MOTIVATIONS TO INNOVATE IN PUBLIC ORGANIZATIONS

James L. Perry
School of Public and Environmental Affairs
Indiana University, Bloomington

Kenneth L. Kraemer
Public Policy Research Organization
and Graduate School of Management
University of California, Irvine

Debora Dunkle
Public Policy Research Organization
University of California, Irvine

John King
Department of Information and Computer Science
and Graduate School of Management
University of California, Irvine

June 30, 1992

Working Paper #URB-026

This is a revised version of a paper presented at the National Public Management Research Conference, The Maxwell School of Citizenship and Public Affairs, Syracuse University, Syracuse, New York, September 20, 1991. The authors would like to thank David Anderson and John Rohrbaugh for their helpful comments on an earlier draft.

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Motivation is a central issue in many theories of the behavior of public officials (see, for example, Downs, 1967; Ostrom and Ostrom, 1971; Perry and Wise, 1990; Miller, 1991). A key controversy surrounding efforts to model the motivations of public officials is the extent to which their behavior is driven by self interest in contrast to altruism (Mansbridge, 1990). Some theories argue that the behavior of public officials can be understood as narrowly self interested. Others contend that much of observed behavior in the public realm can be understood only if citizens and policymakers are motivated by altruistic considerations.

This chapter investigates empirically the motivations of public officials in a particular context--the decision to innovate. Although the motivations of public officials appear to be important for understanding the choices that are made about innovations (Nelson and Winter, l977; 1982), researchers have been content to infer motives from innovation decisions rather than measure them more directly. This study examines a number of motives that have been identified as important in the innovation adoption process and that have been associated with varying degrees of self interest. It uses a policy capturing methodology to identify the underlying structure of these motives and how they differ among local government officials making decisions about computer applications.

LITERATURE REVIEW

Research on innovations has occupied the attention of large numbers of social scientists in many disciplines. Everett Rogers aptly notes in the preface to the third edition of Diffusion of Innovations (1983, p. xv) that "there is almost no other field of behavior science that represents more effort by more scholars in more nations." The focus of this study is on one important dimension of the innovation literature, the motivation to innovate. Nelson and Winter (1977;

1982) suggest that the motivation to innovate is an important component of the innovation process. They argue that innovation is purposive, but inherently stochastic. They use the concept of selection environment to organize the different factors that determine how relative use of different technologies changes over time. In nonmarket settings, the selection environment essentially consists of three primary elements: the motivations of organizations in the sector, the ways in which consumers (usually voters) and financers (usually legislators) constrain agency behavior, and the mechanisms of information and value sharing among organizations in the investment and imitation process.

Nelson and Winter (1977) suggest that the selection environment in nonmarket settings is quite different from market settings. One reason is that the separation of interests between firms and customers is not as sharply defined (Nelson and Winter, 1977). This, in turn, reduces the applicability of competition among providers as a control mechanism and the utility of profit as a motivator. If profit does not motivate organizations in the nonmarket sector, then what does?

Feller (1980; 1981) distinguishes between two potential motivations. One involves the extent to which an innovation increases ***production efficiency***, that is, reduces the cost for producing a given level of output. A contrasting motivation is ***service efficiency***, where an innovation is adopted because it augments or enhances services without reducing costs and potentially increasing them. The latter motivation is grounded in Niskanen's (1971) model of bureaucratic behavior and Yin and colleagues' (1976) bureaucratic self interest model. Feller's contention is that bureaucrats prefer service augmenting innovations because they increase agency budgets to which bureaucratic emoluments are positively correlated, expand the clientele served by an agency, and obscure agency production costs by simultaneously altering input mixes and services provided. Feller concludes that while public bureaucracies may be more risk averse, the innovations they adopt may improve service rather than efficiency.

Others have implied that some innovations involve tradeoffs between citizen interests and bureaucratic control. Summarizing research on computing in federal, state and local governments, Kraemer and Kling (1985) identify two models for adoption of computer systems.

In the rationalist model, computer technology serves citizens by providing more services, more equitably. The reinforcement politics model depicts computers as tools for the most powerful interests. According to this model, computerized systems are used primarily for routine operations and overhead control. Thus, another dimension of the motivation to innovate involves ***decision making and control***.

Kraemer and Kling agree with Feller that the adoption of technologies is not driven primarily by efficiency considerations, but they suggest that service efficiency is less important than reinforcing existing power arrangements. Hannaway's (1987) research on bureaucratic growth, which looked at central office managers in a large school district, provides further support for the contention that production efficiency is secondary and control is primary as a motivation to innovate. Hannaway contends that growth is the result of managers' attention to more immediate concerns, rather than maximizing utility. She argues that the manager is "trying to get a nearly boundless job done without understanding clearly either the means-end relationships involved or the meaning of much of the feedback received, and without incurring much personal risk" (Hannaway, 1987, p. 129).

Mohr (1969) identifies yet a fourth potential motivation to innovate in public organizations, ***professional status***. In a study of health organizations, Mohr argued that large departments chose to adopt a large number of programs rather than a smaller number of programs supported at higher levels. He inferred that the choice reflected status-motivated innovation. Mohr reasoned that the pattern of adoptions reflected "innovation motivated largely by a desire for prestige and professional status on the part of the health officer and other health department staff members" (p. 122).

A fifth motivation to innovate may reside with the newness of a process or product, that is, the symbolism of ***innovation***. Individuals may favor a new product or process because it is new, and simply represents a new way of doing things. An innovation may appeal to preferences for "things modern" or "change for the sake of change."

Hypotheses

Because of their different roles in the hierarchy and their different professional orientations, we expect that different managers will select applications that reflect different mixes of values. Although all managers might hold certain values in common, we would expect that top managers would be more interested in applications that enhance decision making and control since they are concerned with the overall direction of the organization. Similarly, we would expect that department managers would be especially concerned with applications that promote productivity and service enhancement because of their responsibility for the day to day operations of government and with service delivery to citizens. Finally, we expect that information systems managers would be most concerned with the extent to which applications were innovative and enhanced professionalism because their own professional status would be enhanced by leading-edge computer applications.

METHODS

Social judgment analysis (Hammond, McClelland, and Mumpower, 1980) was applied to determine the underlying criteria used by managers in decisions about computer applications.[1] For social judgment analysis, a decision (referred to as 'judgment') is a function of the relative *weight* an individual assigns to the dimensions of the issue under consideration, the *form* of the relationship of the dimensions (referred to as 'cues') to the final decision, and the method used to *organize* these relationships. To measure decisions involves three tasks: (1) identification of the decision to be made; (2) identification of the relevant dimensions for making the decision; and (3) creation of profiles of decisions in which the dimensions are varied, i.e., different mixes (presence, absence, positive, negative) of the dimensions are presented. In this research, the task set for the manager was to provide an overall assessment of the likelihood that a specific software application would be selected for use given a summary of the effects that five criteria would have if the application was implemented.

Based upon the review of literature about the motivation to innovate in public organizations, the five criteria for evaluating the choice of an application were productivity, service enhancement, decision making and control, professionalism, and innovation. They were described to the respondents in the following ways[2]:

> *Productivity*, that is, the extent to which an application reduces the resources required to perform a service or increases the services that can be provided with the same resources. An application that reduces staff or reduces cost would receive a high value on this criterion. In contrast, an application that requires additional staff or increases cost would receive a low value.
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> *Service Enhancement*, that is, the extent to which an application improves an operating department's ability to meet the needs of its clients. An application that makes it possible for departments to speed up service delivery, better target services to clients' needs, or eases interaction with clients would receive a high value on this criterion. In contrast, an application that increases the complexity of service delivery or increases the difficulty of interaction with clients would receive a low value on this criterion.
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> *Decision Making and Control*, that is, the extent to which an application aids decision making and control over government operations. An application that provides relevant information for decision making and monitors operational performance would receive a high score. An application that produces no information for decision making or performance monitoring would receive a low score.
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> *Professionalism*, that is, the extent to which an application enhances professional recognition for you or your organization. An application that brings substantial publicity

and prestige at the local, regional or national level would receive a high score. An application that does not generate any publicity or prestige would receive a low score.

Innovation, that is, the extent to which an application promises a new and better way of doing things but involves some risk. A highly promising but risky application would receive a high value. A less promising, low risk application would receive a low value.

A total of 25 hypothetical software packages were provided for respondents with the five criteria varying for each software package. Respondents were asked to provide an overall assessment of making a purchase given the relative importance they assigned to each of the criteria. For example, for one software profile, the respondent was asked to rate from 1 (low probability of purchase) to 10 (high probability of purchase) whether a software application would be selected for use that had the following assessment: high on productivity (10) and innovation (9), low on professionalism (1) and decision making and control (2) and 'neutral' on service enhancement (5).

In all, respondents were provided with 25 profiles with five 'cues' for each case. For each profile, the respondent assigned an overall rating from 1 (low likelihood of purchase) to 10 (high likelihood of purchase). For each respondent, then, we have a total of 25 decisions made regarding applications and a total of 25 weights for each of the 5 criteria.

Multiple linear regression analysis was used to obtain the judgment descriptions. It was assumed that the form of the judgment was an additive, linear function. The overall assessment of the likelihood of purchase of the software (decision) is the dependent variable and the pre-assigned weighting scores (cues) for the criteria are the independent variables. The beta weights obtained from the regression analysis reflect the relative weighting applied to each of the 5 cues. The multiple R provides an indication of how well the regression model can predict the observed decisions.

This analysis uses data obtained during an intensive study of computer use in 46 cities and one county during 1988. Investigators spent one to two person weeks conducting field research in each location, gathering data about local conditions, political and administrative systems, and information systems. Data collection methods included semi-structured interviews with top management, IS professionals, and department personnel. In addition, user surveys were distributed to approximately 5,000 employees. The user survey focused on questions regarding the 25 profiles of applications and the uses and impacts of computerization. This article uses only the responses of the 464 top managers (mayor or deputy mayor, city manager or assistant city manager), department heads, and IS managers who responded to the values section of the user questionnaire. Response rates to the value section of the questionnaire varied by role type. Seventy five percent of top managers, 68 percent of department heads, and 85 percent of IS managers responded.

Because it was expected that not all respondents would be consistent in their judgments or would understand the task at hand, multiple linear regression analysis of the 25 judgments was performed for each respondent. For the subsequent analyses, we accepted a multiple R of .80 or better as sufficient evidence of consistency of response at the individual level. Using this criterion, a total of 43 of 464 respondents were considered to be too inconsistent in responding to the 25 profiles and were dropped from further analysis. Our sample, therefore, consists of a total of 421 respondents or, more precisely, a total of 10,525 judgments.

An inspection of the beta weights produced for each respondent indicated that it was highly probable that distinct groups of individuals (sharing similar function forms) could be identified. Three steps were involved in identifying the sub-groups. First, a principal components factor analysis with varimax rotation was performed on the 25 judgments. The result was a six-factor solution (eigenvalue 1.0 or greater) which accounted for 65.5% of the variance in the 25 judgments. Factor scores were generated. Second, cluster analysis of the 6 factor scores using Ward's minimum variance method was performed in order to identify the sub-

groups. The results indicated that a 4-cluster solution was optimal[3]. Finally, multiple linear regression analysis on the individual judgments was performed for each of the 4 clusters to obtain the relative weights and organization of the group's decision.

RESULTS

Regression analyses of the individual judgments were performed for (1) all managers, (2) top management, (3) department and division heads (excluding information system management), and (4) information system managers. These results are shown in Table 1.

Table 1 here

All Managers

The results indicate that, across the entire sample, productivity, i.e., the extent to which an application reduces the resources required to perform a service or increases the services that can be provided with the same resources, and service enhancement, i.e., the extent to which an application improves an operating department's ability to meet the needs of its clients, were weighted fairly equally as criteria utilized for selection of applications. On the other hand, such criteria as the innovativeness of the application, namely, the extent to which an application promises a new and better way of doing things, but involves some risk, and professionalism, namely the extent to which an application enhances professional recognition for the managers' organization, were not used as criteria for the selection of software packages. The near zero beta weights indicate that such cues had no impact on the decision making process. The extent to which an application aids decision making and control over government operations, while not entirely discounted in selection, was weighted substantially less in the final decision than productivity and service enhancement.

Top Management. Top management does not evidence a different pattern from that of all managers. Productivity and service enhancement were heavily weighted in the decisions regarding application selection, with productivity of moderately greater importance than service enhancement.

Information System (IS) Management. IS management also placed heavy emphasis on productivity considerations in their decision making. Interestingly, a greater proportion of their software decision making was influenced by productivity considerations than top management and less emphasis was placed on innovative.

Other Department/Division Heads. The other department/division managers showed a somewhat different pattern from top management and IS management. They assigned almost equal weight to productivity and service enhancement considerations.

Sub-Groups

The analysis above indicated that judgment patterns were very consistent across role types. Any variations in patterns of decision making cross-cut roles in local governments. To identify variations, cluster analysis was performed.

The cluster analysis, presented in Table 2, indicated that there were four sub-groups among managers. Group 1, which we call the *Productivity and Service Enhancement Dominants*, was motivated equally by considerations of efficiency and effectiveness. Other values, including bureaucratic control, are given a low level of importance. Group 2, the *Organization Controllers*, were as concerned about the implications of the innovation for organizational control as they were about its consequences for efficiency and effectiveness. This cluster of managers was the largest in the sample. Group 3, *Efficiency Dominants*, were driven, above all other factors, by the productivity implications of an innovation. Only a relatively small proportion of the sample fell into this group. Group 4, the *Risk Avoiders*, sought not only to maximize efficiency, effectiveness, and control, but also to avoid innovations that might be construed as risky and new.

Table 2 here

An assessment of differences among members of the four groups is provided in Tables 3 and 4. Analyses of variance were computed for a series of government environment, information services, individual, and attitudinal characteristics on which the groups might be expected to differ. As Table 3 indicates, none of the group means were significantly different at the .05 level for the government environment, information services, and individual characteristics. In contrast, Table 4 shows that significant differences between the groups were found for each of the measures of attitudes toward computing. In general, Group 1 individuals tend to be the most experienced with computing and have the strongest beliefs in the promise of the technology to alter both productivity and service delivery in positive ways. The Group 2 and Group 3 managers tend to be in the middle on these measures, while Group 4 managers--the risk avoiders--have generally less understanding of what computers can do and considerably less confidence in positive payoffs from their use. The differences across attitudes reported in Table 4 could be ascribed to a common methods problem. However, the different ways in which the social judgments (rating of hypothetical packages) and attitudes toward computing were derived (Likert scales) make it unlikely that common methods account for this result.

Tables 3 & 4 Here

DISCUSSION

The analysis revealed that production efficiency and service enhancement were the dominant factors influencing choices about computer applications. The weightings of criteria in the cluster analysis indicated, however, that few of the public managers were motivated solely by

productivity considerations. Instead, most managers were motivated by productivity *and* service enhancement, about equally. If judgments driven by service enhancement are construed as self-interested, then the results indicate that most managers act with decidedly mixed motives.

We had expected that different managers would select applications based upon different mixes of values. In particular, we had expected top managers to select applications for decision making and control, department managers to select applications for productivity and service enhancement, and information systems managers to select applications for innovation and professionalism. Only the department managers turned out as expected. The broad agreement on criteria across organizational roles indicated that the values associated with computing innovations were widely shared among managers at all levels.

It was also clear that innovation and professionalism were not important factors in the managers' decisions about computing at any level. Indeed, among *risk avoiders* there was an aversion to newness as a consideration in the selection of computing packages.

What factors account for differences in the values managers employ when choosing innovations? Although we identified four distinctive clusters associated with the decision criteria managers emphasize when choosing innovations, many of the background factors that might account for such differences were not significant. The only variables that discriminated among the groups were measures of attitudes toward computing. The results suggest that the most powerful determinant of motivation may be an individual's experiences related to the technology. For instance, the results clearly indicate that most managers were not risk averse but a small subset of the population was prone to reject risky innovations. The risk aversion of this subset of managers, like the other subsets who responded to different cues such as productivity or control, may have been a product of social learning in which responsiveness to particular cues is a function of past experiences in similar situations. The lack of significance of variables such as organizational role and context suggests that motivations are not determined purely or even primarily by environmental factors. They are instead the result of more complex interactions among the environment, experience, and personality. These relationships merit further research

using other methodologies that are capable of identifying such interactions.

If motivations to innovate are a product of a social learning processes, would we find similar motivational patterns for other technologies? Quite possibly not. Computing is a relatively well-known, managerial technology that has grown incrementally in most public organizations. If motivations are a function of social learning, we would expect variations across different technologies. A new, discrete, service-specific technology could conceivably produce radically different motivational patterns. This conjecture also deserves further research.

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Table 1
Relative Weights of Five Cues

	All Managers (N=421)		Top Managers (N=41)		IS Managers (N=76)		Department Heads (N=304)	
Cues	Beta	Standardized Beta*	Beta	Standardized Beta*	Beta	Standardized Beta*	Beta	Standardized Beta*
Productivity	.51	36%	.55	38%	.55	41%	.49	34%
Service Enhancement	.45	32%	.44	30%	.44	32%	.46	32%
Decision Making & Control	.28	20%	.30	21%	.27	20%	.28	19%
Innovation	.10	7%	.12	8%	.06	4%	.11	8%
Professionalism	.09	5%	.04	3%	.04	3%	.10	7%
Multiple R (agreement measure)	.75		.79		.76		.70	
Total judgements in set	10,525		1,025		1,900		7,600	

* Standardized beta calculated as ((beta/sum of betas) x 100)

TABLE 2

Relative Weights of Five Cues: Four Sub-Groups[1]

Cue	Beta	Standardized Beta
GROUP 1 (N = 231) *Productivity and Service Enhancement Dominants*		
Service Enhancement	**.51**	**33%**
Productivity	**.49**	**32%**
Decision Making & Control	.22	14%
Innovation	.18	12%
Professionalism	.12	8%
Multiple R = .78 (agreement measure)		
GROUP 2 (N = 75) *Organization Controllers*		
Service Enhancement	**.55**	**37%**
Productivity	**.46**	**31%**
Decision Making & Control	**.35**	**24%**
Innovation	.08	6%
Professionalism	.03	2%
Multiple R = .80 (agreement measure)		
GROUP 3 (N = 74) *Efficiency Dominants*		
Productivity	**.66**	**46%**
Service Enhancement	.33	23%
Decision Making & Control	.29	20%
Innovation	.07	5%
Professionalism	.07	5%
Multiple R = .80 (agreement measure)		
GROUP 4 (N = 40) *Risk Avoiders*		
Productivity	**.53**	**35%**
Service Enhancement	**.43**	**29%**
Decision Making & Control	**.30**	**20%**
Innovation	**-.18**	**12%**
Professionalism	.04	3%
Multiple R = .76 (agreement measure)		

[1] Clusters based on Ward's minimum variance method (squared Euclidean distances)

TABLE 3

Analysis of Variance of Groups for Environment, Service Characteristics, and Individual Variables

	Group I	Group II	Group III	Group IV	F-Ratio	F-Sig.
Government Environment						
Population of city, 1980	314,547	246,971	395,239	294,174	2.43	.065
Total operating expenditures in millions	$394.7	$263.0	$450.4	$364.7	1.95	.121
Total employees in city	5,300	3,897	6,434	5,652	1.50	.214
Proportion in council-manager cities	.67	.53	.64	.61	1.58	.193
Proportion in cities where written objectives for services is established	.57	.52	.72	.56	2.33	.074
Proportion in cities with measures of performance to meet objectives used	.46	.41	.55	.46	1.06	.367
Proportion in cities with implemented cost accounting procedures	.56	.49	.55	.41	1.24	.293
Proportion in cities in which team management strategy is used	.48	.51	.51	.63	1.02	.384
Information Services Characteristics						
Total applications operational in city	133.46	128.16	142.05	123.78	2.24	.083
Total functions automated in city	16.37	15.85	17.07	14.90	2.22	.085
Number of employees per terminal in city	8.41	9.01	8.64	8.18	.29	.832
Individual Characteristics						
Proportion male	.88	.81	.87	.82	.84	.472
Proportion with graduate/professional degree	.53	.53	.42	.36	1.94	.123
Proportion who attend professional meetings	.83	.83	.78	.65	2.52	.058
Mean age	46.07	47.03	45.21	44.04	1.03	.380
Years of computer experience	10.94	9.89	11.03	10.54	.45	.715
Proportion with programming skill	.24	.17	.28	.14	2.24	.084
Proportion with coursework in computers	.81	.75	.80	.75	.48	.696
Frequency of using computer-based information in reports[a]	5.10	5.11	4.93	4.93	.63	.595
Frequency of direct use of computing in job[b]	3.42	3.77	3.59	3.10	.80	.494

[a] Scores on index are: 1=never, 2=at least once a year, 3=several times a year, 4=a few times a month, 5=a few times a week, and 6=daily. Index was calculated by taking the maximum (most frequently done) of the following activities: request others to get information from a computerized file or receive reports which contain data from computer files.

[b] Scores on index are: 1=never, 2=at least once a year, 3=several times a year, 4=a few times a month, 5=a few times a week, and 6=daily. Index was calculated by taking the maximum (most frequently done) of the following activities: use a microcomputer, use a microcomputer as a terminal to a larger computer, use a microcomputer on a local area network, or use a computer terminal.

TABLE 4
Analysis of Variance of Group Attitudes Toward Computing

	Group I	Group II	Group III	Group IV	F-Ratio	F-Sig.
Attitudes toward computing						
Computers allow departments to handle a greater volume of service without corresponding increases in cost[a]	**3.42**	3.18	3.20	**2.93**	4.91	.002
I lack a good understanding of what computers can do[a]	**1.79**	**2.25**	**1.70**	1.97	4.61	.004
Within the next 5 years, computers will greatly improve the way my job is done[a]	**3.38**	3.34	**3.00**	3.14	3.58	.014
Quality of your department service to clients[b]	4.54	4.29	4.53	4.26	3.66	.013
Computers save me time in looking for information[c]	3.09	2.90	2.75	2.67	3.80	.011
Overall, computers have enabled me to be more effective in performing my work[c]	3.09	2.84	2.72	2.59	4.16	.007

[a] Four-point scale with 1 = disagree and 4 = agree
[b] Five-point scale with 1 = decreased and 5 = increased
[c] Four-point scale with 1 = almost never true and 4 = nearly always true
Note: bolded means indicate statistically significant differences between groups using Scheffe.

NOTES

1. For two other applications of social judgment analysis in the public sector, see Milter and Rohrbaugh (1988) and Whorton, Feldt, and Dunn (1988-89).

2. The description of each dimension in the survey instrument was preceded by the following statement:

   We are interested in the kinds of criteria managers use to make assessments of investments in computing. Assume that your department reviewed 26 packages and scored each on the five criteria often used in evaluating computer applications--their contribution to productivity, service enhancement, professionalism, decision making and control, and innovation. The cost of these packages is essentially the same, so cost is not a consideration.

3. The cluster analysis was performed using SAS. A pseudo t^2 statistic was used to evaluate the optimal number of clusters.