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AUTOMATED INFORMATION SYSTEMS AND URBAN DECISION MAKING†

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Abstract—This paper assesses the value of automated information systems for urban decision making and investigates alternative strategies for enhancing the value of this information. It is based on intensive survey and case study data in 40 U.S. cities with populations greater than 50,000. The findings indicate that although automated information systems are attributed significant usefulness by some types of decision makers for certain arrays of decisions, they are not generally useful to most urban decision makers. However, the findings suggest that they might be made more useful through management strategies which stress sensitive integration of these users with the technology.

AN INCREASING awareness of the complexity and interdependence of urban problems has created a need for better information to aid decision making [4, 21]. At the same time, research suggests that decision makers seldom make particularly effective use of available information [6, 7, 25, 27]. As a consequence, much concern has been focused on achieving more effective utilization of available information resources. This concern has contributed to the development and expansion of automated information systems (AIS), which aim to make better information more accessible to decision makers [18, 20].

The benefit of investments in AIS is a matter of considerable debate. First, research suggests that information is often used to serve dominant organizational and political interests rather than to formulate more rational decisions [2, 5, 25]. And it seems unlikely that the new automated information systems will alter these barriers to rational decision making [14]. In fact, automation might extend an organization's capability to use information in ways that reinforce existing structures of influence [19].

Second, even if information sometimes does enhance the rationality of decision making processes, there is considerable disagreement regarding those factors which have promoted the use of such information for decision making. The most prominent alternate explanations suggest that the effective utilization of information is a function of informational content, or the organizational role of decision makers, or the nature of AIS technology, or the organizational environment, or the style of decision makers, or the level of socio-technical integration.

Some view the *content of information* as a primary determinant of its utilization. Decision makers will use information to the degree it is 'powerful'—important, comprehensive, understandable, sophisticated and from a credible source [6]. From this perspective, automated information will be used differentially, depending upon its direct relevance to particular decision makers.

The use of automated information might also be a function of an individual's *organizational role*. On the one hand, computers might alter the flow of information so that higher level officials will get more extensive, less filtered information, which can be used to enhance their control [13, 15, 28]. On the other hand, computer-based information is likely to be most useful to those with the greatest expertise in the use of information and of computer technology. As a consequence, one might predict that technical

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staffs will gain more information benefits than will top managers, who in turn will gain more information benefits than will top executives [9].†

Many view the utilization of information as a function of *technological development*. Automated information systems are expected to increase the availability of better information (that is, higher quality, greater quantity, more manageable) to top decision makers [1, 26, 28]. Some research suggests that urban decision makers find considerable value even in rather unsophisticated computer applications [10]. It is assumed the development of more sophisticated systems should further increase the value of automated information for decision makers [18, 24].

Others view the *organizational environment* as an important determinant of the impact and value of an organization's information system to the organization itself [20]. Generally, the value of an automated information system is expected to be higher in organizations with a managerial climate that is favorable to the use of modern professional management practices and to rational decision making processes; the value of AIS is expected to be lower in a climate favorable to more traditional and more personal decision making processes.

Finally, two sorts of explanations of the usefulness of AIS are based on individual differences among decision makers. One explanation is dependent on the *decision maker's style*. According to this view, automated information will be of most value to a new class of decision makers who are relatively professional, cosmopolite, educated, young and rational in their approach to decision making. In contrast, the old class of urban decision makers is relatively political, local in orientation, less educated, older and intuitive in their approach to decision making [9]. The second explanation posits that the value of automated information will vary across individuals, depending on the degree of *socio-technical integration*—that is, the degree to which users are involved, trained and familiar with the information systems [3, 12, 25].

It is important to understand which of these alternative explanations best account for the value of automated information to urban decision makers. Knowledge of the political, administrative, and individual factors which constrain or enhance the value of automated information to decision makers might aid in the development and implementation of more effective systems. While the literature offers a rich array of theoretical expectations, few have been empirically and systematically examined outside of case studies. This paper examines alternative explanations for the value of automated information for decision making within the context of American local government. Each hypothesis is examined in light of survey data on the usefulness of automated information for urban decision makers. The findings are then discussed in terms of both their theoretical and policy implications.

METHODS AND DATA

Our strategy for an empirical assessment of the factors which contribute to the value of automated information systems is to analyze the perceptions of a variety of key decision makers in the setting of urban local government. First, we specify the level of usefulness attributed to different kinds of automated information in order to evaluate our first hypothesis, which suggests that the value of information is a function of informational content. Second, we examine whether differences in the perceived usefulness of information is contingent upon the organizational role of the decision maker. Given the organizational role hypothesis, there should be important between-role differences in the value attributed to automated information. Third, we assess the remaining hypotheses by examining the relationships between the perceived usefulness of automated information systems and a variety of independent variables which represent the degree of technological development, the organizational environment, the style attributes of the decision makers, and the degree of socio-technical integration.

† Beyond the factor of expertise, the increased workload placed on top managers who receive more information might make automated information less valuable to them than to their staffs because the managers have less time to examine it [22, 23].

The sample

This study is based on data collected in 1976 in 42 U.S. cities with populations greater than 50,000. The cities were selected by a stratified sampling procedure such that all cities in the sample were automated and the cities varied in the sophistication, extensiveness, and organizational arrangements of computing.† Thus, the average sample city is somewhat more automated than the typical U.S. city over 50,000 and the computing environments of these cities have somewhat more variation than would be the case for a random sample of automated cities.

The data

Within each city, data was collected using self-administered questionnaires, field coded questionnaires and case studies of the use of computing by local government officials. This paper relies most heavily on the self-administered questionnaires, which are treated as empirical data on the way in which computing is used by local government officials. The pretested, self-administered questionnaire was completed by about 75 respondents within each city. An 82% response rate was obtained by using extensive follow-ups and personal visits to pick up questionnaires.

In addition to the self-administered questionnaires, the field work involved each of six investigators, including the authors, in case studies in at least eight cities, with field work averaging three person-weeks per city. Each site visit provided rich case study material as well as systematic judgmental ratings. The systematic ratings were derived from a series of structured questionnaires which were completed by the investigators during each site visit and were based upon numerous interviews as well as archival research.

The respondents

Since decision makers for urban governments are many and varied, we chose to focus on seven important roles within local government itself: mayors, councils, top managers, central management staff, department heads, administrators, and analysts. Mayors are the top elected officials in local governments and are often the primary executive policy makers. Elected council members have a legislative policy role but are usually less likely than the mayor to be involved in executive policy making. Top managers (here, the city manager or the chief administrative officer within a mayor-council city) are the focal point for administrative as well as many policy decisions in local government. Central management staff are those professional staff of the mayor and manager who play important analytical and advisory roles. Department heads, such as the police chief and public works director, have key roles in making and administering policy within their organizational domain. Administrators, in our classification, are those personnel who serve department heads in such tasks as budget monitoring, staff supervision, and project management. And analysts serve various decision makers by maintaining and analyzing data generated from city operational files, field surveys, and other sources. The specific kinds of officials classified in these roles are listed in the Appendix.

Limitations

There are several important limitations to our analysis. First, this study is based on a sample of U.S. cities with at least a moderate level of automation. Consequently, we cannot generalize to all current U.S. cities; but, given our sample, we can generalize to some future state which most cities will experience. Second, the effective utilization of information is a controversial issue and its measurement is complex. Our reliance on individual perceptions of the value of automated information is necessary given our sample size and our focus on individual differences. Hopefully, other studies, using more objective measures, will complement our efforts.

† A detailed description of this sampling procedure is contained in [17].

FINDINGS

Informational content

The value of information to decision makers should increase with its importance, comprehensiveness, sophistication, and credibility. Thus, the value of computer-based information systems should vary, given that urban data systems are not able to address a broad range of questions equally. For a variety of political and administrative reasons, the kinds of computer applications adopted by American local governments tend to be heavily oriented to finance and budgeting [8]. Financial data generally is: the most comprehensive within the government, because it is organization-wide in scope; the most credible because it is based on continually audited accounting systems; and the most important because it is undergirds many nonfinancial as well as financial decisions. Fewer applications contain information about the community environment. Environmental data is less potent because: the data usually is fragmented in planning, building and public works files; its meaning is frequently clouded by the sophisticated analysis used to distill and interpret it; and its importance tends to be limited to physical development decisions. Even fewer applications contain information, such as performance data or monitoring data, which can be used directly for management control [8, 16]. Performance data tend to be fragmentary and the least standard of all. It is easily manipulated by those being monitored and easily misinterpreted by those seeking to control; therefore, it lacks credibility for management decisions.

Given these differences in informational content, we expect that urban decision-makers might find that computer-based information systems are the most useful for budgeting, somewhat less useful for policy and decision making, and least useful for managerial control. In general, these expectations are consistent with the ratings of municipal officials. Computer-based data are not rated as 'very useful' overall. But they are rated as relatively more useful for budgeting than for either community decision making or for management control.

Across all officials, computer-based data is rated between 'useful' and 'somewhat useful' for budgeting decisions (Table 1). Automated data is most useful during the annual budget cycle, with one-fourth of all officials viewing computer-based data as very useful during this period. One-fifth or less of all officials rate computer-based data as very useful for day-to-day expenditure decisions, salary questions and negotiations, or cost accounting (Table 1).

Computer-based data is rated 'somewhat useful' for decision making about the community environment (Table 2). Only about one-tenth of all officials rate automated data as very useful for identifying city problems or for providing indicators of community conditions. Less than one in twenty officials believe that automated data is very useful for determining solutions to city problems (Table 2).

Automated data is reported to be least useful for management control. On the average, the officials rate automated data as less than 'somewhat useful' for manpower allocation, setting realistic goals for subordinates, monitoring subordinates, or evaluating subordinates' performance (Table 3). In general, then, the usefulness of automated data does vary as a function of the match between the information content of AIS and the type of decision to which the automated files are applied.

Organizational role

Since different organizational roles are likely to create different information needs and demands, the value of automated files might vary with the role of a decision maker. In fact, the value of computer-based information across roles does tend to reflect the different informational needs and demands of the occupants of varied roles. Managers tend to find computer-based information more useful for budgetary decisions than do other officials (Table 1), consistent with their responsibility for formulating and executing the city budget. Elected officials and analysts tend to attribute more value than other roles to computer-based information for community policy making (Table 2). This per-

Table 1. The value of computer utilization for budgeting decisions by kind of official

Kind of budgetary uses	Level of usefulness	Level of use by: (per cent of role type) Mayors	Councils	Managers	Top staff	Dep't heads	Administrators	Analysts	All officials
		(N = 21)	(N = 87)	(N = 20)	(N = 86)	(N = 321)	(N = 148)	(N = 79)	(N = 762)
Day-to-day expenditure decisions	(1) Not at all useful	22	21	5	22	20	16	18	19
	(2) Somewhat useful	22	41	26	46	38	32	38	37
	(3) Useful	28	22	42	18	24	23	22	23
	(4) Very useful	28	16	26	15	17	28	22	20
	Average score	2.61	2.33	2.89	2.25	2.38	2.63	2.47	2.44
Salary questions and negotiations	(1) Not at all useful	11	15	12	27	36	34	45	31
	(2) Somewhat useful	22	40	24	34	31	25	24	30
	(3) Useful	33	17	24	20	21	24	20	21
	(4) Very useful	33	28	41	18	13	17	10	18
	Average score	2.89	2.58	2.94	2.29	2.11	2.24	1.96	2.25
During the annual budget cycle	(1) Not at all useful	0	0	0	9	6	5	13	7
	(2) Somewhat useful	24	37	5	31	41	32	28	35
	(3) Useful	29	29	45	31	32	38	33	33
	(4) Very useful	48	25	50	28	22	24	27	25
	Average score	3.24	2.70	3.45	2.78	2.68	2.81	2.73	2.76
Providing the real costs of programs and activities	(1) In no cases	20	27	16	24	32	40	42	32
	(2) In a few cases	35	36	47	50	40	27	23	36
	(3) For many cases	40	23	21	20	17	17	20	19
	(4) For nearly all cases	5	14	16	5	11	16	14	12
	Average score	2.30	2.23	2.37	2.07	2.06	2.08	2.07	2.10

Table 2. The value of computer utilization for community policy and decision making by kind of official

Kind of use	Level of usefulness	Level of use by: (per cent of role type) Mayors	Councils	Managers	Top staff	Dep't heads	Administrators	Analysts	All officials
		(N = 18)	(N = 69)	(N = 20)	(N = 68)	(N = 256)	(N = 129)	(N = 79)	(N = 639)
Determining solutions to city problems	(1) Not at all useful	10	14	15	25	37	25	25	28
	(2) Somewhat useful	80	64	75	63	48	53	54	55
	(3) Useful	10	13	10	9	12	19	18	14
	(4) Very useful	0	9	0	3	3	3	3	4
	Average score	2.00	2.16	1.95	1.89	1.81	2.00	1.99	1.93
Identifying city problems	(1) Not at all useful	11	13	5	24	24	22	14	20
	(2) Somewhat useful	72	56	85	57	55	45	49	54
	(3) Useful	17	22	10	12	14	26	22	18
	(4) Very useful	0	9	0	7	7	8	15	8
	Average score	2.06	2.26	2.05	2.03	2.04	2.19	2.38	2.14
Providing indicators of community conditions, such as employment, housing, age or income of residents	(1) Not at all useful	7	10	21	19	38	44	30	30
	(2) Somewhat useful	50	53	63	38	37	38	36	41
	(3) Useful	14	27	5	28	16	12	18	18
	(4) Very useful	29	11	10	15	8	7	16	11
	Average score	2.64	2.39	2.05	2.38	1.96	1.82	2.21	2.10

Table 3. The value of computer utilization for management control by kind of official

Kind of use	Level of use	Level of use by: (per cent of role type) Mayors	Councils	Managers	Top staff	Dep't heads	Administrators	Analysts	All officials
		(N = 78)	(N = 39)	(N = 18)	(N = 59)	(N = 243)	(N = 137)	(N = 65)	(N = 642)
Manpower allocation	(1) Not at all useful	31	41	28	49	43	35	32	40
	(2) Somewhat useful	62	35	61	32	38	34	45	38
	(3) Useful	6	18	6	16	14	20	18	16
	(4) Very useful	0	6	6	4	5	12	5	6
	Average score	1.75	1.89	1.98	1.74	1.80	2.08	1.95	1.88
Setting realistic goals for units on individuals you supervise	(1) Not at all	39	30	22	41	33	35	38	35
	(2) In a few cases	56	49	72	34	50	46	42	47
	(3) In many cases	6	17	6	22	15	17	20	16
	(4) In nearly all cases	0	3	0	3	2	2	0	2
	Average score	1.67	1.93	1.83	1.88	1.86	1.86	1.82	1.86
Increased your ability to control staff and units under your responsibility	(1) Not at all	30	36	10	44	29	27	41	32
	(2) Somewhat	70	52	80	53	64	57	56	60
	(3) To a large extent	0	12	10	3	8	16	3	9
	Average score	1.70	1.76	2.00	1.59	1.79	1.88	1.62	1.77
Provides information about the performance of your subordinates	(1) In no cases	18	35	33	56	40	29	38	38
	(2) In a few cases	73	35	56	38	44	43	44	43
	(3) In many cases	9	27	11	4	14	24	16	16
	(4) In nearly all cases	0	2	0	2	2	4	2	3
	Average score	1.91	1.96	1.78	1.52	1.78	2.04	1.82	1.84

ception reflects the broad policy making perspective of the mayor and council and the importance of community-based data (e.g. data on land use and population) to analysts in meeting reporting requirements, preparing grant proposals, and developing planning documents. And administrators find computer-based data more useful for management control than do other officials (Table 3). This assessment is consistent with the particular need of department heads and higher level officials to utilize information concerning interdepartmental, inter-governmental and community matters as opposed to intradepartmental management—the job of administrators.

Table 4. Differences by role in the usefulness of automated information systems index[a]

Role of decision maker	Average index score for usefulness of AIS	Standard deviation	(N)
Managers	0.22	0.40	(19)
Mayors	0.16	0.58	(20)
Council members	0.11	0.75	(67)
Administrators	0.07	0.66	(135)
Analysts	−0.02	0.61	(69)
Department heads	−0.06	0.60	(275)
Top staff	−0.06	0.65	(72)
All officials	0.00	0.63	(657)

[a] Role differences are not statistically significant.

However, the similarities among officials in the perceived value of computer-based information are more striking than the differences. This is reflected in the data in Tables 1–3, but is more clearly summarized in Table 4, which lists an average index score for each type of role's rating of the usefulness of automated information systems for budgetary decisions, community policy decisions, and management control.† Interestingly, managers and elected officials tend to attribute more utility to computer-based information than do other professional personnel such as department heads and top staff. But, the differences among these average scores are small and are not statistically significant.

In short, the organizational role of decision makers is not a critical determinant of the value attributed to automated information. There is often more variation within a role-type than between different roles. Yet role is not irrelevant. There is some support for our expectations that AIS provide information of more value to higher level officials. And, more generally, the perceived value of computer-based information tends to reflect the varied information needs of different decision makers.

Technological development

The technological development hypothesis suggests that computer-based information will be more useful in organizations with more highly developed AIS technology. The development of AIS technology in the 42 cities is indicated by measures of the number of automated data banks, the number of operational data systems, and the sophistication of computing at the local government's computer installation (Appendix). According to this hypothesis, officials in cities with more data banks, more operational systems and greater computing sophistication should rate computer-based information as more useful than do officials in less technologically developed sites. However, this hypothesis is not supported. Officials in highly developed cities are neither more nor less likely to perceive computer-based information as more useful (Table 5A).

† The standard scores for every item in Tables 1–3 were averaged for each respondent to yield a summary index of the usefulness of automated information systems (AIS) in the city.

Table 5. Pearson correlation between value of AIS and selected independent variables, $N = 621$

Independent variables	Usefulness of AIS index
A. *Technological development*	
Number of automated data banks	0.01
Number of operational data systems	−0.00
Sophistication of computing	−0.02
B. *Organizational environment*	
City size	−0.01
City manager form	0.10*
Professional management practices	0.08*
Non-Partisanship	−0.02
C. *Style of decision maker*	
Professionalism	0.12*
Cosmopolite	0.07*
Education	0.11*
Age	−0.04
Job experience	−0.04
Intuitive decision orientation	−0.19*
D. *Socio-technical integration*	
Computer utilization	0.32*
Years of computing experience	0.13*
EDP training	0.16*
Interest in computing	0.30*
Involvement in design	0.18*
Contact with data processing personnel	0.06
Use of experts	0.22*

* $P < 0.05$.

Organizational environment

The organizational environment hypothesis posits that computer-based information will be judged more useful by government actors in cities with organizational climates that are more favourable to professional management and rational decision making. The organizational climate of the 42 cities is indicated by measures of the city's size, of the use of the city-manager form of government, of the use of professional management practices, and of political partisanship (Appendix). The organizational environment hypothesis suggests that officials in the smaller, reformed, professional and nonpartisan cities will make greater use of computer-based data and, as a consequence, will attribute greater utility to such data. This hypothesis is weakly supported, since there is a tendency for computer-based data to be rated as somewhat more useful by government officials in council manager cities and in cities with a greater use of professional management practices (Table 5B). City size and political partisanship have virtually no systematic relationship with the usefulness attributed to AIS.

Decision maker's style

The decision style hypothesis suggests that computer-based information will be judged more useful by those governmental actors who are more professional, cosmopolite, more educated, younger, less tenured, and characterized by a rational (vs. intuitive) decision style—in short, who are the 'new' urban decision makers. This hypothesis receives some support in the data, because several of these characteristics of individual decision makers are weakly associated with the usefulness they attribute to automated information. Specifically, officials who are more professional, cosmopolite, educated, and less intuitive tend to rate computer-based information as more useful (Table 5C).

Socio-technical integration

The socio-technical integration hypothesis suggests that the value to decision makers of a 'high' technology like automated information systems is dependent on the degree to which those individuals have been involved with, trained about, and linked to the

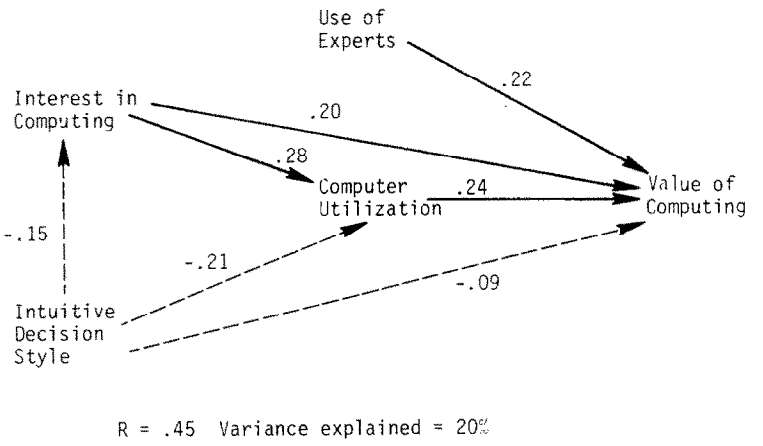

Fig. 1. Path model for value of computing showing significant paths among study variables.

technological system. The socio-technical integration of actors with the automated information systems in the 42 cities is indicated by the individual's degree of computer utilization, years of experience with computing, amount of training in computing and electronic data processing, interest in computing, involvement in the design of computer applications, contact with data processing personnel, and use of computing experts for the analysis and interpretation of data (Appendix). Generally, the expectations about socio-technical integration are more strongly supported than any alternative explanation of the value of computer-based information. Individuals attributing greater usefulness to AIS tend to have a higher level of computer utilization, more experience with computing, more EDP training, more interest in computing, more involvement in design, and they make greater use of computer experts (Table 5D).

The importance of socio-technical integration is further supported by multiple regression analysis. Such analysis indicates that only four variables from Table 5 have a statistically independent direct association with the usefulness of automated information systems index.† Three of these four variables are aspects of socio-technical integration, and the fourth variable is the decision style of the decision maker. The path analysis in Figure 1 reveals that the four variables explain about 20% of the variance in the usefulness of AIS index. Moreover, the figure suggests two interesting 'routes' for enhancing the value of computer-based information to urban decision makers.

First, the use of an expert as an integrating mechanism appears to be a fruitful means to enhance the value of available information resources. This is indicated by a direct relationship between the use of experts and the perceived value of computing. The second route involves a more complex network of variables which represent the individual's relationship to the computing milieu. This route suggests that the active use of computing by an individual is promoted by the individual's interest in computing and by the individual's tendency to employ a rational rather than an intuitive decision style (Fig. 1). If one's objective is to increase the value of computing to urban decision makers, one must involve them in the use of computing, stimulate their interest in the technology, and promote their utilization of systematic information in decision making. Each of these aims concerns an aspect of socio-technical integration. Therefore, it is important to identify those factors which might lead to increased computer utilization, interest, and rational decision making.

Computer utilization is best predicted by other aspects of socio-technical integration: training in EDP, interest in computing, and involvement in the design of computer applications (Table 6). As Fig. 1 also demonstrates, intuitive decision making detracts

† Path coefficients are significant at about the 0.05 level based on the common convention of beta's being at least twice their standard errors.

Table 6. Correlations and path coefficients for computer utilization

Dependent variable: Computer utilization			
Independent variables	Zero-order correlation	Path coefficient	Variance explained
EDP training	0.36	0.20	13%
Interest in computing	0.32	0.18	5%
Intuitive decision style	−0.25	−0.17	4%
Number of operational data systems	0.20	0.15	2%
Involvement in design	0.33	0.17	2%

R = 0.51. Variance explained = 26%.

from one's utilization of computing. Finally, technological development appears to have some relationship with computer use, since use is greater in cities with more numerous operational data systems (Table 6).

Interest in computing also is predicted well by certain socio-technical integration strategies, particularly the involvement in the design of computer applications and also by training in EDP (Table 7). It is also evident that individuals with greater interest in computing tend to be more cosmopolite, more professional and more rational in their decision style (Table 7).

Finally, the *decision making orientation* of an individual, unlike computer utilization and interest, is not strongly associated with any other variables employed in this analysis. Thus, such orientations might be difficult to shape through management strategies other than recruitment practices.

SUMMARY AND DISCUSSION

This study supports the findings of other studies which note the quite low levels of utilization of systematic information in governmental decision making. Specifically, we have shown that most urban decision makers attribute only marginal usefulness to automated information. However, this study has identified important variation among urban decision makers in the utilization and perceived value of automated information for decision making. Furthermore, the findings have indicated that there are specific strategies which might enhance the value attributed to automated information by urban decision makers.

The usefulness of automated information is shaped by the degree an individual decision maker has been 'integrated' with the technology. In particular, the value attributed to automated information by urban decision makers tends to increase where the decision maker utilizes such information more extensively, is interested in computing, is involved in the design of automated systems, and makes greater use of AIS experts.

While socio-technical integration appears to be the most important explanation of the value attributed to automated data, other explanations are also supported. First, the content of automated information is related to its usefulness to different officials. A considerable number of the automated information systems in city governments center in financial data, which is of prime benefit to those concerned with the allocation and

Table 7. Correlations and path coefficients for interest in computing

Dependent variable: Interest in computing			
Independent variables	Zero-order correlation	Path coefficient	Variance explained
Involvement in design	0.33	0.25	11%
Cosmopolite	0.21	0.18	4%
EDP training	0.28	0.14	2%
Professionalism	0.19	0.12	2%
Intuitive decision style	−0.15	−0.09	1%

R = 0.44. Variance explained = 20%.

control of resources. Second, the value of automated information varies with the organizational role of an individual. While higher-level decision makers tend to attribute more value to automated information, other officials also find computer-based information useful when it corresponds to their specific areas of responsibility. Also, the decision style of an individual tends to be important in two respects. First, one's decision making orientation affects the perceived value of automated information. Second, a professional and cosmopolite decision maker is more likely to have an interest in computing, and this, in turn, promotes the individual's utilization and assessment of the value of automated information systems.

There is little support for other alternative explanations for the value attributed to AIS. Technological development does not seem to enhance the value of automated information as much as some research suggests. This might be due in part to the fact that much current utilization of computing for urban decision making involves the pragmatic use of rather unsophisticated computer applications [10, 11]. The amount of automated information is important to the extent of its utilization (Table 6), but the sophistication of AIS technology is not. Likewise, the nature of the decision makers' organizational environment in general is not an important determinant of the value they attribute to automated information. However, two characteristics of reform governments—the city manager form of government and use of professional management practices—do associate positively with the usefulness of AIS. This finding is consistent with earlier studies [10, 11, 18] which indicate that reformed governments have greater management use of computing and greater perceived benefits from that usage.

These findings have implications for the management of automated information systems in local governments and, possibly, in other organizations. Specifically, the value of automated information for decision making can be enhanced by management policies which promote the integration of users with the technology. Socio-technical integration might be approached by involving users in the design of information systems, creating extensive opportunities for training and experience with the technology, providing information analysts to assist decision makers, and recruiting more professionally oriented, rational decision makers to key organizational positions. Collectively, these policies might substantially increase the utilization and usefulness of information systems not only to individual decision makers, but to the organization as a whole.

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APPENDIX—Description of measures

I. Role of decision makers

A. *Mayors.* All responding mayors.
B. *Council member.* A sample of elected councillors.
C. *Managers.* The chief appointed official in the city.
D. *Top staff.* Sample includes staff of the mayor and manager.
E. *Department heads.* Ten department heads were sampled in each city.
F. *Administrators.* Classified in this group are police manpower allocation supervisors, traffic ticket directors, heads of budget reporting units, heads of budget monitoring units, and division heads within a variety of operating departments.
G. *Analysts.* Classified in this group are police manpower allocation analysts, budget analysts, planning staff and data base custodians.

II. Value of automated information systems

A. *Usefulness index*

This index is the average summated standard score (mean of zero, standard deviation of one) of all individual items composing Tables 1–3.

III. Independent variables

A. *Technological development*

1. *Number of automated data banks.* Number of automated data banks coded from case study observations. 'Data banks' (1) contain environmental data; (2) the data are aggregated for analysis yielding statistical descriptions; (3) the data are intended for and/or receive multiple uses; (4) the data are only updated periodically (several months or longer) and (5) the data may be merged from several files.

2. *Number of operational data systems.* Count of total number of operational computer applications automated by the city in 1976.

3. *Sophistication of computing.* A single factor score based on the following variables along with their factor loading: Hardware sophistication measured by total core capacity (0.76); and sophistication of the operating system (0.82); software sophistication measured by the number of automated applications (0.86); number of on-line applications (0.82); range of application types automated[a] (0.70); use of data base management system (0.73); capability for data linkage[b] (0.66); and staff sophistication measured by the number of skilled EDP staff (0.88); and technical skill range of EDP staff (0.81).

B. *Organizational environment*

1. *City size.* 1975 total population.

2. *City manager form.* Coded (1) if city has a city-manager form of government and (0) if any other form.

3. *Professional management practices.* Index which gives the city one point for each of the following: (a) written objectives for programs and services; (b) performance measures; (c) cost accounting procedures; and (d) team management.

4. *Non-Partisanship.* Response for city to: "Can political parties appear on your local election ballots?" Coded: major parties can appear (1); only local parties (2); no parties or groups (3).

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[a] Types include: record-keeping, record restructuring, record-searching, calculating-printing, process control and sophisticated analytics [17].

[b] Use of geo-based keys and standard identifiers.

C. *Background of decision maker*

1. *Professionalism.* Response to: "When did you last take a professional course related to your work?" Coded: never (1); more than 5 years ago (2); 3–5 years ago (3); 1–2 years ago (4); within the last year (5).

2. *Cosmopolite.* Response to: "Are you currently a member of a regional, state or national organization or association for your profession or occupation, other than a union?" Coded: no (1); yes, but never attend meetings (2); yes, and attend meetings (3).

3. *Education.* Response to: "What is the highest educational level you have completed?" Coded: some high school (1); high school degree (2); some college (3); college degree (4); some graduate or professional school (5); graduate or professional degree beyond bachelors (6).

4. *Age.* Age in years.

5. *Job experience.* Response to: "For how many years have you worked in this department or agency?" A broader question concerning years of experience in one's present kind of job yields nearly identical findings.

6. *Intuitive decision style.* Factor score based on the second factor from the following factor matrix:

	Factor[a]	
	I Rational Decision Style	II Intuitive Decision Style
Have personal observation and experience been more important to you than computer-based information in identifying city problems?	−0.19	0.81
Have personal observation and experience been more important to you than computer-based information in determining solutions to city problems?	−0.14	0.90
How useful to you has computer-based information been in identifying city problems?	0.78	−0.19
How useful to you has computer-based information been in determining solutions to city problems?	0.80	0.20
How useful to you has computer-based information been in providing indicators of community conditions, such as employment, housing, age or income or residents?	0.50	0.05

[a] Principal component factor analysis with varimax rotation.

D. *Socio-technical design*

1. *Computer utilization.* Response to question: "In summary, during the course of a year, do you use computers or computer-based information in your job?" Coded: never (1); occasionally (2); often (3); very often (4).

2. *Years of computing experience.* Response to: "For how many years have you been directly involved in using computers or computer-generated information?"

3. *DP training.* Response to: "Have you been instructed in the procedures of using the computer to do your job?" Coded: no (1); yes, less than 5 hr (2); yes, between 5–10 hr (3); yes, over 10 yr (4).

4. *Interest in computing.* Response to: "How interested are you in computers and data processing?" Coded: not interested (1); somewhat interested (2); interested (3); very interested (4).

5. *Involvement in design.* Response to: "Have you worked as a member of a group designing a computer application for your department?" Coded: never (1); on *some* computer application (2); on *almost all* computer applications (3).

6. *Contact with data processing personnel.* Response to: "On your job do you have contact with data processing personnel?" Coded: no (1); yes (2).

7. *Use of experts.* Response to: "How much do you rely on experts or technically trained individuals to interpret and summarize computer-based information?" Coded: no computer-based information (0); not at all (1); somewhat (2); to a large extent (3).