INTRODUCTION

Whenever we talk of the “impact of computers” on a given area of applications, we usually become concerned with the technical character of the applications and how they might be supported with computer systems and/or other advanced information processing devices. Thus, in viewing the computer’s impact on local and regional government, we could easily focus our discussion here on techniques of water billing, crime information retrieval or regional economic data analysis. And, indeed, some attention must be given to matters of this sort.

We have observed, however, that whatever the potential impact of the computer on local and regional government might be, that impact has been somewhat retarded up to this point. In looking for reasons for this retardation, two major problems are apparent. First, the information specialist is usually not familiar with the nontechnical influences on the successful introduction of new technology. And second, both specialist and administrator tend to focus on limited individual applications instead of dealing with broad functional areas where more sophisticated techniques and devices might be applicable.

This paper is an attempt to explore the present and future impact of the computer on local and regional government. Such an objective certainly requires a look at the history of computer uses in local governments and a projection of new technology’s future applications. But considering the two problems described above, it would appear desirable to first explore the organizational and functional contexts in which computer applications must fit.

Accordingly, the paper is organized as follows. The first section provides some background information on the organization of government in local areas, and the intergovernmental relations among state, federal and local agencies and political jurisdictions. These factors have a great influence on what projects are funded, and often dictate the technical content of those projects.

The second section describes the major functional areas of local and regional government. It is within and across these areas that particular computer-oriented projects apply.

In the next section, we describe the past introduction of computers into local government, and give some examples of more current projects of a demonstration or developmental character.

In the final section we provide some projections for the future. We describe there some of the potential impact of new computer hardware and software on the technical, administrative and political factors that have heretofore impeded rapid progress. We conclude with some considerations concerning needed software developments.
ORGANIZATION AND INTER-GOVERNMENTAL RELATIONS

The functional responsibilities of local government are essentially delegated by the state government. The U.S. Constitution provides specifically for the states to undertake those functions necessary for the general safety and welfare of its citizens. Each state deals slightly differently with this problem but, in most states, local governments are franchised by the state, either through charters or other state constitutional provisions.

These considerations of responsibility are important in dictating how overall programs are initiated, decisions made, and funding administered. For example, the California Statewide Federated Information System proposed in the Lockheed study was specifically designed to support the concept of "home rule," implicit in California's local government and state relations. Other states may exhibit more state-centralized control of functional areas, but in general, the basic operating functions of a city (such as public works, police, fire protection, health, sanitation) are provided by some form of local government.

These on-going services and functions are usually supported by local taxes, particularly the tax on real property. Some local and regional programs cross local jurisdictional boundaries; for example, education, highway projects, and certain welfare programs. Funding for these kinds of programs is provided from a combination of local and statewide sources, with state funds being allocated back to the local areas according to some agreed-upon formula.

Federal programs concerned with problems of the metropolitan area can be channeled through both local government and statewide agencies, depending upon the enabling legislation. Most Federal programs, however, involve some tacit consent of the state executive, even for programs administered directly at the local level.

Before we leave the subject of organization, it is important to note that the concept of regional government is in most cases just that—a concept. Strong support for regional government in metropolitan areas is reflected in public administration and political science literature. Nevertheless, in actual fact, existing centers of local political power tend to resist any form of more centralized control which would reduce the power of a particular local jurisdiction. As a result, regional planning organizations tend to exist on a cooperative basis, with authority only to set standards. They do not usually possess the power to enforce those standards.

The issue of whether or not regional government would be more effective in dealing with metropolitan problems is quite controversial. Differing technical as well as political views on this subject may be found. One point is clear, however. The introduction of technology, and particularly information technology, into metropolitan government is greatly inhibited by the multiplicity of decision points involved in getting a program approved and operating successfully.

FUNCTIONAL APPLICATION AREAS

The following is a brief summary of the different application areas in local government. A thorough treatment of all the activities of each agency and department serving functions in metropolitan government would and, in fact, does take volumes (of organizational manuals and procedures). Nevertheless, even this surface description will give some idea of the great diversity of activities being carried on by local government.

For purposes of presentation, the activities are grouped in seven general categories: agencies that are facilities-oriented; those that are people-oriented; agencies concerned with safety; with planning; with administration, tax and fiscal matters; individuals and groups concerned with policy-making; and, certain other nonlocal government agencies that have functions bearing on the local government problem (and may even occupy offices in local areas).

The scope of this paper does not permit a detailed description of the information processing support required for each operational function. However, certain areas have been emphasized as examples of typical requirements.

Facilities-Oriented

In this group we include: (1) the public works departments concerned with major plant facilities, buildings, streets, water and sewage networks, as well as supporting services such as engineering to maintain and expand those facilities as necessary; (2) the building and safety departments concerned with the approval and inspection of private facilities and property; (3) the utilities, such as water and power, either publicly or privately owned; (4)
recreation and parks departments; (5) public transportation agencies; and (6) traffic departments concerned with the flow of vehicular traffic, its control and safety.

People-Oriented

The people-oriented agencies include: (1) the public schools; and (2) various community service agencies and welfare departments. Activities of the schools are not confined merely to the employment of teachers and setting of curricula. The administration of a school system includes such complex activities as areawide facilities planning and specific building construction. Similarly, the community service and welfare agencies are engaged in large scale field activities, as well as interviewing and screening in field and central offices.

Safety

The traditional agencies concerned with safety include: (1) police; (2) fire; and (3) health departments. The police are engaged in a multitude of patrol and investigative functions under an ever-increasing crime and traffic load in the metropolitan areas. To support this patrol and investigation, large volumes of records are kept concerning specific events and people connected with those events. A major communications and dispatching function is also required. Supporting the overall operations are the logistics and management information needed to monitor and allocate scarce resources.

The fire department has a similar on-line dispatching requirement. Current information is also maintained on the building characteristics of large businesses and industrial plants so that rapid, effective action can be taken in the event of a fire. Furthermore, the incidence of fires across the city must be evaluated in order to allocate equipment and personnel resources and to plan for the construction of new facilities.

The health department has a similar dual need for both operations and planning. It is particularly important that the health department be able to isolate disease trends before they reach epidemic proportions.

All the safety agencies, including the civil defense staff and responsible city executives, encounter an especially complicated problem in dealing with emergency situations, such as natural disasters, fires, train wrecks, civil disturbances, and civil defense emergencies. The information specialist cannot help but note the analogies between this requirement and the defense requirements of the military. The military have, of course, made large scale investments in information technology and communications, whereas the local agencies have, up to this time, tended to rely on basically manual systems.

Planning

The planning requirements of local and regional government range from broad area considerations to specific zoning variances on particular properties. The broad planning includes the general question of transportation and its interaction with commercial, industrial and residential land use. Planning for the development of undeveloped areas is one of the most important functions of a local and/or regional planning group. Maintaining the proper balance between residential and industrial usage is extremely important in the economic development of an area because it affects the attractiveness of the area, both to industry and to the work force required for industry.

Following from these needs is the assumption that a regional master plan is essential. This implies a monitoring system of existing land use and other conditions, and a measurement of the conformance of the existing conditions to the proposed plans and/or zoning regulations. This leads to more detailed questions on smaller areas, particularly the question of urban rehabilitation or renewal. Of concern here are the identification of trends toward deterioration in a specific local area and the problem of administering zoning regulations and variances for individual parcels. All of these planning functions obviously imply a sophisticated information system on the characteristics of public and private facilities in a local area.

Administration and Fiscal

The administration of a local government includes the proper accounting for tax revenues and outlays, the preparation of budgets, including the budget analysis and control function in support of the policy-making officials, the maintenance of required records by the city or county clerks, the assessment of taxes, and the treasurer and controller functions typical of any large organization. In addition to the functional needs for information in government ad-
ministration itself, there is a further provision for serving the public with respect to certain information requirements. Such data as land boundaries, and ownership records, must be available to the public on demand.

Policy-Making

Policy-making officials include mayors, city managers and legislative bodies such as city councils or county supervisors. The executive officials have typical top management functions to perform, including overall planning, resource allocation, and monitoring and control of functional activities. In so doing, they need summarizations of specific data, predictions of population and economic trends. Occasionally, they also need certain facts to counter or support criticisms from constituents of particular behavior on the part of the government. Generally speaking, these are not standard or fixed requirements but vary rapidly over time.

The legislative policy bodies have need for similar information. In particular, they require an accurate insight into the historical development of a given issue. Thus, in some cities, the actions of the city council are recorded and maintained by the city clerk in various types of file systems.

Other Agencies

In addition to the agencies that are directly a part of the city or county government, there are certain agencies concerned with local government problems who maintain field offices in the local areas. These include such organizations as the state board of equalization, dealing with the equalization of tax assessments; federal agencies, such as the Urban Renewal Administration, or the Office of Economic Opportunity; and certain commercial agencies, such as land title companies, who have the responsibility of insuring title on particular parcels in the local area. Most of these groups utilize information from local government sources. However, some maintain their own systems and have specialized requirements for which the local governments cannot and do not respond.

EXAMPLES OF COMPUTER USAGE IN LOCAL AND REGIONAL GOVERNMENT

The introduction of computers into city and county government followed closely along the pattern established in the early business use of computers. Agencies which had introduced tabulating equipment for large-scale accounting and billing operations were urged by machine manufacturers to make the transfer directly to computer processing. Thus, it is typical to find the computer in most cities under the administrative authority of the controller. Types of applications for the medium- to large-scale cities and counties include payroll, appropriation accounting for revenues and disbursements, utility billing, business tax billing, and, more recently, tax assessment mailings.

Another branch of computer applications developed quite early in making the transfer from university and government uses of computers for scientific calculations to the requirements of engineering departments of large municipal agencies. Thus, it is not unusual to discover that in a particular local government, the engineering department was an early computer user.

Most of the cities' business-type applications have tended to utilize the computer in a scheduled, sequenced manner, with large quantities of data being repetitively processed on punched cards or magnetic tape. Furthermore, the introduction of computers into municipal government was usually limited to fairly large jurisdictions which could demonstrate volume and input rates that appeared to justify the computer on a purely economic basis.

Some smaller jurisdictions, at the same time, to contract with service bureau tabulating systems, and the service bureaus eventually found it economically feasible to phase their operations into a card-processing small computer. Thus, it is not unusual for a small city, of perhaps 50,000 population, to still maintain particular applications through a service bureau.

Take utility billing, for example. The contractor takes all the input data (e.g., cash payments, utility consumption, etc.) and converts it to card form, processing the debits and credits to each account and producing the bills for mailing, as well as providing reconciliation statements for the city's financial officer. Services of this type are usually billed on a special rate for each application. A city of this size may have several applications totaling, perhaps, $1,500 per month of contract services, supplemented by the staff personnel required by the small city to maintain the operation.

The larger cities, of course, gain certain economies of scale by having sufficient applications and
volumes to justify their own machine. Depending on the size of the city and its computer installation, they may spend between $5,000 and $20,000 per month on equipment rental and between 50 and 100% of that amount for operating staff and programming.

It is emphasized here that the amounts budgeted for data processing are very carefully reviewed by the policy-making bodies, and each addition of capital or staff must usually be justified on a purely cost basis. Although this is not unique to the development of new applications and markets, the particular proximity of the policy body to the operational agency in local government tends to produce an oversensitivity to this cost problem based, primarily, on political grounds. That is, in asking himself if he should vote for a particular new appropriation, a councilman must always consider whether some error, to be investigated at a later date, will cost him his political office. There does not exist the insulation of many layers of intermediate management which protect the federal policymaker somewhat in this regard and, to a lesser extent, the state policymaker.

We have described thus far the early introduction of computers at the local level. More recently, a combination of (1) technological and (2) intergovernmental developments have produced several new areas of interest and resulted in specific demonstration programs.

Technologically, the computers have become more sophisticated and powerful while, at the same time, exhibiting a marked decrease in cost. In particular, the decrease in cost of random-access auxiliary memory, and the availability of inexpensive remote terminal equipment and data communications have led to some new possibilities at the local and regional level. Coupled with this have been the recent developments in software. In particular, the availability of high-level compilers and executive systems, and the projected availability of generalized data management tools, have strongly influenced the interest in computer systems on the part of less mathematically sophisticated users. It has also made the job of indoctrination and demonstration for policy-makers easier.

The developments in intergovernmental relations stem primarily from a growing awareness at the federal level of the increasing metropolitan problems, and local governments' financial inability to deal with those problems. Because of budgetary limita-

Metropolitan Information Systems

One of the early projects sponsored by the Urban Renewal Administration was the Metropolitan Data Center (MDC). Supported by a demonstration grant, the project had the task of testing the feasibility of electronic data processing equipment in establishing a Metropolitan Data Center. This Center would provide for storage and analysis of information concerning land use, housing conditions and occupancy, and related environmental factors. An objective of such a center is to maintain the information on a current basis so that it is readily available to assist local agencies in making urban planning and urban renewal decisions.

Five local government agencies were involved in the joint project from five different states: The Planning Office of Denver, Colorado; the City of Fort Worth, Texas; the Metropolitan Area Planning Commission of Pulaski County (Little Rock), Arkansas; the Tulsa Metropolitan Area Planning Commission; and the Wichita-Sedgwick County Metropolitan Area Planning Commission. The Project was coordinated by a central staff located in Tulsa. Separate centers in each city provided data processing services for the local planning agency. Interagency arrangements and central staff were employed only in relation to project development.

Applications developed included a comprehensive land use plan for Denver; the capital improvement program in Wichita; community renewal program in
Metropolitan Data Center Project, Alexandria, Virginia, has instituted what is called a "data bank". A master file has been created on magnetic tape of information concerning the parcel, land use and space use. The data bank is utilized by every major department and agency in the city, although it is a relatively small operation in a batch process form.

Another major effort of this type was undertaken in the City of Pittsburgh, some time earlier. A computer-processed land record system was developed which provides retrieval of various items concerning parcels in the city.

Another significant early development was the PENJERDEL study. This was a joint Pennsylvania, New Jersey and Delaware Metropolitan Data Study, which was exploring feasibility rather than actual development. A contract with the University of Pennsylvania resulted in an area statistical project. Five types of area data service were to include a data utilization center, a land use and parcel inventory, traffic information, regional accounts, and capital expenditure evaluation.

The concept of a metropolitan area information system is growing in acceptance, but as yet there is no system on a broad area basis that one might call operational. The feasibility of the concept is being explored in several places across the country. In the City of Los Angeles, a study was recently completed by System Development Corporation of an Automated Planning and Operations File, called APOF. The conceptualization of the APOF system included a basic random access file of all 900,000 parcels in the entire city of Los Angeles. The information would be accessible to all city departments and would include data by both city and noncity agencies. This is undoubtedly one of the largest systems ever conceived for a metropolitan area. A specific plan for implementation of that system was presented in the study, and methods of financing are now being considered.

Another major project in the Southern California area is funded with a federal grant. This is the South Gate Municipal Management Information System (SOGAMIS). This project has the twofold purpose of developing a computer management program for South Gate, California, a city of slightly over 58,000 population, and to prepare a model plan for any city between 30,000 and 300,000. The project is being conducted by the University of Southern California. Specific goals of the project are: master zoning plans based on population density and new construction; scheduling of police patrols, using information of types and frequency of crime throughout the city; planning new fire stations and optimal distribution of equipment; handling traffic problems, using accident flow and accident patterns; and planning of school, park and playground sites. This project is now in the early development stage.

Operational City Systems

Some operational systems of a more modern variety may be seen in several cities and counties across the country. In the Bay Area of California, the Alameda County Computer Center provides a random-access system for welfare information for its various social agency departments. Alameda County is also providing real-time retrieval of warrant information for several law enforcement agencies in the Bay Area.

Other police systems of an operational support nature exist in the cities of St. Louis, Chicago and New York. In Los Angeles, large scale experimentation was undertaken in the Police Department on the use of computers to process crime information in natural language. Incorporating those concepts, a system design study was recently completed by System Development Corporation recommending an operational system to process crime and arrest data, providing outputs to field patrol and investigation, as well as providing management information.

One of the most interesting recent developments is a proposal by 19 cities in the San Gabriel Valley, Los Angeles County, to cooperate on a central data service for the entire Valley. A feasibility study is under way as of August 15, 1966, and results should be available for discussion at the AFIPS meeting in November. It is expected that the feasibility study will concentrate on certain "bread and butter" applications, such as utility billing, appropriation accounting, payroll, and police statistics. More complicated functions such as land use records and managerial and policy decision support will also be considered. The study will examine several alternative ways of providing a central service, including the possibility of a central time-shared facility, either operated by a central agency or provided by some
service bureau. Methods of cost-sharing, scheduling and priorities will also be derived so that each city can expect the service to meet its functional requirements.

Area Transportation Studies

Some of the largest regional planning functions have been accomplished under the aegis of area transportation studies. Significant projects have included the Chicago Area Transportation Study; the Tri-State Transportation Study, covering New York, New Jersey, and Connecticut; the Penn-Jersey Transportation Study; and more recently the Bay Area Transportation Study in California. In all of these efforts, large field data collection activities were undertaken concerning the characteristics of commuter travel and projected trip requirements. Models of regional economic growth were constructed and the data used to project effects of alternative transportation facilities. As might be expected, it was usually found that the interaction between the transportation planning and the land use and economic planning was quite significant. As a result, it has become increasingly clear that one of the functions regional organization must provide is a mechanism for maintaining current area-wide information. Periodic studies are not adequate; the data base must be continually updated if planning information is to be at all valuable. The information system implications of this approach are rather significant.

SOME PROJECTIONS FOR THE FUTURE

There is no question but that the population in the urban areas will continue to increase. The service functions of government will even more strongly reflect this trend. This means that the information generated and processed in local and regional government will increase in volume at an even higher rate. When we consider the increasing labor rates, and the decreasing cost per unit of information processed by computers, it seems clear that local and regional government will provide ever-increasing opportunities to introduce advanced technology. The question is, how can the local governments overcome the budgetary and political limitations that tend to retard the introduction of new concepts?

One trend that we believe is unmistakable is the movement toward sharing of central computer facilities. So far, this has mostly been exhibited in the administrative functions, based on the argument that centralization of data processing brings economies in government. In the past, the decentralized user has usually suffered in service when centralization has taken place. This is why the individual city agencies that have their own machines fight centralization so energetically, and yet, so unsuccessfully. It is certainly true that by centralizing facilities, and systems and programming staff, the consistency of programming is improved and the fixed investment is minimized. However, the result of this approach has usually been to frustrate individual departments and agencies who wish to experiment with new approaches, or who have special requirements that are not served as well as if they operated their own facility. How can we solve this dilemma?

We believe that the trend will continue toward centralization of facilities, so that the city can achieve the economies of scale available. However, the difference in the future will be the decentralization of input and output of data, plus the time-sharing concept of different users operating their own programs, built with generalized data management systems and high level compilers. Certainly some efficiency of operation on repetitive functions will be sacrificed, but the overriding consideration will be the availability of computer power to a much wider range of users and applications than is presently possible with central programming staffs and equipment.

In the larger metropolitan governments, this will mean that more operational, planning, and administrative functions will be serviced. In the smaller cities, the time-shared concept will mean that jurisdictions who cannot afford large powerful computers by themselves will be able to get the processing advantages of such systems, with expenditures equal to or less than what they currently spend. This will be accomplished either through service bureaus providing time-shared capability, or through the kind of regional arrangements implicit in the San Gabriel Valley project.

From the functional and political standpoints, this trend will have many salutary effects. The present resistance of individual jurisdictions to join in regional associations is based primarily on the fear that centralized government would result. By decentralizing the user of regional information through the kind of network implied in the time-shared facility, the threat of centralized control is reduced, yet the value of information sharing for planning purposes is retained. Furthermore, specific functional areas
such as the administration of justice, or area transportation, can be served by specific subsystems devoted to that function alone. Those subsystems would be tied to the overall regional or statewide network for purposes of sharing nonsensitive data.

Although these long-range goals are certainly desirable, and although we do believe them to be inevitable (given the present movement of technology and government), there are some serious problems in making a smooth transition from the present state. For one thing, the process of introducing innovation in government is fraught with costly discontinuities in funding, and nontechnical influences on content which severely constrain any real progress. This is partly the fault of the information specialists, who have tended to ignore the requirement for communicating effectively to nontechnical executives and policy officials. The information specialist must take some pains to learn other languages besides PL-1, COBOL and FORTRAN, and deal with political and administrative loops as well as those he normally encounters.

Finally, there is the problem of software development. The local governments have a serious problem, undoubtedly of their own making, in attracting and keeping trained programmers. It is not even clear that raising present salaries would be effective, because industry tends to keep ahead of government in this area, and can do so more easily because they do not suffer from the same legislative time lag. As a result, the local governments cannot maintain continuity of staff. This produces error-prone application programming, or just plain schedule slippage. Contracting for software isn't a solution for two reasons. First, because the higher cost per man-hour of contract services reduces the total output possible for the same dollar (assuming a well-paid internal staff could produce the same output), and, second, because the maintenance function must be accomplished internally anyway. This means that the internal staff must be involved somehow in the initial program preparation in order to fully understand what is going on.

The long-range answer to the software problem in government lies, we believe, in the development of generalized program systems, either specific applications (e.g., water billing, payroll, statistical processing) or data management tools that can be used for general information storage, retrieval, analysis and reporting. The funding of such developments must come from outside the local or regional governments, and probably from outside the states. Only with the advent of these types of systems will the impact of computers on local and regional government reach the potential possible.

REFERENCES