their computer systems to develop stable ties with frequent flyers (the ultimate clients) by offering bonuses for each flight and keeping track of the accruals. They use these same systems to promote joint marketing arrangements with hotels and rental car agencies and allow the frequent flyer to accrue bonuses with these agencies as well.

City governments could develop similar relationships with citizens and corporate clients through strategic use of their computerized systems to (1) share with citizens information collected from them and (2) facilitate direct access by citizen and corporate clients to government information collections. For example, cities could directly share public data in their real property information systems with title insurance companies, real estate agents, property appraisers, and developer-builders thereby reducing the costs of doing business for these firms and raising revenues for the government by collecting fees for access to the data (or, at minimum, reducing the costs to government of servicing these corporate clients at the public information counter in city hall).

Similarly, cities could make their reservation systems for public facilities (meeting rooms, ballfields, playing courts, teleconferencing rooms, etc.) directly accessible to individual citizens for referral. They could extend these reservation systems to include private facilities that are available for public use such as hotels, country clubs and meeting halls and generate revenues for the referral service.

Cities also could vest each citizen or corporate taxpayer in the city by adjusting property tax rates downward according to length of residence, with long-term residents receiving a favorable rate. This could foster a sense of »investment» in the city on the part of taxpayers, and encourage longer terms of residence for both citizens and corporations.

Of equal importance, cities will be able to refine the means by which citizens pay for the government services they receive. Traditionally, most revenues for the city have been collected through tax levies and placed into a general fund from which services are supported. A few services such as water and trash collection have been charged directly to citizens. Information technology makes it possible not only to target services precisely to those citizens who might want them, but to bill citizens directly for certain services they use. This is already happening in the United States, where declining revenues in city governments have made it necessary for many cities to

impose user fees for services formerly provided by the general fund. The billing for these user fees is being integrated into the routine billing for water, trash collection and other services with a billing tradition. Such tailored response to demand in the form of both marketing services and billing for services provides local governments with opportunities for revenue generation never before available.

4. *»Flexible response« of the operating departments to their clientele.* Information technology provides new opportunities for developing more flexible service delivery in response to the demands of citizen and corporate clients. For example, it is possible to:

- Provide highly specialized services such as home security, fire alarm and health emergency via cable or fiber optics technology to narrowly targeted populations, to market those services broadly to groups with similar »life style profiles«, and to bill the clients directly for the services provided;
- Develop »information products« from the unique information collections in the government and to market these products to citizens and corporate clients;
- Use the information in government collections for planning and analysis aimed at anticipation of client needs and developing services to satisfy them.

5. *Consensual decision-making.* Information technology potentially facilitates consensual decision making in two ways. It enables use of local media networks for two-way communication between government and citizens to permit more direct representation of citizen opinions and, therefore, more informed decisions by city management. It also facilitates the use of models and other decision aids in structuring complex choices and assisting communication between relevant interest groups and city management to achieve greater consensus on complex decisions.

## 6. CONSEQUENCES FOR CITY MANAGEMENT

Despite predictions that computers and information technology will produce power shifts (Downs 1967) and political instabilities (Lowi 1971) in urban governance, there is little reason to believe that these political consequences will be revolutionary. Rather, they will be incremental and subtle and, therefore, hard to discern. Unnoticed, their cumulative effects could be consequential for city governments. To ensure these consequences are beneficial, managers should proactively apply the new technologies according to explicit

policies they create. These policies should reflect management's intention to either preserve the government's status quo or introduce a new order of things.

To better decide the government's future direction, city management should consider and evaluate the political consequences associated with new technologies. Looking at the development of computing in city government over three decades, we can draw five major conclusions about the political consequences to date:

1. *Computing has been first and foremost an opportunity or threat to the city bureaucracy rather than the city's managers or its citizens. And it has been more an opportunity than a threat.* Computing has helped to extend the competence of staff, speed up responses, provide standard responses, and improve their image with citizens.

2. *Computing has been used by city management to reinforce political reforms, or to supplant them.* Computing is a political instrument rather than simply a neutral tool. Not only does computing have political consequences, but it is deliberately used precisely to achieve such consequences. And these consequences stem from the way it is introduced and used more than from inherent features of the technology.[7]

3. *Due to the political context of computing innovation, the primary beneficiaries of the technology have been those who own and control it.*[8]

4. *The often predicted rise of a new technological elite has not occurred.*[9] *Rather, computing has tended to reinforce the position of top executives and the dominant political coalition in the government.*[10]

5. *Political activity has been characterized more by resource politics than by information politics although the latter is becoming more prevalent.*[11]

In addition to these conlusions about the political consequences of computing to date, we can draw conclusions about future political consequences by reference to the five specific areas (described above) in which information technology is beginning to interact with city governments. These five areas can be expected to create the following *additional* political consequences:

1. Greater flexibility with regard to how to organize will *increase the administrative burden of city management* in planning, controlling and evaluating the bureaucracy and resolving city-wide and neighborhood issues.

2. Flexibility in organizing will lead to broader distribution of the technology within the government. This in turn will result in *greater interdepartmental competition* for a bigger share of computing and information resources, and *greater democratization of access within the bureaucracy overall.* However, this will lead to *greater inequality of access of the citizens vis-à-vis*

*the bureaucracy.*

3. Broader distribution of the technology within the government will enlarge the storehouse of data about the operations of functional departments and neighborhood centers, and will *facilitate monitoring and control of these operations by city management.*

4. Bureaucratic innovation with regard to computer use will generate new revenues but also *reinforce the professional competence and independence of functional departments vis-à-vis city management.*

5. Closer linkage of government with citizens will contribute to the *political stability of city-hall and, therefore, to the political advantage of the incumbent city management. But city management will face new decision making challenges in bringing about such linkages.* For example, sharing of public data will require policy decisions about how can have access to what, how, when, where and for how much. It will also require determination of how fees should be set for a public good already financed through taxes, and whether any fees derived should accrue to the departments which collect and maintain the data or whether they should accrue to city management for redistribution. And it will require determination of whether sharing public data violates the conditions under which the data was originally provided by citizens.

6. The greater responsiveness of functional departments to their clientele will *create interest group pressures on city management to allocate a greater share of the city's resources to street-level vs. administrative departments.* At the same time, it will *make such allocation decisions more difficult for city management* and enlarge the burden of administrative departments by generating new demands for coordinating the flexible responses of the functional departments, budgeting for flexible response alternatives, and evaluating performance under flexible response conditions.

7. Electronic democracy will *decrease the »information float» in decision making processes thereby restricting the choices available to city management.* Models and other decision aids make explicit who wins and looses thereby increasing political conflict among the major interests.

## 7. ACTIONS FOR THE CITY'S MANAGERS

The enabling potential of information technology can be used to reinforce the existing centralized pattern or to evolve the more mixed pattern of both centralized and decentralized elements of city government. How it is used depends upon the decisions of the city's managers. Achieving the potential

of the technology requires that managers:

1. Be prepared to spend more and deal more with issues raised by the use of information technology. Industry now spends approximately four percent of annual operating revenues on the technology whereas city governments spend 1 – 2 percent. This investment by cities is rising and will probably continue to rise for some time.

2. Integrate the management of information technology. The benefits of the technology depend greatly upon compatibility of the components. Planning and control of the technology should be centralized, although operations can be decentralized to the functional departments in cases where this is warranted and will not erode the control maintained at the center (King 1983).

3. Integrate the city's information systems. With greater administrative decentralization in service delivery, it is critical that the data collected be integrated to provide the city's managers with a comprehensive picture of the daily operations of government.

4. Develop a central analytic staff with full technological capabilities to assist the city's managers in effectively using data, models, analytic technique, and the technology itself.

5. Require an impact assessment regarding the consequences of new applications of information technology for city management, and the development of response measures to mitigate any negative consequences.

Finally, the city's managers should consider Machiavelli's quote about change in light of their existing circumstances. The perils of introducing change must be weighed against the rewards of accomplishing successful change. We leave you, the modern »princes», with the challenge of this decision.

## NOTES

1. For previous scenarios about the »city of the future», see, for example: ICMA 1980; Charlesworth and Sweeny 1967; Masuda 1980; Sachman and Nie 1970; Sachman and Boehm 1972; Smith 1970.
2. Herbert Kaufman (1969) argues that these values underlie the design of government at all levels in the U.S. We view neutral competence, or professionalism, as a subset of the other two values, depending whether it is aimed at increasing standardness and equality in the administration of government services or responsiveness and equity.
3. See Kaufman (1969), Kotler (1969), and Yates (1977).

4. It is interesting to note that in fire suppression, the other major area of public safety services, the advent of new technologies had somewhat different effects. The wide deployment of water supply systems for firefighting coupled with the advent of the mobile pumper made it possible to improve the ability of firefighters to get fire suppression capabilities to the scene of fires more rapidly. Similarly, the use of two-way radio communication made it possible for fire management to better monitor an emergency situation and determine whether more firefighting resources would be needed at the scene, and then deploy them. But there was not a major centralization of the functions of firefighting as there was in the case of the police, because the heavy equipment necessary to fight fires still had to be located relatively close to possible fire sites – in other words, the physical location of fire stations in neighborhoods was still necessary. Thie firefighting example illustrates the important role of the function itself in the way a new technology affects structuring of service delivery.
5. For example, we found that the city management in Eugene, Oregon, which has a population of about 80,000 and 800 city employees, has adopted a deliberate policy of investing heavily in information technology as a strategy for dealing with its continuing service demands in the face of dramatically declining revenues. The city has 350 computer terminals/microcomputers or almost one terminal for every two employees.
6. Not suprisingly, organization and management for the computing and information systems function in government is itself exhibiting the same evolutionary pattern: it was fragmented with electrical accounting machines located in the functional departments in the thirties; a movement towards centralization of equipment, staff and managerial control over computing began with the advent of mainframe computers in the fifties; a movement towards decentralization of computing equipment and staff (but not managerial control) to the functional departments began with the advent of mini's and micro's during the seventies and eighties; for the foreseeable future, computing arrangements will involve both centralized mainframes and distributed mini's and micro's; both central staff and department staff; and both central management control and localized operations.
7. Computing was first introduced into local government in the fifties to reinforce budgeting and accounting reforms which were aimed at centralizing the accounting and finance functions in the government and strengthening the control of central finance departments over department budgets and expenditures.

   Computing was promoted during the sixties for social service information and referal systems which were part of a services integration strategy in local governments, promulgated by federal and state health, welfare, and aging agencies. The manifest role of these systems was to provide a common information base about clients and services, unifying public and private social service agencies, and achieving greater coordination in the handling of social service clients. The latent political role of these systems was to reinforce several centralizing reforms that gave greater control over public and private social service agencies to local chief executives, and better performance monitoring capability to federal and state agencies.
8. The first thirty years of computing development in local government have been characterized mainly by resource politics, and the primary beneficiaries of resource politics have been the owners and controllers of the computing resource – usually, finance departments where computing was first located in the government and has

remained until recently, police departments when they were able to get their own computing resources, and chief executives whose interests everybody took into account. Thus, the introduction of computing to local government created rules for its use, with the finance department as the prime beneficiary; but the expansion of computing outside finance changed the rules, bought in other participants that eventually diminished the finance department's control over computing resources. See Kraemer (1980).

9. City planners, computer specialists and management analysts are prime candidates for becoming an information elite, but the analysis by Danziger, Dutton, Kling and Kraemer (1982) indicates that they have not gained such position in city government. For example, although city planners are involved in a highly politicized activity, they are an extremely weak political group within the government. Their efforts to bolster their position with data-based arguments using models, simulation, data banks, and social indicators have left them politically weak because many of their efforts have been overly ambitious and unsuccessful. Computer specialists have not been successful in gaining power and influence either. Because of their monopoly on computing expertise, they generally have been able to maintain some autonomy and freedom from outside control, but computer specialists are not themselves users of computer-based information and, consequently, they have not been able to benefit from the true power shifts of the information politics game. Analysis groups serving high-level officials appear to have been more successful, but their effectiveness in using data-based arguments appears to be integrally related to the power of their (or their superiors') position in the government, at least as much as to the power of their information and rational argument. These examples illustrate that, given a position of power, data-based arguments may offer symbolic value by adding legitimacy and rationality to decision processes. But they do not in themselves convey power to otherwise weak group or individuals, especially in highly contested disputes.
10. While city planners, computing specialists, and management analysts per se have benefited relatively little from computing, higher level officials, particularly, chief executives have benefited from computing throughout all stages of its development in local governments. Moreover, several general features of computerization have increased the amount, frequency, content, and value of information flows to top executives. These include the desire of lower level officials to share information with the executive as a means of influencing decisions and the desire of the computing staff to ensure that the executives' information needs are met. Consequently, the benefits of information to chief executives have increased at a greater rate than benefits to local legislatures, department heads, and lower level staff (Danziger, Dutton, Kling and Kraemer 1982, Chapter 5).
11. Most political impacts to date have resulted from ownership and control of the computing resource per se. Those who have controlled computing have been able to obtain other resources (staff, space, equipment) needed to apply it, as well as status and prestige. Also, they have garnered a monopoly on expertise in computing; they have been able to justify computing broadly while using it narrowly, for their own purposes; and they have been able to retain control of computing over several decades by serving the agendas of those who control the broader organization. The current information politics is similar to the politics of computing resources, but it also is significantly different in several regards. When computing

was a new resource in government, it was potentially available to all, and generally without strong prior claims. But the current distribution of information resources in the government represents established claims, resulting from past legal assignments of responsibility, and from past political struggles over functional responsibilities and information needs.

Database technology holds the potential for major redistribution of information resources, and therefore for renewal of those struggles. The redistribution of information raises the further possibility that power shifts might result from new uses of information as well as from changes in who controls information resources.

The major uses of information facilitated by consolidation and redistribution of data are those that cross departmental and neighborhood boudaries. Such uses include, for example, monitoring department operations, evaluating departmental performance, and controlling department expenditures or staff, identifying community-wide problems or needs, evaluating proposed solutions to problems, and assessing the political feasibility of various proposals. The prime beneficiaries of these kinds of information uses are top managers, their staffs, and the various planners and analysts who serve them.

## REFERENCES

Banfield, Edward C.: The Unheavenly City, Little, Brown, Boston, MA. 1968.

Banfield, Edward C. and James G. Wilson: City Politics, Cambridge, MA., Harvard University Press, 1965.

Dahl, Robert A.: The city in the future of democracy. American Political Science Review 61 (1967): December, s. 967–962.

Danziger, James N., William H. Dutton, Rob Kling, and Kenneth L. Kraemer: Computers and Politics: High-Technology in American Local Governments, Columbia University Press, New York 1982.

ICMA (International City Management Association) 1980. The Essential Community: Local Government in the Year 2000, Washington, D.C., ICMA.

Jacobs, Jane: Cities and the wealth of nations. The Atlantic Monthly 253 (1984): 3, s. 41–66.

Jacobs, Jane: The dynamic of decline. The Atlantic Monthly 253 (1984): 4, s. 98–114.

Kaufman, Herbert: Administrative decentralization and political power. Public Administration Review 29 (1964): 1, s. 3–15.

Kemeny, John G.: The city and the computer revolution, in James C. Charlesworth and Stephen B. Sweeney, eds., Governing Urban Society: New Scientific Approaches, Monograph 7, The American Academy of Political and Social Sciences, Philadelphia 1967.

King, John: Centralized versus Decentralized Computing: Organizational Considerations and Management Options. ACM Computing Seurveys (1983): December.

Kotler, Milton: Neighborhood Government, Bobbs-Merrill, New York 1969.

Kraemer, Kenneth L.: Computers, information, and power in local government: a stage theory, in Abbe Mowshowitz, ed., Human Choice and Computers, North-Holland Publishing Company, New York 1980.

Kristol, Irvin: Decentralization for what? The Public Interest 11 (1968): Spring, s. 17–25.

Laudon, Kenneth C.: Communication Technology and Democratic Participation, Praeger, New York 1977.

Long, Norton: The Unwalled City, Basic Books, New York 1972.

Lowi, Theodore: Machine politics – old and new. The Public Interest 9 (1967): Fall, s. 83–92.

Masuda, Yoneji: The Information Society, The World Future Society, Bethesda, MD 1980.

Meier, Richard L.: A Communications Theory of Urban Growth, The MIT Press, Cambridge, MA 1962.

Sackman, Harold and Norman Nie, eds.: Information Utility and Social Choice, AFIPS Press, Montvale, NJ 1970.

Sackman, Harold and Barry Boehm, eds.: Planning Community Information Utilities, AFIPS Press, Montvale, NJ 1972.

Scott-Morton, Michael: Computers and organizations: looking to the '90's. Talks presented at 1984 AACSB Meeting. Phoenix, Arizona May 3, 1984.

Smith, Ralph Lee: The Wire Nation: Cable TV: The Electronic Communications Highway, Harper and Row, New York 1970.

Yates, Douglas: The Ungovernable City. The MIT Press, Cambridge, MA 1977.