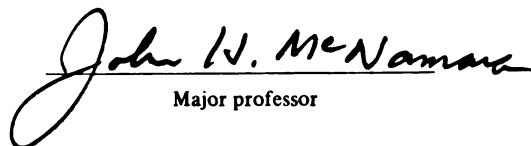This is to certify that the

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A MODEL OF THE PROCESS OF ADAPTATION TO COMPUTER

SYSTEMS AND INFORMATION TECHNOLOGY IN

LAW ENFORCEMENT ORGANIZATIONS

By

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ABSTRACT

A MODEL OF THE PROCESS OF ADAPTATION TO COMPUTER SYSTEMS AND INFORMATION TECHNOLOGY IN LAW ENFORCEMENT ORGANIZATIONS

By

Clara E. Molina

The research was initiated by the question of why some computer systems fail while others are perceived as a success. As personnel in the organization are a critical element in the implementation of a system, the research objective was to determine how personnel adapt to computer systems and information technology in police agencies.

The literature suggested that technology creates changes both to the organizational structure and to the sociotechnical systems within that structure. These changes suggest an intervening process that has three implicit variables: time period of the technology, location of personnel in relationship to the technology and an adaptive process.

A model was derived from the concept of role acquisition theory and two models of the growth of computer technology. The derived model had four stages: anticipatory socialization, expansion, formalization and maturity. The methodology was an exploratory research utilizing the derived model as a guideline for open-ended interviews.

The model was evaluated against the findings and appeared to provide a reliable guideline for further research. Three variations were discovered that had not appeared in the model: (1) a negative attitude and resistance appeared as personnel encountered the reality of system implementation, (2) a systems learning curve adaptive process replaced the resistance encountered in the original system implementation, and (3) the sociotechnical systems of the personnel categories (management, data processing and clerical/police) appeared to be distinct entities with interaction among the systems occurring only as personnel roles met in the course of task performance.

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CHAPTER I

STATEMENT OF THE PROBLEM

Why does a computer information system succeed in one organ-
ization and fail in another, despite the fact that innumerable hours
of experienced consultants' time and millions of dollars have been
spent in developing the system? Why do some systems fail to live up
to expectations, while others succeed? In the police field, for
example, there are agencies where management is ready to get rid of
the system due to a series of disappointments and failures to produce
needed data from the system; other departments have their systems
working very well and the personnel and management are happy with
the results.

What makes the difference? Walter Bauer, in an introduction
to Information Systems for Management, suggests:

> Perhaps the ultimate challenge lies in the fact that these
> systems are used by humans--humans who frequently are not
> sure themselves of the mental processes which take place in
> "managing"--humans who have a great deal of difficulty
> deciding how a system should be designed and what the sys-
> tem's usefulness will ultimately be. It is axiomatic in
> data processing that the difficulty of implementing a sys-
> tem increases drastically according to the degree of inter-
> face of that system with humans.[1]

This would suggest that personnel in the organization are a critical
element in the implementation of a technological system. It raises
the question of how do personnel adapt to technology in complex

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organizations? Both the literature and field experiences indicate a confusion as to what happens when a technology, such as computer technology, is implemented in a complex organization. This is especially significant in regard to the man-machine interface of the system. This lack of knowledge would indicate a need for exploratory research of the problem with the objective of identifying potential stages of the adaptive process and how those stages affect the process.

The Problem

The implementation of a technology, such as a criminal justice information system, always involves change. Yet few recognize the impact that is created during the process of change. Inherent in the change process is the need of the personnel and of the organization to adapt to the changes that occur as a result of the technology. The technology creates new situations that influence both the personnel and their working environment, as well as the manner in which they adapt to the technology.

The rapid growth of computer systems has influenced the evolution of information technology and together they have created situations that, over time, have influenced the adaptation to the technology. An examination of several of these situations will clarify the problem and illustrate the influence of personnel, computer systems and information technology on the problem of adaptation.

Personnel

Over the years, as information technology has evolved, there has been a wide divergence between theory and reality concerning the utilization of human resources. With computer systems and its companion information technology, management has been faced with the problem of interfacing human resources with a technological system that may or may not reflect the environment of the organization. This is particularly true in the interface of the supporting data processing personnel with the organization. Some of the data processing support personnel have been recruited from the "old staff"; others, new to the agency and trained in the complex computer technology, are not familiar with the organization's functional processes and procedures. The increasing number of these support personnel represents a new factor or influence in the organization, an influence that may be very powerful and/or pervasive.

Another factor that has influenced that problem of adaptation is the reaction of the organizational personnel to the technology. Personnel reaction has been characterized by suspicion about the consequences and skepticism about the advantages of what the technology will accomplish. The more resistant the organization's personnel, the more difficult the process of technological implementation will be. There exists the implicit assumption that technology is inherently good and consequently resistance to the technology is wrong. Perhaps the resistance is an indicator that the technology does not meet the human needs of the organization. The resistance of the personnel therefore can be a factor influencing the manner in

which personnel adapt to the technology. Part of this resistance can be suggested by the idea of change itself, but there are other factors that appear to be involved in the "human problems" that are the major cause of failure in the implementation of a technology. These other factors have created problems that can be categorized as:[2]

   a) beating the system: personnel do not cooperate and they manipulate data to fit system requirements. One social service agency's personnel threw away cases which had been returned due to insufficient information for computer processing. Other agency personnel, learning of the edit range, would supply any type of data that fell within the range in order to get the case onto the computer.

   b) blaming the system: the "computer is down" syndrome. One law enforcement agency blamed the computer for failure to notify them about an arrest. Subsequent investigation into the problem found that the information delay was not due to the computer being down, but due to the fact that another agency had held up the information for a period of six hours before entering it into the computer.

   c) ignoring the system: some agencies run parallel systems--one on the computer; the other manually maintained. The reasons given are that the computer doesn't provide enough information or accurate data.

   d) forcing the system: specialists design the system to suit the computer rather than the persons who use the data. Rather than design the system to handle reformatting data internally, system specialists design a different report for each data format.[2]

Along with the personnel's resistance in various forms to the technology is the factor of changed working conditions. The traditional technology was a servant of the employee as it performed at his command. The employee turned the machine on when he wanted to work, and turned it off when he was done. Computer

technology becomes the master of employees as they adjust their working pace to the faster and more rigid requirements of the computer technology. The working day of the individual has been affected by demands of technological efficiency to run on a 24-hour basis rather than the traditional eight-hour day. This has resulted in reorganization of police records sections along with additional working shifts both for records and data processing personnel.

Management has also been affected by the computer technology. An executive must be assured of a constant flow of information in order to know the current state, the organization and to make decisions as a result of this knowledge. In traditional management, the types and sources of information are varied, uneven and unreliable and the traditional manager is permitted some ambiguity for he is not expected to know all the answers and uncertainty is taken into account. Decisions are made as much by withholding information as by injecting it into communication channels at the most appropriate moment. With computer technology, uncertainty is no longer considered to be a major problem and the executive is expected to have accurate information upon which to base his decision.[3] Yet the implementation process and the early years of the technology have the inevitable "bugs" or system problems that must be discovered and solved before the accuracy and reliability of the data are assured. As a result, the implementation of a computer system in the traditional organizational structure has raised questions about the applicability of the data for decision-making. On one hand, information technology is expected to provide timely and accurate

data, yet the executive's experience tends to contradict this assumption.

In addition, there remains considerable uncertainty about the specific factors involved in making decisions. Police departments and other human service agencies are miniature societies in which the community values influence their members' decisions. During the years of a police officer's experience he develops a cognitive reasoning process or "street knowledge." Incorporated into that process are the individual and organizational values of the agency that influence the decision process. The incorporation of either the organizational values or these cognitive factors involved in the decision-making process are highly problematic in the design of the computer technology due to the difficulties the police officer has in making these explicit.

Computer Systems Technology

The computer systems technology is a neutral influence in an organization until it is programmed to provide data. It is not a super-calculator that can be plugged in and turned on, but rather a complex system of several components that interact with the organizational environment and influence that environment. It requires a specialized knowledge of the technology to program computers to handle the data of an organization. Thus, staffs of computer personnel--the data processing component--are required to program the information as well as to operate the system. These persons program the data to fit their perceptions or conceptions of the organization's problems and decision processes. Through this programming,

these people influence the organization's flow of information and thus, indirectly affect the adaptation of line and management personnel to the system and the technology. This influence is particularly noticeable in the choice of applications to be programmed for some will have more impact upon the personnel than others. For example, a computer-assisted dispatch application will directly influence a broad spectrum of police personnel, whereas an application for crime analysis will directly influence only the research unit, although indirectly through the researcher's analysis, it will influence the operational members of the organization.

Thus the design of the system technology becomes a factor in the problem of determining how personnel adapt to the new technology in the organization.

Another facet of the problem is the rigidity of the computer technology. Human service organizations, such as the police, are organized to cope with a dynamic environment with its resulting ambiguity of information and at times, lack of sufficient data. Because of a lack of routine data from the environment, certain procedures have been developed to categorize and stabilize the data. In the process of adapting the manual system to a computer technology, there exists the possibility that information is lost or changed to conform to the more rigid requirement of the data processing technology. The impact upon personnel who must code and upon the field officers who must use the coded data has not been researched. This problem of adapting information may be a causal factor in some of the previously identified problems of interface with the technology.

Further, with computer technology, not only must the data be entered exactly according to specifications, but the format of the data coming out of the computer must also be specified beforehand. In addition, it is no longer possible to randomly search records for a clue, for the clue-data must be specified before a record search is made.

For example, under manual record systems an investigator could search his related cases, looking for an elusive clue, unsure of exactly what he was searching for, but knowing intuitively when he found it. With computer systems technology, he must specify the data before a search is made.

Information Technology

Concurrent with the factor of the rigidity of computer information is the factor of information transfer in communication networks. Communication theory would suggest that unless there is a perfect transfer of data, information is changed due to barriers (which may or may not be perceived) between the sender and the receiver, or in this case, between the report writer and the person who transfers or codes the data into computer-readible images. Another possible barrier is the transformation of the computer data into an understandable form for the receiver.

Further support for the existence of the problem of information transfer comes from research methodology and the recognition of the problems of coding raw data with the concomitant potential for losing information. However, there has been little research on how coding affects other areas of information processing, such as

electronic data processing. Information from the field tends to confirm the potentiality of information loss. The need to specify categories of data as well as ranges within that data also increases the potential of data loss. A police chief recently commented that as a result of the categories established by a computerized incident report, he no longer could identify the complainant by age. To a police officer, this knowledge conveys many possibilities. For example, is the complainant a 20-year old female or a 70-year old? Depending upon the complaint, an entire series of information based upon past experience and cognitive knowledge becomes available to the officer upon knowing the age category of the complainant.

Thus, out of the unstable environment surrounding the transfer of information into routine categories, the personnel must adapt to a change in the process of handling this transfer when information technology is introduced. This problem is especially significant for human service organizations where the entire flow of services is based upon this transfer of information.

Another factor that affects the adaptive process is the evaluation of transferred information. The nature of traditional information technology involved categories and sources of information that had a high degree of variability. Employees took this fact into account in their evaluation of both the data and the technology that produced the data. The data would also be evaluated by knowing who wrote the report and their reliability and credibility. The distortion of organizational records has been recognized as part

of the organizational phenomena and was taken into account by the personnel.[3]

With computer information, there is little identification of who provided the information as only the facts, as reported, are entered into the computer files, and the coder, or data-entry operator is not identified. Therefore, there is a transfer of credibility from the personnel to the computer system. This has led to two effects: one is an aura of credibility surrounding information generated by computer systems and the second effect is the tendency to blame the computer system when data are found to be erroneous. The evaluation of the transferred information is no longer based upon the human element but now is based upon the credibility of the computer.

In summary, the situations created by the interaction of personnel, computer systems technology and information technology have resulted in several factors that impact upon the adaptive process. However, the process itself remains unidentified. The problem to be researched can therefore be stated as the need to identify the stages of the adaptive process and the influence of the interaction of personnel, computer systems and information technology upon the adaptive process.

Significance of the Problem

This examination of some of the factors influencing the problem of how personnel adapt to computer systems and information technology indicates a need for exploratory research on the process of adaptation.

The problem of adaptation to technology becomes increasingly relevant when one considers the amount of men, money and other resources that have been committed to the development and utilization of some form of the information technology. As these computer systems and the concomitant information technology increase among police agencies and other human service organizations, the knowledge of the adaptive process becomes both timely and significant in the organization's continuing effort to increase the efficiency and effectiveness of criminal justice information systems.

Scope of the Problem

The research is concerned basically with the man-machine interface. There are many aspects of this interface that could be pursued. Communication theory in computer systems has been the subject of some of the literature.[4] Another area is the nature and attitudes of data processing personnel.[5] However, the current research, while primarily an exploratory study, will focus upon the perceptions of personnel concerning their interaction with the information technology.

In order to establish parameters on the topic, an abstract model of the adaptive process has been derived. The model is based upon role acquisition theory and stages of computer systems growth. The concept of a role with its rights and obligations as part of a social structure permits an abstract definition of the interactions among the occupants of the role. The process of role acqusition establishes boundaries within the social structure and confines the

problem to the organization and its immediate external environment. The time frame is identified by four stages of the acquisition process: anticipatory socialization, formal stage, informal stage and the personal adaptation stage.[6]

By combining role acquisition theory with information on the stages of computer technology growth and managerial changes in procedures over time, a model can be evolved that is sufficiently general to encompass the adaptive process, yet that will permit a degree of specificity that aids in identifying potential stages in the process.

However, even with a model, it is necessary to limit certain areas of the problem. Thus the research focuses upon police agencies, rather than other components of the criminal justice system or other human service agencies. The choice is made for two reasons. One is the researcher's familiarity with the police function; the other is the greater length of time that police agencies have had computer information systems as compared to other criminal justice agencies. This latter reason permits an examination of a longer period of personnel interface and adaptation with the resultant problems and resolutions, whereas agencies just beginning the implementation process have not encountered the wide range of potential problems that a man-machine interface can involve.

By focusing on the adaptive process, hardware and software designs of the computer technology are omitted as well as the overall feasibility study and technical details of the implementation process. The scope of the problem also omits any comparisons among the

technical designs of the systems or any comparison of the implementation of these designs. While for purposes of comparability, it would be preferable to concentrate on one application for all systems, the variability of the system applications has foreclosed this limitation. Therefore, for purposes of exploratory research, the specific applications area has been excluded and all applications are assumed to be identical in their impact on the personnel unless otherwise noted in the research findings.

Objectives of the Research

1. To identify the specific events within the process of adaptation to computer systems and the concomitant information technology.

2. To evaluate the reliability of the abstract model to predict the adaptive process.

3. To suggest potential hypotheses concerning the influence of the interaction of personnel, computer systems and information technology upon the adaptive process.

Definition of Concepts

Computer system: The organized collection of personnel, computer methods and information, united by regulated interaction and designed to accomplish a specific purpose. The computer has an input, a storage or memory unit, an arithmetic and logical unit, a control unit and an output. Without any one of these five units, the system is not a computer in the full sense.[7]

Computer systems technology: The set of techniques or systematic procedures utilized by computer systems to accomplish organizational functions.

Information: Evaluated data accumulated for general use in the future or which is utilized for a specific problem or for a certain individual at a specific time to achieve a definite goal. Data are the factual bits of information which are used as a basis for reasoning, discussion or calculation. Data become information when they are applied to a specific use and information becomes knowledge when it is integrated into the person's understanding based on previous experience or association. Thus computer systems process data that become information as they are formatted into a specific report. The information provides knowledge of an agency's activities when it is interpreted through a human cognitive process, such as decision-making.

Information technology: The set of procedures, techniques and routines utilized for the collection, processing and reporting of information relevant to the organization's function. Generally applied to information processed by computer systems, although the definition holds for manual systems as well.

Organization: A social system that has an unequivocal collective identity, an exact roster of members, a program of activity and procedures for employing members.[8]

Organizational structure: A set of roles and role relationships, a communication structure, and a set of ordered work flows. The role relationships are orderly and enduring among the positions

in the organization. A role set is a combination of roles that have the occupational position as the common identifying element that ties them together.

Management: Personnel above the rank of supervisor; the collective body of those who manage or direct an organization.

Data processing personnel: Personnel who have a specialized knowledge of computer technology and who work directly with the computer systems as programmers, system analysts, or operators. Support personnel, such as tape librarians or keypunch operators are not included.

Clerical personnel: Personnel who perform routine tasks under supervision or who are direct supervisors of clerical personnel. This category includes data entry operators and tape librarians.

Operations personnel: Personnel who perform the functions of the organization; in police agencies, these are the sworn personnel in patrol and investigation. Sworn personnel working in administration have been classified as either management or clerical, depending upon their particular position and tasks.

Role: A socially expected behavior pattern usually determined by an individual's status in a particular organization that has reciprocal rights and obligations towards certain other roles with which it interacts in the organizational structure.

Role acquisition: The process by which an individual obtains a new or additional role. The process may involve changes to a current role as well as the acquiring of a totally new role.

Adaptive process: The phenomenon of gradual changes that
lead to a modification or adjustment of the role to changed environ-
mental conditions, and which as a result, make the role more fit for
existence under the conditions of the changed environment.

[1] Walter L. Bauer, Preface to _Information Systems for Management_, ed. Fred Bruenberger (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972).

[2] Kit Grindley and John Humble, _The Effective Computer: A Management by Objectives Approach_ (New York: McGraw-Haill Publishing Co., 1973), 123-124.

[3] James Thompson, _Organizations in Action_ (New York: McGraw-Hill Co., 1967), p. 124.

[4] Lian Gorman and Cathal Mullan, "Human Aspects of the Manage ment of Technological Change," _Journal of Management Studies_, 10 (February 1973): 48-61; Anders Edström, Lars-Erik Broman and Roland Levin, "Communication Analysis as a Tool in the Development of Management Information Systems," _Journal of Management Studies_, 10 (October 1973), 217-232.

[5] William Faunce, E. Hardin, and E. H. Jacobson, "Automation and the Employee," _The Annals_, 340 (1962): 60-69; C. Marenco, "The Effects of the Rationalization of Clerical Work on the Attitudes and Behavior of Employees," in _Employment Problems of Automation and Advanced Technology_, ed. Jack Steiber, 1966. Proceedings of a conference held at Geneva by the International Institute for Labour Studies. 18 pp.

[6] Russell Thornton and Peter M. Nardin, "The Dynamics of Role Acquisition," _American Journal of Sociology_, 80 (January 1975).

[7] Martin W. Weik, _Standard Dictionary of Computers and Information Systems_ (New York: Hayden Book Company, 1969).

[8] There are many definitions of organizations. Katz and Kahn describe them as voluntary groups that acquire systematic methods for regulating their activities on the basis of information about their functioning. Parsons focuses on the collectivity with a specific collective goal while Barnard looks at the cooperation among the individuals that is deliberate and purposive. I have chosen Caplan's definition as being most relevant for the purpose of this research.

CHAPTER II

REVIEW OF THE LITERATURE

A review of the literature on complex organizations suggests that technology creates changes in the organizational structure. The kinds of change will vary according to the type of technology and its location within the organization. Computer technology, as a specific type of technology, has also created changes both to the organizational structure and to the sociotechnical systems within that structure.

Research on the impact of technology has focused on the traditional organizational behavior variables of employee attitudes and job satisfaction. The methodology utilized in the research has treated the process of change as an intervening condition rather than as an intervening process or variable.

The amount of variation suggested by the research would indicate that the change process itself varies both over time and in its impact on the sociotechnical systems and upon the organization's structure. This research study suggests that the process of adapting to the computer technology is an intervening variable between the technology and the dependent variables of job satisfaction and attitudes. Further, this intervening variable has variations within it that may cause the differences in the dependent variables.

Technology and Complex Organizations

A review of the literature on the relationship between technology and the organizational structure indicates there is variation in the impact of the relationship, but whether this variation is due to the technology or the structure is not clear. One possible cause of the variation may be a result of the variability of definitions.

One of the basic problems in the research on the relationship between complex organizations and technology has been a failure to standardize the concept of technology. Woodward utilizes a "process" concept; Perrow defines it as routine or non-routine tasks; Thompson as the technical function, while Burns and Stalker define it as organic or mechanistic.[1] These conflicting conceptualizations create a lack of comparability among the findings. However, for the purpose of establishing relationships, this proposal will utilize a sociological meaning defined by Thompson and VanHouten. Technology is perceived as the set of techniques utilized by a particular culture, i.e., an organization, to accomplish whatever the culture identifies as valuable or necessary.[2] Thus, the organization adopts a particular technology to accomplish its function, whether that function is to provide a service delivery or a manufactured product. This definition permits the utilization of the findings of the above noted research regardless whether the findings are based on the purely technical definition or upon the sociotechnical systems of Blau, Emery and Trist, or Perrow.

The type of technology the organization uses will be reflected in variations within the organizational structure. Routine repetitive

technologies lead to formalized procedures, task specialization, and vertical differentiation. These demands of routine technology lead to the same type of structure as do the pressures of size.[3] Non-routine technology requires few formalized procedures, a lower degree of specialization and less differentiation. However, as a result of the less structured environment, more integration is required.[4] Another element that creates variation is the difference in the utilization of technology among the various departments within the organization. This variable creates differences in both the structural arrangements and intra-departmental goals.[5] The research on contingency theory supports the above research (which is based on Weber's and Parson's theory of structure and function) in that the organization's adjustments to technology are local in character. The strategic-contingency theory is based upon the concept of information flow that is utilized selectively (i.e., strategically) by a sub-unit in its interaction with other sub-units in the resolution and performance of required activities (contingencies) in order to gain greater power in the organization.[6]

Other research has provided evidence that the sociotechnical system must adapt to the social structure if it is to be effective.[7] Woodward's work suggests that the technology defines a range of constraints and opportunities within which the social structure of the organization must exist. Her later studies raise the question whether these differences are a result of the type of technology or a result of the methods used by the organization to control the technology. The research supports the latter conclusion.[8] However,

Blau and Scott point out that control can be exerted either directly or indirectly. The latter method relies on a relatively impersonal and automatic process, such as periodic reports, rules and regulations. In earlier research, Blau had found that the social system will also adjust, amplify and redefine these internal control processes in response to the operating needs of the technology.[9] Cohen, building on Blau's research, implies that this flexibility (or dynamics) is the result of conflicting pressures that public agencies face in coping with the demands of technology and of the public.[10]

In summary, technology affects the organization. The extent of the effect demands upon the nature of the technology and the utilization of the technology within different parts of the organization. A potential intervening variable may be the nature of control exercised by the organization to manage the sociotechnical system, which includes the technology.

Computer Technology and Complex Organizations

Computer technology, as a specific type of technology, can therefore be expected to have an effect upon the organization in specific ways. While the research in this area has not met the more vigorous research design (with the exception of Blau's most recent study), the several studies do confirm the tendencies expected from the more general research. One problem in comparability is the difference in the variables chosen. The more general research uses variables with a macro-view, such as centralization, process, task, etc., while the research on computer technology has focused more

specifically on employees: clerical, blue-collar, white-collar, data processing and managerial personnel and their specific task areas. Therefore, the findings need to be interpreted from the specific to the more abstract or macro-view.

The computer technology affects the organization both in structure and in the sociotechnical system. Changes have affected both the internal structure of the organization and its organizational set.[11] Reorganization has occurred internally as the size and importance of sub-units varied with the implementation process. Mumford and Bank's research found that the nature of the changes appeared to be dependent upon the initial conditions and the process under which the technology was introduced.[12]

These changes appear with the initial users and impact on them more heavily.[13] When the use is extended beyond the initial department, those which are schedule/routine oriented are more affected than other departments.[14]

Computer technology appears to have affected the sub-units of the organization with variation in the impact having an outward ripple effect. This ripple or "cascade effect" may be caused by the initial conditions, the implementation process, or the nature of the work task of the affected unit. It is possible that some combination of these three variables interact to create differences among the sub-units and the resultant impact of computer technology upon the organization.

Computer Technology and Sociotechnical Systems

Thus the computer technology varies in its impact on the organization depending upon the location of the technology. In analyzing this impact, one of the determining factors to be acknowledged is the structure of the rules and employee relationships to the total technology. Research has indicated that workers will adapt formal systems to their needs. Blau found that personnel in public agencies developed informal strategies to cope with situations not envisaged by the formal rules.[15] Gouldner showed how rules and regulations respond to the self-interests of those who govern and are governed. Managers and workers ignore rules to accomplish certain ends or to adjust to change, but they do not follow rules blindly.[16] As a result, personnel in public agencies both adapt to change and are in a constant state of change due to the need to adapt to perceived environmental pressures.[17] These changes may represent minimal challenge to the existing structures of authority or they may lead to a rearrangement of the basic authority structure of the organization.[18] The latter generally occurs when there is a redistribution of control over critical organizational resources. This control structure appears to be largely determined by the nature of the technology, especially the size of the technology and the division of labor required.[19]

Implicit in the above research is the assumption that any significant change in the technology of the organization will be accompanied by changes in the social structure of the organization. Trist, in defining the impact of sociotechnical systems on the

structure, suggests that technology creates certain requirements of the social system as well as of the organizational structure. As a result, significant changes in technology will also affect the social system.[20]

Marenco, in his study of French employees and automation, found that automation of computer technology has one unique feature that differentiates it from earlier technological progress: it can lead to widely different results depending upon the organization. The concomitant technical requirements are only partially the causative factor in the observed effects, "either as regards structure and functions of management, or the objective working conditions and work methods."[21]

While Marenco's research was longitudinal, Hardin in an ex-post-facto examination of the effects of computer technology on jobs and employees implied that the form of automation causes changes in the work environment and job satisfaction similar to those which occur normally and without computer technology.[22] He makes the implicit assumption that computer technology is an unique type, rather than merely a sub-category of the more generic technology.

Several factors may explain these dissimilar conclusions. One may be a cultural difference between Americans and French employees, or the differences may lie in the structural differences between white-collar and blue-collar sociotechnical systems. Another possible explanation is found in some of the longitudinal research that indicates attitudes change over time.

There is evidence that change occurs in the sociotechnical systems due to the computer technology. Several studies have found that both the size and skill mix of the personnel will vary differentially over time.[23] This variation in the skill mix is particularly found in the data processing units. The number of data entry and supervisory personnel increases over time, and the computer operations personnel decrease.[24] Longitudinal studies of blue-collar workers and the effect of automation indicate that the introduction of automation results in more autonomous and smaller work groups, greater required skills and less personal supervision.[25]

Two predominant assumptions have emerged from these studies of computer technology and the sociotechnical system. The first assumption views the technology as the prime causative factor and uses computer technology as the independent variable. The second assumption perceives the organizational climate prior to implementation as the prime causative factor, but still uses the computer technology as the independent variable.

Among research studies in the first category are studies by Faunce, Jacobson and Lujan. Their studies indicate the amount of change being imposed by the implementation of computer technology is the primary factor in determining the employee's respone to change. These responses vary according to three factors: readiness to change, the history of management's dealing with change, and the significance of the work to the personnel that were affected by the technology.[26]

Lujan, assuming that role clarity would be affected by the implementation, examined employee's self-concepts of role clarity. His findings supported previous research that found the impact of technology varied according to the location, but he further defined the location according to the job performed and its specifications. However, factors that affected role clarity were directly related to the process of introducing the technology: the stage of development, the amount of training received, the manner in which the technology was introduced and the length of the transition period.[27]

Elliott's research concluded that because of the importance of role clarity, changes in the work environment explain more of the change in openness to innovation than do changes in management activity. Other research indicates that the employees' attitudes prior to change have an effect both upon the change and their attitudes after the change.[28]

Further, personnel react differently to these technical changes, and these reactions depend on several factors: sex and background, job content, and staffing changes.[29]

While the above research studies suggest that prior climate as well as technology may affect the attitudes and job satisfaction of the employees, the second assumption takes a more emphatic view that organizational climate is a determining factor. One of the major variables in the change process, especially in public agencies, is the climate of the organization prior to the implementation of the technology.[30] The general body of literature tends to ignore the initial conditions, especially the social and political options

and choices that affect the sociotechnical systems. The political environment in which the system develops has been found to be a significant variable in determining the type of system and its location. The development of computer systems in public agencies reflects the constraints and/or conflict in the external and internal political environment of the agency.[31]

Anderson's study of automation in the U. S. Post Office related employees' attitudes to organizational climate, but the study lacked data indicating whether this climate existed prior to the study or was the result of the implementation. He found that employees' attitudes were negative, but that the negative attitudes were a result of poor organizational and personnel climate, along with a lack of knowledge about the uses and need for the system, an inability to affect either the structure or the implementation of the system, and a lack of knowledge of how the computer technology would affect the informal communication networks and strategies used by the employees.[32]

In summary, as James Thompson theorized and Laudon's research supports, the technology influences the organization due to the kinds of coordination which it demands and the forms of evaluation or control which it allows. The technology establishes both limits and opportunities in its interaction with the external and internal environments. The research implicitly indicates that changes due to computer technology affect the employee's role, his interpersonal relationships and the management's code of conduct--its methods of controlling and coordinating the role and position requirements that

are affected by the technology. Further, variation is introduced into the sociotechnical system by the employee's self-concept, especially with regard to his openness to innovation and his expectations of the role. These latter are affected by variables of sex, background, job position and job content. However, whether these variations are due to political or organizational climates that existed prior to the introduction of the technology or were a result of the introduction itself is not clear from the research.

Technology and the Individual

The literature on complex organizations and technology, especially computer technology suggests the following propositions concerning technology and the individual:

1. The implementation of a technology, such as computer systems, in an organization will introduce changes in the patterns of work flow, positions and organizational relationships. The technology impacts on personnel and their attitudes directly by forcing changes in procedures and habits and indirectly by requiring them to learn new skills and different communication patterns.

2. The type and extent of change will be determined by the design and utilization of the technology in the organization. The tasks involved in the technology are integrally related to the social system of the organization and its operations.

3. The effect of the change is to create variation in the content of a given position and in the role relationships which surround the position. This variation is created by the

interaction of the technology, the organizational structure and the sociotechnical system.

4. The adaptation to the technology by the personnel in a given position will be affected by the variables of individual background, education, previous experience with the technology and the location of the position in relationship to the technology. The major adjustments have been found to occur closest to the computer technology itself, especially in the data processing department and in major users of the data, where the technology is concentrated in lower-level positions.[33] There is an outward ripple effect with the impact lessening as one moves towards executive management, where its influence is primarily upon the nature of the managerial tasks, i.e. control and decision-making.

5. The adaptation to the role relationships will be affected by the variables of organizational behavior, individual personality and interpersonal relationships.

The technology of the organization, the structure of its subsystems, its formal policies and its rewards and penalties dictate to a large degree the content of the given position and its inherent roles. This would suggest that the adaptation of the relationships between individuals--the interpersonal relationships--rather than the individual himself, is most affected by the requirements of the technical tasks of the organization.[34] The individual in the organization does not work alone, but as a member of a social group. As a result, changes in either the organization or the individual will also create changes in the role relationships. Thus, if changes are

made in the environment of the role relationships, there is an adaptation required among the components that affect the entire organizational role, sets or positions.

This adaptation is influenced by three primary variables of the role relationship: organizational behavior, individual personality and interpresonal relationships.[35]

Research on organizational behavior has indicated that concurrence must exist between the technology and the coordinating control system (i.e. management's rules and procedures) for both affect the participants' attitudes and satisfaction. If this concurrence is absent or changes have been induced into the system, the personnel's attitudes and job satisfaction will be affected, as well as their perceptions about the content and expectations of their roles.[36]

Therefore, the interaction among the technology, management's coordination and control systems and the individual's attitudes and role expectations will influence his organizational behavior and his adaptation to the technology.

A change in the external role relationships affects three elements of behavior: activities, interaction with others and self-concept. These behaviors involve the individual's intuitive, instantaneous responses to the entire range of work-related issues. As a result, they involve the individual's most intimate and persistent assumptions about himself and others.[37]

An individual's self-concept affects his personality and, in turn, the personality affects the individual's ability to handle the potential stress that results from changes in his environment, such

as would be created by a change in the technology. Personality will
then contribute to the variation in the adaptation to both the role
and the interpersonal relationships. Tannenbaum showed that both
the individual's self-concept (autonomy) and the organizational hier-
archical conditions can be affected by changes in the organizational
environment. These personality changes were found to be towards an
increasing congruence between the role and the individual.[38]

Because attitudes are a reflection of personality, changes in
personality will result in changes in attitudes. Implicit in this
concept is that changes in the role of the individual person that are
a result of technology will therefore be reflected in changes in the
worker's attitudes.

Changes in organizational behavior and personality will also
influence the third variable of the role relationship: interpersonal
relationships. The close tie engendered by interpersonal relation-
ships in the organizational structure results in a functional inter-
dependence. The interdependence creates the need for individuals to
work out their role relationships across unit boundaries. The social
patterns that occur during the adaptation are a process of defining
and re-defining the rights and obligations of the role and as a
result, these relationships are subject to stress, conflict and bar-
gaining. Among the factors which affect the interpersonal relation-
ships is the size of the organization or work group, for there is
more dissensus about the pattern of role expectations in large organ-
izations than in smaller ones, or when a unit has been re-organized.[39]
Other factors that affect role relationships and expectations are the

location of the positions within the organization, the conflict
between the priority of the routine activities and administrative
tasks and of the creative, non-routine tasks, and the prevalence of
conflicting role expectations among the hierarchical positions.[40]

In summary, technology creates changes in the individual's
patterns of work flow, his position and his interpersonal relation-
ships. These changes introduce variation in the positions and the
role relationships among the personnel in their adaptation to the
technology. The literature suggests that the variation in a given
position is due to the variables of individual background, educa-
tion, previous experience with the technology and the location of
the position in the organization while the variation in role rela-
tionships is due to the variables of organizational behavior, indi-
vidual personality and interpersonal relationships.

Summary

The research available indicates that technology affects the
organization by creating changes both in the structure and in the
sociotechnical systems. These changes affect the individual's per-
ception of his role in the organization, especially his attitudes
and job satisfaction. As a result of these changed role perceptions,
stress and strain are introduced into the individual's interpersonal
relationships. In order to reduce the potential stress and strain,
the individual must adapt to change. Thus an adaptation to change,
as exemplified by technology, i.e. computer technology, must occur.
The problem is how does this adaptation to technology occur.

There is enough eivdence from the research to indicate a substantial amount of variation in the impact of the technology upon the structure and the sociotechnical systems of the organization. However, the question of the degree to which computer technology is a causal factor has not been determined. The research does imply though that these changes are affected by variables that have a time component: history of management's dealing with change, the stage of development, the length of the transition period. In addition, tests of employee's attitudes taken at different points in the period of the technological implementation indicate changes over time. This implied variable of time would suggest an adaptive process. The problem is further defined as a question as to how does this adaptive process occur--what elements appear in what patterns at what stages in time?

Another implied variable is location. Some of the research has indicated that the effects vary with the location of the technology in the sociotechnical systems and the organization. The review of the literature would appear to indicate that an intervening process exists between the technology and the changed attitudes and job satisfaction. This intervening process is the need of the personnel to adapt to the technology. The discussion of the research on technology and changes to the organizational structure and its sociotechnical systems supports the concept that role adaptation or alteration is required when a new technology, such as computer systems, is introduced into the organization. The literature further suggests that this role adaptation is affected by the variables of time and location.

Therefore, it is hypothesized that an adaptive process exists among the personnel and their interaction with the technology and that this process is influenced by the variables of time and location. This adaptive process will be examined in the context of role acquisition theory in the next chapter and a model of the adaptive process will be suggested.

FOOTNOTES--CHAPTER II

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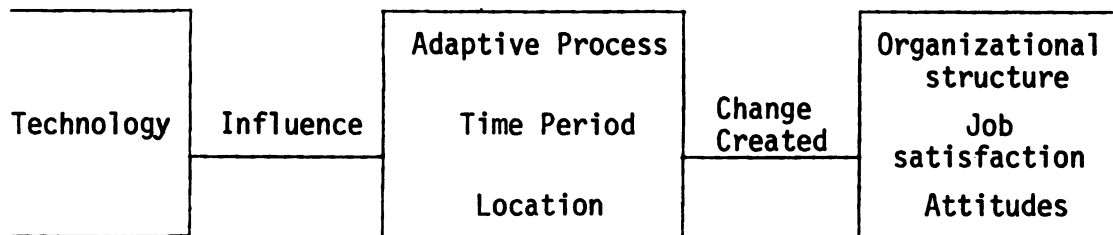
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CHAPTER III

MODEL OF THE ADAPTIVE PROCESS

The research on technology and complex organizations suggests the existence of an adaptive process that has been tentatively identified as having two variables: a time period and location of personnel in relationship to the technology. A potential model of the overall process is:

Technology	Influence	Adaptive Process Time Period Location	Change Created	Organizational structure Job satisfaction Attitudes

In a systemic sense, the technology is the input that influences the "block box" of the adaptive process which in turn creates the changes that occur in the organizational structure, sociotechnical systems and individual attitudes and job satisfactions. Under cybernetic theory there is a feedback to the technology that creates an interactive change. The interaction of structure, attitudes and systems feeds back to the technology and in turn initiates or facilitates further technological change. The concept of a "black box" has been utilized in the systems literature to depict an unknown process. This research study examines the black box and suggests an

explanation of the intervening adaptive process based upon role acqui-
sition theory. While role acquisition theory is oriented towards
the learning of a new role, it is also a helpful construct to utilize
for examining how persons change role expectations and performance.

The development of a model of the internal processes of the
black box, i.e. role acquisition or adaptation, will aid in defining
the potential stages of the process and will provide a conceptual
framework for the research. One further requirement of the model is
the need for an understanding of the process of the implementation
and growth of computer technology.

Computer Growth Models

An examination of the literature on the growth of computer
technology provides two relevant models. The first is based on manag-
ing the growth of the technology, while the second examines the growth
from an historical perspective.

Gibson and Nolan suggest a model that has four stages in the
process:[1]

1. Initiation

Management decisions at this stage focus on the location
of the computer and the personnel's fear of the computer technology
with the concomitant aspect of their resistance to change.

2. Expansion

As a result of the dynamics of rapid growth, an informal
organization of data processing personnel emerges with a "technologi-
cal imperative" that creates a psychological atmosphere of

over-optimism among data processing personnel as they attempt to con-
vert all functions to the computer technology.

Management is faced with the need to develop middle-management
skills of establishing project priorities, budget management, and pro-
ject management. In addition, the growth of the EDP function creates
a need for new personnel procedures to acquire the diverse computer
skills.

3. Formalization

Management attempts to control the data processing oper-
ation through the establishment of formal controls. Other managerial
actions may include restructuring the data processing operations and
providing for its direction by top management personnel. Inherent
in these actions is the dominance of organizational political issues
as the organization begins to perceive the impact of the computer
technology.

4. Maturity

Management faces the integration of computer technology
goals with those of the organization, the establishment of communi-
cation networks between data processing and management personnel, and
the establishment of interrelationships between users and data pro-
cessing personnel.

This model, by Gibson and Nolan, is limited to the managerial
viewpoint and only addresses the problems faced by the other personnel
to the extent they interact with the management function.

A second model, suggested by Withington, would categorize the process according to the evolution of computer technology.[2] These stages are:

1. "Gee Whiz"

The initial stage of computer technology arrives and personnel problems at this stage reflect fears of automation. Personnel problems in acquiring good data processing people are paramount.

2. "Paper Pushers"

The conversion of functions based upon numerical accounting procedures is the primary focus. Problems at this stage are perceived as concerned with the heavy impact on the clerical function and the rigidity and new patterns of procedure that are inherent in the computer technology.

3. "Communicators"

Response time for computer information is shortened and there is a tendency towards centralization of certain functions. This results in managerial alienation due to their superior's increased knowledge of details concerning their operations and the resultant need for explanations of short-comings and/or failures in production.

4. "Information Custodians"

The computer technology becomes the custodial component of organizational information. There is a redistribution of managerial functions with logistic decisions becoming centralized while tactical decisions move out to the field. Managers, especially field managers, are happier at their respective levels. At the

field level, managers are able to make more decisions that require on-the-spot knowledge, while executive managers are freed of administrative detail and have more time for coordinating and planning functions.

From these models, there appear to be certain stages of growth or adaptation to the technology from which a model can be identified that includes the variables of time and location. Withington's model is particularly relevant to identify the type of personnel and how the technology affects each category, e.g. management, data processing and clerical police officers.

Role Acquisition Model

However, these models focus on the external environment of the given position in the adaptive process; yet it has been hypothesized that the process affects role relationships as well as the given position. Two recent research studies have examined the acquisition of a role in the organization: Feldman's "Contingency Theory of Socialization" and Thornton-Nardin's "Dynamics of Role Acquisition."

Feldman's research explored the socialization process as an adjustment to the work environment and the development of work skills. He suggested three distinct stages: anticipatory socialization, accommodation, and role management.[3] He added a fourth stage, outcomes, which were identified as: congruence, role definition, resolution of conflicting demands, and resolution of outside life conflicts. However, there were no assumptions made about the order

in which the socialization activities occurred. His typology of the first three stages is similar to that of the role acquisition theory developed by Thornton and Nardin.[4] The latter's proposition of how individuals acquire a role has been chosen as the basis for the research on the adaptation of people to technology because Thornton and Nardin's model suggests that the acquisition process is a cumulative sequential process. As a result, their model fits the research objectives of examining the adaptive process as growth; that is, adaptation as a natural phenomenon marked by gradual changes that lead toward a particular result. While the two models, Feldman's and Thornton and Nardin's have comparable the first two stages, Feldman in the third stage enlarges the individual's action sphere outward to include the management of the role between the work area and the home life. While this may be a realistic model for socialization, it is too broad for the purposes of this research. In contrast, Thornton and Nardin limit their model to the organization itself and how an individual acquires a new role within that area.

The stages in role acquisition as conceived by Thornton and Nardin are:

1. Anticipatory socialization

Idealized expectations of role performance are received from outside sources. The emphasis is upon features the role should involve, rather than actual functions. The individual develops images of what he perceives is expected of the role and begins to psychologically prepare himself for the role. Anticipation is colored by the individual's wants and needs.

Feldman's research found that realism--a full and accurate picture of what life in the organization was like--was correlated with role definition which in turn was correlated with general satisfaction. We can therefore hypothesize that the degree to which the anticipatory socialization is realistic will affect the individual's perception of his role.

2. Formal Stage

The individual shifts from viewing the role from outside to active participation in the role. Expectations derive from role colleagues and the individual's own expectations. These are generally explicated through the organization's rules and procedures--the rights and obligations inherent in the position. Behavior is perceived as "must" behavior and standards are directed towards everyone in that position in the organization.

Expectations are idealized and refer to expected behavior, knowledge and skills rather than towards attitudes and orientations. However, additudinal elements are present in the form of allegiances to certain others, display of specific emotions, or the feeling of certain likes or dislikes.

Reaction tends to be one of conformity, due to a high degree of consensus on expected behavior. The individual begins to react from a psychological view as to what the situation is and what it may hold for him. From a social viewpoint, the individual meets role requirements; psychologically, he postpones reactions to role situations. This latter is often achieved by "playing at the role" rather than internalizing it.

3. Informal Stage

   The individual encounters unofficial or informal expectations that arise and are transmitted through interaction with others. The expectations of role colleagues remain important and personal expectations become equally important. There is less consensus due to differing views concerning role performance. Expectations tend to be implicit and refer to the attitudinal and cognitive features of the role--the everyday activities of the individual. These informal features may provide a means of dealing with some of the psychological drains that performance of the role makes on the individual. The individual starts to shape the role to fit himself, his past experiences and future objectives and to evolve an individual style of performance.

   The final social adjustment commences as the individual begins to finalize his own techniques of handling the social requirements of the role. The psychological adjustment begins in earnest as the individual begins to formulate his own meanings for the role and performance.

4. Personal Adaptation Stage

   The individual's personality, past experiences, unique abilities and skills, and background (culturally defined values and beliefs) all affect how he will enact his role. Over the developmental period of the previous three stages, the individual transmitted on a tentative basis his personal role expectations to others with whom he came into contact, and the process tended to be of a probing character. The individual tests his inferences about the

role in interaction with his peers and those who are significant to him. Using his past experiences, familiarity with comparable or previous roles, linguistic and other symbolic non-verbal cues that may be present in the situation, he begins to form a definition of his peer's attitudes and future responses which may be validated in his performance of the role. In the personal adaptation stage, role consensus begins to appear and the individual is able to influence the expectations others hold for role performance as he imposes his own style on the role.

Social adjustment occurs through modification of the role. If the individual is able to relate his psychological needs to the modified requirements, then he makes a psychological adjustment to the role.

Research has indicated that adjustment is dependent upon the degree of accuracy of the expectations conveyed and those perceived.[5] If there exists an incongruence between self and role, there will be a perfunctory role performance with problems of social and psychological adjustment.

A basic theme of each of these models is the cybernetic concept of system process. The system is in a state of equilibrium at the beginning of the process. At the initial stage information is received that begins disequilibrium. Initial adjustments are made which in turn create more disequilibrium. This corresponds to the informal stage of Gibson and Nolan's model, the "paper pushers" stage of Withington's and the formal stage of the role acquisition model.

By stage three in each model, the system is in its greatest
state of disequilibrium and adjustments are beginning based on initial
feedback. By stage four, a new stage of equilibrium has been reached
by the system which incorporates the series of adjustments required
by the initial input of information.

Derived Model of Adaptive Process

From these models a potential model of the process of adapta-
tion to technology may be derived as a conceptual framework.

Stage 1. Anticipatory

At this stage the personnel have certain expectations
about the computer technology which are derived from outside sources.
This includes certain fears of the impact of the technology on their
jobs and status in the organization. Managerial concerns are focused
on the location of the computer and on personnel problems encountered
with the new data processing personnel. These expectations and con-
cerns are a result of information concerning the "ideal" role of the
computer, management and the interaction with organizational per-
sonnel. This "ideal" role is interpreted individually within the
reality of each person's perceptions of what he hears and of his
internal needs and desires. Changes in role relationships are minimal
and may be perceived only vaguely.

Stage 2. Expansion

The initial applications have become operational and
additional applications are in the design and programming process.
The data processing unit is expanding and an informal organization

among the data processing personnel has developed along with a technological imperative to further expand computer operations.

Management is faced with the need to develop new skills along with a need to develop new procedures concerning the computer technology. The personnel receive the formal requirements for interaction with the computer system. There is some impact on line personnel in the course of the recognition that computer technology requires a new pattern that is characterized by preciseness in the performance of computer-related tasks. Active participation with the technology at this stage is in general conformance with the written procedures and rules. Attitudinal elements are held in abeyance as the personnel develop a "wait-and-see" attitude.

The beginnings of role change that were vague in the first stage become more sharply delineated as the formal rules and regulations emphasize the differences between the old role and the new role performance that is being imposed by the technology.

Stage 3. Formalization

Adjustments between the computer technology and the organization are channeled into formal procedures. Computer performance is improved and certain areas are stabilized. Managers become aware of the impact as new questions are raised by other members of the agency concerning their operations, that previously were known only to the particular manager. This leads to a certain amount of alienation towards the technology.

This managerial alienation is compounded by the personnel's reactions. These reactions have arisen from encounters with others

in the agency and are composed of the latter's comments, both bad and good concerning the computer system's performance. These informal expectations create an increased dissonance between earlier antici- pations and the actual reality of the performance. At this point, the individual is continuing to maintain social performance while from a psychological basis he is evaluating his perceptions of the effective- ness of the technology in terms of his needs and priorities of the position. While the changes in the role relationships have been par- tially resolved as the individual outwardly adapts to his new role, the internal stress becomes more intense as the individual attempts to resolve the discrepancies that have become apparent between the expectations and the reality.

Stage 4. Maturity

At this point an adaptation is made to the technology and there is an adjustment made among the tasks of the position and the role relationships. The adjustment may be one of several modes.

One adjustment involves smoothing out the computer perform- ance. Bugs (system errors) have been removed, performance levels are maintained with regularity and the data processing personnel have established working relationships with agency users. In another, management has taken control of the data processing function and/or has established priorities and direction for the data processing unit. Decisions have been stratified according to some criteria established by management. Personnel begin to develop their own style of handling computer information. The increasing interaction

with data processing personnel has modified the technology to meet the needs of the particular unit.

There begins to evolve a new role, as past dissonance is reduced and a consensus is reached on the new role content. The "ideal" role has been modified both by the reality of the technology and the individual's perceptions of how the role should be performed.

If these adjustments have not occurred, then the dissonance increases and the ideal role relationships do not materialize. This perceived resistance to change may be a result of the failure of the new role relationships to meet the individual's organizational needs and/or desires. This failure or "resistance" may lead to the problems mentioned in Chapter I: beating, blaming, ignoring or forcing the system.

The review of the literature suggested that role changes both within the position and in the role relationships would be a causative factor in the adaptive process as changes in the technology, structure and policy modify the interactions, patterns and produce stress. While the derived model addresses occupational roles, further analysis of these roles from the perspective of adaptation to the technology may contribute to a greater understanding of the process. Occupational roles have a dual social function: on one hand, roles are related to work tasks, which are interrelated; while on the other, roles are related to people who interact with each other.[6] The analysis of the human component of the role (as contrasted with the task component) will focus on the three categories of personnel: management, data processing and clerical.

Management Personnel and Adaptation

The computer technology changes structure, job content, communication patterns and the control structure in the organization. This results in a change in management activities in two specific areas: control and coordination, and decision-making.[7] Computer technology serves as an impersonal mechanism of control as the system provides a shortened feedback loop which furnishes immediate information about work in progress.[8] The manager is thus expected to more effectively control and coordinate his unit's activities due to the more comprehensive data or timeliness of the data. However, managers prefer verbal information that is now-oriented, in contrast to written information that by its very nature is historical.[9] This results in a need to resolve the dissonance between internal needs and external demands for the manager, as the tasks of the managerial role change under the impact of the technology.

Further, the greater amount of detail available leads to the problem of formatting a report that is meaningful and relevant. Because of the increase in both the types and amounts of information collected and analyzed by the computer, managerial responsibilities are enlarged along with the boundaries of the job. This increase also influences the time frame of the manager. The reduced time delay between action or decision and its reported effect affect the manager's decision-making ability and performance. Decisions can only be made about information, not persons or events. Thus what happens to an individual or event is not determined by their individual characteristics, but rather by the characteristics of the information

sought about them and processed in the mind of the decision-maker.[10]
Managers, especially police-managers, utilize documents, written
sources of information plus the tonal and physical "body" language
of the person providing the information.[11] The deprivation of this
additional knowledge and the requirement that the manager rely solely
upon written communication creates new demands on his ability to make
viable decisions and results in stress due to the discrepancy between
role expectations and role performance.

The model would suggest that adaptation goes through four
stages: the first stage when the manager hears "good things" about
his future ability to manage with the data provided by the information
system is followed by the emergence of the second stage as the reality
of the situation becomes apparent and the manager learns the limita-
tions and fallibility of the data. The third stage presents him with
the greatest stress as he must resolve the conflict generated by his
previous knowledge of discrepancies caused by computer technology
and the new knowledge that his own position has become more controlled
as a result of the increased data, along with handling the increased
demands on his managerial ability. The fourth stage leads to either
incorporation of the technology into the managerial role, accommoda-
tion--the process of learning to live with technology--or a dysfunc-
tional utilization characterized by one of the symptoms mentioned
earlier: beating, blaming or ignoring the system.

Data Processing Personnel and Adaptation

One of the basic areas of conflict in role relationships is
between the data processing personnel and other members of the

organization. The traditional staff-line conflict operates more intensely in data processing due to several factors. The interaction between staff specialists and other organizational personnel carries a potential for conflict as a result of territorial overlap as the data processing personnel attempt to learn and program the member's decision-making processes. While individuals in the organization recognize that no organization can "go by the rules" exclusively, the data processing personnel are seen as expecting precisely that adherence as they attempt to specify the conditions under which data are collected, sorted and retrieved.

As professionals, data processing personnel develop their own speech patterns and cliches that may be markedly different from those of other personnel in the agency. This not only hinders communication with the other personnel, but also encourages the tendency to remain with other data processing personnel who are involved in computer systems, rather than becoming integrated into the organization.[12]

Other differences occur because of disparities in the background and outlook of the data processing personnel and those of others in the organization. Computer staff are generally younger than the managers with whom they interact and in many cases are more highly educated. Their computer education has been oriented towards an analytical approach that seeks the best answer in a systemic manner. Managers, on the other hand, are accustomed to intuitive answers based on previous experience and knowledge in solving problems.[13] They are especially concerned with the behavioral impact of

the solution in contrast to data processing personnel who tend to view organizational behavior as predetermined rather than problematic. Thus systems of programming based on boolean algebra are designed to operate on data in one of four modes: "either," "or," "and" or "neither." Computer personnel appear to develop a tendency to extend this logic to organizational behavior and make assumptions about the regularity of human behavior that corresponds to their understanding of program logic. Having little education in the behavioral sciences and believing that cybernetics applies only to forecasting, they fail to apply the concept suggested by Berr to management and stochastic behavior.[14] This trained incapacity of system personnel leads to perceptions of inadequacy in their inter-relationships with other members of the organization.[15]

These external discrepancies lead to internal problems of self-concept as the data processing personnel seek to design the best system possible in response to the organization's needs, yet meet barriers which hinder their fulfillment. Unable to understand the causal factors, personnel are faced with both inner doubt and outer conflict as their roles fail to materialize according to the "ideal."

The model suggests that the need to adapt the data processing role in the organization occurs in some order or sequence. The first stage is the "honeymoon" period when the data processing personnel are received by the organization as persons to solve all the organization's problems. Expectations of what the computer technology will accomplish are oversold both by data processing personnel who believe

explicitly in their technology and by the organizational personnel
who want to believe implicitly in salvation. The second stage evolves
as the system is implemented and expectations meet reality. The
inevitable reaction comes and disappointment and frustration result.
Data processing personnel lose their status with other personnel.
They are aware of the problems with the computer technology and assume
that other personnel also are aware of the problems which occur with
the implementation of the technology. Changes are also occurring in
the data processing unit that create a degree of anxiety over jobs,
as certain positions decrease and others increase. Eventually the
third stage is reached and a certain stability emerges which requires
maintenance of the system, rather than designing new applications.
The technological imperative is curtailed. Both the task and rela-
tionships of the role are changed for the data processing personnel
and this change creates the need for further adjustment. The per-
sonnel, trained for creative design, must now perform routine mainte-
nance tasks on the system.

The fourth stage emerges as a routine is established, and com-
munication networks evolve. Each side begins to understand and use
the other's terminology and a tenuous rapport begins. Their atti-
tudes become similar to those of the clerical personnel in their
evaluation of the organization, while their job satisfaction either
reaches a level compatible with the position or they leave to seek
newer fields.[16]

Clerical Personnel and Adaptation

Another major problem area in role relationships identified by the literature is the interface between the clerical personnel and the technology. Zand, who analyzed the failure of an interactive systems design effort, pointed out that no one had a coherent understanding of the organizational, human, and technical components of the effort and how they interacted. As a result, the technical components dominated.[17]

This technical dominance is primarily felt by the clerical personnel who interact with the technology. One particular impact is in the task content. Clerical workers, who over the years have built up a knowledge of procedures and acquire status from their knowledge of the location of data in the files, are suddenly deprived of this knowledge and status by the conversion of the files to the computer system. This results in a lessened self-concept as previous experience and knowledge lose their value, and personnel must now rely on an impersonal machine to provide the information.

Further, their interaction with other personnel is inversely related to the degree their position interacts with the computer system.[18] The position of input operator, for example, has its primary interaction with the console, secondary interactions with other personnel and tertiary with other operational personnel, such as the police officer. The interpersonal network that was built up over the years has been pre-empted by a machine and other relationships must fall back to a lesser position of importance to that of the task at hand. As a result, they feel isolated from fellow employees.[19]

While the clerical workers feel a greater challenge because of the newness of the role, they encounter difficulty in assuming the role. This tends to be expressed in a demand for increased supervision.[20] As the personnel encounter increased demands for accuracy, they also seek reassurance that they are performing according to the new role expectations which result in the demand for increased supervision. These changes create new role relationships for the clerical workers as they interact with the new technology.

In the context of the model, clerical personnel have certain expectations about the computer system. The fear of job loss, cited in much of the literature on research in the business sector, is not prevalent in civil service organizations; however, the newness of the technology leaves the personnel without referent conditions by which to evaluate the impending change. As a result of this normlessness, there exists a degree of anomie or anxiety.

During the second stage, after the implementation, personnel learn new tasks--tasks which require a high degree of accuracy at the same time that the human interaction from which the individual draws his psychic support is limited. The third stage is a working through to a viable relationship with the computer technology. The technology, which initially creates a high degree of uncertainty in its operational ability because of high downtime (the amount of time the computer system is inoperable) improves slowly over time. Accustomed to manual systems that had to deal mainly with human error, the personnel must now deal with both human and machine error. Stories begin to circulate about incidents regarding the

success/failure of the system. This informal feedback begins to provide a conceptual framework from which personnel attitudes and job satisfaction emerge. The fourth stage evolves out of the shaping of attitudes and task adaptation as the computer system stabilizes its operation. Uncertainty becomes expected and personnel adapt in various ways to their new role and task environment.

Police Officers and Adaptation

The literature does not identify how police officers as a group react to the technology. By projecting findings from studies on blue collar workers and bank tellers to police, we may hypothesize the following occurrence.

The officer's expectations will be affected by management's previous history in dealing with change. Some of the expectations will be derived from outside sources, such as police magazines and academy lectures. Overall, the expectations will reflect a view that with the increased information, the police officer can perform his tasks more effectively.

During the second stage, the officer's tasks begin to change as they learn the rules and procedures necessary to interact with the computer technology. In addition, there is an increased demand for information and accuracy in completing incident (crime) reports.

By the third stage, the informal communication network has passed along information on the efficiency of the computer technology and the officer has more experience with its product--information. He begins to determine the effectiveness of the technology and its utilization for his role needs and desires.

During the fourth stage, the officer adapts both his performance and role relationships to his perception of the computer technology and the information it generates. This adaptation may reflect either rejection, acceptance or accommodation with technology.

Summary

The literature suggested that the adaptive process may be an intervening variable between technology and the changes in organizational structure, sociotechnical systems and individual attitudes and job satisfaction.

A model of the adaptive process is derived from the role acquisition theory and the stages of computer technology growth. The variable of time is incorporated into the stages of the model while the variable of location is categorized into four personnel groups, each of whom interact differently with the technology.

This model suggests two types of adaptation: a change in the work tasks of a given position and a change in the role relationships. The four stages of the model are examined from the perspective of each of the personnel categories and potential events at each stage of the adaptive process are discussed.

A research methodology to examine the reliability of the model is presented in the next chapter.

FOOTNOTES--CHAPTER III

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[9] Henry Mintzberg, The Nature of Managerial Work (New York: Harper and Row, 1973).

[10] Leslie Wilkins, "Information Overload: Peace or War with the Computer," Journal of Criminal Law and Criminology, 64 (1973): 190-197.

[11] Dr. W. J. Beeners, Director of Speech, Princeton Theological Seminary in a speech to the South Carolina Youth Worker's Association at the 1976 Fall Conference, Myrtle Beach, S.C., stated that words have a credibility of 7%, tonal quality 38% and kinesics or body language of 56%.

[12] Robert Fano, "The Priesthood of the Machine," in Information Systems for Management, ed. Fred Bruenberger (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972).

[13]Rose Mary Stewart, How Computers Affect Management (London: MacMillan Press, Ltd., 1971.

[14]Stanford Beer, Cybernetics and Management (New York: John Wiley and Sons, 1964). Beer suggests that managers look at the organization as a stochastic process interacting with the environment and as a result, receive both known and unknown amounts of information from the environment.

[15]Ida R. Hoos, Automation in the Office (Washington, D.C.: Public Affairs Press, 1961.

[16]C. Marenco, "The Effects of the Rationalization of Clerical Work on the Attitudes and Behavior of Employees," in Employment Problems of Automation and Advanced Technology, ed. J. Steiber, proceedings of a conference held at Geneva by the International Institute for Labour Studies, 1966.

[17]Dale E. Zand, review of Designing Interactive Systems for Organizational Change, Seveden, 1975 in Administrative Science Quarterly, 21 (March 1976): 166.

[18]Hoos, op. cit.

[19]Marenco, op. cit.

[20]Ibid.

CHAPTER IV

RESEARCH METHODOLOGY

The chapter on research methodology is divided into sections
on research design, population sample, data collection and data
analysis. A final section addressing reliability and validity of the
study will complete this chapter.

Research Design

The social sciences have become increasingly oriented towards
the statistical techniques in research, although with the advent of
the computer, a trend has begun towards system simulation and model-
ing. Yet basic to these techniques is the exploratory study that
suggests a model and variables from which more sophisticated research
can be derived. Both the literature review and the model suggest
variables which may affect the adaptive process. However, because of
the variability of the research findings and the lack of standardized
definitions of the variables in the research on technology, the pro-
posed research did not utilize a hypothesis-testing statistical
approach. Because of the limitations imposed by the literature and
research in this field, the most effective research design for the
present study was an exploratory study. This design is best uti-
lized when there is little known about the phenomena under study or
in situations in which everyday life is so familiar that it is likely

to be taken for granted. The exploratory study, by not foreclosing pre-emptorily on certain aspects of the process and attempting to quantify into exclusive categories selective variables that may or may not reflect the significant causes of variation in the process, thus permits an examination of the significant variables in the phenomena as identified by personnel in the field. As all knowledge is basically derived from field experiences and abstracted there-from, the exploratory study would appear to be a more valid metho-dology for the research design.

There exists little research on the process by which per-sonnel adapt to technology, especially computer technology. The model provides a method to incorporate the theory of role acquisition into the growth process of computer systems. However, the model remains a theoretical construct. As a result, the research focused on the adaptive process identified by the model and the various events that occur over time by different categories of personnel. These events are potential descriptions of personnel's reactions to the computer technology that have been identified from other liter-ature, and in a sense, provide direction to the research design.

In order to provide a greater richness of detail on which to evaluate the model, the research design focused on a cross-section of police agencies in several states.

Population Sample

The population sample selected police agencies from the uni-verse of those located east of the Mississippi River. The research

Agency	Number of Personnel (includes both sworn and civilian personnel)	Jurisdiction (type)	Population
P.	9,000	City	2,000,000
B.	3,100	City	650,000
N.	30,401	City	7,895,000
S.	246	City	80,000
G.	393	City	198,000
C_1	1,100	City	453,000
C_2	1,400	City	540,000
D.	472	County	460,700
A.	1,868	City	497,000
C_3	270	County	200,000
C_4	668	City	241,000

Figure 4.1.--Demographic Information on Agencies.

process divided the agencies into three sections: Northeast, Midwest and South. For the Northeastern section personnel in agencies in Massachusetts, Pennsylvania and New York were interviewed. The Midwest consisted of Michigan and Ohio, while the Southern section focused on North Carolina and Georgia.

The division into regions was made for convenience in handling the travel arrangements for the research. South Carolina was used as a site for agencies in the pilot study to determine the feasibility of the research instrument. Two police agencies and a state level police interface network with the local agencies were utilized as research agencies in the pilot study.

Specific agencies were selected primarily on the basis of either a direct personal contact with someone in the agency or through persons who knew someone in the agency. In a few cases, selection was due to geographical proximity of the agency to other agencies; this latter reason was due to limitations of time and money.

Data Collection Instruments

Data collection was based primarily on in-depth interviews with selected agency personnel. The interviews were conducted with personnel who were available and with whom appointments were made by the contact in the agencies. This resulted in a less-than-ideal selection but was a result of the realities of the situation. One factor that influenced the interviews was the experience of the agency personnel who were accustomed to being interviewed on the technical aspects of the system rather than the behavioral aspects.

This resulted in appointments being set up with the police data pro-
cessing managers or their liaison, rather than with the police per-
sonnel who interacted with the system. In one agency, the researcher
was invitied to come and interview them when a commanding officer
learned of the research topic. His comment was "let me tell you the
problems we've had"; his system was perceived as a successful imple-
mentation. This reaction was found repeatedly in agencies as the
personnel realized that the researcher wanted to hear their problems
with the system, as well as their successes. There appeared to be a
feeling that no one wanted to listen to their problems with the
technology.

The interview concentrated on open-ended questions. This
method was determined to be the most feasible one to encourage the
interviewee to talk freely and openly in response to the questions.
It also permitted the researcher the opportunity to re-phrase the
question if the interviewee didn't understand the original question.
In addition, this method permitted the researcher to probe more
deeply into the answer in order to obtain a greater understanding
of the process. The wide range of replies to interview questions
received during the pilot study confirmed the need for the explora-
tory study and also suggested that the findings would undoubtedly
focus more on the impact of system than on the process.

The topical areas were derived from the model of the adap-
tive process and they were explored for source, content, and type
of perceptions along with the degree of consensus and the individual's
reaction to the particular stage of the process, to the degree

possible. The interviews became eclectic at times, as the researcher attempted to put the questions in terms that would draw forth the necessary information.

Along with the interviews, descriptive data about the agency size and systems was collected. One of the criticisms of early research on computer information systems was the failure to indicate these variables. The table presented in Figure 4.2 gives this information. While size did not appear to affect the way the personnel adapted, it did affect the time period, that is, when a system was installed. The larger agencies were into second-generation design, while the smaller agencies were implementing and operating first generation systems. There appeared to be little transference of knowledge about implementation among agencies. While the problems and "horror stories" of errors and failures were passed on, there appeared to be minimal effort at structuring the information. This resulted in each agency repeating the implementation process without the benefit of other's experience. The emphasis has been upon transference of technical knowledge, not of behavioral knowledge.

There were thirty-eight (38) interviews held and they are categorized both by agency (see Figure 4.3) and by personnel category.

Management	13
Data Processing	10
Clerical	12
Police Officers	3

Agency	Ownership	Model
P.	Police	IBM 370/135
B.	Police	IBM 370/135
N.	Police	IBM 371-158 (2)
S.	Police/City	IBM 370/135
G.	City	Burroughs B3500
C_1	Regional	Univac 70/60 Burroughs B6725
C_2	City	Dec PDP 1135
D.	County	IBM 360/40
A.	Police	IBM 370/146 (2)
C_3	County	Unknown
C_4	Police/City	Burroughs B6700

Figure 4.2.--Agencies by Type of System.

Agency	Number of Interviews
P.	4
B.	2
N.	3
S.	6
G.	4
C_1	2
C_2	2
D.	4
A.	4
C_3	3
C_4	4

Figure 4.3.--Number of Interviews in Each Agency.

Data Analysis

The function of the exploratory research was to gather data and through a deductive analysis to provide insight into the concepts evolved from the model. The method of data analysis was to seek events that were found to be common to the experiences of the personnel in the agencies. These were identified and sequences were derived from the systemic nature of the information technology and the nature of the event. The nature of the technology meant that events connected with the system design would come before events connected with the system implementation. Within the event itself, there exists a specific sequence of actions, e.g. a report must be generated before a reaction to it can occur.

The computer technology may be considered the independent variable with the adaptive process as an intervening variable that affects personnel's attitudes and job satisfactions, organizational structure and the sociotechnical system. However, this utilization of the concept of statistical techniques in identifying independent, intervening and dependent variables suggests a linear, progressive relationship unaffected by feedback. The research did not find this linear relationship to hold true; therefore the analysis was expanded to include events that were influential as feedback actions and appeared to create changes in the actions of the personnel. The analysis focuses on the events that appeared during implementation and the stages at which they occurred.

Factors that may have affected the analysis are discussed under the section on validity and reliability. Two other problems

of the analysis must also be discussed: the lack of standardization of the replies and the gathering of material that was not directly related to the model. As mentioned earlier, the replies were varied in content and their interpretation as to their relevance to the model and potential variables is a subjective process based upon the researcher's knowledge of the police function and the computer technology. Material that at first did not appear to be directly relevant to the model, but was more technical, was also collected. During the process of coding and analysis, this material contributed additional insights into the process, for at times it was an indication of events that the personnel were so familiar with they did not think to mention it.

In analyzing the findings, the assumption was made that police agencies are similar in their organizational structure and in their sociotechnical systems, except where differences are noted in the findings. This assumption is based on the similarity of the police technology, i.e. the system of rules and techniques utilized by the police in the performance of their function.

Another critical factor in the analysis of process is that of time. It is a major dependent variable and one that can be defined as either a comparison of specific points during the process, as is the case in statistical research, or one that is defined as a continuous formation. The first is a snapshot, the second is a planar view. In order to study the process of an event, one must analyze how the various components evolve from the initial stage. Statistical research, by its nature, may determine if a certain

variable exists at some point in time, but it has difficulty deter-
mining how that variable evolved. This statement makes the assump-
tion that the variable was identified beforehand by the hypothesis
being tested; otherwise, the research instrument would not be seeking
its presence. Process research, on the other hand, and especially
exploratory research, seeks to identify the variables through the
subject's identification of them, rather than the researcher impos-
ing his variables upon the research. There exists more openness in
process research, as contrasted to the more formalized statistical
techniques.

Validity and Reliability

It has long been recognized that the validity and reliability
of the use of techniques, such as interviews, has not been confirmed
by empirical research.[1] However, Sellitz has pointed out possible
sources of contamination that may affect the analysis of the data.
These sources are presented along with the researcher's comments
from the field experience.

1. True differences may not be found due to the fact that
there are few techniques available to the social scientist that will
provide "true" measures of the differences among human behaviors and
attitudes. The variability of human characteristics is such that
even with the most validated of testing techniques, one can only
establish that the score measures the characteristics.

2. The focus on personal perceptions of the system was
derived from the ethno-methodological research literature and was

based on the concept that although each person has their own sense of reality, there are common shared meanings within a group that can be identified as the essence of the process. The researcher's task was to identify these shared meanings and how they influence the process of adaptation. The process of role adaptation is thus based upon the perceptions of that role by the person occupying it in that particular organization at that particular point in time. In interaction with other personnel, the shared common meanings are evolved from this interaction process. The findings are therefore presented in the context of the personnel's perceptions. The use of this technique is particularly effective in exploratory research as it permits an examination in detail of the breadth and depth of the personnel's experiences. In this research, the common shared meaning was the computer technology, and the process was how the personnel adapted to the technology. Therefore, the perceptions of the personnel are assumed to be "true" measures of their attitudes. The interpretation of those attitudes remains the responsibility of the researcher, and through feedback to the interviewees the truthfulness of the analysis can be determined.

In order to reduce possible bias introduced by the researcher, which would affect the "trueness" of the findings, copies were forwarded to the research agencies for their review and comments. The findings were also reviewed by a group of executives from South Carolina criminal justice agencies who had received instruction in criminal justice information systems. The consensus of both groups was that the findings were correct.

2. Various personal factors, such as mood, tiredness, mental considerations, will affect the responses of the interviewees as well as the interviewer.

This did happen. In some interviews, the researcher recognized that tiredness affected her ability to pursue answers. There was a tendency during these periods to take the answers as given without seeking further clarification. Also, there were times when the researcher had to establish a quick rapport and/or credibility. These also affected the answers that were received. In one agency, the interviewee was very defensive and prone to replying to questions with "textbook answers" until in frustration, the researcher confronted him with the fact that she was more interested in his experiences than with the answers from the book--which she already knew.

3. The situational context of the interview will also impact on the validity of the responses. As environmental psychology is discovering, the environment in which persons work and conduct interviews, by extension, will affect their responses.

The environment did in fact vary. The interviews were carried on while seated in offices, on the street, touring the computer center, at staff meetings, at work stations, and over lunch. This led at times to questions being asked that perhaps wouldn't have arisen if the environment hadn't suggested the question. Certain environments were more free to pursue questions than were others.

4. A lack of clarity in posing the questions may also affect the responses. Concomitant to this is the possibility that the responses may be interpreted differently than the interviewee meant

them. There is always the assumption of perfect communication and that each side will understand and communicate both questions and responses. Communication theory has disproved this assumption, but the difference between perfect communication and imperfect communication cannot be measured. One can only make the assumption that the respondent will understand, or will ask the researcher to have the questions clear and to understand the context of the response.

Many times, communication did present a problem. At each interview, it would generally take some time before the person would understand that the focus was upon behavior and their reactions to the technology, and not upon the technical components. (This reaction was examined under the section, Data Collection Instruments.) Yet, even with understanding the research emphasis, the technical component remained an ever-present topic and was constantly intertwined with the behavioral aspect. The researcher's ability to understand the technical component may have influenced both the interviewee's answers and behavior.

5. Factors in the analysis of the data may affect the research. This is potentially one of the most important in exploratory research, as the researcher must rely upon his knowledge and understanding of the responses, and to the extent possible, put them into the context of the work situation and his own experiences in the area.

This factor has been mentioned earlier in the chapter. However, one further comment is in order. After completing this type of research, it is extremely difficult to separate that which was

known precisely to the researcher and that which is known after, for the two become intermixed, and each contributes insights to the other. A further difficulty is that reading in the area is not suspended during the research, but continues and facts that may have been passed over lightly before take on additional meaning in the context of the research and in the subsequent analysis.

Interview Questions

1. When you heard of the computer system, what did you anticipate it would be? Your expectations about what it would do?

2. What changes in rules and procedures in your job were made as a result of the computer technology?

For managers - this question was related to decision-making and personnel problems.

For data processing - it was related to their interaction with other agency personnel.

For clerical - it was related to new job content and procedures.

3. What did you hear about the system and output from other personnel?

4. Currently, how does the computer system affect your job? What do you think about it--benefits? Problems?

Each question was pursued along the categories listed below.

A. Management

    1. Expectations

    2. Computer technology and decision-making

3. Personnel problems

4. Priorities and direction

B. Data Processing

1. Expectations

2. Interface with agency personnel

3. Quality control and applications

4. Managerial orientation

C. Clerical/Police Officers

1. Expectations and reality of computer technology

2. Changes in rules and procedures due to computer technology

3. Informal interaction

4. Current status

FOOTNOTES--CHAPTER IV

[1]Claire Selltiz, Marie Jahoda, Morton Deutsch, and Stuart W. Cook, <u>Research Methods in Social Relations</u> (New York: Holt, Rinehart and Winston, 1969).

CHAPTER V

RESEARCH FINDINGS

An exploratory study is the preliminary step of research for it seeks to discover ideas or insights into the proposed problem area. The focus of this research, as an exploratory study, has been to seek information that may provide further clarification on how police personnel adapt to computer technology. Data collection methodology has relied on observation and open-ended interviews, thus permitting the personnel themselves to express their perceptions of the technology and the ways they have adapted to it. These perceptions, at the time of the research, varied among different agencies and within the agencies, among the different positions. An analysis of the findings indicates that certain events are discernible and these are identified within personnel categories.

Interviews were held with personnel from systems that ran the gamut from failure to success. Each geographic section had an agency where a system was perceived negatively by the personnel who interacted with it. The findings do not separate these observations into a distinct category, but rather, in an effort to present overall views, combine the good with the bad in an attempt to present a holistic picture.

The findings are presented by personnel category. One problem that emerged in the categorization was that of overlap. Many

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times management and clerical findings could have gone into the data processing category and vice versa. Therefore, the categories are not mutually exclusive but rather an effort to simplify and define areas in order to give a more complete presentation of the police personnel's perceptions.

Interviews were accepted as they were set up by the police agency and data gathered as it was obtainable.

Management

Expectations about the computer system and information technology were generally derived from outside consultants who were hired to develop the system. The content of the expectations ranged from improved managerial capability, twenty-four hour information availability, integrated municipal information systems to increased dispatch capability. The police managers tended to perceive computer systems as the solution to their problems. As a result of this oversell and lack of knowledge about the technology, police management did not have a clear understanding of the constraints imposed by the computer systems.

Initial resistance to the computer system and information technology were a result of this lack of knowledge. Another factor in the lack of initial acceptance was the utilization of outside consultants. Police managers tended to question the outsider's knowledge of police operations and information requirements.

The issue of administrative control was addressed through either the creation of a data processing committee consisting of

several staff members or by delegating authority to the Research and
Development Unit to act as liaison with the data processing staff
and/or consultants. Agency control of the system remained in the
Administrative Section during the entire period of the system design
and implementation. In the early stages, priorities emphasized appli-
cations oriented towards collection of data on the agency's clients
or suspects, and the generation of reports addressing crime events.

As system implementation began, report generation encountered
managerial resistance. Poor data quality and poorly designed reports
led to problems of credibility with the information technology.
Report formats were designed that utilized numbers and statistical
data in the presentation of crime events and client data. The
resultant difficulty in interpreting the reports and using the infor-
mation contributed to the disappointment in the technology. Part of
the cause underlying this difficulty is that traditional police manage-
ment is not trained in numerical analysis.

In addition, management was flooded with data, but relevant
data for decision-making was either not in the report content or was
spread over several levels. This created resistance to the system
from police personnel at all levels. This inundation of data led to
a belief among some managers that the data processing personnel
failed to analyze whether the data could be processed more effi-
ciently by using a manual information processing technology. These
managers felt that the data processing personnel wanted to computer-
ize current procedures and impose the technology upon police opera-
tions regardless of efficiency.

The third stage can be characterized by changed report formats. The data was now presented in a more understandable form for police officers. The managers began to realize the potential for resource accountability that was available in the reports. This potential was a two-way street in that the manager could more accurately be informed of the activities of his subordinates; however, the same report was also available to his superiors who could now more accurately evaluate his performance. The recognition of this factor of accountability tended to be found more often in those agencies that had a history of management-employee confrontations.

During this phase, a tendency to push downward decision-making on resource allocation to the supervisory level was found. Parallel to this downward trend was a demand for better data quality. Pressures for this latter arose from the line officers.

The duration of the third stage, derived from departmental estimates, suggests that it took about three years for police management to become familiar with the system. During this period there was a definite trend "both in breadth and width" of increased usage of computer-generated reports.

As management became more familiar with the requirements of the information technology and computer systems, there was a pressure exerted by police management upon the data processing system to redesign both the computer system and information technology. The requirements of the new system design were defined by police management. Emphasis in the computer system was placed on system reliability (maintaining a high percentage of operational time) and on

reducing response time to inquiries for information. The information technology design addressed both report format and language, with an increasing emphasis placed upon the use of words instead of numbers in data presentation. For example, instead of listing calls by the ten code, the new design called for the meaning of the call (in place of "10-25" would be "call for wrecker").

The report format became more management-oriented. From a simple report of the number of crime events within a given period, the reports changed to officer activity by individual sector of precinct. In addition, the officer activity reports became information for budgetary and other resource allocation planning.

The multiplicity of reports were reduced, either by elimination or by combining specific data items from several reports into one comprehensive format.

The major impact was on the patrol function. The investigative area did not utilize the information technology extensively due to the rigidity of the data structure of current computer systems.

Data Processing

Their expectations were optimistic for they expected agency personnel to see the benefits of the computer technology. The data processing personnel believed in the benefits to be derived from the use of computer systems and information technology, and that these systems could accomplish almost every task from a technological viewpoint. Their projects tended to focus on optimal systems design and the use of sophisticated technology. Yet these personnel appeared to be unaware of the internal environment of police agencies, i.e.,

the internal and external political processes, the history of management's attitudes toward change, the amount of support the technology had among the personnel, etc. This lack of awareness resulted in problems of establishing supportive relationships with the police personnel.

One problem encountered by the data processing personnel in the early stages was the small number of personnel assigned to the projects. This, along with the traditional high turnover among data processing personnel, created pressure. Design sophistication was reduced to basic techniques; the lack of system documentation led to a lack of understanding the original program logic, and in some instances, out-dated technology was implemented on sophisticated computer hardware. During the early stages of the technology, the data processing personnel were mainly outside consultants. As the project progressed, some police departments established their own data processing unit within the agency; while others utilized the local (either city or county) data processing unit. This contributed to a high variability among data processing personnel. Personnel mix varied among the police departments from all police to all civilians to a mix of both. From a data processing viewpoint, this was due partly to the high turnover in the field and partly to personnel who use governmental agencies to gain experience before moving to the more lucrative private sector. From the police viewpoint, there was a feeling that police officers would be able to explicate the needs of the police function better than civilians or outsiders, and that there was a lower turnover rate among sworn officers.

The technological imperative was found to have occurred in several agencies. In these, data processing personnel were perceived as wanting to extend computerization in the agency.

This imperative which created rapid growth of the system and technology also created pressures for the personnel in handling the increasing numbers of applications and data files generated by the expansion.

The rapidity of implementation led to problems of quality control in the data, i.e. accuracy of the information produced.

During the second stage as systems were implemented, resistance was encountered from other personnel. Data processing personnel tended to blame the police officers for the latter's failure to understand the technology. Over time, data processing personnel adapted to the behavioral problems that arose from system implementation and they began to seek ways to resolve or reduce the resistance. This was facilitated by the support they received from management. However, where support was lacking, resistance tended to remain.

On the other hand, many of the problems encountered by the data processing personnel were seen as part of the normal implementation process. This resulted in their failure to communicate problems in system development to other personnel in the agency.

The use of technical terminology also contributed to problems of communication between the data processing personnel and the police during this stage. System changes aggravated the communication problems. Data processing personnel would make changes in the system

or information technology without providing the police with an explanation for the changes.

The improvement in performance and increased experience of the police operations personnel also led to decreased resistance. The use of police personnel in data processing further contributed to the reduction of resistance, especially in the area of communication.

As systems performance was stabilized, the technological imperative waned and system personnel began to establish priorities in systems design and applications development as well as beginning to perform some cost/benefit analyses. In addition, the problems of remaining current on the ever-advancing technology limited the time available to the personnel to plan new applications. This resulted in systems maintenance taking priority over system development. As data processing personnel were integrated into the organization, other changes occurred. System design teams were established that reflected the organizational structure and the data processing technicians no longer were the major components of the team. This resulted in an increased emphasis upon planning and integration of the system with the organization's goals and objectives. System design and implementation experience among police management elicited a higher criteria for the acceptance test on second-generation systems.

Data processing personnel learned that system growth also impacted upon the service availability of both the batch and on-line applications as well as creating a need for distributive processing.

This resulted more from the increasing size of the computer system than from considerations of privacy and confidentiality.

The technical improvements, however, created problems of storage and increased the cost of data processing. Data file storage areas in computer systems became filled, limiting the growth of the system. The failure to accurately estimate the cost of data collection and storage led to budgetary problems.

In addition, there appeared a facilities resource-allocation problem. Among regional systems, a need arose to establish priorities for time usage and data item storage among the various governmental agencies.

An increased emphasis upon complex applications opened up new problem areas. Geo-coding applications, for example, uncovered the out-of-date files of other county offices, such as the tax assessors. This resulted in an inability to use such files without a large expenditure of time and money to update them.

As operations smoothed out and the computer system and information technology increased in both usage and reliability the data processing staff increased their status with other agency personnel. There also developed a growth in staff and an improved work environment.

Management-data processing relationships changed over time with management increasing its control over the system design. In the early stages, data processing personnel were in control of the system design and implementation as a result of their expertise.

During the later stages of the process, the work of the personnel, both in computer systems and information technology, came increasingly within constraints imposed by management and the users of the data. Managerial control of the data processing function itself, however, appeared to be a political decision negotiated either with city or county governmental personnel or among other police agencies who also interacted with the system.

Internal computer systems located directly within the agency tended to be under the control of the administrative commander, and were either a separate section reporting directly to him or to the head of the records section. This reflected the primary orientation of the majority of police computer systems--that of operational record-keeping. As management established and implemented second-generation system designs, data processing personnel discovered the phenomena of the learning curve, e.g. performance decreased when the new system became operational and systems downtime increased. However, due to previous experience with system implementation, the police and clerical personnel more rapidly adapted both to the initial problems and to the systems performance, without the resistance that appeared during the initial system implementation process. The life span of a system appeared to be about eight years. Towards the end of this period there was increasing pressure by police management for a new system. This pressure evolved into the second-generation system--one that resulted from much greater input by police management.

The implementation period of the second-generation system was estimated to be around eight months by the respondents.

Clerical/Police Officers

Clerical expectations were not clearly defined due to the method of transmission--through police command personnel. This plus the lack of any previous referent condition created a stage where change was coming but the manner and impact were unknown.

When the system began to be implemented, the newness of the terminal operations and the fear of bringing down the system contributed in part to their fear of the technology. Initial training was through reading an operations manual and a short period of instruction. The remainder of the task was learned on-the-job. The introduction of the information technology resulted in a loss of responsibility for the data processing function. Under manual systems, the clerical personnel not only had complete control of the data, they also understood the process of data handling. With the introduction of the information technology there was an implicit assumption that because their tasks were limited to inputting data, they did not need to understand the system. This resulted in the knowledge and control of the data processing being removed from the clerical function and its placement in the hands of computer systems technicians. The clerical position became more routine and there was less area for individual decision-making.

During this period, changes were frequent both in the task content and the procedures to perform the task.

As the technology began to stabilize, the clerical positions were the first to bear the brunt of downtime. Officers would complain that they couldn't get any information when the system failed. When it was functioning, the officers began to rely on the expertise of the operator to obtain data for them. Regardless of the clerical personnel's ability to operate the system, the officers gave credit to "the computer."

Task content began to change. Some agencies established specialized positions, such as data entry operator and data analyst (to reconcile output with input). Other departments moved to a generalist work-station concept and clerical personnel were cross-trained in each other's tasks. The computer system also affected their work hours. Shifts were spread over 24 hours in order to provide input to the computer and to process information more rapidly.

By the fourth stage, routine had been re-established. In those systems perceived as successful, paper flow decreased, although the number of personnel appeared to have increased.

In those systems perceived negatively, clerical personnel had low morale and felt that no one listened to them. Their tasks were perceived as futile in view of the system's low performance. Work had increased as now they maintained duel systems in order to provide information. The police officer's performance also changed due to the impact of the computer technology.

In the expectation stage, he heard rumors about the system. These were compared with what he had learned during training about the use of NCIC system and availability of information.

When the system was implemented, his reporting responsibilities increased, both in the demand for more accuracy and for more information to be provided in the report.

As system stability grew, along with more detailed reports, the officer discovered his activities were receiving increasing scrutiny by his superiors. In some agencies, the officers initially refused to use the terminals for this fear of increased management control.

With increasing information, he also discovered the impact of false information. Through hearing of the experiences of other officers and his own experiences, he discovered that at times information was too late to be helpful or worse yet, had not been removed and therefore was no longer valid when he wanted to utilize it.

Depending upon these experiences and the ease of obtaining the information, the officer made his own decision about the utility of the information technology. Depending upon his location in the organization he developed new skills in interacting with the terminal. These skills ranged from increased accuracy in communication to learning how to operate terminals to performing simple system maintenance tasks.

In summary, the findings indicated that each personnel category reacted to the technological change from the perspective of their position within the organization. Further, the impact of the technology upon their tasks affected their mode of adaptation as well as their perception of the utility of the technology.

CHAPTER VI

DISCUSSION AND RECOMMENDATIONS

While a model is recognized to be an abstraction of the essential process, there always evolve variations in the process that tend to provide "surprises" to the researcher that were not expected. The following variations were found in the research.

The first was the negative attitude that arose at the beginning of the implementation stage. It appeared that as the system and technology became a reality, the discrepancy between reality and expectations was so great that it resulted in a sense of disappointment which was "acted out" by resistance to the system.

The second variation from the model that was encountered was the learning curve. Nothing in the literature had suggested this pehnomena, yet in the interviews with departments that were in second-generation systems, this process was mentioned repeatedly.

A third variation was the discovery of the separateness of the sociotechnical systems of each personnel category: management, data processing and clerical/police officer. This had not been predicted by the literature nor the model. Yet from the research findings these systems appeared distinct with interaction on the boundaries with the other systems as personnel roles met in the course of task performance.

Model Evaluation

Stage 1--Anticipatory
Socialization

The model suggested that during the initial stage, the role would begin to be defined by the individual's expectations. The research findings suggest that these expectations were derived from several sources and were interpreted through the individual's needs, which were both personality- and job-related. Primary sources of expectations appeared to be either an individual higher up in the organizational hierarchy, an outside source considered to be an expert, or one's profession.

These expectations were found to be influenced by the individual's position and role relationships in the organization as well as by the amount of interaction the individual had with the external environment of the agency.

It would appear that with the introduction of a new technology into the organization, the most accurate perception of its initial impact on the organization is derived from the expectations held by the technicians. Thus, for the computer technology, the data processing personnel held the most accurate perceptions of its impact and utility. However, their technical knowledge failed to provide an understanding of the organizational behavior that would result from the introduction of the technology.

Managerial concerns in the police agencies were not related to the location of the computer as this was pretty much defined by the funding. If the computer was located on-site, generally it was

placed in the records department. This was due to the fact that police computer systems are primarily client- and record-oriented, with other applications of secondary importance. In addition, the police agency is only one component of the city or county government, and functions such as payroll and budget are usually established on a level outside the agency.

One factor that limited the concern at this stage was the lack of knowledge about the technology among the police personnel.

Problems with personnel, specifically data processing personnel, may begin in this stage, as the model suggests, but the findings indicate they remain a constant problem throughout the system operations, due to the high turnover in the industry and, in some agencies, due to the lower salaries paid by the city or county unit. There have been attempts to relieve this situation by incorporating sworn personnel into the data processing operations, but this has met with mixed success, as these personnel may be promoted out of the unit, or may leave the department for more lucrative positions outside the agency.

The model suggested fears from the technology due to possible job loss or status. The findings indicate that the fear is of a different type than suggested. This may be due to the fact that civil service protects governmental positions in most agencies.

The fear appeared to be not one of basic security, but of competency and self-image. There was an implication that a machine can do the job and, therefore, there is perceived a loss of power--or empire building--which reflects on the competency and motivation of

the individual. Due to the lack of any previous knowledge about the technology, the individual begins to question how it will affect their job. Implicit is the unspoken question of how will the individual react and interact with the technology.

Overall, the expectations that provided the basis for anticipatory socialization were interpreted individually within the reality of each person's perceptions of what he heard and what he desired--his internal needs that resulted from his profession and work environment.

Stage 2--Expansion

The second stage of the adaptive process appears to begin with the implementation of the technology. This is only a suggested event and further research is required to more accurately define the sequence of specific events.

As systems are implemented, expectations become reality. The model noted, at this stage, that management needed skills in project management, establishing priorities and budget management. These did not appear in the research findings. However, this does not mean they are not important, only that police management had not focused on the importance of these skills at this point in systems development. It may become more important during subsequent systems.

The findings indicated that resistance and disappointment with the system and the technology appeared during this period. Attitudinal elements were decidedly negative at this point, rather than being held in abeyance as the model suggested. The underlying causes for this negative attitude were a reflection of the

individual's expectations of the impact of the technology on their particular position and role within the organization. The only commonality lay among personnel categories across the various agencies. Thus, management personnel in the agencies interviewed were disappointed with the initial report formats and contents, and this finding held across all agencies for the management category.

The model suggested that the data processing unit tended to expand and develop an informal organization as well as a technological imperative to extend computerization throughout the agency's operations.

The growth of data processing units was not determined by the research. There appeared to be a small growth in staff where data processing personnel were assigned solely to the police function. Internally, there may be the development of a liaison position either within the records unit or R & D to interact between the police and the data processing department. This occurred particularly with those agencies that have off-site computers.

On-site computer systems were generally developed by outside consultants and the system turned over to the agency during this stage. Operating personnel and a programmer-analyst were hired to run the system. As it grew, staff grew, but the particular growth pattern in police data processing units was not discovered by the research.

The technological imperative, suggested by the model, was found in all agencies and appeared regardless of the perceived success or failure of the system--or so it was perceived by those

interviewed. The actual growth of planned applications remains to be determined.[1]

No reference to the growth of an informal organization was mentioned by those interviewed. However, this lack may have been a failure to notice the development on the part of those involved in the implementation process. One potential indicator of the existence of an informal organization could be the reaction of the data processing personnel to the resistance they encountered during this stage. Through a failure to communicate the normal problems of this stage of system implementation, data processing personnel were "distanced" by the agency personnel and blamed for the system shortcomings. Recognizing that police personnel did not know the technology, yet failing to understand the implications of that lack, the data processing personnel tended to become cohesive and form a group spirit among themselves as they met the agency resistance. This cohesiveness would lead to an informal organization evolving among the personnel.

For those systems in the second-generation stage, this phase began with the downward trend of the learning curve. System performance decreased as the change-over was made. The trauma was reduced as personnel were more experienced with system development and data processing personnel were aware of the need to prepare the agency personnel for the new changes.

During this phase in second-generation systems, clerical and police personnel continued to use the system as the problem of downtime was a familiar phenomenon by now. Although police

management raised the criteria for acceptance of the new system, because of the earlier input into the design, the data generated by the system was more relevant to their needs. Management's new skills focused on greater utilization of the data, learning to use the reports for control purposes, and seeking to improve their own performance on the basis of the computer information.

The model did not suggest these events nor that adaptation to technology was a reiterative process as new technological improvements were introduced.

The research findings indicated that the adaptive process is one of repetition and because of previous familiarity with the process, a referrant condition exists. This referrant condition may be a critical element for the creation of the learning curve pehnomena that was found among second-generation systems.

In summary, this stage appears to initiate resistance to the technology. This resistance, if not acknowledged and resolved, continues to influence the remaining process of adaptation. The lack of effective communication--both in the lack of a common terminology and of a common network--contributed to the resistance. Another factor contributing to the resistance was the performance criteria imposed by the new technology. There appeared to be an implicit assumption that a new criteria for both role performance and evaluation would be established by the technology, although due to poor system performance at this period, such criteria was amorphous.

Toward the end of this stage the technology began to stabilize and become more reliable in its performance.

Stage 3--Formalization

As system reliability increases and the information technology is adjusted to the agency's operational needs, this stage of adaptation emerges.

The findings were similar to the model at several points in this phase.

System performance became more reliable. Data processing personnel were assigned permanently to the police function, if they had not been earlier. By this stage, the consultants had left and the system was on its own.

Managerial controls were established. However, the findings did not indicate managerial alienation at this stage. This may be a fault of the research instrument--e.g. interviews--used to collect the data rather than an indication that none existed. The issue of alienation remains to be researched.

There were events not predicated by the model. The dichotomy between clerical data handling and automated data processing was institutionalized during this phase by the establishment of data processing operations staff who were given responsibility for the function.

In regional and other shared systems there was a settling down process as the participants began to use the system. Questions no longer focused on cooperation and data elements, but began to address the allocation of resources and the priority of system time and programming.

As the model predicted, an informal communication network was at work during this stage. The network began to pass along stories of both success--the arrest made due to computer data--and failures-- the data was out-of-date or unavailable. Police officers started to use the system on a regular basis. This appeared to be a critical stage for them. If the system hadn't improved its performance to a state of fairly steady reliability, the officers quickly became discouraged and discontinued their use of the technology.

The model suggested that personnel would begin to adapt the technology to their role. This was found primarily among management and clerical personnel. Management required the information technology be changed to meet their needs. Where systems failed to change, some managers attempted to ride out the failure by continuing the system in hopes that at some point in time, the technology would improve. A minority of chiefs at this point laid down an ultimatum that either the system was improved or out it would go. Under pressure, data processing began to salvage the most feasible components of the system, that is, those that were working or near working on a reliable basis.

Clerical personnel began to extend the formal rules about data entry. They added new codes to fill in the gaps of the original coding structure. They learned ways to retrieve data that were not specified in the operations manual. Police and clerical personnel continued to input data into the systems that were perceived as a failure. This was generally done under pressure from management who

felt that due to the large investment already made, they could not afford to withdraw.

The search findings further indicated that personnel who interacted directly with a system perceived as a failure began to lose their credibility with the remainder of the department.

In summary, the adaptive process during this phase was one of adjusting the technology to meet both the organization's needs and the interpretation of those needs by the personnel. However, contrary to the model's suggested formalized adjustment structure, the findings indicated that the adjustment was informal, and that this informal adjustment varied with the personnel category.

Communication was gradually established among the three sociotechnical systems and integration among personnel categories began to appear. In those systems perceived as failures, the differences between the personnel were emphasized, and communication was conflict-oriented.

Stage 4--Maturity

As suggested by the model, adaptation occurred in several ways. By this stage, the system had begun to establish a reputation for reliability and the personnel came to rely on the availability of the data. Management had learned to understand the reports and had begun to request specific data. The model suggested decision-making would be stratified according to some managerial criteria. The research found there was some outward and downward movement of responsibility for resource allocation, but it was dependent upon the realibility of the computer-generated reports.

Data processing had begun the maintenance process and early application programs were reworked to make them more relevant to the policy function's needs. As they interacted more with the police, rapport was established and confidence was placed both in the personnel and in the data generated by the computer.

The model suggested personnel would begin to develop their own style of handling computer information. The findings indicated that clerical personnel learned the system and they began to train other operators. Their own self-image was enhanced by the capability to retrieve data and they began to seek new challenges, such as verifying the data elements before transmission into the system.

The police officers used the system more, and they were more willing to wait when they were told the system was down. Detectives began to use the system on a limited basis. Other uses, such as crime trend analysis, were found for the original data as it became increasingly reliable.

In those systems perceived as failures, this stage generally evolved into one of two conditions: the system was shut down or management maintained the system through exerting its influence and authority to overcome the increasing resistance of lower personnel who had no faith left in the system. Blame was tossed back and forth with each group claiming the other was responsible. Morale was increasingly affected as credibility among the groups plummeted downward.

As suggested by the model, where the implementation was successful, personnel felt competent in their interaction with the

technology, and their self-image was enhanced by this competency and their unique knowledge of the technology. On the other hand, if it was not successful, personnel used various actions to indicate their attitudes: withdrawal, distancing, or refusing to use the technology. These findings agreed with the model's suggestions.

Other actions suggested by the model were found: non-cooperation or cooperation under duress was one method found as the personnel acted out their frustration in having to interact with a technology that was perceived as ineffective. Mistakes in output were generalized to the technology and it became a scapegoat for all problems.

The work of the clerical unit was increased as the technology began to be run again in parallel with the old system, and the agency attempted to resolve the problems. Management was caught up in its own role crisis, as it became apparent that somewhere along the line a bad decision was made. At this point, it was easier to place the blame outward, thus continuing the negativity that began in Stage 2 and which increased as the technology failed to live up to initial expectations.

The technical personnel, with the same faith in their capability as that of management, reacted in a similar way by placing the blame on management for not understanding the technology.

For this stage, the model and the findings were fairly similar in their description of the adaptive process. Overall, the model provided guidelines for the research. The findings indicated there are stages in the adaptive process which can be identified as

indicative of differing behaviors and attitudes over time. However, as the research was of an exploratory nature, the findings are broad generalizations and specific time-bound categories are not defined by these stages. Their applicability may also be limited as the research did not include police agencies in the Western half of the United States.

Recommendations

Recommendations on specific research needs has been addressed in the model evaluation. More general research recommendations focus upon the exploratory nature of the current research.

1. While the utilization of interviews among various police departments provided a foundation to the exploratory research, an in-depth case study would provide more accurate data on the occurrence of the various phenomena and on the events that appear to be catalysts in the adaptive process. In addition, further research utilizing other methodologies would provide for the "triangulation" required to substantiate the findings.

2. The research subjects were limited to police agencies in the current study. Yet within the criminal justice system, the police are only one of several components. Similar research on the adaptive process utilizing other criminal justice agencies would provide an increased understanding of the adaptation to criminal justice information systems and technology.

An overall evaluation of the model and findings indicates that a definite phenomena of adaptation exists and that the phenomena

is influenced by the time-period of the process and the location of personnel in the organization and in relationship to the technology. Further research--both by the use of various research methods and the use of different populations--is required to more accurately determine the sequence of specific events in the process.

FOOTNOTES--CHAPTER VI

[1]Kent Colton has performed research in this area and indicates growth rate depends upon the particular type of application. Certain categories are more prone to growth than others--which tend to remain in the planning stages. "Computers and the Police Revisited: A Second Look at the Experience of Police Department in Implementing New Information Technology," 1975 Municipal Year Book, International City Management Association, Publishers.

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