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Computerization as a Predominant Technology Effecting Work Unit Structure

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ABSTRACT

This study investigated the question: does the impact of computerization on the work unit structure come from computerization as a moderating variable with respect to task routineness or as an independent variable independent of the task being accomplished? A further question investigated was: does work unit effectiveness influence these relationships? Results of discriminant analyses between organizational units whose mission requires the predominant use of computers (IS units) as compared to organizational units that do not require the use of computers (non-IS units) found that IS units were more centralized, less complex, and perceived less environmental uncertainty. The addition of individual variables (age, education, years with the company) substantially increased the power to discriminate between IS and non-IS units. IS units were composed of younger, more educated, and shorter tenured personnel. There were no differences in task routineness between IS and non-IS units measuring that the effect of computerization was independent of the work done. The distinction between process (the impact on work) and content (the use of computers) may help resolve the conflicting results in the literature concerning the relationship between computerization and work unit structure.

Introduction

The principal purpose of this study was an attempt to resolve the conflicting results in the literature concerning the effect of computerization on organizational structure. Some research finds the effect is towards increased bureaucratization while other research finds the effect is towards looser, more decentralized structures. In this study, we compared work unit structure where computerization was the predominant technology (IS units) with the structure of work units which did not use computers as their predominant technology (non-IS units) in addition we added the effects of individual demographic variables along with work unit effectiveness as additional factors influencing differences between IS and non-IS units.

Background

Research investigating the effects of computerized information systems (IS) on organizational structure has been concerned mainly with the effect that implementing IS in organizations has on the functioning of the organizational system. This research has been sparse as well as contradictory (Robey, 1981; Robey, 1977; Pfeffer and Leblebici, 1977; Hedberg, et al., 1975; Klatzky, 1970; Meyer, 1968; Scharack and Barten, 1975). Some studies have found that computerization increases bureaucratization, while other research suggests computerization increases decentralization. Some researchers have found, for example, that increasing computerization takes over the routine work of lower and middle level organizational employees, thus increasing the capacity of these levels to

handle less routine decisions (Wolek, 1975; Benbasat, Dexter, and Masulis, 1981).

Carter (1984), on the other hand, indicates that implementation of computer technology has multiple effects on the organization and the effects were moderated by the size of the organization. While Burack (1977) suggests the major intervening variable is overall routinization of the task.

These conflicting results may be partially explained by the confusion between the process and content of computerization. That is, computers do automate routine tasks and decision making, and so would seem to be related to reports of more routine technology and hence greater centralization. However, the contrary view is that with routine jobs computerized, less routine technology would result since computers would now function as tools, augmenting the capabilities of people for non-routine problem solving. The process of computerization is certainly one of automating tasks as well as doing computational processes. Thus, as Burack and Sorensen (1977) suggest, where tasks are already routine computerization will increase routinization. Where tasks are currently non-routine, computerization augmenting completion of the task in the sense of taking over the routine aspects of the non-routine task will result in the perception that the task is now non-routine. Thus, the degree of routinization can vary greatly due to computerization. The question is, however, does the use of computers influence work unit structure independent of whether the work is routine or nonroutine?

Carter (1984) refers to the effect of computers on organizational structure do to a change of technology employed in the organization as the influence of "computerization as a predominant technology" (p.247). Research indicates an effect due to computerization as a predominant technology on work group structure and effectiveness. However, the specific effects of computerization as a technology influencing structure are related to the specific tasks for which the computer is used. (Carter, 1984). This means that in some instances computerization leads to increased bureaucratization and in some cases to increased decentralization. Thus, the effect of computerization is difficult to generalize.

Perhaps the distinction between the process and content of computerization may explain the contradictory evidence in the literature to date such as Robey's (1977) finding that under stable task environment conditions, computers tend to reinforce centralization, but under dynamic conditions, decentralization is facilitated. "Process" refers to the impact of computerization conditional on task or environmental conditions, while "content" refers to the impact of computerization independent of the task or environment. In the former condition computerization is a moderating variable while in the latter case, computerization is an independent variable. The process effect is analyzed by comparing the effect of computers for a particular task, such as purchasing. The effect of computerization is assessed by comparing purchasing decisions in work groups where computers are used versus where they aren't used. The content effect is assured by comparing work units that use computers with those that don't use computers across all tasks that those work groups are responsible for.

This study analyzes the effect of computers on work group structure and effectiveness by considering computerization as an independent variable. This is done by assessing work group structure and effectiveness for work groups with computers as their predominant technology as compared to work groups where the predominant technology was not involved with computers across all tasks of the work groups. In this way, we control for the moderating effect of technology in order to focus on the relationship between computerization and work group structure.

Technology and Environmental Uncertainty

The organizational context for work units is a combination of technology and environmental uncertainty. The technology variable generally is conceptualized by a continuum ranging from routine to nonroutine. This was first suggested by Perrow (1967) who felt that the degree of routinety was a function of the number of exceptions encountered in performing the task as well as the analyzability of the task (the degree of task structure). The environmental uncertainty variable can be conceptualized as ranging from certain to uncertain as suggested by Thompson (1967). This variable is a function of the stability of the environment as well as the degree of homogeneity encountered by organizational decision makers in their decision making. These two variables can be combined into a single 2 × 2 matrix as shown in Figure 1.:

Hypotheses

Research questions guiding this study are derived from Figure 2.

Figure 2 depicts the two critical variables of the hypotheses: Computerization as the predominant technology and work unit effectiveness. IS units refer to those work units that use computers of information systems as the predominant technology as opposed to non-IS units that do not use information systems. Cell I then, is composed

Figure 1

Technology and Environmental Uncertainty

		Technology	
		routine	*nonroutine*
Environmental Uncertainty	certain	I	III
	uncertain	II	IV

Figure 2

Framework for Studying Differences and Similarities
Between IS and Non-IS Organizational Units

HYPOTHESES

Research questions quiding this study are derived from Figure 2.

		EFFECTIVENESS		
	Unit Computerization	*more effective units*	*less effective units*	*both more & less effective units*
Predominant Technology	IS Units	I	II	III
	Non-IS Units	IV	V	VI

of effective IS units while Cell V is composed of less effective non-IS units. Cell III is composed of both effective and non-effective IS units while Cell VI is composed of both effective and non-effective non-IS units. Since the structure of each work unit was assessed in each cell of Figure 1, the structure of each work unit was the average structure across all four cells of Figure 1. Thus the structure of each work unit was a combination of the average across the four cells of Figure 1 of three structural elements: centralization, formulation and complexity. By doing this, the moderating effects of technology and environmental uncertainity should be controlled for. Since we are not sure of the effect of computerization on organization structure, we are not hypothesizing how the structure will be different between the IS and non-IS units (more or less bureaucratic), but just that the structures will be different.

Hypotheses derived from Figure 2 are (numbers refer to cell numbers):

1. III will be differently structured than IV: IS units will be differently structured than non-IS units.

2. I will be differently structured than II: more effective IS units will be differently structured than less effective IS units.

3. IV will be differently structured than V: more effective non-IS will be differently structured than effective non-IS units.

4. I will be differently structured than IV: more effective IS units will be differently structured than more effective non-IS units.

Since the thrust of this research was to add to theory about the structure of IS units, effective versus ineffective units (IS and non-IS combined) as well as differences between less effective IS and less effective non-IS units do not add to theory about IS units and structure and hence were not included in this investigation.

Methodology

The sample consisted of 12 work units from a manufacturing organization and 9 work units from an insurance organization. A work unit was defined as a supervisor and his subordinates (there were not women supervisors in the sample) of all whom performed related tasks. The size of the units ranged from 3 to 12 members with an average size of 6 members. Work units in the sample included, among others, purchasing, manufacturing, engineering, personnel, quality control, and computer systems. Of the 21 units, 7 were formally designated IS units and the members of which had computers as their predominant technology, and 14 were non-IS units which did not have computers as their predominant technology (5 IS units were in one organization and 2 IS units in the other). Tasks in *all* units ranged from rather routine ones that typically followed preprogrammed routines, such as maintaining production schedules, preparing engineering drawings, to non-routine tasks that involved more discretionary behavior, such as developing a program of variable work hours, solving engineering problems or designing new computer systems.

PROCEDURES

To determine whether different structures are used in different work groups, it was first necessary to develop a separate set of "scenarios" that illustrated the situations of Figure 1 for each work unit. The scenarios illustrating each situation of Figure 1 were developed on the basis of structured interviews with each work unit supervisor. Each supervisor was asked to list four routine and four nonroutine tasks that were performed by members of the work unit. Routine tasks were defined as tasks that were simple and straightforward and had little variability. Supervisors then were asked to indicate for each task which environmental factor or factors had an important bearing on the performance of that task. Finally, they were asked to indicate how unpredictable they felt each of these environmental factors was. The results of these interviews indicated that all but one of the 21 sampled work units encountered all four situations described by Figure 1. That is, all but one of the work units faced each of the four scenarios: routine tasks/certain environment, nonroutine tasks/certain environment, routine tasks/uncertain environment, and nonroutine tasks/uncertain environment. The one work group that did not face all four of the scenarios, faced only Cell I and Cell II of Figure 1.

The scenarios, as described by the supervisor and using jargon relevant to the work unit, then were transposed to questionnaires administered to all members of that supervisor's work unit only. Examples of the scenarios found in a computer system's work unit appear in Table 1.

Members of a work unit then were asked to read each scenario (as described by their *supervisor* and pertaining to *their* work unit) and to respond to seventeen questions about the structure, technology, and environmental uncertainty for each scenario. Thus, each work group (except one) completed four sets of seventeen questions, one for each of the four scenarios. The questionnaire was administered and collected by the researcher at the re-

Table 1

Scenarios for a Computer Work Unit

Situation	*Scenario*
Routine task/ certain environment	Application of systems, releases for packaged systems, including review of changes and test output with user departments
Nonroutine task/ uncertain environment	Systems studies and evaluation of new applications

search site. Questionnaires were subsequently distributed by a member of the respective personnel department to those individuals who were unable to attend the original sessions. These questionnaires were later collected at the research site by the researcher. There was a 100% response rate.

MEASURES

Measures of structure were based on Duncan (1973) and Sathe's (1974) questions pertaining to centralization, division of labor, and formalization. Examples of the questions asked are: "Any decision I make has to have my supervisor's approval" (centralization); "The rules and procedures are developed as I go along" (formalization); "I engage in many kinds of activities" (division of labor).

Reliability coefficients were determined for each situation because it was possible that the reliability of the scores might vary with the situation. Coefficient alphas ranged from .64 to .88 for each dimension with the exception of division of labor (for routine tasks/certain environment), which was .43.

Data on centralization, division of labor, and formalization for each work unit were obtained by averaging the responses from each person in the work unit across each structural dimension. The work unit averages were used in the subsequent data analysis.

STRUCTURE

Data on centralization, division of labor, formalization and task routineness and environmental uncertainty for each work unit were obtained by averaging responses from each person in the work unit on each dimension. Thus, four sets of responses were obtained, one for each cell of Figure 1. The work unit averages across all four cells of Figure 1 were used in the subsequent analysis.

An effectiveness measure developed by Tushman (1979) was used to classify work units as more or less effective. Effectiveness ratings were obtained from all managers who were familiar with one or more of the work units being studied. Units were rated on an effectiveness scale from 1 (high) to 5 (low) on the basis of their budget and cost performance, adaptability, ability to get along with others, and so on. On average, each unit was rated by two managers. Interrater reliability was acceptable; none of the scores for the same work unit varied by more than one response category. As in previous research (Lawrence and Lorsch, 1969; Tushman, 1979), scores were averaged across individual raters to provide overall measures of unit effectiveness. Based in the distribution of unit effectiveness scores, there appeared to be two distinct clusters from which more and less effective work units could be determined. The 13 units with scores below 2.3 were considered more effective work units, and the 8 units with scores equal to or greater then 2.3 were considered less effective work units. Of the 7 units with computers as their predominant technology (IS units) 4 fell

into the more effective category, and of the 14 noncomputer (non-IS) units, 9 fell into the more effective category. The average for the less effective IS units was 2.9 compared to 1.75 for more effective units, while the less effective non-IS units had a score of 3.3 compared to 1.6 for the more effective non-IS units.

Since we used an overall measure of effectiveness we cannot know effectiveness of particular situations. Thus, it was possible that a unit can perform quite well in one cell in Figure 1 but not well overall, or, conversely, poorly in a particular situation but quite well overall.

Results

In order to test the hypotheses concerning computerization as an independent variable, differences of task routineness across the cells of Figure 1 must first be investigated. The task routineness variable between IS units and non-IS units was compared across the four scenarios. The results of t-tests between IS units and non-IS units for each cell of Figure 1 indicated no significant differences between IS units and non-IS units on any of the four scenarios. This indicates that IS and non-IS units both experienced the same degree of task routineness in each of the cells. This is a critical finding indicating that computerization was the difference between IS and non-IS units, rather then the degree of routineness. Thus, task routineness does not confound computerization as the difference between IS and non-IS work groups.

HYPOTHESES TESTING: THE USE OF DISCRIMINANT ANALYSIS

Discriminant analysis begins with the desire to statistically distinguish between two (or more) groups of cases. The objective is to weigh and linearly combine the discrimination variables in some fashion so that the groups are forced to be as statistically distinct as possible (Nie, et al., 1975, p. 435). The analysis begins by going through the variables one at a time and selecting the variable that affords the greatest discriminating power. At each step, the variables already selected may be removed if they are found to reduce discrimination when combined with more recently selected variables. This continues until it is found that the remaining variables are no longer able to contribute further discrimination. The set of discrimination variables are then used to classify the set of cases from which the discriminant function was derived in order to test the efficacy of the discriminant function.

In this study, four discriminant functions were derived since we wished to distinguish between four sets of groups:

1. IS and non-IS groups (H1)
2. Effective IS and less effective IS groups (H2)
3. Effective non-IS and less effective non-IS groups (H3)
4. Effective IS and effective non-IS groups (H4)

In each case the possible discriminating variables were centralization, complexity, formalization, task routineness, and environmental uncertainty. Scores on each of the variables generated for each of the cells of Table 1 were combined to yield an overall score for each of the 5 possible discriminating variables. Since the group scores were averages across people in the group and averaged across scenarios of Figure 1, the group score was an average of an average. In order not to be twice removed from the individual scores, individual scores were used in the discriminant function rather than the averaged unit scores. This means that the effective "n" was four times the number of people in each work group since four scores were obtained from each person, one for each of the four cells of Figure 1.

The results of the discriminant analyses indicated that significant discriminant functions were found for two of the four hypothesized differences: between IS and non-IS groups, and between effective IS and effective non-IS groups (Table 3). This means that the discriminating variables chosen for this study were not able to distinguish between effective IS and less effective IS and between effective non-IS and less effective non-IS.

Tables 2a and 2b present the variable means of the discriminant functions in order of most discriminating to least discriminating for both significant discriminant functions. Thus, IS groups were distinguished from non-IS groups, and effective IS groups were distinguished from effective non-IS groups by environmental uncertainty, centralization, complexity and task routineness. IS units and effective IS units were more centralized, less complex, perceived less environmental uncertainty, but were about equal on task routineness, than both non-IS groups and effective non-IS groups. The overall interpretation of the results is that computerization as a predominant technology influences the development of a more bureaucratic or mechanistic structure.

The canonical correlation squared is the proportion of variance in the discriminant function explained by the groups. In the case of IS units versus non-IS units the amount of explained variance as 12.9% (canonical correlation = .3587). In the case of effective IS versus effective non-IS the canonical correlation was .474.

One way to test the efficacy of the discriminant function is to ask to what degree the function correctly classifies

Table 2

Discriminant Functions Variables

Table 2a

Discriminant Function Between IS and Non-IS Units

Variable	*Mean IS Units*	*Mean Non-IS Units*
Environmental Uncertainty	4.62	4.23
Task Nonroutineness	4.04	3.97
Complexity	4.32	3.81
Decentralization	3.48	2.88

Wilks' Lambda $p < .02$, canonical correlation = .359

Table 2b

Discriminant Function Between Effective IS Units and Effective Non-IS Units

	Effective IS Units	*Effective Non-IS Units*
Decentralization	3.48	2.65
Task Nonroutineness	3.83	3.86
Environmental Uncertainty	4.61	4.16
Complexity	4.16	3.63

Wilks' Lambda $< .03$, canonical correlation = .474

people to groups. Since the unit of analysis in the discriminant function was the individual, the classification test was used to see if the discriminant function could correctly classify people to IS or non-IS groups as well as to effective IS or effective non-IS. The results of these classification tests are contained in Tables 3a and 3b. In both cases, the chi square was significant: between IS and non-IS groups the chi square was 11.03 (1 df) and $p < .001$; between effective IS and effective non-IS groups the chi square was 10.81 (1 df) and $p < .001$; between effective IS and effective non-IS groups the chi square was 10.81 (1 df and $p < .005$, thus indicating the discriminant functions could effectively differentiate the two sets of cases.

DISCUSSION OF DISCRIMINANT FUNCTION RESULTS

This study found that IS and non-IS groups as well as effective IS and effective non-IS groups could be distinguished from one another on the basis of unit structure, although the explained variance was fairly low. Since task routineness was the same between the units that had computerization as the predominant technology compared to the units that did not, we can conclude that computerization was an independent variable rather than a moderating variable. These results suggest that computerization as a predominant technology is related to more centralized, less complex, structures and to less per-

ceived environmental uncertainty. In addition, and perhaps more importantly, computerization was not related to an increase in task routineness.

These results support the contention of increased bureaucratization due to computerization. However, the effect of computerization is not due to increased routinization of technology which supports Robey's (1981) finding that computerization can lead to either more routine or less routine work depending on the tasks the computers are supporting. Rather, the influence of computerization is an independent effect of the degree of routinization. Since computerization can be due to implementation of a mainframe or a set of stand alone microcomputers the effect on tasks due to computerization can be considerably different. The reason for the increased bureaucratization due to computerization is probably due to the requirements for increased centralized control of the computer *resource*. That is, whereas individuals might work relatively independently, organizations are moving to manage the computer resource centrally. The effect on the individual worker is the perception of increasing centralization although the task itself might not be appreciably changed toward increased routinization. Thus, the process of using computers may not affect work as much as the need for increased centralization due to the need to control the proliferation of the computers, databases, need for common software and operating systems, LAN, electronic mail, etc. The content of computers then plays a greater role in explaining the structure effect of computers than does the moderating effect of technology.

In sum, these findings suggest that computerization leads to tighter organizational structures. In other words, the independent effect of computerization leads to more bureaucratic organizational forms.

INDIVIDUAL DIFFERENCES

Since the explained variance of the discriminant functions were fairly low, and since the information systems literature discusses individual differences to such a great extent (see Huber, 1983, for a critical review of the literature) it was felt that individual differences variables might add to the explained variance of the discriminant functions. Five individual difference variables (age, education, job satisfaction, years in present position, and year started with the company) were added to the original discriminant variables. We expected that persons in units with computers as the predominant technology would be younger, more educated and would have been in the company fewer years than people in other, more traditional units, particularly since the organizations for this study were older, more established concerns where the computerization of some operations was a more recent addition to company functioning (in terms of company history).

Results of the discriminant analysis between IS and non-IS units with the addition of individual differences variables is contained in Table 4a. In these analyses, the three greatest discriminating variables were the three individual difference variables: age (32 versus 44), education (between college degree and graduate work versus some college and college degree), and year started in the company (1974 versus 1964) for people in IS units versus people in non-IS units respectively. Tests of significance (t-tests) between the variables indicated that these individual differences were significantly different between IS and non-IS units at the $p < .003$ level. Three structural dimensions were also part of the discriminant function: environmental uncertainty, formalization, and task routineness. Thus, IS units were composed of younger, more educated personnel who have been with the company a shorter period of time than non-IS personnel. Results of the discriminant analysis indicated that the discriminant function was significant at the $p < .0000$ level with roughly 36% more variance explained when the individual difference variable were included in the analysis. Thus, adding individual demographic variables adds substantially to the explanatory power of the discriminant function. In addition, the ability of the function to correctly classify people to groups (Table 5a) was 84.21% with individual difference variables as compared to 65.26% without the individual difference variables.

When individual difference variables are added to the discriminant analysis between effective IS units and effective non-IS units, two individual difference variables, year started (1977 versus 1961) and education (college degree versus some college to college degree), for IS units and non-IS units respectively, were selected as part of the discriminant function (Table 4b). The discriminant function was significant at the $p < .0000$ level and explained variance was 67.5% versus 22.5% without the individual difference variables, an increase of 45% in explained variance. In terms of correctly classifying people to groups, adding individual difference variables increased the percent of correctly classified cases to 93.62% as compared to 72.3% without the individual difference variables, a 21.3% increase (Table 5b).

In summary, adding individual difference variables substantially increases the power to discriminate between IS and non-IS units. Thus, any discussion of the differences between units that have computerization as the predominant technology and those that do not should consider differences among the people as much as the differences in structure.

Discussion and Summary

The results of this study support previous findings relating computerization to increased centralization (Robey, 1981; Klatzky, 1970). In addition, this study demonstrated that the addition of individual difference variables can substantially increase our understanding of the differences between IS and non-IS units. Thus, not only were IS units structured more bureaucratically, but the personnel in IS units were younger, more educated and have been with the company for a shorter period of time than individuals in non-IS units. What is somewhat surprising is the lack of differences on the job satisfaction variables between individuals in the IS versus non-IS units. We would have expected that younger, more educated personnel would have been less satisfied with the tighter structure than the older, less educated personnel in the non-IS units.

There are a number of unanswered questions in addition to the satisfaction issue, however, that require further study. The context for this research were two fairly traditional organizations, manufacturing and insurance, where the centralization measure across the entire sample was 3.2 on a scale of 7, indicating fairly low centralization. However, the formalization score was 5.3, indicating high formalization. The complexity score was 4.0, which is the middle of the scale. These suggest a fairly rule intensive organization, wherein members make many of their own decisions. The question remains as to whether in a different context, for example where the organization as a whole was more organic, would the units where computers were the predominant technology, be more tightly organized than the rest of the organization and would the personnel be younger, more educated and have a shorter tenure with the organization? An additional question concerns the possible differential effect on structure due to increased computerization due to mainframes or to micros.

The impact of these results for management concerns the differential managerial behavior towards IS units as compared to other organizational units. Since these units seem to be different than other units in terms of being more tightly structured, encouraging creativity for the nonroutine aspects of the units' tasks, and rewarding that creativity would seem to be important to override the tendency of tight structures to inhibit creativity. In addition, since younger, more educated personnel have different needs than older, less educated personnel, the question of differentially rewarding IS personnel becomes problematic with respect to perceptions of equity vis-a-vis the rest of the organization.

REFERENCES

Benbasat, I., Dexter, A.S. and Masulis, P., "An Experimental Study of the Human/Computer Interface", *Communications of the ACM*, Vol. 24, 1981, pp. 752-762.

Burak, E. and P. Sorenson, Jr., "Computer Technology and Organizational Design: Towards a Contingency Model", in E. Burack and A. Negandhi (eds.), *Organization Design: Theortic Perspectives and Empirical Findings*, Kent Ohio, Kent University, 1977.

Carter, N., "Computerization as a Predominant Technology: Its Influence on the Structure of Newspaper Organizations", *Academy of Management Journal*, Vol. 27, 1984, pp. 247-270.

Hedberg, B., Edstrom, A., Muller, W., and Wilpert, B., "The Impact of Computer Technology on Organization Power Structures", in E. Grochia and N. Szyperski (eds.), *Information Systems and Organizational Structure*, New York, Walter de Gruyter, 1975, pp. 378-397.

Huber, G., "Cognitive Style as a Basis for MIS and DSS Designs: Much Ado About Nothing?", *Management Science*, Vol. 29, 1983, pp. 567-579.

Klatzsky, S., "Automation, Size and Locus of Decision Making: The Casade Effect", *The Journal of Business*, Vol. 43, 1970, pp. 141-150.

Lawrence, P. and Lorsch, J., *Organization and Environment*, Homewood, Illinois, Richard D. Irwin, 1969.

Meyer, M., "Automation and Bureaucratic Structure", *The American Journal of Sociology*, Vol. 74, 1968, pp. 256-264.

Nie, N., Hull, C., Jenkins, J., Steinbrenner, K., and Bent, D., *PSS*, 2nd Ed., New York, McGraw Hill Book Company, 1975.

Perrow, C., "A Framework for the Comparative Analysis of Organizations", *American Sociological Review*, Vol. 32, 1967, pp. 194-208.

Pfeffer, J. and Leblebici, H., "Information Technology and Organizational Structure", *Pacific Sociological Review*, Vol. 20, 1977, pp. 241-159.

Robey, D., "Computers and Management Structure: Some Empirical Findings Re-examined", *Human Relations*, Vol. 30, 1977, pp. 963-976.

Robey, D., "Computers Information Systems and Organizational Structure", *Communications of the ACM*, Vol. 24, 1981, pp. 679-687.

Schareck, B. and E. Barten, "Comments on the Influence of Information Technology on Organizational Structure in the Insurance Industry", in E. Grochla and N. Szperski (eds.), *Information Systems and Organizational Structure*, New York, Walter de Gruyter, 1975.

Thompson, J.D., *Organizations in Action*, New York, McGraw Hill, New York, 1967.

Tushman, M., "Work Characteristics and Subunit Communication Structure: A Contingency Analysis", *Administrative Science Quarterly*, Vol. 24, 1979, pp. 82-98.

Wolek, F., "Implementation and the Process of Adopting Managerial Technology", *Interfaces*, Vol. 5, 1975, pp. 38.45.

Table 3

Classification of People to Groups

Table 3a

		Predicted Group Memberships	
		IS	*Non-IS*
Actual Group Membership	IS	32	15
	Non-IS	18	30

Percentage correctly classified = 65.26%

Chi Square = 11.03, with 1 df, $p < .001$

Table 3b

		Predicted Group Memberships	
		Effective IS	*Effective Non—IS*
Actual Group Membership	Effective IS	17	3
	Effective Non-IS	10	17

Percentage correctly identified = 72.3%

Chi square = 10.81, 1 df, $p < .005$

Table 4

Discriminant Functions and Individual and Structure Variables

Table 4a

Discriminant Function Between IS and Non-IS Units
with Individual Difference Variables plus Structure Variables

Variable	*Mean IS Units*	*Mean Non-IS Units*
Age	32 years	44 years
Education	18 years	14 years
Year Started in Company	1974	1964
Environmental Uncertainty	4.62	4.23
Formalization	5.4	5.24
Task Routineness	4.04	3.97

Wilks' Lambda < .0000, canonical correlation = .699.

Table 4b

Discriminant Function Between Effective IS and Effective Non-IS
Units with Individual Difference Variables Added to Structure Variables

Variable	*Mean IS Units*	*Mean Non-IS Units*
Year Started in Company	1977	1961
Education	16 years	14 years
Formalization	5.49	5.06
Task Routineness	3.83	3.86
Environmental Uncertainty	4.61	4.16

Wilks' Lambda < .0000, canonical correlation = .821

Table 5

Classification of People to Groups Including Individual Variables

		Predicted Group Membership	
		Effective IS	*Effective Non-IS*
Actual Group Membership	Effective IS	20	0
	Effective Non-IS	3	24

Correctly identified = 93.6%