TR 134

AUTOMATED INFORMATION SYSTEMS AS SOCIAL RESOURCES IN POLICY MAKING

Rob Kling
Department of Information and Computer Science
and
Public Policy Research Organization
University of California, Irvine
Irvine, CA 92717

Automated information systems have been suggested by a number of theorists to aid public policy makers in acquiring more accurate, timely, and relevant information. This paper reports a study of the uses and impacts of automated systems for policy analysis in 42 municipal governments. Automated analyses are commonly used in municipal governments and are used to support policy suggestions which are often implemented. Automated systems in these settings serve in both educational and political roles. The utility of automated data systems for both rational and political uses increases with the extent that automated data is available in a given municipal government.

In addition, we investigate the influence of computer-based policy analyses on the distribution of power in municipal governments. We find that computer-based systems reinforce the existing distribution of power in American municipalities. They provide differential support to mayors and city managers in smaller cities and to departments in the larger cities.

More generally, this analysis indicates that the political arrangements of the social setting in which a computer-based system is utilized must be well understood, in addition to the technical features of the system, to predict its likely uses and impacts. This principle undermines the sufficiency of the formulations of rational and organizational process theorists who emphasize the technical characteristics of systems and neglect the political dynamics of the settings in which automated data systems are utilized.

1. Problems in Intelligence

Over the past several decades, the problems faced by large organizations have become more complex, and the lead times from the emergence of important problems to the time appropriate actions are needed have become shorter. In addition, as the scope of action of public agencies has increased, the costs of misconceived policies have also proportionately increased. To respond effectively to this increasing complexity and urgency, policy makers must depend upon appropriate and timely sources of information. Some scholars suggest that the kind or quality of data provided by certain automated information systems might enable top policy makers to gain greater insight into the complex milieus faced by their organizations [1, 9, 21, 23, 24, 25, 26].

It is commonly believed that computer-based information systems currently have little impact on policy analysis and policy making in public agencies [3, 16], although there is little systematic evidence to support the belief. Most of the evidence is based upon casual observation and occasional case studies which emphasize more technically sophisticated, and thus "interesting," technologies. Analysts who seek to improve the utility of automated systems or explain why existing systems do not have major impacts emphasize different features of information systems, data, or the settings in which they are used. In particular, the following are often emphasized:

1. *Design of information systems* emphasizing the analytical routines employed, and the modes of data presentation [1, 9, 23].

2. *Quality of data* available for analysis [5, 11, 12, 16, 23].

3. *Availability of data to analysts*, particularly because of the organizational arrangements in which it is collected, and shared, and the multiple purposes for which data may be "stretched" [11, 12, 26].

4. *Analytical skills either of analysts or policymakers* who commission, produce, or utilize computer-based analyses [18, 23].

5. *Structural features of organizations* (e.g., formalization, centralization, hierarchy) that influence the flow of data and analyses between organizational subunits [20, 30].

6. *Conflicting values and interests served by different outcomes of an analysis* and the extent to which different interests may bias studies in their favor [11, 12].

7. *The system of social control under which policy analyses are reviewed for quality and integrity* [11, 12].

While all these aspects of automated systems and their settings of use make sense and can be sensibly linked to the ways in which information is used in policymaking, different scholars tend to emphasize different clusters of these features. Allison [2] identifies three different models of policymaking activity commonly utilized by analysts. Analysts of each theoretical persuasion view the roles and uses of information systems in policymaking differently. Consequently they make different assumptions about the payoffs and problems of utilizing automated information systems as policymaking aids.

1. *Rational theories* view policymaking as a problem of choosing among a set of alternatives to satisfy a set of organizational goals. Organizations are viewed as unitary actors, attempting to maximize their expected utility, subject, perhaps, to limitations of resources both for policy analysis and consequent actions. Rational theorists propose to improve policymaking by helping organizations define their problems, enumerate their alternatives, and to understand the strategic costs and benefits of each alternative. Information is viewed as a critical resource in improving each step of policymaking. Rational theories emphasize the role of the analytical components of automated systems, the quality of the data they process, and the skills of the staff that prepare and utilize computer-based reports [9, 25, 26, 27]. Rational theories hold that improvements in these elements of computer-based information systems and their conditions of use will result in substantial improvements in the net rationality and thus, effectiveness, of computer-using organizations.

2. *Organizational process* theories view organizations as working with restricted resources when their participants are analyzing and making policy. Organizations frequently face restricted classes of problems with which their staffs become particularly familiar. Familiarity, repetition, and limitations of time lead organizational actors to develop standard operating procedures and relatively limited repertoires of skilled responsiveness. According to these theories, not only do organizations develop relatively specialized but "efficient" perceptions of problems, but the modes for handling given policy problems also become routinized. Similar participants are engaged in analyzing, making, and reviewing the same kinds of decisions on a regular basis. Organizations do not "reorganize" each time a new policy issue emerges for attention. Rather, a division of labor and set of established communication channels map the "nerves and brains" that will usually work on a new problem. Organization process theories emphasize that appropriate information must not only be available within an organization, but that it must flow to the certain participants at a time they can integrate into their activity if it is to significantly influence policy outputs [26, 30]. *Organizational process* theorists emphasize the structural elements of organizations within which automated systems are used, and hope that selected alterations in structure (e.g., altering information channels) will help improve the quality of decision-making [26].

3. *Political process* theorists view policymaking as the by-product of differently situated players jockeying for their preferred courses of action. Public organizations are governed by officials and administrators who develop constituencies with particular interests. The policies that matter most are those that commit large resources, or that set the stage for future commitments. People prefer different places and strategies for investing organizational resources. Different analyses, under slightly altered assumptions, often yield conflicting recommendations. In the "pulling and hauling" of bureaucratic politics, the players can utilize information as a resource to analyze the effectiveness of alternative actions vis-a-vis their opponents. In addition, forms of information that support one's policy preferences or which give them additional legitimacy help mobilize support and maintain a preferred "definition of the situation." Political process theorists differ in their preferred reforms, but they often suggest that specialized *combinations* of technical and organizational arrangements help to constructively exploit conflicts of value and interest in a decision-making arena [11, 12].

Each of these three models provides a different lens for viewing policymaking and the role of information systems for different actors. Each model is framed in characteristic terms and emphasizes some features of policymaking while ignoring others. Rational theories treat organizations as unitary actors which are selecting amongst relatively fixed menus of alternative policies. For a rational analyst, "Chicago's housing policy" is a useful abstraction. Rational theorists emphasize the gains that can result from technically improved information systems. They assume that increases in the technical quality of systems will result in more rational uses of computer-based analyses by providing insight into a wider array of policy choices and their repercussions. For organizational process theorists and political process theorists, organizational policies are the outcomes of complex social events involving many parties. Organizations cannot be viewed as unitary actors with a single set of values. Organizational process theories eschew the language of "organizational goals" and focus upon the specialized definitions of problems and strategies for dealing with them developed by different organizational subunits. A "redevelopment authority" may be adept at converting dilapidated housing into new commercial units while a housing inspection department within the same government may emphasize ways of keeping existing housing stock through the renovation of existing units. For organizational process accounts, the extent to which diverse administrative units are coordinated and pursue parallel policies is empirically open, and will vary from setting to setting. Political process theories differ from the other models by explicitly accounting for the self-interested behavior of players in policy games. They view players as preferring policies which maximize their individual utility as well as that (or even instead of that) of the organizations in which they act. Political process theorists suggest that improved information will increase the likelihood of rational choice for collective decisions only under special social circumstances

[6, 11, 12]. Under other circumstances (e.g., centralized sources of expert analysis) they emphasize that complex analyses are more likely to be biased by narrowly construed alternatives and the preferences of specialized interests [11, 12]. It should be clearly emphasized that political process theorists do not adopt the cynical position that policy analyses are always subject to bias and abuse.[1] Rather, they attempt to clarify the conditions under which different uses of analyses are likely, and link these to conflicting values and interests in the organizations preparing and using them. Thus, rational theorists discount the importance they attach to the social settings in which analyses are developed and used in influencing the uses to which they are put. Political process theories hold that the way influence and access to resources is distributed in a social setting, and the kind of stakes that different players have in the outcomes of policies of interest, will influence the roles of computer-based analyses.

The study reported here provides some insight into and support for the working hypothesis that the political organization of social settings plays a potent role in shaping the uses of analyses based upon automated data systems.

2. Methods

The use of computer-based systems in urban planning and policymaking was studied in 42 municipal governments through a study conducted in 1976.[2] In each municipality, intensive interviews were conducted with planners, department heads, mayors, chief administrative officers, city councilmen and their staffs regarding the production and use of computer-based analyses. Typically, 10-20 interviews would be conducted in each city to learn about the uses of automated information systems in planning and policymaking. Each city was studied by one or two researchers for one to two weeks. Each researcher collected a standard set of information about the automated files, their use in reports, and the uses of reports from a wide variety of respondents. Those accounts were coded in a standardized manner, and collated into data files for analysis. The comparative case data, and results of the intensive interviews are the primary sources of data for this paper.

In each city we studied the kinds of data sources which were available and the uses to which they were put. We did not attempt to evaluate the technical quality of reports or the quality of decisions based upon them. Rather, we emphasized different uses to which reports were put. For example, we asked respondents whether they gained clearer perceptions of community conditions from reports including computer-based data. And we asked whether such reports were used to legitimize decisions or gain publicity for particular programs. In each case, we asked for examples to illustrate and substantiate our respondents' claims.

3. Planning Data and Reports in Municipal Governments

Planning agencies in municipal governments obtain social and environmental data in computer-based systems from many sources. Local governments purchase demographic data collected by the U.S. Census Bureau, economic data collected by firms such as R.L. Polk, and administer their own surveys to collect data about housing, land use, service provision, and the attitudes of citizens on specific issues. Most of the cities in our sample had both manual and automated data files (Table 1).

Planning agencies vary in frequency with which they prepare and send reports to different officials. The "typical agency" used computer-based data for reports which were circulated to top officials (i.e., mayor, chief administrative officer, city manager, and/or council members) several times a year (Table 2). Reports vary tremendously in content and formal role. Common reports, however, include demographic and economic analyses of specific neighborhoods, local transportation plans, population forecasts, studies of land use (e.g., open space, land for commercial development). Most of the reports are narrative, accompanied by frequency distributions and maps or bar graphs. Planning agencies in about 60 percent of the cities developed reports in which contrasts were made between fixed geographic districts (e.g., census tracts). Correlational and multivariate analyses were rare.

We have good evidence that reports containing computer-based analyses are used by top officials. Many of the subtle influences of these reports will be discussed in the next sections. But, here we note that computer-based reports often lead to programmatic recommendations (Table 3). In a majority of our sample cities, computer-based reports have led to recommendations which have been implemented.

4. Consequences of Information Use

If an analysis meaningfully serves to inform rational decision-making, we should expect that it should provide its audience with clearer perceptions of their choices and occasionally surprise their readers with unexpected insights that violated their prior expectations. Rational theories would predict:

Hypothesis 1: Computer-based reports will provide their readers with clearer perceptions of community conditions.

Hypothesis 2: Computer-based reports will provide their readers with surprising insights.

In addition, if the assumptions of the rational and organizational process theorists hold, we should expect that computer-based reports do not serve some of the "political" roles that are commonplace in local governments. They should not be used to legitimize perceptions, gain publicity for programs, or determine the political feasibility of particular policies. In simple form, they would predict:

Hypothesis 3: Computer-based reports will not be used to legitimize problems already perceived to exist.

Hypothesis 4. Computer-based reports will not be used to gain publicity for programs.

Hypothesis 5. Computer-based reports will not be used to assess the political acceptability of alternative policies.

We now examine each hypothesis.

4.1 Computer Uses to Support Rational Decision-making

Hypothesis 1: Computer-based reports will provide their readers with clearer perceptions of community conditions.

Hypothesis 2: Computer-based reports will provide their readers with surprising insights.

In a majority of cities, respondents will attribute increasing insight into community problems through the use of computer-based reports (Table 4). Administrative staff (e.g., CAO and planners) are much more likely to attribute educational value to the reports they receive than are elected officials (i.e., mayor and councilmen). In part, the elected officials receive reports less frequently than do the administrative staff (Table 1). In addition, in most American cities, city councilmen are part-time officials who are provided little staff assistance. Even the mayors have little direct staff support in smaller cities, aside from the administration staff of the regular agencies.[3]

In about 43 percent of the cities, administrative staff claim that computer-based reports have provided sufficiently surprising or persuasive analyses that previous decisions have been altered (Table 5). However, in only 30 percent of the cities do elected officials make a similar claim. In both cases, it is easier to attribute "clearer perceptions" to a report than to find reports that really surprise.

If one careully examines the claims about the educational roles of computer-based reports (Tables 1 and 2) one also finds that in only a modest fraction of the sites were respondents able to provide examples to illustrate their claims. In 90 percent of the cases clearer perceptions were exceptional, at best. In almost none of the cases were surprises commonplace. Most often, repondents would attribute educational roles to computer-based studies, but could only illustrate them with exceptional examples, it at all.

However, these attributions cover a wide variety of cities with differing levels of automation. Rational theorists would lead us to believe that respondents should attribute increased educational value to computer-based reports in cities with more automation. To test this version of Hypotheses 1 and 2, we constructed indices of the extent to which computer based reports lead to clearer perceptions (PERCEPTIONS) or surprises (SURPRISES) (Figure 1). Both PERCEPTIONS and SURPRISES correlate moderately with the number of data files in a city, the sophistication of reports, and the number of different kinds of data available to planners[4] (Table 9).

Both PERCEPTIONS and SURPRISES are unrelated to the fraction of files that are automated (Table 9). While the fraction of files automated may seem to be a good index of automation, it is biased to give high values to cities with relatively few files. A city with only one file which is automated would receive a value of 1.0 on this index, while a city with six automated files and three non-automated files would score .67 and appear less automated. While the number of data files, sophistication of reports, and number of different kinds of data confound level of automation and overall levels of activity, they turn out to be better indices of the overall level of computing in policy analysis.

We interpret this data as providing moderate support for Hypotheses 1 and 2.

RECCOMS[a] - Frequency that computer-based reports and analyses lead to programmatic recommendations (Table 3).

PERCEPTIONS - Extent to which computer-based reports and analyses lead to new or clearer perceptions of community problems (Table 4).

SURPRISES - Extent to which computer-based reports and analyses provide surprising results (Table 5)

LEGITIMACY - Extent to which computer-based reports and analyses are used to legitimize problems already believed to exist (Table 6).

PUBLICITY - Extent to which computer-based reports and analyses are used to gain publicity for policies and programs (Table 7).

POL-ACCEPT - Extent to which computer-based reports and analyses are used to determine whether a policy or decision will be politically acceptable (Table 8).

---

[a] Indices were constructed by averaging the data in the indicated tables for mayors, managers, and council members in each city.

Figure 1. Definitions of Indices of Uses of Computer-Based Reports & Analyses

4.2 Computer Uses to Support Political Influence

Accounts of the uses of information systems in organizations provided by rational and organizational process theorists do not include uses of information systems to build political influence [1, 16, 22, 25, 26, 27]. Presumably, the reports based on data from computer systems cannot be so used. Thus, these theories would suggest:

Hypothesis 3: Computer-based reports will not be used to gain publicity for programs.

Hypothesis 4: Computer-based reports will not be used to gain publicity for programs.

Hypothesis 5: Computer-based reports will not be used to assess the political acceptability of alternative policies.

Respondents in a majority of cities indicate that computer-based reports are used to legitimize the importance of problems already believed important (Table 6). Mayors and planners in 33 percent of the cities could substantiate their claims with examples. Computer-based reports are also commonly used to gain publicity for programs and policies (Table 7). In almost 30 percent of the cities, computer-based analyses are used to help determine

whether policies are politically feasible (Table 8). This last finding is more important than the number of cases would make it appear since top officials typically utilize opinion surveys for testing the political feasibility of programs. Most of the data collected by planning departments (e.g., demographic data, housing data) is simply unsuited. Only 50 percent of our cities have conducted any sample surveys at all, and fewer still have conducted opinion surveys.[5]

Again, one may wonder whether the political uses of computer-based reports are more likely in settings with higher levels of automation. Indices were constructed for uses of computer-based studies to legitimize perceptions (LEGITIMACY), gain publicity (PUBLICITY), and the extent to which computer-based analyses are used to determine the political feasibility of policies (POL-ACCEPT) (Figure 1). All three indices correlate positively with our measures of the level of automation and PUBLICITY and POL-ACCEPT show consistant, moderately sized correlations ($.32 \leq R \leq .41$).

These attributions and relations lead us to reject hypotheses 3, 4 and 5. Not only do planners and officials in municipal governments use computer-based reports to gain support for their programs, but such uses increase with the level of automation in a planning agency.

5. Automated Data as a Social Resource

In the preceding section we have seen that computer-based analyses can serve *both* to provide insights to report readers and to assist municipal officials in gaining political support for their beliefs and programs. In addition, the extent to which such multiple uses occur increases with the overall level of automated activity (e.g., number of files, richness of data, sophistication of reports). This leads us to view automated data systems as resources which may be exploited by actors playing the games common to a given organization [19]. In the case of local governments, the games include political maneuvers to build and maintain support for policies and programs as well as managerial games of insightful planning, and administrative games of producing routine reports to meet Federal reporting requirements.

6. Power Shifts

It is an open question whether computer-based systems are a neutral resource. That is, it is relatively common to observe that computer-based systems increase the influence of parties who have access to the technology and understand its use [7]. Such an analysis leads Downs [7] to suggest that data custodians will gain power relative to other staff, and that full time administrators will gain power relative to elective officials. We collected data to investigate alterations in power relations attributable to the use of computer-based reports. In each city, the researchers coded the extent to which different actors gained or lost power because of computer-based reprots (Table 10). "Power" was treated operationally, as "effective influence." Actors which seemed to gain influence in the outcomes of decisions in the previous year or two were viewed as gaining power. A weak group gaining power need not be relatively strong, and a strong group losing power need not be relatively weak.

The following patterns stand out in the data:

1. In a majority of the cases, there is no discernable shift of power attributable to computer use. Respondents attributed shifts of power to a variety of sources including demographic changes in the city, personal style of top officials, etc.

2. Data custodians (e.g., planners) are most likely to gain power, and never lose power because of computer-based analyses. Nevertheless, data custodians remain relatively weak. At best they appear as the favored experts of more powerful actors. At worst, their counsel is distrusted and their reports receive little sustained interest.

3. Supporting Downs, city councilmen are most likely to lose power (20%) and rarely gain power (5%) becuse of computer-based analyses.

4. Supporting Downs, top-level administrators (city managers and CAO's) often gain power (27%) and rarely lose power (3%) when there are any shifts at all.

The conditions under which mayors and departments gain and lose power are more complex, and are best illuminated with two more subtle analyses. First, we constructed a new category, "top officials" (Table 10) which indicates the shift of power for the top official in each city. For city manager cities, it indicates whether the manager gained or lost power; for other cities it indicates whether the mayor gained or lost power. Table 10 indicates that the top official in a city is more likely to gain power and less likely to lose power than all other role-takers except the data custodians. This suggests that computer-based analyses *reinforce* the patterns of influence in municipal governments. Kling [10] suggests that computer-based information systems should reinforce the structure of power in an organization simply because computer-based systems are expensive to develop and use. Thus, top officials who can authorize large expenditures, will on the average, insure that expensive analyses serve their purposes.

However, our data indicate even more subtle patterns of influence (Table 11). Correlations between power shifts attributable to computing and measures of both city size (e.g., operating budget) and the extent of automation in policy analysis were computed (Table 11). Departments gain power in the larger cities ($R=.46$, $p \leq .001$) while top officials lose power in the larger cities ($R=-.29$, $p \leq .05$). This pattern follows the structure of influence in American municipalities. In the smaller cities, the mayors and city managers are able to stay on top of department operations and place a strong stamp upon municipal activities. In larger cities, the departments can become vast fiefdoms (particularly police and public works). In the larger cities, the top officials are in a weaker bargaining position vis-a-vis department heads. In addition, in the cities with several hundred thousand residents, the larger departments have sufficiently large budgets to afford their own skilled analysts and to build information systems that suit their needs with less scrutiny from top officials.

Thus, in these cases, it is not top officials who gain most, but managers who are sufficiently up the organizational hierarchy that they can command large resources.

The sensivitity of power shifts to the bases of power in cities supports a much more general observation that computer-based systems for policy analysis are *political, power reinforcing* instrumentalities. They differ from automated upward reporting systems which may cause data providers to lose power to data collecters [24]. In general, to predict the influences of a computer-based information system, one must have a sharp characterization of the distribution of influence in the social setting in which it is used [10, 11, 12, 13, 14].

7. Conclusions

We have indicated that automated analyses are commonly used in municipal governments and are used to support policy suggestions which are often implemented. Automated systems in these settings serve in both educational and political roles. The utility of automated data systems for both rational and political uses increases with the extent that automated data is available in a given municipal government. All three models of policymaking--rational, organizational process, and political process--help provide some insight into the role of information in policymaking. However, this analysis indicates that automated information systems should be viewed as social resources which are absorbed into ongoing organizational games, but which do not materially influence the structure of the games being played. In organizations in which bureaucratic politics characterizes "normal business," computing will not be a neutral resource. It can easily reinforce the power of potent actors.

This analysis is neither vacuous nor obvious. Recently, McLaughlin [21] recommended that the Office of the President should develop a "policy management system" with extensive automated support to help provide greater control over the U.S. Department of HEW. Since the Federal cabinet agencies have developed into extensive bases of independent power vis-a-vis the Presidency, they may be analogous to departments in larger cities. The analysis presented here suggests that extensive automation is likely to reinforce the power of the executive agencies. In that case, McLaughlin's strategy would backfire.

This analysis indicates that the political order of the social setting in which a computer-based system is utilized must be well understood, in addition to the technical features of the system, to predict its likely uses and impacts. This principle undermines the sufficiency of the formulations of analysts who emphasize the technical characteristics of systems and neglect the political dynamics of the settings in which automated dats systems are utilized.

Footnotes

1. Lynch [18], for example, provides a detailed account of the role played by rational analyses helping Coast Guard officials set policies for navigational aids. However, he contrasts this case with others in which analyses were biased by special interests.

2. The 42 municipal governments were selected in a random sample stratified on several dimensions including the number of automated applications, the sophistication of automated applications, the extent to which computer users are involved in the design of applications, and the extent to which computer operations are decentralized. See Kraemer, et al. [15] for the detailed sampling design.

3. In a few cities, such as New Orleans, Newton, Mass., and Tulsa, Okla., the mayors have managed to hire special assistants who help analyze municipal problems and policies for them. See the discussion below in the section on "power shifts."

4. The sophistication of reports was indexed by the number of different forms of data presentation and analysis (e.g., maps, regression, geo-based analyses) which appear in reports produced by the municipal planning staffs. The number of different kinds of data (e.g., housing, industry, demographic, opinion) ranges between 2 and 8 for our cities.

5. Sample surveys are sometimes conducted for purposes other than opinion sampling (e.g., spot checks of housing quality or levels of employment in particular neighborhoods.

References

1. Ackoff, Russell, Redesigning the Future: A Systems Approach to Societal Problems, (John Wiley and Sons, New York, 1974).

2. Allison, Graham, Conceptual models and the Cuban missile crisis, American Political Science Review, 63 (Sept. 1969):689-718.

3. Brewer, Gary, Politicians, Bureaucrats and Consultants (Basic Books, New York, 1974).

4. Catanese, A.J. and Farmer, W.P. (eds.) Personality, Politics and Planning: How City Planners Work, (Sage Publications, Inc., Beverly Hills, CA, 1978).

5. Conn, W.D., The difficulty of forecasting ambient air quality, J. Am. Inst. Plnrs. 41 (Sept. 1975):334-346.

6. Dahl, Robert and Lindblom, Charles, Politics, Economics, and Welfare, (University of Chicago Press, Chicago, Ill. 1976).

7. Downs, Anthony, A realistic look at the final payoffs from urban data systems, Public Administration Review, 27 (Sept. 1967):204-209.

8. Greenberger, Martin, Crenson, Mathew A. and Crissey, Brian L., Models in the Policy Process (Russel Sage Foundation, New York, 1976).

9. Kamnitzer, Peter, Urban problems in Computers

and the Problems of Society, H. Sackman and H. Borko (eds.) (AFIPS Press, Montevale, N.J., 1972).

10. Kling, Rob, Computers and social power, Computers and Society 5(3) (Fall, 1974):6-11.

11. Kling, Rob, Automated information systems and public policymaking, ICS TR#78, Department of Information and Computer Science (University of California, Irvine, July 1976).

12. Kling, Rob, Information systems in public policymaking: Computer technology and organizational arrangements, Telecommunications Policy 2(1) (March 1978):22-32.

13. Kling, Rob, Automated welfare client tracking and service integration: The political economy of computing, Communications of the ACM 21(6) (June, 1978):484-493.

14. Kling, Rob, Value conflicts and social choice in electronic funds transfer systems developments, Communications of the ACM 21(8) (August 1978):642-657.

15. Kraemer, K., Danziger, J., Dutton, W.H., Mood, A., and Kling, R., Future cities survey research design for policy analysis, Socio-economic Planning Sciences 10(5) (October 1976).

16. Lee, Douglas, Requiem for large scale models, Journal of the American Institute of Planners (May 1973):163-178.

17. Lupo, Alan, Colcord, Frank and Fowler, Edmund, Rites of Way: the Politics of Transportation in Boston and the U.S. City, Chapter 12 (Little, Brown and Co., Boston, 1971).

18. Lynch, Thomas, Policy Analysis in Public Policymaking, (Lexington Books, Lexington, Mass.,1975).

19. Long, Norton, The local community as an ecology of games, American Journal of Sociology LXIV (November, 1958):251-261.

20. March, James and Simon, Herbert A., Organizations (John Wiley and Sons, New York, 1958).

21. McLaughlin, R.A. The (mis)use of DP in government agencies, Datamation, 27(7) (July, 1973):147-157.

22. Mihram, G.A. The modeling process, IEEE Trans. Systems, Man and Cybernetics 2(5) (November, 1972):621-629.

23. Pack, Howard and Pack, Janet Rothenberg, Urban land use models: the determinants of adoption and use, Policy Sciences 8 (1977):79-101.

24. Quinn. R., The impacts of a computerized information system on the integration and coordination of human services. Public Administration Review (March/April, 1976):166-174.

25. Simon, Herbert A., Designing organizations for an information rich world, in Greenberger, Martin, Computers, Communications, and the Public Interest (Johns Hopkins University Press, Baltimore, MD, 1971).

26. Simon, Herbert A.. Applying information technology to organizational design, Public Administration Review 33 (May/June, 1973):268-287.

27. Simon, Herbert A., The New Science of Management Decision (Rev. ed.) (Prentice Hall, Englewood Cliffs, NJ, 1976).

28. Sterling, Ted, Information for public policy, Computers and Society 5 (2) (Summer, 1974):2.

29. Strauss, Anselm, Negotiations: Varieties, Contexts, Processes, and Social Order, (Jossey-Bass, San Francisco, 1978).

30. Wilensky, Harold, Organizational Intelligence, (Basic Books, New York, 1967).

Table 1. Planning Data Resources in Municipal Governments (N=42)

	Median	Mean	S.D.
Number of manual files	0.5	1.4	1.8
Number of automated files	3.7	4.0	2.6
Total number of files	5.8	5.5	2.0
Number kinds of data	6.2	5.9	1.4
Number basic reports generated from this data between 1971-1976	9.8	19.2	24.0
Number special requests per month for information from these data sources	7.5	18.0	34.0

Table 2. Frequency Computer-Based Reports Are Sent to Different Officials

Officials:	Never	Less than once a year	About once a year	Several times a year	Monthly or weekly
The chief administrative official (N=30)[a]	6.7	16.7	26.7	30.0	20.0
The chief elected official (N=39)	7.7	17.9	33.3	28.2	12.8
The council (N=32)	2.4	26.8	36.6	24.4	9.8
Departments (N=41)	7.3	26.8	34.1	24.4	7.3

[a]Numbers indicate % of respondents in each role receiving report at a given rate.

Table 3. Frequency that Computer-Based Reports Lead to Programmatic Recommendations

Perception of:	Never led to recommendations	Yes, but none have been accepted	Yes, but some have been accepted
Manager or chief administrative officer (N=34)	21.4	3.6	75.0
Mayor and staff (N=34)	41.2	.0	58.8
Council and staff (N=37)	40.5	2.0	59.5
Planners (N-38)	21.1	2.6	76.3

Table 4. Claims that Computer-Based Reports Lead to New or Clearer Perceptions of Community Problems

Perception of:	No	Yes, but vague or no cases cited	Yes, but in exceptional cases	Yes, generally	Total
Manager or chief administrative officer	26.7	43.3	20.0	10.0	100 (N=30)
Mayor and staff	40.5	27.0	21.6	10.8	100 (N=37)
Council and staff	41.0	20.5	25.6	12.8	100 (N-39)
Planners	17.5	17.5	42.5	22.5	100 (N=40)

Table 5. Computer-Based Reports or Analyses Provide Surprising Results

Perception of:	No	Yes, but vague or no cases cited	Yes, but in exceptional cases	Yes, generally	Total
Manager or chief administrative officer	57	23	20	0	100 (N=30)
Mayor and staff	72	3	22	3	100 (N=36)
Council and staff	67	15	18	0	100 (N=39)
Planners	58	10	28	5	100 (N-40)

Table 6. Computer-Based Reports Used to Legitimize Existing Problems

Used in this way by:	No	Partly a motive	Yes	Yes, cases cited	Total
Manager or chief administrative officer	40	37	7	17	100 (N=30)
Mayor and staff	33	31	3	33	100 (N=37)
Council and staff	36	33	18	13	100 (N=39)
Planners	26	31	3	36	100 (N-40)

Table 7. Computer-Based Reports Used to Gain Publicity for Programs or Policies

Perception of:	No	Yes, but vague or no cases cited	Yes, but in exceptional cases	Yes, generally	Total
Manager or chief administrative officer	40	17	33	10	100 (N=30)
Mayor and staff	47	22	28	3	100 (N=36)
Council and staff	54	10	28	8	100 (N=39)
Planners	38	13	38	13	100 (N=40)

Table 8. Computer-Based Analyses Used to Determine Whether a Policy Will Be Politically Acceptable

Used in this way by:	No	Yes, but vague or no cases cited	Yes, but in exceptional cases	Yes, generally	Total
Manager or chief administrative officer	77	7	10	6	100 (N=30)
Mayor and staff	69	10	10	12	100 (N=36)
Council and staff	77	5	13	5	100 (N=39)
Planners	73	10	13	5	100 (N=40)

Table 9. Correlations between Features of Information Environment and Uses of Computer-Based Reports

	# of data files	Sophistication of reports	# different kinds of data	% of files automated	FY '76 city budget	# of computer-based reports (1971-76)
RECCOMS[a]	.28*	.38*	.19	.10	.20	.16
PERCEPTIONS	.33*	.47***	.25*	.05	-.02	.38***
SURPRISES	.37**	.47***	.32**	.17	.11	.31**
LEGITIMACY	.22	.06	.02	-.09	-.03	.14
PUBLICITY	.41**	.15	.34**	.02	.16	.21*
POL-ACCEPT	.32*	.35**	.32**	.07	.09	.45***

[a]See Figure 1 for description of indices.

*P≤.05
**P≤.01
***P≤.001

Table 10. Power Shifts Attributable to Computer-Based Analyses

Official	Given less influence to	No discernable shift	Given more influence to	Total
Manager or chief administrative officer	3	70	27	100 (N=30)
Mayor and staff	14	68	19	100 (N=37)
Council and staff	20	75	5	100 (N=40)
Departments	10	73	18	100 (N=40)
Data bank custodians	0	68	33	100 (N=40)
Top officials[a]	5	60	35	100 (N=37)

[a]See text for explanation

Table 11. Correlations between Power Shifts and Information System Features

Power shifts:	FY '76 city budget	# of data files	Sophistication of reports	% of files automated
Manager/CAO and staff	-.25	.13	-.08	.23
Mayor and staff	-.15	-.03	-.09	.17
Top officials	-.29*	-.08	-.25*	.25
Council	.03	-.24*	-.18	-.14
Departments	.46***	.34**	.15	.06
Data bank custodians	.29**	.44***	.24*	.30*

*P≤.05
**P≤.01
***P≤.001