MANAGING CHANGE IN A COMPLEX ORGANIZATION: AN EMPIRICAL STUDY

DISSERTATION

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By

Daniel E. Strayer, B. A., M. B. A.

The Ohio State University

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Reading Committee:

Professor Peter L. Mullins
Professor Sven B. Lundstedt
Professor Leo D. Stone

Approved By

Advisor

Department of Finance
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VITA

March 18, 1935  Born—Bellefontaine, Ohio
1957  B. A., Ohio Wesleyan University, Delaware, Ohio
1958  Officer on Active Duty in the United States Air Force
1958-1962  Buyer and Contracting Officer, Aeronautical Systems Division, Air Force Systems Command
1962-1965  Contracting Officer, European Office of Aerospace Research, Brussels, Belgium
1966  M. B. A., The Ohio State University, Columbus, Ohio
1966-1969  Assistant Professor of Economics and Management, United States Air Force Academy, Colorado
1969-1972  Mershon Fellow and Doctoral student, The Ohio State University
1972-Present  Management, Headquarters, Air Force Logistics Command, Dayton, Ohio

PUBLICATIONS


FIELDS OF STUDY

Major Field: Finance. Professors Peter L. Mullins, Leo D. Stone, Wilbur A. Rapp, John K. Pfahl, and Roger K. Harvey

Minor Field: Adaptive Systems. Professor Daniel Howland


Studies in Public Administration. Professors Sven B. Lundstedt, Harold A. Hovey, Arthur D. Lynn, and Peter L. Mullins
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CHAPTER I

INTRODUCTION AND DESCRIPTION OF RESEARCH PROBLEM

INTRODUCTION AND STATEMENT OF THE PROBLEM

The planning and management of change has been aptly described as a challenge of both intellectual and practical dimensions (Bennis, Benne, and Chin, 1969, p. vi). In an age of instant communication, of increasing world interdependency, of change in every aspect of society, few would argue with Bennis's contention that radical change is the single constant in the situation. While there is general agreement regarding the need for change in many areas of our society, there is no consensus as to how these changes should be effected.

Bennis refers to the need for an adequate theory of the processes by which knowledge is applied as the intellectual challenge. The practical challenge is to devise and deploy to managers in both the public and private sectors of our society a set of social techniques which they can apply to the change situations at hand. As these techniques must conform to the moral, practical, and political context in which the changed behavior is desired, it is an increasingly complex challenge.

Weingartner (1971) notes that management science studies often fail in application because they did not properly consider the organizational implications of their recommendations.
This oft noted fact has led to considerable consternation in management science. A lengthy and often lively debate over the subject has occupied the pages of *Management Science* for years. Yet despite the concern of numerous researchers and some public officials, the theory of change management represents a hoped for, rather than an existing state (Jones, 1968; O'Connell, 1968; Starr, 1969, and others).

Much of the problem may stem from the importance of the situational context. Regardless of the nature and purpose of the change, its introduction into a given social setting will probably cause a unique reaction. Thus social scientists have been forced to rely on using organizations as their research units. This has led to a scarcity of empirically supported research into the problem of change implementation (Gruber and Niles, 1971).

This research is designed to yield information regarding the change implementation problem in complex organizational settings. For the purpose of this effort, change will be defined as "the devising and evaluation of new performance programs that have not previously been a part of the organization's repertory and cannot be introduced by a simple application of programmed switching rules" (March and Simon, 1958, p. 175).

**RESEARCH SITUATION**

The change implementation effort studied here took place in the contract administration activities of the United States
Department of Defense (DOD). Two branches of the DOD, the U. S. Air Force and the Defense Contract Administration Service were involved. The new performance program is an attempt by the Department of Defense to improve the cost and technical performance characteristics of its major weapons. To do this, the Department has initiated considerable study into various aspects of its operations.

Background of Change Effort

The Department of Defense and the National Aeronautics and Space Administration initiated a major study of the contractor overhead cost control problem in late 1966. An ad hoc committee, the Joint DOD NASA Contractor Overhead Cost Study Group, was created to investigate the existing contractor overhead analysis and management structure and to devise means of improving it. (A copy of the group's charter is included in Appendix A.) The researcher has been associated with this effort since June of 1967.

Under the Ad Hoc group's sponsorship—later transferred to the Department of the Air Force—a research effort was established which conceived, developed, and tested a method of classifying the indirect overhead costs incurred by major Department of Defense contractors. This method was designated the PIECOST System. (PIECOST is an acronym for Probability of Incurring Estimated Cost.) In addition to developing the analytic methodology to permit more intensive management of contractor overhead costs, the research effort demonstrated that in a sample of seven major airframe contractor profit centers, overhead costs averaged two-thirds of the
costs actually generated under the managerial control of the profit center.

Description of Innovations Developed

The PIECOST System made several major improvements in the financial methodology employed by DOD contract administration organizations. The most significant PIECOST innovations involved:

A. A computer assisted system of classifying the hundreds of cost accounts which comprise a contractor profit center's indirect cost accounting system trial balance into eleven generic cost modes based on the purpose for which the funds were expended.

B. A system of implicit price deflators for removing the effects of price change from the modal account costs and permitting meaningful analysis of time series data.

C. A series of behavioral equations comprising a model of the contractor profit center's indirect cost incurrence process.

D. A matrix method of dividing the total indirect cost predicted by the model into the functional pools employed by the profit center to recover the indirect costs against the output activity of the business. Most of the basic research was documented by Otto B. Martinson's 1969 DBA dissertation, Classification System for Indirect Costs of Defense Contractors in the Aircraft Industry (Martinson, 1969).
Impact of Innovations

Although PIECOST implied change in all aspects of the DOD contract pricing function, its major impact was on the complex organizations created to administer the contractual interface between the government and private industry. These organizations are functional counterparts of the contractor's major organizational activities and are often physically located in the contractor's facilities. Thus, the government maintains at locations throughout the United States auditors, quality assurance specialists, production analysts, price analysts, industrial engineers, and other specialists who employ their skills in most cases within the same plant complex as their contractor-employed counterparts. Most of the larger plants have a government staff co-located while the smaller plants rely on a centrally located staff.

PIECOST constituted a major innovation for the organizational entities required to employ it. For example, in 1969, there were no time-shared computers employed by the contract pricing functions in any of the military services or Defense Contract Administration Service (DCAS). Their use as a tool in the analysis and negotiation of contract prices had not been proposed to the procurement function. Procurement pricing offices were not well equipped to handle the statistical and logical demands imposed by the PIECOST System. In practice, the process of evaluating and establishing the prospective overhead component of contract price varied from
profit center to profit center. The approach employed was strongly influenced by the philosophy used by the various procuring agencies, and as there was no Armed Services Procurement Regulation covering the subject, the treatment of overhead cost varied greatly. PIECOST thus sought to inject order into an extremely complex and heterogeneous system.

Figure 1 is a typical administration office, in this case for a large Air Force plant. Responsibility for establishing overhead rates rests with the Administrative Contracting Officer (ACO) who heads the Contract Administration Division. The ACO is the most direct beneficiary of the PIECOST System and an important individual in the organization. PIECOST implementation required him to introduce a new performance program fundamentally different from then existing practice. As the research effort which developed PIECOST had been conducted from the start with implementation in mind, it offered a unique opportunity to study how well the implementation strategy worked.

Change Strategy Employed

The PIECOST System was made available to the military services in late 1970 and has been actively supported by DOD top management since that time. The Air Force and the DCAS have made the most progress in implementing PIECOST, and their organizations were selected as the site for this research on the PIECOST change effort.

Both the Air Force and DCAS contract management organizations are managed by the military and are largely staffed by
Figure 1. Air Force Plant Representative Office Organization
Office Organization
civilians who are employed under the provisions of the U. S. Civil Service system. Therefore, the formal organizations and responsibilities are constant, and operations have considerable uniformity. The Air Force and DCAS employed similar strategies. This research concentrates on the Air Force experience including the DCAS experience by use of case studies.

The basic strategy employed was a normative re-educative approach similar to that described by Chin and Benne (1969, p. 49). This strategy aims at instilling experience-based learning into the social system. By re-educating the persons involved, the strategy encourages people to learn from their own experiences and thus to become self-directed instruments of change. To clearly establish responsibility, the Air Force Contract Management Division (AFCMD) established a new position in each plant for the specific purpose of managing overhead costs. This individual was designated the overhead specialist and was placed on a par in terms of grade and organization with other functional areas. The position hiring notice and job description are included as Appendices B and C.

In addition, a school was established at the Lowry Technical Training Center of the Air Training Command in spring, 1971, to provide the technical skills needed to implement and operate the PIECOST System. A two-week course was designed to impart the skills needed in time-shared computer operation and programming, indirect cost classification and analysis, deflator construction and use,
and model building and testing using regression analysis. The overhead specialist was sent to this school, and as soon as possible, another individual from each implementing organization was sent. These individuals were assigned the task of implementing the PIECOST System at their organization. They were provided time-sharing computer service at no direct organizational expense.

To counter expected resistance from the formal organization, two additional courses were added to the Lowry Technical Training Center's PIECOST offerings. The first course, "PIECOST for Managers," is a travelling course providing a two-day exposure to the PIECOST System designed to appeal to upper and middle level management levels of the administration office. This course was designed around a disturbance-response theme and emphasized the gravity of the current challenge to Defense procurement management and the significance of the overhead problem in that context.

March and Simon (1958, pp. 173-174) have indicated that the amount of search increases as satisfaction with the existing alternative decreases. Schein (1969, p. 98) employs the term "unfreezing" to convey the same meaning. Having created a search mode, the course then described the PIECOST performance program response to the challenge. It also provided a brief orientation to time-shared computational analysis to ease some of the apprehension that is often felt toward new technology. This course
was provided on site to insure that all levels of local management could attend the sessions. The two-day course presented an overview to designated contractor and government personnel on the first day with the second day being utilized for increased hands-on orientation for AF/DCAS personnel and discussion of how PIECOST could be applied in their situations.

The second course provided a team of analysts skilled in implementation of the PIECOST concept to visit the implementation site, assist in resolving any analytic problems remaining, and otherwise support and instill confidence into the local implementation team. The analytical team were typically employed for one to two week time periods and were only sent in after the local team had performed all of the steps necessary to implement the system. The second course was essentially an outside source of energy and expertise—a change agent.

RESEARCH PURPOSE

PIECOST benefitted from a carefully designed implementation program and the support of top officials in the office of the Secretary of Defense and the Department of the Air Force. In the twelve months after the completion of the first class at the Lowry Technical Training Center, five of the nineteen possible Air Force sites had completed negotiations of Forward Pricing Rate Agreements for overhead costs using the PIECOST System. The Defense Contract Administration Service (DCAS) had also completed several negotiations using PIECOST. To evaluate
Air Force progress, the AFCMD decided to hold a workshop to discuss possible implementation problems and to secure insights into aspects needing further emphasis.

In conjunction with the AFCMD workshop, a survey instrument was designed to enable the researcher to test the implementation program itself. This research is reported herein. Its purpose is to evaluate the basic stimulus—response change strategy that was employed.

RESEARCH APPROACH

Data gathered from the survey questionnaire were supplemented by six case studies involving both successful and unsuccessful implementation programs. One of the case studies had been performed before the field survey. This had demonstrated the complexity of the technical and social-psychological situation created when a major innovation such as PIECOST is introduced. The case studies permitted the researcher to more fully explore the dimensions of the implementation situation than would have been possible with the survey instrument alone. As case studies and survey instrument were unified by the change model described in Chapter II, they explored common dimensions of the problem.

Case studies were also performed of successful implementation efforts conducted by the Defense Contract Administration Service (DCAS). The case studies thus broadened the depth and breadth of the research.
The research reported herein must be classified as exploratory by rigorous scientific standards. Although every effort was made to insure consistent response, control bias, etc., the situational context was too complicated to accommodate rigorous methodology. The results, therefore, must be regarded accordingly.

ORGANIZATION OF THE STUDY

Chapter II sets forth the theory and models found to be relevant to this research. It synthesizes these into the model actually employed for PIECOST change implementation. Using the model, the research dimensions selected for this study are presented.

Chapter III presents the details of the research plan. It describes the case study and survey methodologies, the development of the survey questionnaire, the treatment of validity and reliability, and the analytic techniques employed. Questions of measurement are briefly treated, and the methodological limitations of the research are identified and discussed.

Chapter IV presents the results of the field survey. The respondents are described, and the variables relating to the major dimensions being studied are set forth along with the results of the analysis. Problems in question design or analysis are presented in the context of discussing the analytic results obtained. The reliability analysis is presented. An analysis of the chance and non-chance associated variables is presented, and the survey results are summarized.
Chapter V sets forth six brief case studies. Four successful implementation efforts are described first. These are followed by two studies of unsuccessful implementation efforts. The correlates of success or failure in implementation are identified.

Chapter VI sets forth the conclusions of this research and presents recommendations for further research.

DEFINITIONS

The complex industry and government organizations which comprise the units of analysis for this research have evolved their own jargon. These are set forth in regulations, operating procedures, and daily practice and have become a part of organizations' operating language. Many people are not familiar with these terms and their specialized nature makes redefinition cumbersome. Therefore, portions of the unique terminology will be employed in this dissertation. Thus:

1. **The government.** In contractual usage, the term refers to the United States of America in its contractual capacity. In this capacity, the government acts through the applicable department or agency and is represented by a contracting officer designated by that agency in accordance with law and internal regulations.

2. **Administrative Contracting Officer.** This term refers to a warranted contracting officer who is restricted to acting on contractual administrative matters. He is usually referred to as the ACO.
7. Defense Contract Administration Service (DCAS). This Defense Department organization is responsible for establishing policy and procedures for all field contract management activities not under Army, Navy, or Air Force organizational control.

8. Air Force Contract Management Division (AFCMD). This is the Air Force organization responsible for establishing policy and procedures for all field contract management activities assigned to the Air Force Systems Command (AFSC). This command is responsible for acquiring new weapons systems for the United States Air Force.

9. Air Force Contract Maintenance Center (AFCMC). This is the Air Force organization responsible for establishing policy and procedures for all field contract management activities assigned to the Air Force Logistics Command (AFLC). This command is responsible for logistics support of all United States Air Force weapons systems.

11. Defense Contract Audit Agency (DCAA). This Defense Department agency is responsible for all contract auditing.
CHAPTER II

RELEVANT THEORY AND MODELS

The size and complexity of the organizations involved, the importance of improvement to DOD management, and the circumstances surrounding the change dictated a carefully designed implementation approach. In view of the lack of received doctrine, it was necessary to design a model to identify the variables which could be influenced to facilitate implementation of the PIECOST System.

SITUATIONAL REQUIREMENTS

Lawrence and Lorsch (1969, p. 88) observe that the desired model is conditioned by the nature of the change involved. Therefore, the following requirements were placed on the model and the change management approach:

1. The implementation model must consider the "sunk costs of innovation which, regardless of origin, tend to produce program continuity [March and Simon, 1958, p. 173]." PIECOST, although a much more powerful tool than that previously available to DOD contract administration functions did not require any radically new organizational outputs. On the contrary, it affected an ongoing process which had long been used to assist in contract
pricing—an agreement on the rates to be used by the contractor to recover the estimated overhead costs for some future period. The implementing activities thus had a choice between changing, i.e., implementing PIECOST and persisting in whatever program they had been using for the purpose. This ruled out the alternative of a directed addition to the performance patterns. As they were already performing the forward pricing overhead task, many organizations were in substantial compliance with any regulation that could have been added to the ASPR. Further, the analytic demands of the PIECOST system were considered difficult or conceivably impossible. (It should be noted, however, that as of January, 1974, PIECOST has been implemented and used successfully in five additional AFCMD plants plus one AFCMC plant and several DCAS plants.

2. Because of PIECOST's analytic demands, the model had to suggest how the working level of the using organizations could best be influenced.

3. The implementation effort must not detract too much from the operation of the organization. (See Shedler's article in the June, 1971, *Interfaces* for a good discussion of this point.)
4. The model must consider the change management problem on a system basis; i.e., the organizational system had to be recognized. The reasons for this are as noted by Gouldner (Bennis, Benne and Chin, 1969, p. 93).

   (1) System models forewarn the applied social scientist that a change in one part of the system may yield unforeseen and undesirable consequences in another part of the system due to the interdependence of its elements.

   (2) System models indicate that changes may be secured in one element, not only by a frontal attack on it but also by a circumspect and indirect manipulation of more distantly removed variables. These, because of system interdependency, may ultimately produce the desired changes in the target variable.

   (3) For this reason, as well as others, system analysis, therefore, directs attention to the multiple problems of intervention with respect to a single problem.

5. The model must identify organizational variables which may be either directly or indirectly influenced by the change manager.

6. The approach must permit employment of a strategy which is compatible with the normal action patterns of the complex organization.

DESCRIPTION OF CHANGE MODEL

Relevant Models

An extensive survey of the literature was performed to insure familiarity with the work that has been accomplished by others working in the field. The literature search included
the fields of change management, diffusion of innovations, social psychology, laboratory training, and organizational theory. The organizational development literature was examined in depth. Although numerous models have been presented, only three were found to be of assistance in this research. A model was synthesized from their contributions and used to identify variables which could be influenced by the implementation program.

The basic model was presented by Mann and Neff (M & N) (1961). In adapting it to the situation, the researcher was also influenced by the ideas and models of Greiner (1967) and Leavitt (1965). Mann and Neff employ Lewin's force field concept to postulate an organizational equilibrium based on the social and technological forces bearing on the ongoing processes utilized by the major units of the firm, such as billing and accounting, facilities, production, etc. The equilibrium is depicted in Figure 2.

**FIGURE 2**

**ORGANIZATIONAL EQUILIBRIUM**

Social Process

Lower the Level

Social and Technological Forces Tending to Lower the Level

Level at which Social Process Occurs over Time

TIME Social and Technological Forces Tending to Raise the Level

Source: Mann and Neff, p. 62
Mann and Neff offer a process model for conceptualizing the role of the process to be changed, the forces acting on the organizational subunit affected, and the passage of time. They conceive the level of the social process as the performance variable to be improved by the change. To secure changed performance, the force field supporting organizational performance must be altered. The change process thus can be modeled as in Figure 3.

FIGURE 3
ORGANIZATIONAL CHANGE

Unfortunately, the social and technological forces were not catalogued, nor did Mann and Neff suggest how they might be identified (Mann and Neff, pp. 63-64).

Harold L. Leavitt's conceptualization was employed to refine the Mann and Neff approach. Leavitt (1965, p. 114) views industrial organizations as complex systems in which four interacting variables dominate—task variables, structural variables, technological variables, and human variables. They are defined as follows:
1. Task: Production of goods and services, including the many different but operationally meaningful subtasks existing in the complex organization.

2. Actors: People. However, the acts of people may subsequently shift to one of the other variable categories, i.e., structures etc.

3. Technology: Direct problem solving inventions. May be either a machine or a program of activity.

4. Structure: Systems of authority, communication, authority (or other roles), and work flow.

Leavitt considers the four classes of variables to be highly interdependent. He notes, however, that the structural, technological, and people variables are usually influenced in a manner ultimately designed to influence the task variable (p. 1145). His model is set forth in Figure 4.

FIGURE 4

LEAVITT'S CHANGE MODEL

Source: Leavitt, p. 1145
Leavitt's model was employed to identify the dimensions along which variables could be identified. In some instances, the change strategy was designed to influence the variable. Other variables could not be influenced but were known to be present, e.g., education level, etc., of the actors.

The Model Employed

The change model synthesized the Mann and Neff and Leavitt conceptualizations. PIECOST was intended to improve the level of organizational performance in the area of indirect cost analysis and negotiation. Achievement of a negotiated forward pricing rate using the PIECOST system of cost classification and analysis is a measureable improvement in performance of a task variable. With PIECOST posited as the principal technological variable and the negotiation of overhead forward pricing rates using PIECOST as the task variable, the remaining variables operating on the change process are to be found along the individual psychologic and demographic (referred to as "people" by Leavitt) and formal organizational structure dimensions.

This reformulation of Mann and Neff's model employs Leavitt's psychological/demographic and formal organizational structure variables for the social and technological variables which M & N originally conceived as supporting the performance equilibrium. The model presented by Greiner was of assistance in identifying the specific variables to be influenced. Greiner's approach, based on analysis of eighteen change efforts, is as follows (p. 126):
1. Successful change depends on redistribution of power within the organization's structure. (Power is defined as the locus of formal authority and influence which is typically top management. Redistribution is defined as significant alteration in the traditional practices used by the power structure in decision making.)

2. Power redistribution occurs via a developmental change process involving a number of phases, each containing specific elements and multiple causes that provoke a needed reaction from the power structure.

Greiner's conception of change employs six phases defined in terms of a stimulus to the power structure leading to a reaction which leads to another stimulus, etc. His model is set forth in Figure 5.
FIGURE 5. GREINER'S CHANGE MODEL

Greiner* approach emphasizing stimulus and reaction through time identifies two variables operating along the formal organizational structure and individual psychological/ demographic dimensions. These are pressure on top management and recognition of specific problems. Pressure on top management is a commonly identified variable, although often defined somewhat loosely. There is general agreement, however, that the firm, constant, and unequivocal support of top management is of great importance to any change effort (Ginzberg and Reilley, 1957; O'Connell, 1968; Radnor, Rubinstein and Tansik, 1970; and others).

Top management concern is communicated by formal methods. Letters, items in organizational newspapers and on unit bulletin boards, briefing teams, and staff visits are among the techniques used to bring top management's concerns to the attention of operating level personnel. This process brings together both the systems of communication and authority referred to by Leavitt (p. 1144) as comprising the structure variable. In this research, Leavitt's structure variable has been designated the formal organizational structure dimension. Because of its significance within the dimension, the interest of top management was considered an important variable.

Four additional variables were identified along this dimension. These were imposition of other organizational
priorities, organizational communication, organizational slack, and organizational resistance. Imposition of other organizational priorities was considered an excellent variable representing the desired performance program communicated by the formal organizational structure. By their actual job demands, the structure clearly signals the importance which it attaches to the various aspects of the individual's job. The priority communicated through workload requirements, moreover, is a true indicator of the immediate supervisor's performance demands. The nature of organizations often results in conflicting objectives being established for the working level. These are resolved by priority establishment. Thus, the imposition of another priority workload variable, although a measurement of communication, was considered sufficiently important to be classified as a separate variable.

Another aspect of the formal organizational structure communication system is the program review process. In the Department of Defense, large weapon development programs are more intensively reviewed than smaller ones. Thus, large program size subjects the plant organization to more frequent contact with their own and Defense Department management. Program size, therefore, was selected as an indicant of organizational communication.

Organizational slack, defined by Cyert and March (1963, pp. 36-37) as payment to organization members in excess of
what is required to maintain the organization, operates to stabilize the organizational system absorbing excess resources when demands are low and releasing them when events require.

The organizational resistance variable is closely related to the organizational communication system. It is used here to measure a specific attempt to counter anticipated resistance to PIECOST from supervisors and contractors. Watson (1966, p. 494) identifies systemic and cultural coherence as a source of resistance to change in social systems. This systemic consideration is based on the fact that repercussions of the change felt elsewhere may be more influential in the innovation's survival than resistance encountered from individuals.

To counter expected resistance from this source, the PIECOST for Managers Course was developed and made available to the implementing organizations. As PIECOST for Managers was aimed at the system's influential actors, the hoped for result was reduced organizational resistance in the detachments which employed the course. This variable measured the association between reduced organizational resistance inferred from having the course presented in residence, and implementation of PIECOST. Table 1 summarizes the formal organizational structure variables.
Greiner's recognition of specific problem variable appears identical to the conception of search advanced by March and Simon (p. 173). For this research, Greiner's title was used. However, the individual action pattern, a search for alternatives to the present performance program, is that of March and Simon. This action pattern was attached to the individual psychological/demographic dimension.

The classification is based on the fact that overhead analysis is so technically complex that only a small number of people in the plant organization are involved. The Overhead Specialist (OHS) is the individual designated to analyze and negotiate the overhead cost component. Thus, recognition of a specific problem and search for a better solution must be responses of the overhead specialist as an individual.

Several additional variables were identified along the individual psychological/demographic dimension. These were attitudes toward
PIECOST system, age, provision of supportive environment, and provision of a progressive technical environment.

Attitudes, defined by Krech, Crutchfield, and Ballachey (1962, p. 139) as "enduring systems of positive or negative evaluations, emotional feelings, and pro or con action tendencies with respect to social objects," are generally acknowledged to be important influences on individual's social actions. Their inclusion in the individual psychological/demographic dimension was thus appropriate. Provision of supportive environment relates to the individual's receiving psychological support from the presence within the immediate social group of another person trained in the PIECOST system. The supportive environment, while resulting from organizational actions, impacted on the individual's perception of psychologic support for his innovative activities. Similar reasoning with regard to a progressive, larger social setting applies to the progressive technical environment variable. Because the support is delivered to the individual via his social system rather than by his formal organization, these variables were considered individual psychological in operation. Age, of course, is a demographic consideration. Table 2 sets forth the individual psychological/demographic dimension variables.
TABLE 2

INDIVIDUAL PSYCHOLOGICAL/DEMOGRAPHIC VARIABLES

1. Recognition of Specific Problem
2. Attitude toward PIECOST
3. Age
4. Provision of Supportive Psychological Environment
5. Progressive Technical Environment

Management exercised its best efforts to influence the formal organizational structure and individual psychological/demographic variables to achieve implementation. Although most of the variables are theoretically subject to influence by management, the situation prevented this from being exercised to the fullest. Civil Service hiring regulations lessened management's ability to insure that all of the overhead specialists perceived the overhead cost control problem and PIECOST's ability to improve that situation, to cite one example. In any case, these practical aspects of the PIECOST implementation effort were not within the researcher's control. Thus, the various steps taken by the AFCMD and DCAS organizations to secure PIECOST implementation will not be discussed. This research is designed to test whether the
overall change implementation strategy was associated with the degree of success that the using organization achieved. For this purpose, the means of influence employed by those organizations need not be considered.
CHAPTER III

RESEARCH METHODOLOGY

CHARACTER OF EXPERIMENT

Scott (1965, p. 265) has noted that to succeed, the field researcher must meet the demands of at least two groups: those of his scientific colleagues and those of the subject group or groups. As defined by Seashore (1971, p. 147), the research reported herein is a field experiment. It was performed in a natural setting and was incidental to the organization's main purpose. As the research took advantage of the DOD decision to implement PIECOST and was designed to minimize the researcher's direct intervention with field organizations, it satisfies Seashore's (p. 151) definition of a natural field experiment.

Scott (1965, p. 267) suggests that hypothesis testing studies center on collecting data to confirm or deny a specific hypothesis or a set of hypotheses. This requires collection of specific information from a selected group of subjects. In this study, the overhead specialists and their assistants constitute the subjects. Data were collected using a questionnaire. However, Scott admits that the distinction between hypothesis testing and exploratory studies is not wholly satisfactory (p. 268).
It does not describe what researchers actually do in the field or what they should be doing.

To partially remedy this situation, six case studies will be presented. The research, while exploratory in character, satisfies Seashore's (p. 147) minimum criteria for field experiment design:

1. Definable and measurable change in organizational environment, structure, or process
2. Some means for quantification of variables
3. Some provision for testing of causal hypotheses through the method of difference

DESCRIPTION OF EXPERIMENT

Population

The research study involved eighteen of the nineteen plant organizations comprising the Air Force Contract Management Division, a major operating arm of the Air Force Systems Command (AFSC). (One AFCMD AFFRO participated in the implementation effort but had no representative present when the survey instrument was administered.) The AFCMD charter requires that it "act as the primary Air Force agency performing field contract management functions at those contractors' plants assigned to the Air Force by the DOD for plant cognizance to ensure protection of the government's interest while executing assigned and delegated contract administration functions and to provide nationwide contract
administration interface with Defense Supply Agency, National Aeronautics and Space Administration and other government agencies [AFCMD, undated]."

In addition, an Air Force Contract Maintenance Center installation was included in the survey population. Two facilities of the Defense Contract Administration Service also participated in the study. Thus, the research involved a total of twenty-one organizations ranging in size from twenty-six to two hundred individuals.

Change Approach

PIECOST is a purposive change resulting from the Defense Department's need for more rigorous control of the overhead element of cost. Because of its complexity, overhead is analyzed by a very small number of people in the administrative organization. The overhead specialist and his assistants have been assigned this responsibility; therefore, the PIECOST System impact is primarily on the overhead specialist. The impact of the change is at the level of the individual organization member and how he performed an ongoing organizational process, analyzing and negotiating forward overhead rates for pricing future contract effort.

Selection and Measurement of Variables

The implementation of PIECOST constitutes the dependent variable in this research. The implementation model establishes
the use of PIECOST in the negotiation of overhead rates for forward pricing of contract proposals as the output of the ongoing social process supported by the individual psychological/demographic and formal organizational structure variables in a Lewinian force field. As the research tests for independence between the variables supporting the process and improvement in the performance of that process, implementation of PIECOST must be measurable.

Measurement of the implementation variable is possible because of the nature of the PIECOST overhead system. Use of PIECOST consists of completion of five distinct phases of activity: classification phase, deflation phase, analytical phase, forecast phase (which includes negotiations), and tracking phase. Full utilization of the system consists of completing all of the first four phases and establishing a monitoring program using the monthly trial balance produced by the contractor's cost accounting system. The first four phases must be accomplished sequentially; i.e., the costs must be classified into the eleven cost modes, and then deflators must be constructed to remove the effects of price change. Analysis can begin only when the cost modes have been deflated. Forecasts depend on the completion of analysis, etc. Implementation was thus measured directly by asking the respondents how many of the phases had been completed. The specific measuring scheme is discussed in Chapter III.
In addition to the direct measurement, the dependent variable was measured by the amount of computer time that the organization had used during the preceding twelve months. Webb et al. (1966) have referred to such data as archive. As the computer units were installed for the overhead specialist's use, and as the PIECOST system requires considerable computer use to implement, computer usage is a proxy for implementation effort and, thus, to the degree of implementation actually achieved. Computer usage data were obtained, analyzed, and used as a check on the primary data. The independent variables are specified in Table 3. Whenever possible, these were measured directly. However, this was impossible for several of the most important. For these, proxies were employed.
TABLE 3

INDEPENDENT VARIABLES

<table>
<thead>
<tr>
<th>Individual Psychological/Demographic</th>
<th>Formal Organizational Structural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognition of Specific Problem</td>
<td>1. Top Management Interest in Change</td>
</tr>
<tr>
<td>2. Attitude toward PIECOST</td>
<td>2. Imposition of Priority Workload</td>
</tr>
<tr>
<td>3. Age</td>
<td>3. Organizational Communication</td>
</tr>
<tr>
<td>4. Provision of Supportive Psychological Environment</td>
<td>4. Organizational Slack</td>
</tr>
<tr>
<td>5. Progressive Technical Environment</td>
<td>5. Organizational Resistance</td>
</tr>
</tbody>
</table>

Stevens (1951, p. 27) has noted that the assessment of behavioral aspects is usually done indirectly through the use of indicants rather than by direct measurement of the psychological phenomena. As the indicant is a presumed effect or correlate whose relation to the underlying phenomenon is unknown (but usually monotonic), measurement, in the sense of assigning intervals or ratios, was impossible. Thus, nominal data were obtained on most of the variables. The remaining data were either obtained from the survey instrument or from the organizational archives. Table 4 sets forth the variables, indicants, and the source of the data. The indicants will be discussed in connection with development of the questionnaire.
TABLE 4

VARIABLES, INDICANTS, AND DATA SOURCES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicant(s)</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude toward PIECOST</td>
<td>Influence on Judgment</td>
<td>Questionnaire</td>
</tr>
<tr>
<td></td>
<td>Influence on Status</td>
<td>Questionnaire</td>
</tr>
<tr>
<td></td>
<td>Influence on Difficulty</td>
<td>Questionnaire</td>
</tr>
<tr>
<td></td>
<td>Influence on Adaptability</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Recognition of Specific Problem (Organizational Search)</td>
<td>Perception of Problem in Indirect Cost Analysis and Negotiation</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Age</td>
<td>Direct</td>
<td>Archive</td>
</tr>
<tr>
<td>Provision of Supportive Psychological Environment</td>
<td>Attendance of two or more Individuals from Organization at PIECOST School</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Top Management Interest In Change</td>
<td>Expression of AFFR and ACO Interest in Overhead</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Imposition of Other Priority Workload</td>
<td>Impact of PIECOST Implementation on Workload</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Organizational Communication</td>
<td>Dollar Size of Major Program Being Performed</td>
<td>Questionnaire</td>
</tr>
<tr>
<td></td>
<td>Dollar Size of Profit Center</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indirect Cost Accountants</td>
<td></td>
</tr>
<tr>
<td>Organizational Slack</td>
<td>Professional Personnel</td>
<td>Questionnaire</td>
</tr>
<tr>
<td></td>
<td>Strength of Organizational Units and Sub-units</td>
<td></td>
</tr>
<tr>
<td>Organizational Resistance</td>
<td>Provision of On-Site Training</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>PIECOST Implementation</td>
<td>None</td>
<td>Questionnaire Checked with Archive Data</td>
</tr>
<tr>
<td>Progressive Technical Environment</td>
<td>Use of PIECOST Computer Terminal by Other Organizational Members</td>
<td>Questionnaire</td>
</tr>
</tbody>
</table>
Level of Theory

The theory employed in this research is social-psychological in that it dealt with the psychological results of changes made in the organizational process. As mentioned in Chapter II, the theory is Lewin's field theory which is concerned with the behavior of the individual as a totality, not merely as an act by some part of the body (Deutsch, 1954, p. 183). The theory regards all psychological events as being determined by the interactions of the individual and his environment which constitute the life space or psychological field. The theory is syndromatic and global, in that it does not predict how each independent variable might affect the dependent variable.

Time Duration

Although the PIECOST change effort began in 1967, the period covered by this experiment is relatively brief. Full scale implementation began with the first class at the Lowry Technical Training Center in March of 1971. Data for this research were gathered in October of 1972. Thus, a total of eighteen months is covered by the change effort. This period is long enough to permit change to occur, but it did not permit great variation in organization composition, personnel or managerial practices. In fact, there were no changes in overhead specialists during the period. In some cases, the implementation effort did not
begin in March, 1971, but was delayed until the personnel could complete the Lowry school and the time-sharing computer could be installed. However, all sites had had their computers for at least ten months. Sixteen sites had had their computers for a year or more at the time of the data gathering. While the computer availability is an important consideration, the time period is considered long enough to permit sufficient change for measurement while not encompassing too much variation in setting, personnel, or intruding variables.

**Analysis Plan**

Practical limitations dictated that all data be obtained from one sample. Siegel (1956, p. 42) notes that in this instance, the analysis must be confined to the number of objects or responses which fall into various categories. As the majority of the data were nominal, the analytic plan was designed to employ $x^2$ tests of association. Hays (1963), Siegel (1956), Stevens (1951), and others agree that in this situation, the $x^2$ test is the most powerful available.

In this experiment, the $x^2$ test is used to examine the results for independence (lack of statistical association) between the categorical attributes of the information (Hays, 1963, p. 589). The independence that is of interest is that between the degree of implementation achieved by the respondent's organization and the respondent's perceptions, attitudes, or other attributes. Implementation here constitutes the columns and the variable attribute the rows in an $R \times C$
contingency table. Each response represents an occurrence of a joint event \((A_j, B_k)\) and occupies one, and only one, cell in the contingency table.

Of the conditions required for the \(\chi^2\) test, two are controversial. One of these relates to the rules followed for grouping the data into categories. Hays argues that combining classes to avoid empty cells in the contingency table or greater frequencies in the cells amounts to "tinkering with the randomness of the sample [p. 588]." However, Siegel (p. 46) states that adjacent categories may be combined if the combination is meaningful. In an example, Siegel defines a meaningful combination as those which do not violate the direction of response, e.g., strongly support and support could be combined into support. Siegel's approach was followed in this research.

The second controversial aspect is closely related to the categorization problem: What minimum expected cell frequency should be accepted? Rules of thumb are widely used and the question of small expected frequencies is controversial. Siegel (1956) and Hays (1963) advocate that a minimum cell expected frequency of five be maintained. However, Roscoe & Byars (1971) concluded that their study findings suggest that the \(\chi^2\) approximation is valid in many cases which would not have been considered appropriate under the traditional criteria. Roscoe and Byar's study is the most recent available on the accuracy of the \(\chi^2\) test of independence.
As the theoretical issues appear unresolved, no attempt was made to insure that the categorization resulted in five, or any other value, observations per cell. It will be noted that a number of contingency tables contain cells with less than five observations. In these instances, the expected frequencies were also less than five. However, no cells with zero observations were included in the analysis.

The questionnaires were coded to prevent bias. Each respondent worked independently. Records were kept of questions asked during administration. No patterns were observed on the questions asked during administration. The completed questionnaires were first checked for omissions and changes. Then the raw data were categorized into classes, and a series of contingency tables prepared. These were analyzed on a General Electric Mark III System Time-Shared Computer. The computer program employed, CHICON, was part of the GE library of statistical and mathematical programs. The program performs a $x^2$ test for a two-way contingency table. The program description is included in Appendix D.

SURVEY METHODOLOGY

Questionnaire Development—Validity

The questionnaire was carefully constructed to insure that it would yield scientifically useful data. Validity and reliability of the attitude measurement were of great concern in the questionnaire development. Bohrnstedt defines
validity as "the degree to which an instrument measures the construct which is under investigation [1970, p. 91]." To test for this quality, a panel of judges was assembled. These men were both military and civilian Air Force employees who had been associated with both research on and performance of government procurement functions. They combined practical experience in the organizational and functional settings which the questionnaire respondents represented with theoretical knowledge of the problems of performing research in operating organizations. After the questions had been revised to the judges' satisfaction, they were discussed with the faculty research advisors, and further revisions were made.

**Questionnaire Development - Reliability**

Reliability, which Bohrnstedt defines as "the ability of an instrument to place an individual on the attitude scale consistently in relation to others [pp. 83 and 87]," was assessed using the internal consistency approach. Ten questions were designed using proxies for respondent attitudes. The responses to these questions were scaled, assuming equal intervals and a covariance matrix obtained from the GE MUL-REGRESSION computer program. (See Appendix E for program description.) The reliability coefficient was computed using Cronbach's generalization (Bohrnstedt, 1970, p. 88). In this
generalization, $\alpha$, the reliability of the total score, is defined as follows:

$$\alpha = \frac{n}{n-1} \left[ 1 - \frac{\sum_{i=1}^{n} \sigma^2_i}{\sigma^2} \right]$$

Results of the reliability analysis are presented in Chapter IV.

**Questionnaire Administration**

To minimize bias, the questionnaire included an opening explanation setting forth its scientific purpose and pledging confidentiality of response. Further, the questionnaire was administered at the beginning of the conference, before the respondents had a chance to mix socially or were exposed to the conference speakers or material. For the same reason, archive data were relied on for some of the variables such as age. Although these steps hopefully lessened the possibility that cosmetic responses were obtained, there is no way to insure that all of the biases inherent in the organizational command line were eliminated. As will be noted in regard to the reliability assessment, the biases were apparently consistent. A copy of the questionnaire is included in Appendix F.
CASE STUDY METHODOLOGY

Role of the Researcher

The research employed three methods of gathering data for the case studies. In two instances, the researcher was a participant. One detachment involved the actual analysis and negotiation of forward pricing overhead rates using the PIECOST system. The researcher was a member of the implementation team which worked with the overhead specialist to implement the PIECOST system. Data for this study were gathered in two ways. First, the researcher kept written notes of the strategy followed and the major events that occurred during the implementation effort. Second, tape recordings were made on a regular basis to capture the situation more completely.

The second case study, in which the researcher assumed a direct role, involved an unsuccessful implementation. Data were obtained in the course of discussing other business which the researcher had with the detachment. Interviews were held with the overhead specialist and the ACO during the site visit. A follow-up telephone interview was conducted with the overhead specialist's assistant.

Surrogate Observations

A third case study was performed by a surrogate observer. This man, an Air Force officer and trained researcher, visited the site at the request of the AFCMD. He conducted
an extensive evaluation of the status of PIECOST implementation and conveyed his impressions to the researcher by telephone.

**Telephone Interviews**

The remaining case studies were performed via telephone interviews with the individual responsible for implementing PIECOST at the site. These interviews were conducted in a structured fashion. The research purpose of the interview was explained at the outset of the conversation, and confidentiality of response was assured. Specific questions were asked regarding the variables under investigation. Careful notes were taken of the responses during the conversations.

**METHODOLOGICAL LIMITATIONS**

As this research involves both the sample survey and case study research strategies, the limitations of these must be acknowledged. Evan (1971, P. 2) observes that survey methodology is beset by two principal problems: how to study changes over time by overcoming cross-sectional bias, and how to infer causal relationships from correlational data. Although approaches to treating the cross-sectional bias problem have been advanced, they could not be applied in this situation. Nor is there any assurance the principal remedy advanced by Evan (p. 2), repeated interview of the same respondents, would have yielded significantly increased confidence.
Causal inference is also in an unsatisfactory methodological status. In this research, the data dictates that the $x^2$ test for goodness of fit be employed. Thus, the most powerful conclusion that can be reached is that the implementation results are not independent of the variable concerned. This limitation cannot be circumvented; nor to the researcher's knowledge is there any generally accepted method for inferring cause. Resolution of this problem will have to await methodological advance.

The case studies are affected by the general consideration that while they can generate insights and propositions, they cannot either test propositions or provide a basis for generalizing to either classes of organizations or to organizations in general (Evan, 1971, p. 1).

The experimental situation prevented pre-experiment testing of the population. A control group was also prohibited. However, the number of organizations involved and their nationwide geographical distribution make it likely that the intruding variables were randomized. In addition, all of the organizations were staffed and managed in accordance with Civil Service and Defense Department regulations and thus displayed stable environment, technology, and membership characteristics (Seashore, 1971, p. 152). The population is described in Chapter IV.

Consideration must also be accorded to internal and external validity. Internal validity is concerned with the possibility that
extraneous variables may have accounted for the change rather than the change strategy employed. External validity involves the question of what settings, populations, treatment variables, and measurement variables can be considered generally influenced by the effect involved. Given the unique aspects of the organizations involved, the methodological difficulties mentioned previously and the rudimentary state of our knowledge of the change process, generally, the findings are considered exploratory.

The Department of Defense contract administration functions are highly specialized organizations. Because they operate in a unique environment subject to criticism from several sources, contract administration activities may not be representative of other organizations. The generalizability of these findings, therefore, must be tempered by the nature of the research setting.

However, these very problems contribute to the need for the research. In closing, it is appropriate to quote Homans, "There are neither good nor bad methods but only methods that are more or less effective under particular circumstances in reaching objectives on the way to a distant goal [1949, p. 330]."
CHAPTER IV

RESULTS OF FIELD STUDY

The questionnaire was completed by thirty-four overhead specialists (OHS) and their assistants. Nineteen organizations were represented. As the respondents are charged with the responsibility of implementing the PIECOST system at their contractor profit center, their perceptions, attitudes, and organizational settings constitute the fundamental data source for this research. The major characteristics of this population are described in terms of the corporate profit centers they are co-located with, their age, their education, and their professional backgrounds.

RESPONDENT CHARACTERISTICS

All of the respondents worked in Air Force Plant Representative Offices (AFFROs). Of the nineteen corporate profit centers presented, eighteen were under the organizational control of the Air Force Contract Maintenance Center, a major operating arm of the Air Force Logistics Command. Both commands are organized similarly, and the organization chart in Chapter I, Figure 1, is representative of both the AFSC and AFLC operating agencies.
The demographic characteristics of the AFPRO's will be discussed in connection with the analysis of the demographic variables.

Each of the nineteen plants is a profit center. All are accounting entities responsible for generating revenue, obtaining government contracts, acquiring resources, managing expenses, and achieving a profit. Air Force contract management activities have been located at these plants because of their substantial involvement with important Air Force weapon systems, either under development, as in the case of the B-1 bomber and F-15 fighter or currently in the Air Force inventory as first line systems, such as the B-52 bomber and Minuteman Missile. Table 5 lists the profit centers involved.

**TABLE 5**

**CORPORATE ACTIVITIES INVOLVED**

<table>
<thead>
<tr>
<th>Corporation</th>
<th>Profit Center Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Boeing Corporation</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>Aerospace Group</td>
<td></td>
</tr>
<tr>
<td>McDonnell-Douglas Corporation</td>
<td>St. Louis, Missouri</td>
</tr>
<tr>
<td>McDonnell Aircraft Company</td>
<td></td>
</tr>
<tr>
<td>The Boeing Corporation</td>
<td>Wichita, Kansas</td>
</tr>
<tr>
<td>Wichita Division</td>
<td></td>
</tr>
<tr>
<td>Lockheed Aircraft Corporation</td>
<td>Marietta, Georgia</td>
</tr>
<tr>
<td>Georgia Company</td>
<td></td>
</tr>
<tr>
<td>Aerojet General Corporation</td>
<td>Sacramento, California</td>
</tr>
</tbody>
</table>
TABLE 5 CONTINUED

CORPORATE ACTIVITIES INVOLVED

<table>
<thead>
<tr>
<th>Corporation</th>
<th>Profit Center Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>McDonnell-Douglas Corporation</td>
<td>Huntington Beach, California</td>
</tr>
<tr>
<td>Huntington Beach Division</td>
<td></td>
</tr>
<tr>
<td>Thiokol Corporation</td>
<td>Ogden, Utah</td>
</tr>
<tr>
<td>Ogden Division</td>
<td></td>
</tr>
<tr>
<td>Martin-Marietta Corporation</td>
<td>Denver, Colorado</td>
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<tr>
<td>Denver Division</td>
<td></td>
</tr>
<tr>
<td>United Technology Corporation</td>
<td>Sunnyvale, California</td>
</tr>
<tr>
<td>Lockheed Aircraft Corporation</td>
<td>Sunnyvale, California</td>
</tr>
<tr>
<td>Sunnyvale Division</td>
<td></td>
</tr>
<tr>
<td>AVCO Corporation, Wilmington</td>
<td>Wilmington, Massachusetts</td>
</tr>
<tr>
<td>North American Rockwell Corporation</td>
<td>Los Angeles, California</td>
</tr>
<tr>
<td>Los Angeles Division</td>
<td></td>
</tr>
<tr>
<td>General Electric Company</td>
<td>Cincinnati, Ohio</td>
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<tr>
<td>Evandale Division</td>
<td></td>
</tr>
<tr>
<td>North American Rockwell Corporation</td>
<td>Los Angeles, California</td>
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<tr>
<td>Rocketdyne Division</td>
<td></td>
</tr>
<tr>
<td>General Motors Corporation</td>
<td>Indianapolis, Indiana</td>
</tr>
<tr>
<td>Detroit Diesel/Allison Division</td>
<td></td>
</tr>
<tr>
<td>North American Rockwell Corporation</td>
<td>Downey, California</td>
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<tr>
<td>Electronics Division</td>
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<tr>
<td>Hughes Aircraft Corporation, All</td>
<td>Culver City, California</td>
</tr>
<tr>
<td>Valley Forge Division</td>
<td></td>
</tr>
<tr>
<td>General Electric Company</td>
<td>Valley Forge, Pennsylvania</td>
</tr>
<tr>
<td>Valley Forge Division</td>
<td></td>
</tr>
<tr>
<td>General Dynamics Corporation</td>
<td>Ft. Worth, Texas</td>
</tr>
<tr>
<td>Ft. Worth Division</td>
<td></td>
</tr>
</tbody>
</table>

Total Number of Facilities  19
Total Number of Corporations 13
Although the nineteen contractor organizations are all heavily involved with Air Force programs, a wide spectrum of technology is involved. Of the nineteen profit centers, airframe manufacture is the predominant activity for seven plants. The remaining plants are engaged in research, design, production, and support of jet engines, rocket engines, missiles, and avionics. Table 6 sets forth the primary activity involved at the profit centers.

**TABLE 6**

**TYPES OF ACTIVITY PERFORMED BY PROFIT CENTERS**

<table>
<thead>
<tr>
<th>Primary Activity</th>
<th>Number of Profit Centers Engaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airframe (Including assembly of Complete Aircraft)</td>
<td>7</td>
</tr>
<tr>
<td>Jet Engines</td>
<td>2</td>
</tr>
<tr>
<td>Rocket Engines</td>
<td>3</td>
</tr>
<tr>
<td>Missiles</td>
<td>4</td>
</tr>
<tr>
<td>Avionics</td>
<td>3</td>
</tr>
</tbody>
</table>

The profit centers involved were passive participants in this research. That is, although the profit center is affected by the Air Force's use of PIECOST, the effect is to enhance the Air Force's ability to perform a task which it has had to do for many years—negotiate forward pricing rates for
overhead to permit pricing of contracts to be performed during future time periods. In performing this function, the Air Force and the Defense Contract Audit Agency have long had access to contractor cost accounting information. As PIECOST uses this information for its data base, its implementation utilized data which the contractor customarily provided to the government, which is available to the government under the terms of its contracts and on which both parties have reached an accommodation regarding use and disclosure. PIECOST was specifically designed to employ this data base, thus minimizing the likelihood of active contractor opposition.

While the contractors have had a role in PIECOST's implementation, their influence has been indirect. Legally and historically, there has been a continuing Air Force role in the overhead estimation and control process. As a result, the contractors' reaction, if any, would influence the attitudes and perceptions of the OHS and his assistant. Thus, the Air Force employees charged with implementation were the sole population for the research. Contractor reactions were not sought.

Respondent's Age Profile

Of the thirty-four respondents, twenty-five were civilian employees of the Department of the Air Force. The nine military respondents all were assistants who worked under
the overhead specialist's supervision. They were either second or first lieutenants. The civilian respondents were either GS-11, 12, or 13's, depending on whether they were overhead specialists or assistants. The OHS's grade, GS-13, is the second highest civilian employee in the AFFRO organization. Within the AFFRO civilian hierarchy, therefore, the OHS carries sufficient formal stature to insure that he is not ignored by the formal organization. In addition, the OHS reports directly to the principal ACO, who is the most powerful civilian in the AFFRO organization. The respondent's age profiles are displayed in Table 7.

TABLE 7

RESPONDENTS BY AGE

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 30</td>
<td>8</td>
</tr>
<tr>
<td>30 - 40</td>
<td>5</td>
</tr>
<tr>
<td>40 - 50</td>
<td>11</td>
</tr>
<tr>
<td>50 - 60</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>34</td>
</tr>
</tbody>
</table>

**Age Range** 22 - 55  
**Average Age** 40.4  
**Median Age** 43  
**Mode** 46
**Respondents' Educational Background**

Table 8 displays the educational background and degrees held by the respondents.

**TABLE 8**

**RESPONDENTS' EDUCATIONAL BACKGROUND AND DEGREES**

<table>
<thead>
<tr>
<th>Degree and Field</th>
<th>Number of Holders</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MBA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Accounting</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>MA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Economics</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>MS</strong></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Business</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Management Science</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total Graduate Degrees</strong></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td><strong>BS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Management</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Accounting</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Commerce</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>BA</strong></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Industrial Management</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>No Degree</strong></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>34</td>
</tr>
</tbody>
</table>

Three respondents hold CPA certificates.
In keeping with their professional status in a highly technical job, the OHS's and their assistants are well educated people. Ten, or 29.4%, held Master's Degrees. Of these, all were in business or related fields such as accounting, economics, finance, or management science.

Among Bachelor's Degree holders, which include thirty of the thirty-four respondents (including those holding Master's Degrees), accounting was the predominant background. Sixty percent of the BA/BS holders majored in accounting. With only two exceptions, the rest of the respondents majored in business or related fields.

Four respondents had no college degree. Of these, two had completed sixteen years of education, but they had not received degrees. A third had completed fourteen years, and one had completed twelve years of formal education. Table 9 displays the summary statistics regarding the years of formal education characteristics of the responding population.

**TABLE 9**

<table>
<thead>
<tr>
<th>Range</th>
<th>12 - 18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>16.25</td>
</tr>
<tr>
<td>Mode</td>
<td>16</td>
</tr>
<tr>
<td>Median</td>
<td>16</td>
</tr>
</tbody>
</table>
As the preceding tables indicate the respondents were with few exceptions well educated and mature individuals. Their educational backgrounds were strongly accounting and business-oriented.

Respondent's Professional Experience

Selection of applicants is strongly influenced by their professional experience. Reflecting the PIECOST system's problems and the overhead analysis problems, requirement for analytic skill using accounting data, twenty-seven respondents indicated professional experience in the pricing area. Auditing was the next most frequently indicated work experience area with eleven. Contract administration experience was reported by five respondents. (The total does not equal the number of respondents due to multiple experience by some respondents.) Table 10 summarizes the professional work experience reported by the respondents.

**TABLE 10**

**RESPONDENTS BY PROFESSIONAL WORK EXPERIENCE**

<table>
<thead>
<tr>
<th>Professional Category</th>
<th>Number Reporting Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing</td>
<td>27</td>
</tr>
<tr>
<td>Contract Administration</td>
<td>5</td>
</tr>
<tr>
<td>Auditing</td>
<td>11</td>
</tr>
</tbody>
</table>
RELIABILITY ANALYSIS

Attitude of the respondents toward the PIECOST system of cost analysis and control was considered an important variable in the individual's psychological/demographic dimension. As Krech, Crutchfield, and Ballachey (1962), Stevens (1951), and others have observed, attitudes, "enduring systems of positive or negative evaluations, emotional feelings, and pro or con action tendencies with respect to social objects [Krech, Crutchfield, and Ballachey, 1962, p. 139]" must be measured indirectly. The attitudes must be inferred from the individuals' responses toward the object.

An attitude scale consisting of a set of statements or items was designed and tested for validity as described earlier. Reliability, the ability of the survey instrument to place the individual respondent consistently on the measurement scale, was tested by the Kuder-Richardson internal consistency method. The reliability test sought to answer the question posed by Bohrnstedt (1970, p. 83), "If no time change occurs in a given attitude an individual holds, does the attitude scale consistently yield the same ordering for him relative to others?"

The Kuder-Richardson method is based on the evaluation of responses to all items at a given point in time. This approach simultaneously examines the covariance among all attitude items, thus evaluating the internal consistency which
the respondents displayed in their responses. Bohrnstedt considers the following generalization of Kuder-Richardson's formulation to be the most popular approach to reliability measurement available today (Bohrnstedt, 1970, p. 87):

\[
\alpha = \frac{n}{n-1} \left[ 1 - \frac{\sum \frac{X_i^2}{n}}{\sigma^2} \right]
\]

(The term, \( \alpha \), was applied by Cronbach to the generalization of Kuder-Richardson's formula and is not to be confused with a type I statistical inference error.)

To compute the value of \( \alpha \), the ten attitude items were interval scaled and a covariance matrix obtained by the MUL-REGRESSION computer program offered by General Electric's Mark III Foreground time-sharing computer service. The value of \( \alpha \) was then calculated using the method described by Bohrnstedt (p. 89) to be 0.721.

If no measurement error existed, the value of \( \alpha \) would be unity. However, perfection is rarely, if ever, achieved in attitude measurement. Bohrnstedt (p. 84) observed that many attitude scales have reliabilities lower than 0.8. The attitude scale's reliability compares satisfactorily with other attitude scales in this regard. Therefore, the internal consistency reliability estimate for the attitude scale was considered acceptable.

**ANALYSIS OF SURVEY DATA**

The survey instrument was designed to obtain information on variables which can be categorized along two dimensions:
individual psychological/demographic, and formal organizational structure. As the purpose of the research was to subject the change model to an empirical test, the statistical tests were designed to evaluate the possibility of a non-random association between the degree of PIECOST implementation achieved by the respondent's organization and the values of certain variables comprising the respondent's individual psychological/demographic and organizational structural dimensions. The basic form of the test is goodness-of-fit. The objective is to test whether there is a significant difference between the number of observed and the number of expected responses falling in each category (Siegel, 1956, p. 43).

The categories were established first along the lines of the degree of PIECOST implementation achieved, and next in terms of the respondent's contextual and perceptual situation as reflected by his responses to the questionnaire items. As the respondents formed a single sample distribution, the $x^2$ goodness-of-fit test is considered by Hays (1963), Siegel (1956), and others to be the most powerful test available where only categorized data are available for analysis. The assumptions required for use of Pearson's $x^2$ statistic are (Hays, 1963, p. 583):

1. Each and every sample observation falls into one and only one category or class interval;
2. The outcomes for the $N$ respective observations in the sample are independent;
3. Sample $N$ is large.
Of these assumptions, several are subject to some controversy. Regarding sample size, Hays (1963, p. 597) observes, "There are no hard and fast rules that are sufficient to cover all the things which can influence the goodness of the chi-square approximation."

The remaining assumptions were fulfilled by insuring that the respondents answered each item independently of influence from the others and that each and every observation occupied but one and only one row, one and only one column in the contingency table. After the contingency tables were completed, the data were analyzed using the CHICON computer program offered by the General Electric Mark III Foreground time-sharing computer service. To facilitate presentation, the variables will be presented within their appropriate dimension, i.e., organizational structural or individual psychological/demographic in the following format:

1. Identification of variable
2. Statement of hypothesis
3. Presentation of analysis
4. Discussion of results

Analysis of Output Variable

As suggested by the model, the establishment by negotiation or other means of an overhead rate structure for pricing contract effort to be performed one or more years in the future constitutes the output of the organizational subunit.
This is referred to as a forward pricing rate agreement (FPRA). Implementation of PIECOST is designed to materially improve the quality of this ongoing process, shifting it upward to a higher equilibrium.

Measurement of PIECOST implementation was critical and was treated on several levels. A direct question was formulated asking the phase of PIECOST implementation that had been achieved. This question was based on the previously described nature of PIECOST. Use of PIECOST consists of five phases: classification phase, deflation phase, analytical phase, forecast phase (which included negotiations), and tracking phase. Full utilization of the system consists of completing all of the first four phases and establishing a monitoring system using the monthly trial balance supplied by the contractor's cost accounting system. The first four phases must be accomplished sequentially. The costs must be classified into the eleven cost modes, then deflators must be constructed to remove the effects of price change on the time series cost data. After the costs have been deflated, the modes are analyzed to establish a driving variable. Once the driving variables have been identified, forecasts are developed for use in negotiations with the contractor. Implementation was measured, therefore, in terms of the number of phases completed as of the date the questionnaire was administered. The extent of implementation was then
categorized in accordance with the phases completed. Table 11 set forth the scheme used to measure PIECOST implementation.

**TABLE 11**

**MEASUREMENT OF PIECOST IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>PIECOST Phase Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0 No Progress</td>
</tr>
<tr>
<td></td>
<td>1 Classification</td>
</tr>
<tr>
<td>Medium</td>
<td>2 Deflation</td>
</tr>
<tr>
<td></td>
<td>3 Analysis</td>
</tr>
<tr>
<td>High</td>
<td>4 Forecast and Negotiation</td>
</tr>
<tr>
<td></td>
<td>5 Tracking</td>
</tr>
</tbody>
</table>

Because of the importance of this measurement to the research, two further measurements of completion were utilized. The first employed archive data (Webb, Campbell, Schwartz, and Sechrest, 1966). PIECOST requires extensive computer-assisted analysis using specially developed programs. Time-sharing computer time and input-output equipment have been provided to each AFFPRO organizations. Billings are identified to the location involved. The archive data were grouped by category of use, i.e., terminal connect hours (TCH), computer resource units (CRU), thousands of characters transmitted (KC),
and program/data storage costs (PSU/DSU). The data were analyzed to determine whether any site reporting completion of negotiations appeared unduly low. One site was identified as having used a marginal amount of computer time in relation to the degree of implementation reported.

This was then employed as a part of the second check on the implementation measurement. This consisted of verifying with Headquarters USAF and Headquarters AFCMD officials that were closely following the PIECOST program that the sites had in fact done what they had reported. These officials verified that two sites, including the one previously mentioned, had overstated their progress and that the other sites had fairly stated their progress. Their reported completion was adjusted accordingly. Table 12 sets forth the number of sites, the number of respondents per site, and the degree of completion used in the analysis.

TABLE 12

PIECOST IMPLEMENTATION BY SITES AND RESPONDENTS

<table>
<thead>
<tr>
<th>Extent of Implementation</th>
<th>Number of Sites Achieving</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>34</td>
</tr>
</tbody>
</table>
The completion measurement was then employed to categorize one axis of a contingency table with the other axis being the variable suggested by the model as being associated with the extent of implementation reported.

The formal organizational structure and individual psychological/demographic dimensions were analyzed in twenty contingency tables. (Tables 1 and 2 list the variables associated with each dimension.) The value of \( \chi^2 \) and the probability that the observed \( \chi^2 \) value could be exceeded by chance were calculated for each contingency table. The contingency tables and analytic results are set forth in the remainder of this chapter. Where proxy values were employed, their rationale is briefly discussed. Where a contingency table is based on a specific question, the question number is included to facilitate reference to the questionnaire in Appendix F.

**Formal Organizational Structure Dimension**

**Top Management Interest in Change**

The support of top management has been frequently mentioned as one of the most important considerations in the successful implementation of change. Ginsberg and Reilly (1957), O'Connell (1968), Marella (1972), and Radnor, Rubinstein, and Tansik (1970) are among numerous authors who have commented on the significance of top management's expressed support of desired organizational change. Howland (1964), Katz and Kahn (1965), and March and Simon (1958)
have noted the importance of the immediate social system to
the goal structure of organizational personnel. Given the
possibility that lower level managers might hold different
views regarding the desirability of implementing PIECOST in
their organizations, two questions were developed to explore
the respondent's perceptions of local top management's support
of PIECOST implementation.

Knowledge of the plant level organization identified
two individuals, the Administrative Contracting Officer (ACO)
and the Air Force Plant Representative (AFFR), who were
recognized as being the principal policy setters in the AFFRO
organization. Their strong roles in the organizational
structure stem from legitimate power conferred by their
positions. The AFFR is the senior Air Force officer and
Commander of the detachment. In addition to being the Air
Force's representative to the company's management, he is
the Commander of the detachment possessing the formal military
authority associated with command. The principal ACO is the
senior civil servant in the Air Force organization. He is
also the principal contractual spokesman for the Air Force,
empowered by regulation with the authority to legally bind
the United States government on matters within his purview.
Negotiation of forward pricing overhead agreements (FPRA's)
is specifically delegated to the ACO by ASPR 3-807.10. For
these reasons, the AFFR and ACO were selected as the individuals
most likely to convey the interests of the formal organization structure to the overhead specialist and assistant.

Questions were formulated to test these concepts. The responses were categorized low, medium, or high and analyzed using the CHICON program as described earlier. The contingency tables and results are set forth in Tables 13 and 14.
### TABLE 13

**EXPRESSED INTEREST OF AFPR IN IMPLEMENTATION**  
(Question 12)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Once in A While</th>
<th>Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Medium</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

Value of $x^2 = 1.03$

Probability of exceeding $x^2$ value by chance = greater than 0.05

Degrees of freedom = 2

### TABLE 14

**EXPRESSED INTEREST OF ACO IN IMPLEMENTATION**  
(Question 13)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Once in A While</th>
<th>Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Medium and High</td>
<td>3</td>
<td>23</td>
</tr>
</tbody>
</table>

Value of $x^2 = .88$

Probability of exceeding $x^2$ value by chance = 0.35

Degrees of freedom = 1
Neither of these variables could be identified as having a significant non-chance relationship with the degree of implementation achieved. The lack of significant effect on the part of these two variables was somewhat surprising in view of their powerful position in the formal organization. This position leads many experienced observers to consider the ACO the most important influence in PIECOST implementation. For these reasons, considerable attention has been devoted to bringing the PIECOST system to the attention of the top Air Force plant organization management. The lack of association between interest expressed by these individuals and implementation was thus difficult to explain.

In analyzing the situation, it seems possible that the question did not measure the intended construct. Due to situational considerations, it was impossible to ask the respondents directly regarding their superior's interest in PIECOST implementation. Interest in overhead was substituted as a proxy. The pattern of responses indicates that the question may not have accurately measured the degree of ACO or AFPR interest in implementing PIECOST. Thus, while the interest of top management variable did not prove statistically significant, the reasons may be due to methodological problems.

Imposition of Other Priority Workload

The imposition of other workload ahead of the PIECOST implementation was selected as an indicator of the organizational communication system. Although the overhead specialist
and his assistant are charged with the responsibility of negotiating forward pricing rates, they may also be required to perform other duties. Discussions with some overhead specialists confirmed that this had sometimes occurred in their organization. As a means of communicating the desired priority to the organization, workload priority frequently is a more highly regarded indicator of top management's desires than their formal exhortations.

An item was designed to test this variable. The responses were categorized and are analyzed in Table 15.

**TABLE 15**

**EFFECT ON IMPLEMENTATION OF ADDITIONAL WORK REQUIRED BY PIECOST (Question 26)**

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>No Effect</th>
<th>Makes Implementation Somewhat Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Medium</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>High</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Value of $x^2 = .153$

Probability of exceeding $x^2$ value by chance = greater than .50

Degrees of freedom = 2
The question attacked the priority imposition construct indirectly by asking whether the respondent felt that additional work required by PIECOST was hampering its implementation. The results did not reveal a statistically significant relationship. Several reasons may account for this. First, the question was difficult to formulate without evoking organizational bias. Thus, its somewhat indirect nature may have elicited answers that responded to constructs other than that intended. Also, the respondents may not have believed the researcher's assurances of confidentiality and answered on the basis of what they believed the organization wanted to hear, rather than on the facts of their situation. Some support for this possibility is suggested by the fact that five respondents chose not to answer this question. With the largest number of failures to respond of any question, it seems possible that the question was interpreted correctly but that organizational bias could not be avoided. Therefore, the significance of the imposition of higher priority workload variable on implementation must be regarded as undemonstrated.

Organizational Communication

For many reasons, the program being performed impacts on the Air Force's plant organization. Large important programs, such as the F-15 and B-1 are highly visible. They attract the attention of the top management of the acquiring military service. The great amount of federal resources
involved attracts the attention of the Congress and its fiscal watchdog, the General Accounting Office. The result of all this managerial attention is communicated to the working level. As the level of managerial attention devoted to a program is related to its dollar value, this value was selected as a proxy for formal organizational communication.

An item was designed to ascertain the dollar value of the largest program being performed by the contractor.

The contingency table and $x^2$ statistics for the item are set forth in Table 16.

**TABLE 16**

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Less than $50 Million</th>
<th>$51 to $100 Million</th>
<th>Over $100 Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/Medium</td>
<td>7</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Value of $x^2 = 4.41$

Probability of exceeding value of $x^2$ by chance = .108

Degrees of freedom = 2

Program value showed a slight non-chance association with PIECOST implementation. This suggests that the additional emphasis placed on larger programs was communicated to the implementors.
However, the $x^2$ value is not large enough to indicate a significant relationship.

In addition to the size of the largest program, the amount of money spent by the contractor in its indirect cost accounts was identified as an organizational communication consideration. Major programs are composed of direct and indirect elements of cost. In the direct element, current practice includes both the direct costs incurred in the prime contractor's plant and the costs of subcontracting and raw materials, purchased parts, and other direct costs that can be identified to specific cost objectives. Thus, the impact of a given program on the costs incurred by the prime contractor could vary substantially, depending on the amount of purchasing and subcontracting involved.

The variability of the program's impact on prime contractor costs suggested that the level of indirect costs might be a reliable indicator of the formal organization's communicated interest in the PIECOST implementation. With the exception of transfers and corporate allocations, indirect costs are all incurred by the profit center. As Martinson (1969, p. 34) has noted, indirect costs averaged 66% of all in plant costs for a sample of eleven defense profit centers. It was, therefore, reasoned that organizational concern might be more oriented to indirect costs than to the size of the major program being administered. To test this reasoning, each respondent was asked to indicate the total value of his contractor's indirect costs for 1972.

Analysis of the responses yielded the contingency table and $x^2$ statistics set forth in Table 17.
TABLE 17

INDIRECT COSTS VERSUS IMPLEMENTATION
(Question 9)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Millions of Dollars Booked</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18 - 43</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
</tr>
</tbody>
</table>

Value of $x^2 = 8.86$
Probability of exceeding $x^2$ by chance = .18
Degrees of freedom = 6

Although the $x^2$ test suggests a non-chance relationship, its level does not warrant attaching much significance to the results. A further consideration is suggested by the responses observed in the highest dollar category. Of the ten respondents represented here, only two have fully implemented the PIECOST system. The most widely reported implementation success was observed at the next to the highest category ($\$120 - 168 million$), a result contrary to expectations if the formal organizational structure's concerns were being consistently transmitted to its most significant plants. Therefore, the formal organizational structure appears to either not be communicating its concerns to the individuals charged with implementation.
Organizational Slack

Implementing a major change such as PIECOST is a significant task. The efforts of one or more individuals must be diverted from other on-going activity and devoted to the various analytic tasks required. In nearly every case, the diversion of effort must be either made up by reallocation of workload among existing personnel or by accepting a lower level of organizational performance for some period of time. The change model accommodates this fact of organizational existence.

Because there must be organizational slack if resources are to be diverted, the size of the organizational units involved was selected as a proxy for the existence of sufficient personnel resources to devote to the PIECOST implementation effort. If this reasoning were correct, the larger organizations, presumably having more organizational slack, should have exhibited a higher proportion of successful implementation sites.

Two questions were developed to test the organizational slack variable.

Each respondent was asked to indicate the size, in terms of numbers of professional personnel, of both the total AFFRO and the contract administration division. (The contract administration division was the organizational subunit containing the technical skills necessary to sustain an expected loss of responsibility, or the proxy variable may not be satisfactory.)
productivity during the period of greatest implementation effort.) The responses were categorized according to size and the following contingency tables and $x^2$ statistics contained in Tables 18 and 19 were obtained.

**TABLE 18**

**IMPLEMENTATION VERSUS AFFRO PROFESSIONAL PERSONNEL**

(Question 7)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Number of Professional Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25-65</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
</tr>
</tbody>
</table>

Value of $x^2 = 5.96$

Probability of exceeding $x^2$ value by chance alone = .20

Degrees of freedom = 4

**TABLE 19**

**IMPLEMENTATION VERSUS CONTRACT ADMINISTRATION DIVISION PROFESSIONAL PERSONNEL**

(Question 8)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Number of Professional Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-10</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
</tr>
<tr>
<td>Medium/High</td>
<td>8</td>
</tr>
</tbody>
</table>

Value of $x^2 = .02$

Probability of exceeding $x^2$ value by chance alone = greater than .50

Degrees of freedom = 2
Although the total AFPRO personnel proxy variable indicates an 80% possibility of a non-chance relationship, only two of the cells contain expected frequencies greater than five. Also, two factors suggest that total AFPRO professionals is not as accurate an indication of slack resources as is the immediate organization. One of these has been mentioned previously—the fact that resources to perform pricing and related financial analysis are not interchangeable with those required to monitor the contractor's quality control function, for example. Thus, total organizational strength may be a questionable proxy for relevant organizational slack. In addition, the size of the AFPRO is a result of the importance and nature of the program it is administering. Therefore, the results obtained regarding this variable may be the reflection of program size and importance, rather than organizational slack available to support the implementation.

The lack of significance regarding immediate organizational slack is further evidence that organizational slack has little relationship to successful implementation of the PIECOST system. Although the observed result may result from a poor proxy, it seems likely that other factors offer more plausible explanations for implementation success or failure.
Organizational Resistance

A number of authors have emphasized the importance of the immediate supervisor to the implementation of new methodologies within their organizations (Ginzberg & Reilley, 1957, and others). Considerable emphasis has been placed on the problem of overhead cost control by Department of Defense contractors. However, it is possible that the middle managers of the AFPRO organizations do not appreciate the significance of the problem or the ability of PIECOST to improve their overall performance. To counter middle management antipathy, a course was designed to impart the magnitude of the problem and generally describe how PIECOST dealt with it. This course, designated PIECOST FOR MANAGERS, was designed by the Lowry Technical Training Center of the Air Training Command and was given at the requesting organization's facility. It was designed to present the problem and the PIECOST response to the AFPRO and contractor management jointly on the first day with an in-depth orientation for AFPRO operational personnel on the second day. The course was made available to requesting organizations at no cost.

To test whether this aspect of the strategy was associated with the degree of implementation achieved, the respondents were asked whether PIECOST FOR MANAGERS had been presented at their facility and whether their supervisor had attended. Table 20 sets forth the analysis.
TABLE 20

IMPLEMENTATION VERSUS PROVISION OF PIECOST FOR MANAGERS (PFM)
(Question 30)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>PFM Presented Supervisor Did Not Attend</th>
<th>PFM Presented Supervisor Attended</th>
<th>PFM Not Presented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/Medium</td>
<td>3</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

Value of $x^2 = 1.89$

Probability of exceeding value of $x^2$ by chance = .39

Degrees of Freedom = 2

This variable is regarded as inconclusive. Part of the problem lies in the fact that the course was not presented at fifteen respondents' facilities. Thus, although the rationale for the course appears sound, the analysis suggests that the respondents were not apparently influenced by the fact that their supervisors were exposed to the overhead problem and how PIECOST could improve their capability to analyze and monitor it.

The formal organizational structural dimension contains five variables which were tested. The variables and their test results are set forth in Table 21.
The formal organizational structure variables did not as a group exhibit strong association with implementation. The strongest association, organizational communication, had a $x^2$ value of 4.41 and a .108 probability of being exceeded by chance. Only two other variables had less than .20 probabilities of being exceeded by chance. The relatively low association of the remaining

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value of $x^2$</th>
<th>Probability of Exceeding Value of $x^2$ by Chance</th>
<th>Degrees Of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management Interest in Change (AFPR)(Table 13)</td>
<td>1.03</td>
<td>&gt;.50</td>
<td>2</td>
</tr>
<tr>
<td>Top Management Interest in Change (ACO)(Table 14)</td>
<td>.88</td>
<td>&gt;.35</td>
<td>1</td>
</tr>
<tr>
<td>Imposition of Other Priority Workload (Table 15)</td>
<td>.15</td>
<td>&gt;.50</td>
<td>2</td>
</tr>
<tr>
<td>Organizational Communication (Table 16)</td>
<td>4.41</td>
<td>.108</td>
<td>2</td>
</tr>
<tr>
<td>Organizational Communication (Table 17)</td>
<td>8.86</td>
<td>.186</td>
<td>6</td>
</tr>
<tr>
<td>Organizational Slack (Table 18)</td>
<td>5.96</td>
<td>.199</td>
<td>4</td>
</tr>
<tr>
<td>Organizational Slack (Table 19)</td>
<td>.02</td>
<td>&gt;.50</td>
<td>2</td>
</tr>
<tr>
<td>Organizational Resistance (Table 20)</td>
<td>1.89</td>
<td>.44</td>
<td>2</td>
</tr>
</tbody>
</table>
variables was unexpected. The lack of strong association with formal organizational structure variables increased the importance of the individual psychological/demographic dimension.

**Individual Psychological/Demographic Dimension**

Attitude of the Respondent Toward PIECOST

The nature of PIECOST required that it be implemented by persons working in operational organizations as opposed to staffs. In performing their organizational duties, these men were under the control of their designated supervisors. Little, if anything, could be done if progress was not realized. An important, but largely unforeseeable and uncontrollable consideration, therefore, was the attitudes which the individual overhead specialists and their assistants held toward the PIECOST system. If these were positive, the individuals would probably persevere in their implementation efforts and achieve a successful result. If lukewarm or negative attitudes were held, the chances of successful implementation would be reduced.

Ten items were developed and analyzed to secure an estimate of the role of respondent attitudes in the implementation process. The results of each item are presented and summarized before the remaining individual psychological/demographic variables are presented.

Effect on Respondent's Organization

The first item explored the respondent's attitude toward the PIECOST innovation by assessing his view of the effect of the
system on the contract administration organization. In a highly bureaucratized organization, individuals are aware of the importance of their unit in the total organization. The usual organizational performance reviews are presented by unit chiefs, and all involved are aware of their relative performance. As a result, their assessment of the effect that PIECOST had on their organizations was selected as one indicant of their attitude toward the system.

A question was designed and the responses evaluated as described earlier. The responses were categorized, and the contingency table and results of Table 22 were obtained.

TABLE 22

EFFECT OF PIECOST ON THE CONTRACT ADMINISTRATION DIVISION
(Question 14)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Some Negative</th>
<th>Some Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

Value of $x^2 = 3.11$

Probability of exceeding value of $x^2$ by chance = .21

Degrees of Freedom = 2
The $x^2$ value and its probability of being exceeded by chance were inconclusive. A possible explanation may lie in the highly specialized nature of the overhead analysis function. Because of their high degree of differentiation, overhead specialists and assistants may not perceive the effects of PIECOST on the entire contract administration function. In any case, the respondent's attitude toward PIECOST as viewed by their perception of its impact on their immediate organization was not significant.

Effect on Respondent's Professional Role

Another attitude indicant was the respondents' perception of the effect of PIECOST on their professional role. It was reasoned that role conception was a significant measure of the respondents' estimation of the innovation's impact on them as professional employees. Therefore, the respondents' role was considered an indicant of their attitude toward PIECOST. An item was designed to test this conception. The analysis set forth in Table 23 was developed.
TABLE 23

EFFECT OF PIECOST ON THE ROLE OF THE OVERHEAD SPECIALIST
(Question 15)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat More Important</th>
<th>Much More Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Value of $x^2 = .056$

Probability of exceeding value of $x^2$ by chance = greater than .50

Degrees of Freedom = 2

Although the role of the overhead specialist was created by PIECOST, there was no evidence that its perception was positively associated with implementation. All respondents gave "safe" answers; i.e., none thought PIECOST lessened the overhead specialist's role. It seems possible, therefore, that the relative newness of the overhead specialist's role may partially explain this result.

Effect on Respondent's Job Importance

The perceived effect of PIECOST on the importance of the respondent's job was established as an indicant of their attitude toward the innovation. It was reasoned that the various jobs within the AFFPRO were regarded by their occupants as having differing
degrees of importance. Because PIECOST was a significant aspect of their job, it was reasoned that the respondent's concept of job importance would be affected. An item was designed to test their conception of job importance. The analysis of this question is set forth in Table 24.

**TABLE 24**

**EFFECT OF PIECOST ON RESPONDENT'S JOB IMPORTANCE**  
(Question 17)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat Increases</th>
<th>Much Increases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Value of $x^2 = 2.29$

Probability of exceeding value of $x^2$ by chance = .32

Degrees of Freedom = 2

The analysis suggests that the respondent's perceptions of PIECOST's effect on their job's importance was at best weakly associated with implementation. The reasons are similar to those affecting the previous indicant. The respondents again offered "Safe" answers. Because of the relative newness of the job, its importance may not have been defined by the social system. It is also possible that the respondents did not relate PIECOST to the job importance concept.
Effect on Respondent's Professional Judgment

Professional judgment is an extremely important attribute to people performing in the pricing field. ASPR states the importance of professional judgment in these terms: "Good pricing depends primarily on the exercise of sound judgment by all personnel concerned with the procurement [ASPR 3-801.1]."

Because judgment is so important to the individuals working in the contract pricing field, four items using the judgment indicant were formulated and tested. Their results are set forth in Tables 25 through 28.

**TABLE 25**

**EFFECT OF PIECOST ON RESPONDENT'S OPPORTUNITIES TO EXERCISE PROFESSIONAL JUDGMENT (Question 16)**

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat Increases</th>
<th>Greatly Increases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>High</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

Value of $x^2 = 3.08$

Probability of exceeding value of $x^2$ by chance = .21

Degrees of freedom = 2
The indicant measured the increase in scope which the respondents perceived PIECOST having afforded to their professional judgment. Because the innovation greatly increased opportunities for the overhead specialist to exercise professional judgment, the question was designed to preclude a neutral response. It was interesting that all respondents shared a common direction of response. There is again a possibility that "safe" answers were offered. However, the greater $\chi^2$ value suggests that they offered an improvement over the previously discussed attitude constructs.

In addition to the opportunities for exercising professional judgment, PIECOST was designed to increase the impact of judgment. Again the respondent was forced to be directional: the no effect response was not offered.

TABLE 26

EFFECT OF PIECOST ON IMPACT OF RESPONDENT'S PROFESSIONAL JUDGMENT

(Question 18)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat Increases</th>
<th>Greatly Increases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/Medium</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>High</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

Value of $\chi^2 = 2.69$
Probability of exceeding value of $\chi^2$ by chance = .09
Degrees of Freedom = 1
The analysis suggests that the respondents perceived PIECOST as enhancing their impact, and that this perception was associated with implementation.

Judgment could be perceived as being threatened by PIECOST rather than enhanced. If this occurred, implementation would be construed as a threat to the respondent rather than an aid.

To explore this aspect, a question was developed. The results of its analysis are set forth in Table 27.

**TABLE 27**

**EFFECT OF PIECOST ON RESPONDENT'S PERCEIVED NEED TO EXERCISE PROFESSIONAL JUDGMENT**

(Question 22)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>About the Same or Less</th>
<th>Somewhat More</th>
<th>Much More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Medium</td>
<td>8</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Value of $\chi^2 = 6.72$

Probability of exceeding value of $\chi^2$ by chance = .15

Degrees of freedom = 4

The analysis indicated that the respondents did not perceive PIECOST as reducing the need for their professional judgment. On the contrary, the need for professional judgment was positively associated with successful use of PIECOST.
Need for professional judgment was considered a very important indicant. To further test its significance, a second question was developed phrased in terms of the perceived effect of PIECOST on the requirement for professional judgment. Table 28 sets forth the analysis of the responses to this question.

**TABLE 28**

**EFFECT OF PIECOST ON RESPONDENT'S PERCEIVED REQUIREMENT FOR PROFESSIONAL JUDGMENT**

(Question 25)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat Decreases Or No Change</th>
<th>Somewhat Increases</th>
<th>Increases Quite a Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>High</td>
<td>3</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

Value of $x^2 = 7.99$

Probability of Exceeding Value of $x^2$ by chance = .09

Degrees of Freedom = 4

The analysis confirmed the importance of the need for judgment construct. The high $x^2$ value indicates that the possibility of the result occurring by chance, .09, would be correspondingly low. This was a higher value than that observed for the question when phrased in terms of need but not significantly so. The similarity of results confirmed that the requirement for
professional judgment is an important indicant. Based on the low probability of the observed value of $x^2$ occurring by chance, the perceived requirement for professional judgment appears to be positively associated with PIECOST implementation.

Perceived Ease of Understanding and Statistical Difficulty

Prior to PIECOST overhead or indirect cost analysis had been performed using auditing and accounting methods. These relied heavily on transaction analysis, account analysis, and rudimentary line of fit techniques. They were not very rigorous, nor were they expected to be.

After the discovery of the significance of indirect costs, emphasis on its analysis increased. PIECOST embodied a sophisticated computerized approach involving classification, index preparation and application, and regression-tested indirect cost modeling. It was considerably more sophisticated than the approaches previously employed. The statistical and analytical demands of PIECOST were new to most of the men who had to use it. Thus, the ease of understanding PIECOST was considered a satisfactory indicant of the respondent's attitude toward the innovation. Two items were designed to obtain the respondent's reactions to the notions of statistical rigor and ease of understanding. The results of these indicants are set forth in Tables 29 and 30.
### TABLE 29

IMPLEMENTATION VERSUS PERCEIVED EASE OF UNDERSTANDING

**PIECOST**

(Question 19)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat Difficult</th>
<th>Relatively Easy</th>
<th>Very Easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Value of $x^2 = .43$

Probability of exceeding value of $x^2$ by chance = greater than .50

Degrees of Freedom = 4

Perceived ease of understanding PIECOST was not significantly associated with implementation. Most of the respondents apparently considered PIECOST easy to understand or were afraid to admit otherwise. Both explanations seem plausible. This suggests that ease of understanding is an unsatisfactory indicant.
TABLE 30

IMPLEMENTATION VERSUS PERCEIVED STATISTICAL DIFFICULTY AS
OPPOSED TO PREVIOUSLY USED ANALYTICAL TECHNIQUES
(Question 20)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Somewhat Less</th>
<th>Somewhat More</th>
<th>Much More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/Medium</td>
<td>3</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Value of \( x^2 = .068 \)

Probability of exceeding value of \( x^2 \) by chance = >.50

Degrees of Freedom = 4

Although PIECOST was perceived as being slightly more
difficult statistically than previous techniques, the indicant
does not reveal a meaningful association with implementation.
The expected association of perceived statistical difficulty
with lack of implementation was not observed.

Perceived Adaptability

Overhead analysis and negotiation takes place in an uncertain
and stressful environment. Changes in expected business volume,
timing, and product mix are frequent. Accounting practices are
altered in response to changing business conditions, legal
decisions, and the actions of regulatory agencies. All of these
require the overhead specialist to adapt his analytic tools to the situation rapidly and effectively. On the reasoning that the respondents would be negatively inclined toward PIECOST if they perceived it rigid and inflexible, an item was developed to measure the perceived adaptability of PIECOST relative to previous methods of overhead analysis. The results were as follows:

TABLE 31

ADAPTABILITY OF PIECOST RELATIVE TO PREVIOUS METHODS
(Question 27)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Less Adaptable</th>
<th>Somewhat More Adaptable</th>
<th>Much More Adaptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Value of $x^2 = 2.135$

Probability of Exceeding value of $x^2$ by chance = greater than .50

Degrees of Freedom = 4

The results are inconclusive. Most respondents perceived PIECOST as being more adaptable than previous methods. However, contrary to expectations, high implementation was not associated with a perception of greater adaptability. Apparently, the
indicant did not satisfactorily relate to the respondent's attitude toward PIECOST.

Summary of Attitude Variable

The ten attitude items displayed very different results. These are summarized in Table 32.
TABLE 32

SUMMARY OF ATTITUDE VARIABLE ANALYSIS

<table>
<thead>
<tr>
<th>Indicant</th>
<th>Value of $x^2$</th>
<th>Probability of Exceeding Value of $x^2$ by Chance</th>
<th>Degrees of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of PIECOST on Contract Administration Division</td>
<td>3.11</td>
<td>.21</td>
<td>2</td>
</tr>
<tr>
<td>Effect of PIECOST on Overhead Specialist Role</td>
<td>.057</td>
<td>&gt; .50</td>
<td>2</td>
</tr>
<tr>
<td>Effect of PIECOST on Job Importance</td>
<td>2.29</td>
<td>&gt; .32</td>
<td>2</td>
</tr>
<tr>
<td>Effect of PIECOST on Opportunities to Exercise Professional Judgment</td>
<td>3.08</td>
<td>.21</td>
<td>2</td>
</tr>
<tr>
<td>Effect of PIECOST on Impact of Professional Judgment</td>
<td>2.01</td>
<td>.15</td>
<td>1</td>
</tr>
<tr>
<td>Effect of PIECOST on Need For Professional Judgment</td>
<td>6.72</td>
<td>.15</td>
<td>4</td>
</tr>
<tr>
<td>Effect of PIECOST on Requirement For Professional Judgment</td>
<td>7.99</td>
<td>.09</td>
<td>4</td>
</tr>
<tr>
<td>Ease of Understanding PIECOST</td>
<td>.43</td>
<td>&gt; .50</td>
<td>4</td>
</tr>
<tr>
<td>Statistical Difficulty of PIECOST as Compared to Existing Methods</td>
<td>.068</td>
<td>&gt; .50</td>
<td>4</td>
</tr>
<tr>
<td>Adaptability of PIECOST as Compared to Previous Methods</td>
<td>2.13</td>
<td>&gt; .50</td>
<td>4</td>
</tr>
</tbody>
</table>
The results suggest that the role of attitude may be quite significant. Much of the problem stems from the difficulty of identifying satisfactory indicants. The indicants used attempted to evaluate the respondent's perceptions about the effect of PIECOST on their jobs, their personal judgment, and the difficulty of understanding and using PIECOST.

The results suggest that only the judgment construct consistently functioned as a satisfactory indicant. The four judgment items $x^2$ values ranged from 2.01 to 7.99. The probability of these being exceeded by chance ranged from .09 to .21. This indicates that the professional judgment indicant was consistently viewed. Only one of the other seven indicants displayed a possibly significant relationship with implementation. Given the important role which judgment occupies in the pricing environment, the results indicate that attitude toward the change is a major factor in the respondent's decision to implement that change.

Of the remaining indicants, only the effect of PIECOST on the implementing organization displayed possible significance. All others evinced only a chance relationship with implementation. Several reasons may explain this fact. One problem is that the indicants relating to role and job importance were affected by the relative newness of the overhead specialist role. Because overhead specialists did not exist until 1970, the conception of the job and its importance may not have been fully formed as of the date of the research in late 1972.
Another possible explanation lies in the chance that organizational bias may have distorted the responses.

Bias also appears to be a possibility in the indicants dealing with the difficulty of understanding and using PIECOST. These dealt with the constructs of difficulty, statistical rigor, and adaptability. Adaptability had the higher $x^2$ value, 2.135 versus .430 and .068. It seems probable that the constructs were either not perceived as being related to PIECOST or that their relation was too readily perceived and a biased response was the result. Only judgment was consistently associated with the implementation achieved. Given the marked difference between the judgment items and the remaining attitude items and the strong official and social importance attached to professional judgment, the importance of attitude is considered more confirmed than denied.

The Age Variable

The association of age with implementation is traditionally a negative one. Such terms as "hidebound," "moss-backed," and "set in their ways," are reserved almost exclusively for men who have passed the mid-point in their professional careers. To the researcher's knowledge, however, there has been no scientific proof advanced for the hypothesis that innovation is inversely associated with age. To shed some light on the possible influence of age in this implementation effort, the respondents were
classified according to their ages and the degree of implementation achieved. The $x^2$ analysis of this variable yielded the results set forth in Table 33.

**TABLE 33**

**AGE VERSUS PIECOST IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>20 - 35</th>
<th>36 - 50</th>
<th>50 +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>9</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Value of $x^2 = .133$

Probability of exceeding value of $x^2$ by chance = >.50

Degrees of Freedom = 2

The lack of association was not surprising for the age variable. There was no indication from the literature review that this is the case. Age is not, on the whole, meaningfully associated with the ability and willingness to implement revised performance programs. This result thus confirmed existing knowledge.
The Recognition of Specific Problem Variable

Greiner (1967) and March & Simon have identified recognition of a specific problem or search as a variable influencing the innovative behavior evidenced by an individual or organization (1958, p. 173). As March & Simon view the organizational change process, the existing program is continued primarily because the individual or organization does not search for or consider alternatives (p. 173). To investigate the possible influence of this variable, two items were formulated. The need for two questions was established by the nature of the indirect cost control problem.

Indirect costs are viewed as overhead rates by the procurement process. This is dictated by the requirement that each contract be priced. To develop the price, the direct costs are estimated and the indirect costs added to them by a system of recovery rates. These are usually referred to as overhead or burden rates. If they are not satisfactorily developed and documented, procurement centers are forced to take special steps to insure that the prices, including the overhead components of their contracts, can be justified as fair and reasonable in the context of total price to be paid by the government. This requirement, established by the Armed Services Procurement Regulations, is strictly adhered to. Thus, the inability to recommend acceptable overhead rates to procuring activities constitutes a significant problem.
Therefore, one question dealt with the respondent's perception of a problem in overhead rates at their profit center.

The second question was designed to test the success of the PIECOST implementation strategy in educating the respondents to the importance of the total overhead cost being recovered by their profit center. This was achieved in part by emphasizing that the problem in overhead expense control had to be addressed by viewing the amount of costs to be incurred in total. Thus, the PIECOST school and briefings emphasized the need to establish the total indirect dollars to be incurred before applying the appropriate bases to develop overhead rates for pricing purposes. By increasing the managerial and analytical attention devoted to the empirical causes for incurring the major elements of indirect cost, i.e., taking the cost incurrence view, PIECOST seeks to avoid costs by imposing pressure on the contractor's budgeting process. This question, therefore, sought to learn the respondent's perceptions of a problem in the total overhead costs being incurred by the contractor. Tables 34 and 35 relate the results of the analysis.
### TABLE 34
PIECOST IMPLEMENTATION VERSUS OVERHEAD RATE

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>No Problem</th>
<th>Little Problem</th>
<th>Big Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Medium/High</td>
<td>2</td>
<td>11</td>
<td>13</td>
</tr>
</tbody>
</table>

Value of $x^2 = 5.867$

Probability of exceeding value of $x^2$ by chance = .052

Degrees of Freedom = 2

### TABLE 35
PIECOST IMPLEMENTATION VERSUS OVERHEAD COST PROBLEM PERCEPTION

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Little Problem</th>
<th>Big Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Value of $x^2 = 2.105$

Probability of exceeding value of $x^2$ by chance = .35

Degrees of Freedom = 2
The differences between these two values were interesting. With equal degrees of freedom, the $x^2$ values were nearly three times as large for the overhead rate problem as for the overhead cost problem. The probability of the $x^2$ value being exceeded by chance was approximately .05 for the problem perceived in rates versus the problem being perceived in terms of total indirect cost terms probability of .35. Apparently, the overhead problem is, despite the recent emphasis on total indirect costs, predominantly viewed in terms of rates. This is not surprising in view of the long standing emphasis on overhead rates as opposed to total indirect costs.

If the search variable is viewed in terms of a problem in overhead rates, the analysis supports March & Simon's view. Dissatisfaction with existing indirect cost estimation programs appears to have a non-chance relationship with implementation of improved programs.

Provision of Supportive Psychological Environment

In government organizations, one individual is frequently relied upon to bring the results of specialized schooling back to the entire functional organization. When the PIECOST implementation effort was designed, it was decided to broaden the base of psychologic support for the overhead specialist by designating at least one additional person from the AFPRO organization to assist in the implementation effort. Provisions were
made to send another person of similar skills to the PIECOST training school at Lowry Air Force Base as soon as possible after the overhead specialist had attended. The reasoning behind this strategy stemmed from the belief that the analytic demands could be best handled by two persons. This facilitated implementation by making it possible for the two individuals to support each other in the various tasks required. When problems arose, two minds could be deployed to reach a solution. Because of the greater effectiveness which two persons could generate, it was reasoned that successful implementation should be associated with the number of months which the AFPRO had had two or more persons working on PIECOST.

A questionnaire item asked each respondent when he had attended the PIECOST course, whether someone else from his organization had attended the PIECOST course, and when that individual had attended. The answers were then paired, and the length of time available after both individuals had completed training was computed. This was categorized and analyzed with the results as set forth in Table 36.
**TABLE 36**

IMPLEMENTATION VERSUS DURATION OF TEAM EFFORT  
(Question 3)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>6 Months or Less</th>
<th>7 Months or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Value of $x^2 = 5.44$

Probability of exceeding value of $x^2$ by chance alone = .06

Degrees of Freedom = 2

The statistical results must be regarded with caution. Because this hypothesis dealt with situations rather than individual responses, the number of responses was reduced to seventeen. Cell values were accordingly reduced, and only one cell demonstrated an expected frequency greater than five. Still, this variable exhibits a logical appeal that cannot be ignored.

Overhead cost analysis and negotiation is complex and difficult. Because of accounting problems, and analytic complexity an individual analyst often becomes overwhelmed and dispirited. However, a genuine team effort both augments the skills applied to the task and increases the social rewards of its performance.
Provision of Progressive Technical Environment

Considerable research has been devoted to the influence of the group on problem solving. A number of variables have been identified that may lead to different problem-solving behavioral characteristics between individuals in isolation and those in groups. Kelley and Thibaut (Lindzey, 1954) have observed that the group environment may encourage or inhibit the initiation of problem-solving activity. It was thus considered likely that the environment of the respondent's organization might have influenced the PIECOST implementation effort.

As the environment of the individual organization is difficult to define or measure, the perceived use of the time-shared computer terminal by others in the respondent's organization was established as a proxy. In view of the terminal's identification with the development and use of innovative approaches to pricing, the response of other group members to its presence is a reasonably good reflection of the organization's receptivity to technical innovations. As the computer was susceptible to many other applications within the AFFRO pricing organization, and as the official policy of the PIECOST school was to encourage the attendees to permit others in their organizations to employ the time-shared computer system on their own problems as appropriate, the proxy relationship appears sound. The analysis is set forth in Table 37.
TABLE 37

IMPLEMENTATION VERSUS PERCEIVED USE OF TIME-SHARED COMPUTER BY OTHER ORGANIZATION MEMBERS (Question 24)

<table>
<thead>
<tr>
<th>Degree of Implementation</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/Medium</td>
<td>2</td>
<td>7</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Value of \( x^2 = 7.80 \)

Probability of exceeding value of \( x^2 \) by chance = .049

Degrees of Freedom = 3

The high \( x^2 \) value and attendant low probability of this having occurred by chance suggest that the receptivity of the environment to technical improvements may influence adoption of innovations.

Table 38 summarizes the analysis of the variables comprising the individual psychological/demographic dimension.
### TABLE 38

**SUMMARY OF INDIVIDUAL PSYCHOLOGICAL/DEMOGRAPHIC VARIABLE ITEM ANALYSIS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value of $x^2$</th>
<th>Probability of Value Exceeding Value of $x^2$ by Chance</th>
<th>Degrees of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive Technical Environment (Table 37)</td>
<td>7.80</td>
<td>.049</td>
<td>3</td>
</tr>
<tr>
<td>Recognition of Specific Overhead Rate Problem (Table 34)</td>
<td>5.87</td>
<td>.052</td>
<td>2</td>
</tr>
<tr>
<td>Provision of Supportive Psychological Environment (Table 36)</td>
<td>5.44</td>
<td>.064</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 28)</td>
<td>7.99</td>
<td>.091</td>
<td>4</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 26)</td>
<td>2.69</td>
<td>.097</td>
<td>1</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 27)</td>
<td>6.72</td>
<td>.15</td>
<td>4</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 22)</td>
<td>3.11</td>
<td>.21</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 25)</td>
<td>3.08</td>
<td>.21</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 24)</td>
<td>2.29</td>
<td>.32</td>
<td>2</td>
</tr>
<tr>
<td>Recognition of Specific Overhead Cost Problem (Table 35)</td>
<td>2.10</td>
<td>.35</td>
<td>2</td>
</tr>
<tr>
<td>Variable</td>
<td>Value of $x^2$</td>
<td>Probability of Exceeding Value of $x^2$ by Chance</td>
<td>Degrees of Freedom</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Age (Table 33)</td>
<td>.13</td>
<td>&gt;.50</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST</td>
<td>.05</td>
<td>&gt;.50</td>
<td>2</td>
</tr>
<tr>
<td>(Table 23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Toward PIECOST</td>
<td>.43</td>
<td>&gt;.50</td>
<td>4</td>
</tr>
<tr>
<td>(Table 29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Toward PIECOST</td>
<td>.68</td>
<td>&gt;.50</td>
<td>2</td>
</tr>
<tr>
<td>(Table 30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Toward PIECOST</td>
<td>2.13</td>
<td>&gt;.50</td>
<td>4</td>
</tr>
<tr>
<td>(Table 31)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY

This chapter presented an analysis of the responses of thirty-four individuals who were working with the PIECOST overhead system in nineteen Air Force plant detachments. The respondents were charged by their organizations with implementing the PIECOST system at the contractor plants where the Air Force has administrative responsibility for U. S. government contract work. As the individuals responsible for introducing the considerably advanced PIECOST overhead system, the respondents' impressions, attitudes, situational context, and demographic characteristics were postulated as being associated with the degree of implementation that had been achieved at that contractor profit center as of the date of this research.

Using a model suggested by Mann & Neff (1961), the variables were identified as lying along two principal dimensions: individual psychological/demographic and formal organizational structural. The variables analyzed were identified by the model as being among the forces supporting a given level of organizational performance. Aided by the model, an implementation strategy was designed to influence the variables. To test the possible relationship between the degree of implementation achieved and the values of the variable, a questionnaire was developed and administered to the thirty-four individuals directly responsible for implementing PIECOST. Their responses
were categorized and a series of contingency tables prepared. These categorized the variable values in relation to the degree of implementation achieved by the respondent's organization. An $x^2$ analysis was performed on the data using the General Electric Mark III Foreground time-sharing computer system's CHICON program. The $x^2$ analysis revealed relationships which may be non-chance with the variables set forth in Table 39.

**TABLE 39**

**NON-CHANCE RELATIONSHIPS**

(In Decreasing Order of Significance)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dimension</th>
<th>$x^2$ Value</th>
<th>Probability Of Exceeding $x^2$ Value by Chance</th>
<th>Degrees of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive Technical Environment (Table 37)</td>
<td>Individual</td>
<td>7.80</td>
<td>.049</td>
<td>3</td>
</tr>
<tr>
<td>Recognition of Specific Overhead Rate Problem (Table 34)</td>
<td>Individual</td>
<td>5.87</td>
<td>.052</td>
<td>2</td>
</tr>
<tr>
<td>Provision of Supportive Psychological Environment (Table 36)</td>
<td>Individual</td>
<td>5.44</td>
<td>.064</td>
<td>2</td>
</tr>
<tr>
<td>Variable</td>
<td>Dimension</td>
<td>$x^2$ Value</td>
<td>Probability Of Exceeding $x^2$ Value by Chance</td>
<td>Degrees of Freedom</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------</td>
<td>-------------</td>
<td>-----------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 28)</td>
<td>Individual</td>
<td>7.99</td>
<td>.091</td>
<td>4</td>
</tr>
<tr>
<td>Organizational Communication (Table 16)</td>
<td>Organizational</td>
<td>4.41</td>
<td>.108</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 27)</td>
<td>Individual</td>
<td>6.72</td>
<td>.15</td>
<td>4</td>
</tr>
<tr>
<td>Organizational Communication (Table 17)</td>
<td>Organizational</td>
<td>8.86</td>
<td>.18</td>
<td>6</td>
</tr>
<tr>
<td>Organizational Slack (Table 18)</td>
<td>Organizational</td>
<td>5.96</td>
<td>.20</td>
<td>4</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 22)</td>
<td>Individual</td>
<td>3.11</td>
<td>.21</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 25)</td>
<td>Individual</td>
<td>3.08</td>
<td>.21</td>
<td>2</td>
</tr>
<tr>
<td>Recognition of Specific Overhead Cost Problem (Table 35)</td>
<td>Individual</td>
<td>2.10</td>
<td>.35</td>
<td>2</td>
</tr>
</tbody>
</table>
Substantial statistical and methodological problems must be considered in evaluating these results. These were mentioned earlier. Their combined effect reinforces the tentative and exploratory nature of this research. However, the logic of the model and the statistical support of this analysis suggest that the model has potential and should be further refined and tested.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dimension</th>
<th>$x^2$ Value</th>
<th>Probability Of Exceeding $x^2$ Value by Chance</th>
<th>Degrees of Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management Interest in Change-ACO (Table 14)</td>
<td>Organizational</td>
<td>.88</td>
<td>.35</td>
<td>1</td>
</tr>
<tr>
<td>Organizational Resistance (Table 20)</td>
<td>Organizational</td>
<td>1.89</td>
<td>.39</td>
<td>2</td>
</tr>
<tr>
<td>Attitude Toward PIECOST (Table 24)</td>
<td>Individual</td>
<td>2.29</td>
<td>.32</td>
<td>2</td>
</tr>
</tbody>
</table>
CHAPTER V

CASE STUDIES

PURPOSE AND ORGANIZATION OF CASE STUDIES

To shed further light on the processes and variables believed to have influenced this natural field experiment, six case studies were performed. One case study was performed prior to the field study; the remainder were performed subsequently. This chapter relates these studies and discusses them in relation to the dimensions and most significant variables identified by the model. It identifies the common threads in the successful cases and compares these with the unsuccessful implementation efforts. The significant variables in both successful and unsuccessful situations are identified and explanations offered as to the reasons for their importance.

The four case studies of successful implementation efforts are presented first. They will be followed by the two unsuccessful detachments studied. For organizational reasons, the detachments have been assigned coded designations and other identifying information masked.

SUCCESSFUL IMPLEMENTATION EFFORTS

The following efforts are successful PIECOST implementations. They have all established models of the indirect
cost incurrence functions, and they employed these in negotiating forward overhead rates for use in pricing contracts to be performed in future time periods. The overhead specialist and his assistant have instituted an overhead control program and actively utilized the PIECOST system to monitor the contractor's actual indirect cost performance against that estimated when the forward pricing rates were established. These implementation sites are all considered by their headquarters to be sound overhead management situations.

Case Study of Detachment A

Setting

Detachment A is located at a major profit center of one of the largest United States corporations. Profit center sales exceeded $400,000,000 in 1970. It produces complex and sophisticated military hardware with sales almost exclusively to various agencies of the Department of Defense. The company provides total systems design and fabrication of new military hardware, as well as spare parts for existing systems. For most of its sales, the profit center enjoys a "sole source" position, having won earlier technical competitions for the systems.

The profit center was significantly affected by the 1969-1970 recession. Stringent cost cutting measures were instituted, and employment had been substantially reduced. Despite intensive cost cutting efforts, the company remained in a cash-short situation at the time that PIECOST implementation
began in early 1971. During the cash crisis, the profit center had extensively revised its operating philosophy and was aggressively pursuing non-governmental markets for its technological expertise. Management was in the process of implementing a management concept that emphasized control of costs by the project manager. To this end, accounting changes were being instituted which reduced the percentage of uncontrollable (allocated) costs that were distributed to the programs and increased the program manager's cost visibility. This change was in process at the time PIECOST implementation began.

Significant individuals in the detachment were the AFPRO Commander, the principal ACO (PACO), and the overhead specialist (OHS). The Commander had had wide experience in contract administration and plant administration. During a previous tour, the Commander had been briefed on PIECOST (early in its career) and was not impressed.

A second significant individual was the principal administrative contracting officer. This man was a senior civil servant of long tenure in this facility. He had long been considered an outstanding ACO. Despite many excellent qualities, he did not have a reputation for vision or innovation.

The overhead specialist was the third significant individual in the situation. As the position had been newly
created, the OHS had been on the job only two months when implementation began. He was new to the AFPRO, having transferred from another AFPRO to fill this OHS job. A man in his middle thirties, the OHS was well educated (MBA) and innovative in outlook. Although he had not attended the PIECOST training course, he was an enthusiastic supporter of the concept. He had worked with time-sharing computers and was willing to experiment with this important tool.

Implementation Status

Implementation of PIECOST was to be accomplished as a part of a major procurement action cost analysis. Because of its size, the procurement received much attention from top government officials and special effort was being placed on the analysis and negotiations. Under these conditions, it was essential that new overhead rates be negotiated with the company. Further, there was evidence that indirect costs had not been sufficiently controlled in previous years. This, coupled with recent and projected changes in overhead pools and allocation practices, combined to create a perception among those responsible for the major procurement that overhead costs were a problem. The procurement action created a situation in which the problem had to be resolved.

The new procurement also brought additional energies to bear on the problem. In addition to the resources normally made available by the AFPRO and the buying activity, a team of
consultants and analysts from various Air Force units was assembled to assist in establishing the Air Force's price objective. This team included several individuals well versed in PIECOST. Thus, ample resources were brought to bear on the problem. Time, however, was a constraint, for there were pressures for placing the current funds under contract quickly. Thus, despite the fact that ample energy and talent was provided, it was expected to perform a complete analysis in a very short time frame.

Assessment

Analysis of the reasons for the successful implementation at this detachment suggests that three factors were very significant:

1. Indirect costs were a problem. Both the contractor and the government perceived them as a problem and realized that an acceptable forward pricing rate had to be negotiated.

2. A vigorous indirect cost analysis was demanded by high procurement officials. In this situation, PIECOST's coherent methodology and its statistical models were able to demonstrate their power.

3. Sufficient time was provided for a competent team to implement the PIECOST system. This team employed a conscious implementation strategy based on problem identification and demonstration of a coherent, powerful response to the problem.
While the AFFRO Commander and the principal ACO were not perceived as having a positive attitude, they did not attempt to hinder implementation. Further, the OHS was converted to PIECOST during the implementation effort. He was thus able to keep the model going and improve upon it. Further, the contractor perceived indirect cost control as a significant problem. He thus cooperated with the implementation effort and, in all probability, utilized the results to improve his internal cost control and budgeting procedures.

Case Study of Detachment B

Setting

Detachment B is located at a major profit center of a large United States corporation. Sales at this profit center exceeded $200,000,000 in 1970. It is designer, system integrator, and manufacturer of extremely complex military hardware. In addition, the company provides spare parts for previously produced systems. Sales are predominantly to the United States government and are based on technical considerations, rather than on demonstrated ability to compete on a price basis.

The profit center has been adversely affected by shrinking demand for its major products. As a result, employment has been shrinking and the profit center has been forced
into a general retrenchment. It has, however, remained profitable, and despite its size reduction, it remains a very large business enterprise.

The government administrative organization employs between 50 and 100 non-clerical personnel. The work force is predominantly civilian with many having been at that installation for ten years or longer. Three individuals are considered particularly significant to the PIECOST implementation.

The overhead specialist is responsible for analyzing and understanding the indirect cost incurrence and recovery process of the contractor. This individual is in his middle forties and has worked at the organization for several years. Before assuming his present job, he worked in various auditing and pricing functions within the government. This individual is able and energetic. His assistant is also a man in his middle forties. He is innovative and aggressive and enjoys using the time-shared computer. The principal administrative contracting officer also has a reputation for being aggressive and able. He, too, is now in his middle forties and has spent several years at that plant.

The Commander is an energetic and innovative individual. He has been at the organization for two years and is aware of the need for improved management of contractor incurred costs. His attitude toward PIECOST was perceived by the OHS as being positive.
Implementation Status

In this situation, the overhead specialist did not perceive a grave problem in controlling overhead costs. He felt, however, that the existing tools for overhead estimation were not good enough to tell him whether the contractor was estimating rigorously. He believed that the contractor had little idea how the overhead costs should be estimated, and that they were avoiding serious trouble by luck rather than skill. In this situation, the OHS found the PIECOST methodology promising. Further, he was able to sell his management on two of the main concepts on which PIECOST is based: the total dollar concept and the cost avoidance concept. Because he had an assistant who was of like mind and who understood and enjoyed working with computers, the OHS was able to avoid lost effort and time due to equipment unfamiliarity.

Although they did not have much time specifically allocated for implementation, the OHS and his assistant made effective use of it by starting at the classification phase and securing contractor agreement on the results before moving on. By building a sound base, they were able to establish credibility early and gain the support of management. Management support from the early stages through the negotiation phase remained constant.

Assessment

Detachment B is a successful implementation. In terms of the dimensions being explored, two appeared to govern this
situation: the individuals concerned and the perceived
support they received from top management. Both the overhead
specialist and his assistant have a rarely found blend of
mature credibility and willingness to explore improved
methods. In addition, they were encouraged by their top
management.

Contributing variables are the perception of a problem
and the perception of the improvement potential inherent in
the methodology. Although overhead cost and rate estimation
were not perceived to be significant immediate problems,
there was an underlying dissatisfaction with the way those
tasks were being carried out. The comment was made that the
plant may have been getting along all right on the overhead,
but that the OHS and his assistant doubted that the company
knew why this was happening. Given this perception of the
overhead control situation, the government's representatives
perceived an incipient problem. If the contractor was operating
on a hit or miss basis, there was a probability of a miss each
time indirect costs were estimated. In this environment, the
coherence and power of PIECOST's methodology offered a means
of adding discipline to an unruly and potentially embarrassing
situation.
Case Study of Detachment C

Setting

Detachment C is located at a major profit center of a large United States corporation. Sales at this profit center exceeded $100,000,000 in 1972. The enterprise designs, produces, and provides field support for complex military electronic systems. Sales to the United States government are estimated at 70% of the total volume. The company's business has been decreasing in recent years, and total employment has declined from approximately 12,000 in 1966 and 1967 to between 4,000 and 6,000 today. Although the profit center's technical competence is undoubted, the nature of its product line exposes it to a greater degree of price competition than is often found with the companies who deal strictly with major weapons systems or subsystems thereof.

In Detachment C, three individuals were identified as having played a strong role in the PIECOST implementation effort. These were the overhead specialist, who was responsible for implementation, the administrative contracting officer responsible for the plant selected, and the PIECOST analyst, an individual assigned to assist the OHS in acquiring the necessary data and implementing the system. The overhead specialist recalled that the ACO had been supportive and that the analyst had worked closely with him in getting the effort underway. As the three-man team involved with the implementation effort had all attended the Lowry school prior to beginning the
effort, they shared a common base of knowledge about PIECOST and, to a certain extent, about the contractor. In addition, the PIECOST specialist and the ACO had worked together previously and had good rapport.

Implementation Status

Detachment C's overhead specialist did not perceive a serious and immediate problem in controlling overhead costs. He was, however, aware that the downward trend of business at the profit center created a potential overhead problem. In fact, he observed that the contractor was "actually looking at the overhead dollars very closely." Thus, he knew that the overhead situation was potentially troublesome and that the administrators faced a changing and potentially risky situation on the overhead costs with little or no tools to employ on the problem. The PIECOST methodology was, therefore, a promising approach to the overall problem. At the least, he could foresee the methodology leading to lower uncertainty about the veracity of the overhead rates negotiated by the ACO for pricing purposes. And in this climate, even an unsuccessful implementation was worth something. If the newest technique were to fail, then little blame could come to either the overhead specialist or the ACO for using the alternatives available. Thus, while no gross problem existed, there was cause for uncertainty and PIECOST offered assistance in reducing it.
Time to analyze the costs and complete the implementation was not constrained. The overhead specialist took advantage of this by establishing an approach beginning with the classification phase. He met with contractor management and informed them that he was going to employ PIECOST. They responded by assigning a liaison man to interface between the PIECOST implementation effort and the company. The implementors further exploited the situational context by working in the contractor's plant, thus becoming familiar with his system and organization. This approach enhanced the implementation effort's credibility. By working with the contractor's personnel, the implementors benefitted both from the ability to involve them in the numbers acquisition, and perhaps to co-opt them in the process!

Assessment

Detachment C is a successful implementation. Overhead rates have been negotiated for two years and are considered satisfactory by the users, both company and government. Viewed in terms of the dimensions being studied, the individuals concerned stand out as being the most significant contributors to the end result. By establishing a three-man team, which included a capable and innovative ACO, the implementors put themselves in a stronger position than a single analyst could have hoped to occupy. Further, their team followed a strategy
of informing the contractor and securing his involvement, although not necessarily his agreement, with their efforts.

The team was aided by the existence of an incipient problem for which the PIECOST methodology offered improvement. At the least, a successful implementation reduced the level of uncertainty which the administrative office would have to bear regarding the prices they were recommending for work to be performed by the contractor during the forthcoming time period. As the overhead specialist put it to the contractor, "Right now we're negotiating millions of dollars of contracts with you, but we have no feel for your overhead rates. We have a right to look at these rates and look at these dollars." After completing the PIECOST implementation, he commented, "Now I'm confident that I know as much about (the contractor's) overhead dollars and rates as the DCAA auditor knows." PIECOST has apparently served as a vehicle for redressing the knowledge gap between contractor and administrative activity. In the process, it increased their confidence in the estimates they were forced to make and reduced the risk and the severity of mistakes in this area.
Case Study of Detachment D

Setting

Detachment D is located at a major profit center of a large United States industrial concern. Its sales exceed $300,000,000 of which roughly $100,000,000 are generated at this profit center. The major product line is various types of accessory drives which are incorporated into aircraft subsystems. Approximately 20% of the profit center's sales are made directly to the Department of Defense. Most of the remaining sales are to prime contractors operating under Department of Defense contracts. Sales in 1969, 1970, and 1971 declined substantially, reflecting the general economic pause and the problems affecting the aerospace industry in particular. Sales in 1972 showed a strong upward trend.

The administrative organization does not maintain a large staff in residence. Instead, a small group of people are kept well informed of the affairs of a particular contractor, and these call on specialists within the office when they need assistance in a specific area. Thus, the organizational arrangements adopted for PIECOST implementation included designating an overhead specialist and an analyst to perform the classification, analysis, and forecasting needed to prepare the ACO's negotiation objective. The OHS and analyst are technical specialists assisting the generalist ACO. This team had the
responsibility of implementing the PIECOST program at the designated contractor facility. Both the overhead specialist and analyst had attended the Lowry school. The ACO had not been exposed to PIECOST before the implementation effort began.

Implementation Status

During the 1969-1970 time period, overhead costs had been a significant problem at the profit center. Then a major government customer had refused to accept the rates negotiated by the ACO for forward pricing purposes. The matter had been elevated to the respective headquarters and had required a major joint effort before being satisfactorily resolved. The overhead specialist recalled this as a "substantial problem with overhead rates." The aftermath of this problem was still in the minds of both contractor and government personnel. The overhead specialist thus perceived the program as a "good method of arriving at a realistic rate projection." He also believed that the ACO was tremendously impressed with PIECOST and what it could do for him. Thus, the perception of a genuine problem in the overhead area was a cause for concern by the responsible individuals. As a method of alleviating their concern, PIECOST offered positive value to them.

Although the OHS and assistant were responsible for implementing PIECOST, they were not permitted to work full time
on the project. They managed to overcome the imposition of higher priority work on their time, but they estimated the project was delayed about three months. Their efforts were improved because they operated on a plan of first selling the contractor and then securing DCAA's cooperation. By bringing both the contractor and DCAA into the implementation program at the beginning, the team avoided problems from those organizations. They were then able to present a completed implementation to the ACO and insure his acceptance.

The overhead specialist and assistant did not perceive top management in their organization as being supportive. This was demonstrated by their imposing higher priority work on the implementing team during their effort. However, once the team succeeded with the implementation, the OHS perceived command level support for the program which has since been translated into further successful implementations. Despite top management's lack of enthusiasm for the PIECOST program, a competent and capable team established a successful model, gained managerial support, and is continuing to implement the PIECOST system at other contractor profit centers.

Assessment

Detachment D is a successful implementation. A model has been developed and employed in negotiating forward pricing overhead rates. Both government and contractor consider that the model generates realistic results in terms of its independent
variables. In terms of the dimensions being examined, two stand out as apparently determining the outcome. First and most important, the individuals, both the overhead specialist and assistant analyst were able men who were convinced that the system could work and would improve the government's confidence in its overhead cost analysis and resultant recommendation. As a team, the individuals involved were able to supplement each other's knowledge and keep the implementation effort going, despite the pressure of other workload. As the monitor remarked of the analyst, "He actually pulled the program over most of the rough stages." The team also made its job easier by bringing the contractor into the implementation effort early in the process as a part of an overall strategy.

The second important dimension operating in this implementation is the fact that overhead costs were a genuine problem to both the contractor and to the administering activity. The recent problem involving unsatisfactory overhead rates created a desire for improvement. As PIECOST was addressed to this specific problem, it offered much to the organizations and individuals involved. Successful implementation increased the specialist's confidence in the projections that were required. Thus, the ACO's confidence was increased that the prices which he was recommending to government customers would not be proven incorrect. Both contractor and government benefitted from reducing the likelihood of another embarrassing overhead pricing incident.
UNSUCCESSFUL IMPLEMENTATION EFFORTS

These detachments are unsuccessful implementation efforts. They have not completed the analysis and forecasting phase of the PIECOST overhead system. In one case, the site had reported that it had completed the analysis phase when it had not completed the classification phase. The second detachment had completed its model but had been unable to complete the development of rates for negotiation purposes. Both sites had relatively low computer usage.

Case Study of Detachment X

Setting

Detachment X is located at a major profit center of a large United States corporation. Sales exceeded $250,000,000 in 1971. The profit center produces a full line of extremely sophisticated subsystems. It produces all aspects of its product line from basic research to production and logistics support. The highly technical and sophisticated nature of the equipment produced by the company restricts its competition to an extremely small group of companies which possess the required technical, production, and logistics support capabilities. Approximately 50% of the profit center's production is sold to the United States government.

The administrative organization at Detachment X employs between 50 and 100 non-clerical personnel and is predominantly
a civilian organization. Many of these have been employed by the government for ten years or longer. Because of their special role in implementing PIECOST, three individuals are considered significant.

The overhead specialist is responsible for the analysis and understanding of the contractor's indirect cost incurrence and recovery process. This individual is in his middle forties and has worked at the organization for several years. His experience before entering the civil service was in public accounting and auditing. By all accounts, this individual is a very intelligent and able person.

A second significant individual is the principal administrative contracting officer. At Detachment X, this individual is a senior civil servant who has worked at the profit center for many years. He is generally regarded as an extremely able individual.

The Colonel commanding the AFPRO is another significant individual. He has not been in the present job for very long, and his attitude toward overhead control via the PIECOST system was considered neutral.

Implementation Status

The overhead specialist perceived the existence of a problem in overhead control. Further, he is considered to have an appreciation of the difficulty of the problem and the need to employ more powerful methodology than that previously available.
The OHS has properly classified the costs, developed sound deflators, and identified the driving variables essential to a sound model. However, the implementation effort has been unable to proceed beyond that point, because he had narrowly construed the training given and had not been able to solve the allocation problem.

The administrative contracting officer had only a superficial appreciation of PIECOST. He did not believe that there was an overhead problem at the detachment. He, therefore, had adopted a neutral posture toward the subject. The overhead specialist had received only minimal ACO support in his efforts to implement PIECOST but had not been discouraged.

In this respect, the ACO echoed the attitudes of the Detachment Commander. The Commander is best described as having neither pushed implementation nor blocked it. He does not appear to perceive a problem. However, he and the ACO, too, talk about doing something about the overhead situation but, when pushed, are reluctant to take an active role in pushing forward. This is consistent with a lack of perception that the overhead constituted a problem at their facility. Their interest in discussing the problem, however, can be explained by their awareness of command line interest in the situation. In essence, they were speaking for the record, not from their convictions.
The power of the methodology was not fully perceived by any of the individuals concerned with implementation. The OHS had a vague perception of the possibilities inherent in the technology and coherence of the system. However, none of the significant others in the situation were believed to perceive the potential power of the PIECOST methodology.

The attitudes of the individuals concerned toward the PIECOST system could be best described as positive for the OHS and neutral for the ACO and the Commander. There was no indication, however, that anyone above the OHS had any negative attitude toward the PIECOST system. All of these people considered PIECOST to be irrelevant, rather than dangerous. The OHS was believed to look positively on the system, but he had no leverage on the attitudes of the others.

Assessment

When data for this case were gathered, Detachment X had completed a satisfactory model but had not been able to proceed further. The profit center had been accurately defined, its costs classified, satisfactory deflators constructed, and driving variables identified and tested. Although a great deal of work had been done and much information gathered, there were some complex problems to be solved to put that information into usable form. Although the technical problems were difficult, the Detachment made no effort to seek help. The lack of a perceived
problem by the ACO and AFFR is probably the cause of the inaction. Only when the command channel became concerned to the point of proferring assistance did the Detachment move to solve the remaining technical problems.

Case Study of Detachment Y

Setting

Detachment Y is located at a major profit center of one of the largest corporations in the United States. Sales were over $300,000,000 in 1971. The profit center is engaged in an extremely technical and demanding line of business, performing all aspects regarding its product line from basic research to production. Because of the highly technical and complex nature of its product, the company has little concern for loss of market position resulting from additional entrants into the market place. Competition is encountered from a relatively small group of companies which possess the rigorous technical, production, and logistic support capabilities. Further, the company sells its output to a small group of buyers, principally the United States government, which do not buy on the basis of price.

The administrative organization employs between 50 and 100 non-clerical personnel. The work force is predominantly civilian and has often been there for ten years or longer. Due to the mobility of military management, the civilian cadre is extremely important. They usually are best acquainted with the procedures and personnel of the host contractor and, thus
know how to obtain data and company cooperation. As these are often needed in the implementation process, the civilians play a very important role.

The overhead specialist is directly responsible for the government's understanding and appreciation of the host contractor's indirect cost incurrence and recovery process. This individual is in his middle forties and has worked at the organization for several years. Prior to entering government service, he worked for several years with private industry and considers himself well versed in production management. He is very self-confident and outspoken.

A second significant individual is the principal administrative contracting officer. At Detachment Y, this individual is a senior civil servant, having worked at that plant for over twenty years. He has worked most of his career in other functional areas including quality assurance, production, and industrial property before becoming the principal administrative contracting officer. He professes to be quite receptive to new ideas and procedures. He is not, however, particularly knowledgeable in the financial aspects of the contractor's operation.

The third significant individual is the military officer who commands the plant representative office. This person is an aggressive and innovative officer. He is described as being in favor of PIECOST but not well versed in it.
Another individual concerned with the PIECOST system is a young man who is responsible for the actual implementation. He is new to the situation, not having previously worked in a plant before. Therefore, he has no basis for evaluating either the extent of the indirect cost problem or the capability of PIECOST to provide a useful tool for impacting on the indirect costs.

Implementation Status

Discussion with the principal administrative contracting officer revealed that he did not consider himself well qualified to discuss indirect costs. However, he did not feel they had an overhead problem. He indicated that he would prefer that discussion on this subject be held with the overhead specialist whom he considered "the best in the business." He admitted that he did not know much about PIECOST at all; in fact, he didn't know what the acronym stood for.

When the overhead specialist was contacted about the implementation situation, he indicated that the PIECOST methodology was of no advantage to him. He discussed two instances in which he claimed that his extensive knowledge of production had enabled him to accurately forecast certain overhead rates without requiring the PIECOST analysis. In his judgment, also, there is little likelihood that the contractor would let a certain component of the overhead rate structure stray very far from the rate used to price a major government contract. Therefore,
he did not see any problem in overhead or any reason to take unusual steps to analyze it. Further, he did not believe that there is any reason to attempt to price work out beyond a year with a forward pricing rate agreement. He believed that this was not a problem which the overhead specialist could or should concern himself with. In addition, he commented that PIECOST took too much time and did not address the question of past contractor inefficiency. Thus, he did not feel that PIECOST would help him in any aspect of the overhead specialist's function.

Discussion with the individual directly responsible for implementing the PIECOST system confirmed previous impressions. His lack of experience with the contractor is a negative factor, for he did not know the contractor's cost incurrence patterns. He indicated that he had ample time to work on the problem. He stated, however, that he only received such support from the overhead specialist, the DCAA, and the contractor as he specifically requested. He had received only faint indication of interest from the Detachment Commander and none from the civilians which he dealt with on a day-to-day basis.

Assessment

As of the time data were gathered, implementation at Detachment Y had proceeded only to development of equations on improperly classified costs. The profit center had not been accurately defined, and the model was not, therefore, ready to use.
Reclassification would require the analyst to revalidate and possibly revise his deflators and independent variables. Thus, while the Detachment had indicated that it had completed the analytical phase of implementation, actually it had not completed the classification phase.

The reasons for this are basically the absence of a perceived problem to which PIECOST would provide a meaningful response. Having never perceived a problem in establishing indirect cost rates, top management had expressed only perfunctory interest, at best. As the responsible persons have never perceived a problem, the power of PIECOST to provide coherent and rapid analysis of indirect costs has little, if any perceived value to the Detachment's management. When the negative attitudes of the overhead specialist, the DCAA, and the contractor's immediate management are considered, the unsuccessful results are not surprising.

IDENTIFICATION OF CORRELATES

The case studies identified several common threads whose existence or absence was correlated to the success or failure of the implementation effort. While no statement of scientific cause or effect can be made, the degree of presence or absence observed for certain variables may shed light on the problem. These correlates involve four variables suggested by the model: Interest of significant others, individual attitudes, team approach, and perception of a problem or organizational search.
Interest of Top Management

The interest of top management, defined as the AFPR and the ACO, in the unsuccessful implementation detachments was uniformly low. Comments such as, "Well, he (the AFPR) hasn't pushed it, but he hasn't blocked it either," and "I rely on my overhead specialist for anything in the overhead line. He's one of the best in the business," were voiced regarding or by top management in the non-implementing detachments. Such interest as was perceived was ascribed to the fact that detachment management knew that their command structure was interested in implementing the PIECOST system, rather than to any genuine interest. In fact, the level of detachment interest and support for PIECOST implementation was superficial, at best.

Even at the successful detachments, the interest of top management was clearly perceived by the implementors in only one case. In the remaining three successful detachments, the top management was not perceived by the implementors as having any real interest in the effort. One respondent observed that "our chiefs didn't really support the PIECOST operation."

Another implementor noted that only after PIECOST had succeeded did management support its use. The remaining detachment was also characterized by a wait and see attitude. The case studies show only one instance where top management actively supported
the PIECOST implementation effort. In all of the other cases, top management at the local level was apathetic.

**Individual Attitudes**

The individuals responsible for implementing PIECOST were very significant factors in the outcome. Their attitudes toward the PIECOST system were strongly correlated to the success or failure of PIECOST implementation at their detachment. The following statements by successful implementors are illustrative: "We had to support this ourselves—the actual people doing the work," and, "I would say that I had faith in the program. I think it's a good method of arriving at a realistic rate projection." In contrast, the unsuccessful implementors displayed little enthusiasm for PIECOST. One of them noted that he believed that PIECOST offered him no advantages in terms of his situation. The other unsuccessful site adopted a strict interpretation of the innovation which prevented it from adapting the system to its situational context.

All of the successful detachments, however, had open-minded, creative, and aggressive individuals responsible for implementation. All of them expressed positive attitudes toward the PIECOST system.

**Team Approach**

A common thread running through the case studies is the importance of a team approach to the implementation task. Without exception, the successful detachments were team efforts. Comments
such as, "He actually pulled the program over most of the rough stages," were offered about the partner. In three of the four successful situations, the respondents referred to the partner as having contributed significantly to the results achieved.

However, the unsuccessful sites also had teams responsible for the implementation effort. Here, the lack of success appears to be explained by the personality of the OHS. If the OHS failed to set an aggressive example or was actually opposed to the system, the other team member could not overcome that problem. This was expressed by one respondent who noted that he felt that he had to generate some credible overhead estimates to secure support for his implementation effort. He perceived no support from the other team member. Thus, in fact, there was no team at this detachment.

Perception of Problem

The case studies indicated that the successful detachments perceived a problem, either actual or incipient, in the area of indirect costs or overhead rates. Comments regarding the unsuccessful sites were, "They haven't pushed it on through to its fulfillment because of the lack of a sense of need," and, "PIECOST offers no advantage to us here." These individuals showed no indication that they had any problems in the indirect cost area. In fact, they actively disclaimed any need for improved
indirect cost analysis.

Successful detachments, however, unanimously perceived an actual or potential problem in the analysis or control of indirect costs. They were characterized by statements such as, "They (the contractor) have had substantial problems with their overhead rates in the past," or, "The contractor probably had a pretty good handle on it, but I'm not sure he knew how he'd gotten there," or, "Right now we're negotiating millions of dollars of contracts with you, but we have no feel for your overhead rates." On the whole, therefore, perception of an actual or potential problem with overhead costs characterized the successful detachments.

SUMMARY

The case studies confirmed the results of the questionnaire. With only one exception, top management was not considered a positive factor in the results achieved. This finding was consistent with the questionnaire results which found very low associations between implementation and perceived interest of top management. The case studies, therefore, confirmed the questionnaire results and suggest that the questionnaire items were satisfactory indicants.

Individual attitudes, suggested by the questionnaire as the most significant variable, were also the most significant factor in the case studies. The successful implementors were persons of ingenuity and vigor. They had a feeling of mission and accepted
responsibility for making PIECOST work at their detachment. They overcame lack of time and conflicting organizational priorities. Perhaps the attitude they brought to the task is best summed up by the response of one implementor to the question of whether the ACO was the person most responsible for getting the system implemented, "Oh, no! No! I was."

The team approach as used in this research implies more than merely assigning two individuals to work on a specific problem. It refers to the creation of an effective unit of two, and perhaps more, individuals who work well together toward organizational goals which they internalized. They adopted a conscious approach to achieving the desired results. In other words, they looked beyond the technical task to the social task of securing the assent of the appropriate actors in the situation. Most of them had held orientation meetings with the contractor to secure their assent. In some cases, they had pursued a clear strategy of influencing the individuals in their own organizations who could influence the outcome of the implementation effort. Further, the questionnaire results suggest that the team approach is associated with a supportive social environment. The questionnaire items on computer usage by other members of the organization were highly associated with implementation. Together, the case study and questionnaire results suggest that the successful detachments had succeeded in creating an environment in which creative teams conducted an innovative implementation effort.
The perception of specific problem (organizational search) variable was also important. As postulated by March & Simon, the need for dissatisfaction with the current performance program appeared to be a universal associate of implementation. This was noted in all successful detachments. It was also among the most significant variables identified by the questionnaire. The evidence that this variable is a significant correlate is extremely convincing. With a combination of unanimous observance in the successful case studies, no observance in the unsuccessful case studies, and an association with implementation which had only a .05 chance of random occurrence, this variable must be considered one of the most important in the implementation process.

The case studies thus confirmed questionnaire results indicating that the individual attitudes, team approach and perception of problem/organizational search are strongly associated with successful implementation. Interest of top management, however, did not appear related to successful implementation in any non-chance fashion. This somewhat surprising conclusion was suggested by the questionnaire results and confirmed by the case studies in three of the four successful implementations. Thus, of the four variables investigated via both case study results and the questionnaire, the results were confirmed in each instance.
CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

OVERVIEW

The purpose of this research was to examine the effect of variables suggested by a change model synthesized from the ideas of Greiner (1967), Leavitt (1965), and Mann & Neff (1961) on the adoption of a new performance program within a complex organization. There is no presently accepted theory of organizational development or change management. This research was designed to contribute toward a better theory and understanding of the problems of managing change in complex organizations by subjecting the model to empirical test in a natural field experiment.

The setting for the experiment was units of the Air Force Contract Management Division (AFCMD), The Air Force Contract Maintenance Center (AFCMC), and the Defense Contract Administration Service (DCAS). (For definitions, please refer to Chapter I). Each of these organizations has administrative organizations (detachments) which are responsible for administering government contracts with large profit centers of major United States corporations. Individuals working at these administrative organizations were assigned responsibility for implementing a major innovation in financial methodology. The general strategy of the change management
effort was suggested by the model referred to earlier.

The change management model was Lewinian in that the organizational sub-unit performance equilibrium was supported by social and technological forces in an individual force field. These forces were hypothesized as consisting of variables operating along formal organizational structure and individual psychological/demographic dimensions. Variables were identified along the dimensions. The variables were measured by a questionnaire and correlated with the degree of implementation achieved. Contingency tables were developed and $x^2$ analysis performed. In addition, six case studies involving both successful and unsuccessful detachments were prepared.

CONCLUSIONS

Five variables were identified along the formal organizational structure dimension:

1. Top management interest in change
2. Imposition of other priority workload
3. Organizational communication
4. Organizational slack
5. Organizational resistance.

Five variables were also associated with the individual psychological/demographic dimension:

1. Recognition of specific problem
2. Attitude toward PIECOST
3. Age
4. Provision of supportive psychological environment
5. Progressive technical environment.

Analysis of these variables indicated that the individual psychological/demographic variables were more frequently associated with implementation than the formal organizational structure variables.

Importance of the Individual

Of the top six variables in terms of the probability of the $x^2$ value being exceeded by chance, four were identified along the individual psychological/demographic dimension. These were:
1. Existence of a progressive technical environment
2. Perception of a problem in the areas of overhead rate analysis
3. Provision of supportive psychological environment
4. Attitude

The probabilities of the $x^2$ values of the best indicants of these variables being exceeded by chance ranged from .049 to .097. Of fifteen questionnaire items which had $x^2$ values with less than a .50 probability of occurring by chance, ten were associated with the individual psychological/demographic dimension. Only one variable associated with this dimension, age, did not have either a possible non-chance association with observed implementation or an observed result that can be explained by an unsatisfactory indicant.

The formal organizational structure variables were not strongly associated with implementation. Of eight questionnaire
items, the lowest probability of $x^2$ being exceeded by chance was .108. While the formal organizational structure variables presented difficult problems in indicant selection, proxy relationships and question formulation, the same considerations were present on the individual dimension variables. The weakness of the formal organizational structure was an unexpected result of this research.

The $x^2$ analysis strongly suggests that the individual, particularly his attitudes, is very critical to the success of an implementation effort. The case studies confirmed the results of the $x^2$ analysis. All of the successful detachments studied were characterized by having aggressive individuals in charge of the implementation. In three situations, these men accepted responsibility for the success of their implementation effort and set about insuring it. In the fourth case, the researcher, in an action consulting role, accepted this responsibility and adopted a strategy to insure that the social aspects of the implementation problem were satisfactorily resolved. In every case, the implementors approached this problem with a strategy which helped them overcome expected resistance. In view of the evidence from both the $x^2$ analysis and the case study portions of this study, and within the limitations previously acknowledged, the individual responsible for implementing new innovations dominates the situation. More than any other fact, the individual's personality, attitudes, and abilities determine the outcome.

Perception of the Problem

The research strongly supports March & Simon's contention
that existing performance programs will be continued so long as
the organization and its members perceive their results as
being satisfactory. The $x^2$ analysis and case studies both
offer strong support for the March & Simon position. In
both unsuccessful detachments, the individuals responsible
for implementation did not perceive a problem in the area
of indirect costs or overhead rates. In fact, they were
strongly convinced that the opposite was true.

At the successful sites, however, an actual or potential
problem in the area of overhead rates was identified by the
respondents as having influenced their actions. The very
high $x^2$ value observed on the field survey and the case studies
suggest that the induction of organizational search by those
responsible for the implementation effort is extremely important
to the change effort's fate. It is not argued that the organi­
zational search variable overpowers individual attitudes.
Rather, it seems more likely that the two aspects are closely
related, that perceptive and open-minded individuals, being
more sensitive to the overall problems of defense procurement
and contractor cost control, were most likely to perceive the
problem and to take action to alleviate it.

Team Effort

Although all of the sites were supposed to have two
or more persons trained and capable of implementing PIECOST,
vagaries in availability of training school slots and individuals
prevented this aspect of the strategy from being carried out
as fully as hoped for. Nonetheless, the research suggests that the team approach has merit. The \( x^2 \) analysis of the questionnaire item relating to the duration of time which two or more people trained in PIECOST were able to work on the implementation to the degree of success achieved indicated a probability of only .064 of the \( x^2 \) value occurring by chance.

Further support may be inferred for the team approach from the organizational slack variable. Inferred from the professional personnel strength of the contract administration division, this variable had a .19 probability of having a greater value of \( x^2 \) by chance. Thus, larger organizations being better able to provide a second individual for the PIECOST implementing team were best able to establish implementation teams.

The case studies supported the importance of a genuine team approach. All of the successful detachments had meaningful team efforts. The principal members were quite aware of the important contributions made by the other team members and commented favorably to that effect. Unsuccessful detachments studied did not have teams in a meaningful sense. Perhaps, as noted previously, the reasons for the lack of teams were functions of the individual OHS at that facility. Unfortunately, the results are not conclusive on this point.

Supportive Organizational and Psychological Environment

The research strongly suggests that the overall environment at the working level was a very significant factor
in the success or failure of the PIECOST implementation effort. The previously discussed relationships, of course, constitute a significant factor in the provision of a supportive organizational and technological environment. Further support for this conclusion is offered by the $\chi^2$ analysis of the item which measured the perceived use of the time-sharing computer by other members of the organization. As the time-sharing computer was installed for the PIECOST implementation effort, and as there was no other computer-oriented performance program being implemented at this time, use of the computer was required in a formal sense only for PIECOST. The perceived use of the terminal by other organization members, therefore, can best be explained by the presence of innovative individuals in other functional organizations within the detachment. The presence of such individuals and the fact that they were willing and permitted to employ the time-sharing computer terminal for their jobs prove the existence of a supportive organizational and psychological environment for innovation.

The high $\chi^2$ values for these variables coupled with relatively low values for the interest of top management and imposition of other organizational priorities are evidence that, at least in the PIECOST implementation effort, the individuals comprising organizational sub-units and the general environment of those sub-units were the most important factors in the change management problem.
Interest of Top Management and Imposition of Other Priority Workload

Both the interest of top management and the imposition of other priority workload were considered likely to be significant factors influencing the implementation process. Among the more interesting findings of this research was the strong suggestion that these variables did not impact the implementation process as strongly as expected. Only the interest of top management variable had more than a non-chance association with the degree of implementation achieved. At .39 probability that the $x^2$ value could have been exceeded by chance, the top management interest variable does not exhibit the expected strong relationship. To some extent, this finding was corroborated by the case studies. Only one successful case study indicated a supportive attitude on the part of top management in the situation. Their role in that detachment was passive rather than active. The real force behind implementation was the OHS. Top management provided moral and organizational support when requested. Thus, despite the methodological difficulties of measuring this variable, the results indicate that the organizational hierarchy, in terms of top management, played a relatively passive role in the success or failure of the PIECOST implementation effort.

Similar questions are raised by the failure of the imposition of other priority workload variable to demonstrate a
more significant association with results achieved. While measurement difficulties and bias may have hampered assessment of this variable, the possibility that the variable is less significant than originally hypothesized is an interesting finding. It is heightened by the fact that two of the successful teams mentioned that imposition of other priorities had delayed completion of their PIECOST effort. In both cases, the team involved was able to deal with the priority workload and return to successfully complete the implementation. These findings reinforce, therefore, the overall conclusion that the individuals involved were the most important variables in the PIECOST implementation situation.

The research supports the change model as a useful approach to the conceptualization of the change process. The model greatly assisted identification of the important variables influencing the change adoption process. Empirical support of the importance of the variables identified was obtained in several instances and was confirmed by the case studies.

RECOMMENDATIONS FOR FURTHER RESEARCH

This research suffered from a number of previously mentioned limitations which inhibit the universal applicability of the results. Further research is needed to test the change model under more varied circumstances and settings.
Replication

A major limitation, generalizability, should be addressed by replication of the research in other organizations and settings. The bureaucratic environment of the Department of Defense's contract administration functions is very specialized. The attitudes and responses of individuals long exposed to this activity may not typify those of persons in other organizations. Thus, replication of the research in other organizations would be desirable to test the model's value. The natural field experiment can be adapted to other organizational change efforts in both smaller and larger organizations. Also, organizations operating in other governmental jurisdictions may display different responses to the change model and strategy applied here.

Organizations which operate in the market economy should also be studied. Profit making, shareholder-owned corporations occupy positions of power in today's world that would have been beyond the reach of the most powerful heads of state not many years ago. Yet, our understanding of how these organizations function in the all important area of change is rudimentary. A replication of this research in the setting of a large corporation should, therefore, yield valuable information on their workings. A comparison with results from governmental organizations should yield interesting insights for students of management and public administration.
**Improved Questionnaire Design**

Further research, regardless of the environment in which it is conducted, should take advantage of the experience gained during this study to improve the design of the questionnaire. Particular attention should be devoted to improving the attitude measurement process in view of its apparent significance. Alternate forms of measurement should be considered. A separate questionnaire using a Likert scale would possibly improve the confidence attachable to the attitude variable by employing more indicants. Indicant identification should receive more refinement as several indicants were apparently ill-perceived by the respondents. Although the strength of the most logical indicants was great, future research should eliminate as many of the disparities noted during the analysis as possible.

The formal organizational structure dimension variables also experienced measurement problems. Improved methods of measuring organizational slack, imposition of higher priority workload, and organizational communication should be developed. In view of the difficulties in questionnaire development, a more intensive pre-test program than was possible in this study should be used.

**Greater Organizational Control**

Additional research could also benefit from a more closely controlled approach to the organizations involved than was possible on this study. By creative use of control groups and modified
experimental approaches, the model could be subjected to more closely controlled tests involving more than one population and a larger sample size.

By encouraging additional research into the area of change implementation, management in both the public and private sectors will contribute to development of much needed theory to guide future change efforts.
APPENDIX A

CHARTER CONTRACTOR OVERHEAD

COST STUDY GROUP

Background

The effort of the Department of Defense over the past six years has been to create a contracting environment such that, through competition and the greater use of fixed-price type instruments, contractors would have the maximum motivation to minimize total costs. Significant progress toward this goal has been made. It is still the objective of DOD to find ways to provide contractors maximum motivation to minimize total costs. Overhead costs represent a significant part of total cost. In a price competitive environment, the pressures of competition cause contractors to exercise maximum ingenuity to reduce all costs and to manage overhead costs closely. However, in a non-competitive environment, the pressures of competition being largely absent, the motivation to minimize costs must come from other stimuli.

While cost type contracts in DOD have been reduced to 20.3% of the total dollars obligated in FY 66, non-competitive procurements comprised 50% ($18.6 billion) in FY 66. Consequently, even where fixed-price type contracts are being used, approximately a third of the dollars are placed in a non-competitive environment.
A related fact of current DOD contracting is the increasing use of long term (3 or more years) contracts. These require projections of costs, including overhead costs for periods of three to five years. The capability to project or to appraise contractor projections of such cost is a critical consideration in pricing non-competitive procurements of this type as well as in program costing.

During the past several years, individual elements of overhead (e.g., R & D, Bid and Proposal Costs, Automatic Data Processing, Leasing expense, etc.) have been the subject of critical reviews by a variety of sources. Efforts have been extended to either adjust the affected ASPR cost principle or to devise special procedures to provide better government knowledge of these costs and to provide contractors an increased incentive to manage such costs.

A further influence on overhead cost has been such factors as (1) the changing pattern of Defense procurement policies over the past five years, (2) changes in technology, (3) increasing specialization and associated increases in salaries for such specialists.

In recent years there have been expressions by various responsible sources that overhead costs in general are increasing disproportionately to total costs and that particular elements of overhead costs have been increasing so rapidly as to require special controls. There is evidence that such costs have been on the rise. What is not so apparent are the reasons for these trends. The shifting
patterns of Defense procurement policies as well as the demands of a rapidly changing technology (within Defense and non-Defense industries) have undoubtedly had some influence on overhead costs and their relationship to total costs. The nature of these impacts is not well understood and is requisite to any judgment on whether overhead costs are being adequately controlled.

In summary:

(1) Approximately 50% of DOD procurement dollars are awarded non-competitively (20% are cost-reimbursement type).

(2) There is evidence which indicates growth in overhead cost generally, and in specific overhead elements in particular; there is concern that these costs may not be adequately controlled.

(3) The relationship of increased overhead costs to changing procurement policies, technology and business practices is not clearly defined.

(4) The increasing use of long term contracts emphasizes the necessity for valid projections of overhead costs and highlights the need for techniques which will support such projections adequately.

As a result of these type considerations, an in-depth study of contractor overhead costs, including management, administrative and technical practices, is clearly indicated.
Objectives

The study will be directed primarily toward those contractors (or divisions) whose business is predominantly with DOD and NASA and whose contracts are largely awarded non-competitively. The basic objectives of the study are:

(1) Determine whether overhead costs are too high or are being adequately managed by contractors either specifically or in the context of total cost management.

(2) Develop and/or improve techniques for projecting long-range estimates of overhead cost for use in cost analysis, program costing, and contract pricing.

(3) Develop, as determined necessary, a proposal directed at increasing the contractor's motivation to effectively manage overhead costs in context with the primary objective of minimizing total costs.

(4) Determine to what extent further guidance, visibility and/or controls are necessary. To the extent determined to be necessary develop a system for review of contractor overhead experience that will afford a basis for:

(a) Reporting and analyzing the historical trends of individual contractors and the reasons for changing relationships.

(b) Developing generalized indicators for overall or individual elements of overhead costs that may be useful to contractors and to the government as a basis for improving overhead management.

(c) Providing criteria, where feasible or desirable, to contracting officers in the application of contract cost principles.
Procedure

1. An Ad Hoc group will be constituted to conduct this review and to pursue the objectives set forth above. This group will consist of representation as follows:

   Office Secretary of Defense
   I & L (Chairman)
   Comptroller
   Systems Analysis
   Defense Contract Audit Agency
   Defense Contract Administration Services
   Army
   Navy
   Air Force
   NASA

Representatives from other activities will be invited to participate to the extent matters are considered which affect them or where their assistance may be required.

2. The Logistics Management Institute will assist the Ad Hoc group as appropriate.

3. The group will meet at the call of the Chairman.

4. Minutes of all meetings will be kept.

5. The members designated by their agency are expected to be present at all meetings; make arrangements for additional agency participation or assistance as the study progresses; assume responsibility for specific tasks related to the study as may be directed by the Chairman; keep the appropriate level people within their agencies informed on the progress and specific work of the group.

Approach

In proceeding with this study the overhead Ad Hoc group will identify
those overhead activities which appear to impact on this study with a view of avoiding duplication of effort. As is determined appropriate, these separate efforts will continue as separate activities or will be made a part of the Ad Hoc Group Charter. Inclosure 1 lists those activities so far identified which are considered appropriate for action by the Ad Hoc group.

Schedule/Reports

The Chairman will keep the DASD (Procurement) apprised of progress. He will also keep other interested OSD offices informed on a request basis. Periodic reports will be rendered to the ASD (I & L) and other policy management level personnel of DOD & NASA.
APPENDIX B

MERIT PROMOTION ANNOUNCEMENT

CENTRAL CIVILIAN PERSONNEL OFFICE
AIR FORCE CONTRACT MANAGEMENT DIVISION
— — LOS ANGELES, CALIFORNIA

POSITION: Contract Specialist, GS-1102-13
LOCATION: See Reverse
AREA OF CONSIDERATION: AFCMD-Wide

ANNOUNCEMENT # 71-44
OPENING DATE: 10 May 1971
CLOSING DATE: 24 May 1971
APPLICABLE PEP: 3

SELECTION FOR THIS POSITION IS SUBJECT TO RESTRICTIONS RESULTING FROM THE DEPARTMENT OF DEFENSE PRIORITY PLACEMENT SYSTEM FOR DISPLACED DOD EMPLOYEES.

SELECTIONS FOR THESE POSITIONS WILL BE BASED ON SKILL, TRAINING, ABILITY AND MOTIVATION, NOT ON PACE, RELIGION, COLOR, NATIONAL ORIGIN, SEX, POLITICS, OR ANY OTHER NONMERIT FACTOR.

ABILITY STATEMENT: This position may require a civilian mobility statement; the incumbent may be reassigned within AFCMD after four years to satisfy a management need or to enhance the employee's career progression.

DUTIES: Accomplishes regular and special staff visits to field offices as a consultant and technical advisor on new or revised procedures, methods and policies concerning contract administration areas involved in overhead negotiations. Initiates or performs surveys and research of special projects requiring special actions to resolve problems for guidance of field activities engaged in overhead negotiations. Provides technical assistance to field personnel and participates in negotiations between Government negotiators and contractors on unusual or difficult overhead negotiations. Develops functional operational procedures for guidance of field offices.

SPECIALIZED EXPERIENCE: Two (2) years of progressively responsible experience in contract negotiation or administration which included: (a) Negotiating, awarding, administering or terminating contracts. (b) Studying market conditions and prices. (c) Preparing bid proposals, contracts or similar instruments. (d) Analyzing cost-price proposals. (e) Legal practice involving participation in negotiating and awarding contracts; or (f) Consulting with or advising business or Government in the field of purchasing and contracting. In addition, one (1) year of progressively responsible experience in one or both of the following: (a) Experience as an Industrial Cost Accountant or Industrial Cost Auditor who performed or supervised Industrial Cost Accounting and related activities in connection with complete accounting systems of large industrial manufacturing concern. Work of this type will have included such duties as: classifying, recording, allocating, summarizing, auditing and reporting costs. (b) Experience in two or more of the functional areas of financial management (i.e., budgeting, statistical reporting of data, etc.) which included taking objective and logical determinations of facts contained in particular bodies of data and drawing inferences on magnitudes, difference, and relationships by means of analysis, reasoning,
etc., when such work involves responsibility for the selection and application of the proper evaluative or determinative technique, skill, or method of analysis or presentation. At least one (1) year of the required experience must have been at a level of difficulty comparable to that of the next lower grade in Federal Service.

GENERAL EXPERIENCE: Three (3) years of progressively responsible experience in administrative, technical or other responsible work which provided opportunity for the applicant to gain: (a) a general knowledge of contracting and procurement practices and procedures; (b) skill in dealing with others in person-to-person work relationships; and (c) the ability to exercise mature judgement.

OTHER REQUIREMENTS: Applicants must have eligibility on Administrative Judgement (AJ) Test. If you have not taken subject test you may be scheduled by contacting your servicing Central Civilian Personnel Office or Civilian Personnel Representative.

ALL APPLICANTS MUST SUBMIT THE NAMES AND CURRENT ADDRESSES OF THE TWO PREVIOUS SUPERVISORS PRECEDING THE PRESENT. APPLICANTS NOT SUBMITTING NAMES OF SUPERVISORS WILL NOT BE CONSIDERED.

NON-SERVICED AP APPLICANTS: SF-171, "Personal Qualifications Statement," should be submitted to your servicing Civilian Personnel Office with a request that they attach Supervisor's Appraisal of Employee Current Performance and AJ Test score and forward them to this Civilian Personnel Office. In addition, applicants should submit a listing of any education/training and awards/accomplishments not shown on SF-171 and include a resume of any other pertinent merit formation.


LOCATIONS: Position vacancies may be filled from this announcement at any of the following locations. There is no assurance that vacancies of this type will occur at any particular listed location. Applicants NOT specifying locations for which they desire consideration WILL NOT be considered. Locations are listed below:

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<td>HQ AFCON</td>
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<td>AFFRO, Allison Div, General Motors Corp., Indianapolis, IN</td>
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<td>AFFRO, NAR Corp., Los Angeles Int'l Apt, Los Angeles, CA</td>
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<td>AFFRO, NAR Corp., Automation Div., Anaheim, CA</td>
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<td>AFFRO, General Electric Co., Evendale, OH</td>
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<td>36</td>
<td>AFFRO, Hughes Aircraft Co., Culver City, CA</td>
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<td>37</td>
<td>AFFRO, Northrop Corp, Hawthorne, CA</td>
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<td>38</td>
<td>AFFRO, General Electric Valley Forge, Valley Forge, PA</td>
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<td>40</td>
<td>AFFRO, AVCO Co, Systems Div, Wilmington, MA</td>
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<td>42</td>
<td>AFFRO, McDonnell Douglas, St. Louis, MO</td>
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HOW TO APPLY: Submit "Request for In-Service Placement Consideration" to: HQ, AFCON/CFP, AF Unit Post Office, Los Angeles, California 90045
APPENDIX C

1. INTRODUCTION:

The purpose of this position is to serve as a Staff Technical Specialist to the Chief, Contract Administration Division, overseeing contractor overhead costs and related bases used for allocation of overhead costs and other plant-wide activities affecting costs; and to participate in the establishment and/or implementation of procedures at AFFRO level for monitoring and identifying where the contractor’s control of such costs requires reformation.

II. DUTIES AND RESPONSIBILITIES:

1. Monitoring and Control of Contractor Overhead Costs:

a. Responsible for planning and developing in-depth scheduled reviews, as well as special reviews, of possible problem cost areas, making his own determination as to areas to be reviewed and methodology and techniques to be employed. Assigns the other Overseas Contract Specialists to in-depth scheduled and special reviews. Monitors the performance of these Contract Specialists in accomplishing their assigned tasks and provides technical guidance and assistance when necessary, and reviews their completed report for technical accuracy and validity of the findings, conclusions and recommendations prior to submitting the report to the Overseas Chief. Where deemed necessary, requests and obtains audit reviews of historical costs, obtains technical information from other AFFRO divisions, and coordinates their efforts. During performance of such reviews, researches possible precedent type information, evaluates and equates the information with the contractor’s operation and forms a judgment as to the extent such precedents apply to problem cost areas being reviewed. Discusses results of reviews with high level contractor personnel and obtains contractor’s comments and position concerning areas reviewed. Reviews and determines the soundness of the contractor’s position before making recommendations to the Overseas Chief concerning action to be taken, and if appropriate, prepares for the Overseas Chief’s signature, the necessary correspondence and attachments to be submitted to contractor and/or Government personnel.

b. After completion of bidding rate negotiations, responsible for:

(1) obtaining from the contractor the detailed monthly budget plan for major elements of overhead costs and the bases used for allocation, and (2) receiving monthly the actual overhead expenditures and allocation base data. Assures that Division personnel assigned the responsibility track actual expenditures against

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the targeted amounts in order to determine trends, identify areas of significant variations, and isolate specific problem areas. Reviews the analysis performed by Overhead personnel and discusses appropriate items with high level contractor accounting and controller personnel and recommends specific action to the Chief when justification for the variances and/or corrective actions are required of the contractor. Determines the financial implications of all changed conditions within the contractor's operations, and when these changes indicate that forecasts should be revised and new rates and factors negotiated submits recommendations on these to the Overhead Chief for action.

c. Maintains continuous review of contractor's procedures affecting specific elements of costs, including plant-wide costs such as ADFS, salary and wages, travel, etc. Initiates requests for changes where deemed necessary, and monitors compliance by contractor employees to assure that costs incurred and charged to government contracts are in accordance with such procedures.

d. Where reviews indicate that costs incurred or to be incurred by contractor are considered unallowable or unacceptable for bidding purposes or as actual incurred costs, prepares for the Overhead Division Chief's a notice to the contractor of possible disallowance of costs or proposed expenditures; reviews contractor's rebuttals or justifications submitted in reply, and makes recommendations to the Overhead Chief concerning final action to be taken.

2. Bidding Rates:

a. Obtains bidding rate (prospective) proposals for overhead costs from contractor, and performs a thorough analysis of forecasts of sales and resulting bases used for distribution of overhead costs, and of individual overhead cost elements. Requests Defense Contract Audit Agency (DCAA) to conduct audit of historical data used by the contractor to support position, and requests technical input from other AFFRO divisions as appropriate. Directs a full team analysis of the proposal, and based on the information obtained and use of appropriate statistical techniques, prepares overhead costs and rates to be used as objectives in negotiating bidding rates.

b. Participates as a technical specialist or personally conducts the negotiation of Forward Pricing Rate Agreements (FPRA). Maintains supporting documentation and detailed records of problems and other matters pertaining to the rate negotiations, and prepares the formal negotiation memorandum setting forth the treatment of costs and rationale for such treatment, for review and approval by the Overhead Chief.

c. Because of the importance of the direct costs or other bases involved in allocating overhead costs which are included in the proposal and resultant negotiation of overhead costs and rates, he is also required to analyze and make recommendations concerning labor rates and other plant-wide cost factors, such as rework and waste factors, fringe benefits, quality
control labor factors, computer center rates, special facility rates, etc., and total cost forecasts used for allocating certain overhead items, such as: total material costs for allocating material burden, total cost of work input (or cost of sales, if appropriate) for allocating general and administrative expenses, total direct labor hours or dollars in the base for each pool for allocating manufacturing and engineering burden, etc.

3. Costs Incurred:

a. Participates in a full team analysis of the contractor's final overhead proposal and assists in preparing the government position by arranging for the further review of technical matters by DCAC and other AFFRO Divisions on those items assigned by the Tri-Service negotiator. Participates in pre-negotiation and negotiation conferences conducted by the Tri-Service negotiator and maintains supporting documentation and detailed records of problems and other matters encountered during the overhead rate negotiations that pertain to his items of responsibility.

b. When DCAC Forms 1, Notice of Disapproval of Costs, that impact on overhead costs are appealed by the contractor, reviews contractor's submission and initiates an AFFRO team analysis. Makes recommendations to the Overhead Division Chief to be used in settlement of controversial items, and participates in settlement conferences to resolve these. Maintains supporting documentation and detailed records of problems and other matters pertaining to the overhead settlement and prepares a memorandum setting forth the treatment of costs and rationale for such treatment. Where agreement with contractor cannot be reached, prepares findings and determination for PSCO signature, and processes contractor's appeal, through channels, to Armed Services Board of Contract Appeals (ABSCA).

4. Liaison With Buying Activities:

Maintains liaison with PCOs and buyers at buying activities to resolve overhead cost problems in bidding actions and final cost determinations or negotiations. Reviews negotiation memoranda from buying activities to determine extent to which PCOs used overhead rates and allocation bases that have been recommended by AFFRO, and to improve input from AFFRO to buying activity. Upon request of buying activities attends and participates in pre-negotiation and negotiation conferences for large and/or significant procurement actions, and furnishes information and technical advice concerning overhead rates and allocation bases.

5. Other Duties:

a. Accomplishes special projects covering cost items of a plant-wide nature and performs other duties as assigned by the Chief. Acts as the focal point on all overhead matters for various HAC divisions as assigned by the Overhead Chief.

b. Serves as Acting Chief in the absence of the Overhead Chief.
III. CONTROLS OVER WORK:

Works under the general supervision of the Chief, Overhead
who approves leave, makes special assignments, outlines broad program
objectives for review and analysis of overhead, related bases, and plant-wide
cost factors; and is available for consultation on matters of policy of a
precedent setting nature. Incumbent will be technically sufficient and will
determine the methodology and techniques for performing these tasks, and will
determine areas of inquiry. There are no specific written guidelines for this
function. Broad general guidelines appear in Armed Services Procurement
Regulations Section XV, and precedent type information is contained in HQ AFCD/TO
Case Study Letters, and decisions of the Armed Services Board of Contract Appeals,
Controller General, and Court of Claims.

IV. OTHER SIGNIFICANT FACTS:

1. Because of the close working relationship among incumbent, DCAA auditors,
and contractor accounting and controller personnel, and the fact that treatment
of overhead costs involves technical cost accounting procedures and principles,
incumbent must have major experience and/or training in statistical techniques
and in advanced industrial cost accounting and/or contract auditing, involving
large contractors with varied operations.

2. Employee may be required to use transport-type Government Aircraft
operated on scheduled or non-scheduled flights or on regularly scheduled
commercial aircraft.
APPENDIX D

The CHICON Time-Shared Computer Program employed in this research performs a chi-square test for a two-way contingency table. A complete description of the program is contained in General Electric Information Services User's Guide 5700.01, Statistical and Mathematical Programs, October 1971 revision, pp. 11 - 13.

Further information on this program and the time-sharing service can be obtained from the Information Services Division of General Electric Company.
APPENDIX E

The MUL-REGRESSION Time-Shared Computer Program employed in this research performs regression using the linear model

\[ y = b_0 + b_1 x_1 + b_2 x_2 + \ldots + b_m x_m + e. \]


Further information regarding and the time-sharing service can be obtained from the Information Services Division of General Electric Company.
PIECOST IMPLEMENTATION STUDY
RESEARCH QUESTIONNAIRES

The PIECOST implementation is a major change management effort. Because of this, it offers a unique opportunity to improve our knowledge and understanding of this critically important process. Your honest answers to all of the questions will contribute to our understanding of how our organizations can be better managed during a time of changing priorities and requirements. The data gathered by this questionnaire will be treated confidentially and will be used only for research purposes.

1. When did you attend the PIECOST training school at Lowry?
   a. Month _________
   b. Year _________

2. Has anybody else from your office attended the PIECOST training school at Lowry?
   a. Yes ☐
   b. No ☐

3. If the answer to question 2 is yes, when did that person attend the school?
   a. Month ___________
   b. Year ___________

4. Which phases of the PIECOST system have you implemented? Please indicate the highest phase completed.
   a. None ☐
   b. Classification ☐
   c. Deflation ☐
   d. Analysis ☐
   e. Forecast and Negotiation ☐

5. Is overhead cost estimation much of a problem in your plant? How much would you say?
   a. No problem ☐
   b. Little problem ☐
   c. Big problem ☐

6. Is overhead rate estimation much of a problem in your plant? How much would you say?
   a. No problem ☐
   b. Little problem ☐
   c. Big problem ☐

7. How many non-clerical personnel do you have in the total detachment? ☐
8. How many non-clerical personnel work in the contract administration division? __________

9. How much is your contractor's estimated 1972 total indirect cost? (Approximately) __________

10. Which customer has the largest single program in your plant?
   a. Army
   b. Navy
   c. Air Force
   d. Other

11. About how much will that program spend in your plant during calendar year 1972?
   a. Don't know
   b. 0-50 million
   c. 51-100 million
   d. Over 100 million

12. How often does the Air Force plant rep express concern about overhead costs?
   a. Frequently
   b. Once in a while
   c. Never has

13. How often does the Principal ACO express concern about overhead costs?
   a. Frequently
   b. Once in a while
   c. Never has

14. On balance, does PIECOST affect the capability of the contract administration division to perform its assigned duties?
   a. Some negative effect
   b. No effect either way
   c. Some positive effect

15. How does PIECOST affect your role as overhead specialist/PIECOST manager?
   a. Makes it much more important
   b. Makes it somewhat more important
   c. Makes it somewhat less important
   d. Makes it much less important
16. How does PIECOST affect your opportunities to use professional judgment in performing your job?
   a. Greatly increases my opportunities to use professional judgment
   b. Somewhat increases my opportunities to use professional judgment
   c. Somewhat decreases my opportunities to use professional judgment
   d. Greatly decreases my opportunities to use professional judgment

17. How does PIECOST affect the importance of your job?
   a. Much increases my job's importance
   b. Somewhat increases my job's importance
   c. Somewhat decreases my job's importance
   d. Much decreases my job's importance

18. How do you feel PIECOST affects the impact of your professional judgment?
   a. Greatly increases the impact of my professional judgment
   b. Somewhat increases the impact of my professional judgment
   c. Somewhat decreases the impact of my professional judgment
   d. Greatly decreases the impact of my professional judgment

19. How do you consider the PIECOST system in terms of ease of understanding?
   a. PIECOST is very difficult to understand
   b. PIECOST is somewhat difficult to understand
   c. PIECOST is relatively easy to understand
   d. PIECOST is quite easy to understand

20. How much statistical knowledge (relative to previous methods of overhead analysis) does PIECOST require?
   a. Much less
   b. Somewhat less
   c. Somewhat more
   d. Much more

21. What phase of PIECOST is the most difficult to implement?
   a. Classification
   b. Deflation
   c. Analytical
   d. Forecasting
   e. Tracking

22. What effect, if any, does PIECOST have on the need to use professional judgment in performing your job?
   a. Much more need to use professional judgment
   b. Somewhat more need to use professional judgment
   c. About the same need to use professional judgment
   d. Somewhat less need to use professional judgment
   e. Much less need to use professional judgment
23. How often (outside of PIECOST) do you use the time-shared computer in performing your job?
   a. Frequently
   b. Occasionally
   c. Rarely
   d. Never

24. How often have you noticed others in your organization using the time-shared computer for their jobs?
   a. Often
   b. Sometimes
   c. Never

25. Does PIECOST reduce the requirement for professional judgment?
   a. Yes, quite a bit
   b. Yes, somewhat
   c. No change
   d. No, it increases it somewhat
   e. No, it increases it quite a bit

26. Is additional work associated with PIECOST affecting your implementation of the PIECOST system?
   a. No effect on implementation
   b. Makes implementation somewhat difficult
   c. Makes implementation very difficult

27. Relative to previous methods of overhead analysis, how easily can PIECOST be adapted to changed situations?
   a. Much more easily
   b. Somewhat more easily
   c. Somewhat less easily
   d. Much less easily

28. Compared to previous methods of overhead analysis what is PIECOST's most significant advantage?
   a. Speed of analysis
   b. Disciplined approach to total indirect cost analysis
   c. Explicit recognition of economic impact (deflators)
   d. No major advantage
   e. Other (indicate)
29. How often have you used the "HELP" system?
   a. Several times
   b. Once or twice
   c. No occasion to use
   d. Wasn't aware of it

30. Has "PIECOST for Managers" been presented at your facility?
   a. Yes, and my immediate supervisor did not attend
   b. Yes, and my immediate supervisor attended
   c. No

31. Do you intend to utilize the PIECOST negotiation preparation course?
   a. Yes
   b. No
   c. Didn't know about it

32. If you have used the PIECOST negotiation preparation course please indicate how much benefit you received from it.
   a. Very significant benefit
   b. Significant benefit
   c. Little if any benefit
   d. No benefit
AF Pamphlet 70-14, PIECOST, dated 1 March 1974, is a training pamphlet designed to aid government personnel in establishing and using the PIECOST (Probability of Incurring Estimated Cost) System to analyze, forecast, and track the indirect costs incurred by defense contractors. Copies can be requested from Hq USAF/LGPLB, Washington D. C. 20330.
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