AN INVESTIGATION OF ENGINEERING FACULTY ATTITUDES TOWARD A PROPOSED CURRICULUM INNOVATION

Thesis for the Degree of Ph. D.
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R. DALE LEFEVER
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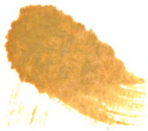

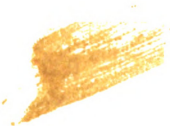

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ABSTRACT

AN INVESTIGATION OF ENGINEERING FACULTY ATTITUDES TOWARD A PROPOSED CURRICULUM INNOVATION

By

R. Dale Lefever

While proposed innovations in educational institutions are common practice, the successful implementation of such new ideas lacks similar frequency. This lack of success has prompted much rhetoric describing resistance to change and has focused on the individual characteristics of potential adopters as barriers to innovation.

Noticeably absent from much of the research on planned change, however, has been the examination of organizational variables. Despite the fact that faculty work in an institutional setting, individuals have been viewed as independent adopters in the diffusion process. Such an approach ignores the influence of the social system on individual members and the complex nature of organizational change.

The purpose of this study, therefore, was to examine a proposed curricular innovation employing the

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organization as the unit of analysis. Specifically, the primary purpose was to measure the degree to which faculty in the College of Engineering at Michigan State University had internalized the proposed curriculum innovation--the Bachelor of Arts in Engineering program. The concept of internalization employed followed the development of Kelman (39) and Lin (46) and described the degree to which a faculty member perceived the innovation as relevant and valuable to his role performance. An additional purpose was to explore the relationship of six independent variables which might help explain any degree of variability in internalization among the faculty. Individually, these variables were job satisfaction, leadership styles of department chairman, group cohesiveness, formal communications, and the relative advantage and compatibility of the innovation.

The population selected for this study was the full-time faculty in the College of Engineering at Michigan State University. This population was selected basically because it represented a target system at a strategic phase in the innovative-decision process. Since the new program had not been implemented at the time of this study, faculty perceptions were reported in isolation from actual experience with the innovation. This research context facilitated the study of attitudes apart from behavior.

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Since comparable research was not available, scale development was facilitated by adapting items from industrial research and secondary education contexts. A pilot study was conducted within the College in an effort to increase the internal consistency of the instrument. The Method of Reciprocal Averages (RAVE) was used for this purpose. The final instrument was mailed to ninety faculty with over 83 per cent returning usable responses.

The statistical treatment of the data was accomplished by the multiple correlation analysis using the "least squares delete" format. The goal of this approach was to determine the existence of simple correlations and to predict a maximum of variance in the dependent variable, internalization. One distinct advantage of this approach was the ability to disclose the degree to which each independent variable was related to internalization, while controlling the effects of all other independent variables.

The results of this analysis supported three of the six hypotheses at the .05 level of significance. The three correlations involved were those between the dependent variable of internalization and the independent variables of relative advantage, compatibility, and formal communications. An analysis of the combined correlation matrix, however, revealed significant

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correlations between the same predictor variables, denoting lack of independence in these variables.

With reference to the multiple regression analysis, .68 of the variance in the dependent variable was explained by the six independent variables examined. It was further discovered that the variable of relative advantage was the most potent variable in the regression equation. In fact, this one variable combined with any other single variable could account for the total variance identified.

One final area of discovery involved decision-making styles in the College of Engineering. When Havelock's (29) decision-making styles in general were compared with decision-making styles with reference to the new curriculum, very little discrepancy was revealed. What was evident, however, was the predominance of "power struggle" and "informal influence" styles of decision-making. Since no hypotheses were purported with respect to these styles, no specific relationships between decision-making and internalization were describable. It was clear, however, that participative decision-making models were not predominant in this specific organizational context.

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R. Dale Lefever

A THESIS

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1972

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The author is indebted to a number of individuals for their support and assistance. In particular, he is appreciative of the guidance, suggestions, and encouragement offered by Dr. James H. Nelson, chairman of the doctoral guidance committee and director of the thesis research. Thanks are also extended to the other members of the committee, Dr. Michael L. Moore, Dr. Vandel C. Johnson, and Dr. C. Keith Groty.

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And I am especially grateful to my wife, Marty, for her continuous support and understanding throughout the completion of this study; also to Krista and Douglas who were patient and understanding during this time.

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CHAPTER I

THE PROBLEM

Introduction

It is an underlying assumption of this study that the healthy organization anticipates and prepares for change. The readiness of an organization for change is more than the attitudes of the top administrators toward change. The effectiveness with which an organization reacts to the need for change is a function of the behavior of each individual within the organization. Prior research (Coch) has demonstrated that the successful introduction of change into an organization is in large measure a function of the responses of the employees who are the recipients of the change. Decisions to change made at the administrative level do not guarantee the success of a change. Decisions are made at the employee level as well--decisions to resist or facilitate the change--which can profoundly affect the success of the change and the health of the organization (72).

Primarily as a result of the empirical evidence provided by the research of Bavelas and Coch, coupled

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with the theoretical contributions of Kurt Lewin, some conceptualizations of response to change have been made. The term, resistance to change, is one such concept that has found its way into the literature of social psychology. The phrase has carried with it, however, the perhaps unfortunate implication that resistance to change is the rule, experienced to an equal degree by all employees, and always negative or unhealthy in its consequences.

Gross recognized this biased position toward change when he stated, "An examination of the sociological and social psychological literature on planned or deliberately instituted organizational change reveals that the most common explanation of why innovations introduced into organizations do or do not have their intended effects places primary emphasis on the ability of a change agent to overcome the initial resistance of organizational members to change" (27, p. 1).

While much of the research focusing on resistance to change emanates from the industrial context, such awareness is not a phenomena peculiar to industrial institutions. Educational reformer, Henry Wriston, for instance, stated,

> Reform easily exhausts the energies of its proponents. The stubborn, silent, but destructive effect of passive resistance is continuous, pervasive, and insidious. A change voted is merely a challenge to resistance; the vote is preliminary to the real battle. (76, p. 39)

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C. P. Snow struck a similar note of pessimism when he wrote,

> In a society like ours, academic patterns change more slowly than any others. In my lifetime, in England, they have crystallized rather than loosened. I used to think it would be about as hard to change, say, the Oxford and Cambridge scholarship examination as to conduct a major revolution. I now believe that I was over-optimistic. (68, p. 186)

In an attempt to understand such pervasive resistance, J. B. Lon Hefferlin (31) cited several organizational variables that deserve attention in understanding the change process. One basic variable is that academic or curricular change is first of all organizational change and that to understand its dynamics requires an understanding of academic organizations. A second factor is that curricular change seems difficult because colleges, just like other institutions, exist for the sake of order in human life. They function to routinize interaction between people. Consequently, they are naturally and inherently antithetical to change. To alter the educational program of a college is to threaten its very rationale and existence. And thirdly, collegiate reputations do not hinge on curricular innovation. Instead, the highest status colleges and universities are not noted for experimentation, but rather for admitting elite students and for quality performance of generally accepted programs. The ideology of professors

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and teachers as professional experts provides a rationale for resisting pressure for change from nonprofessionals and outsiders.

Lon Hefferlin continued his analysis by stating,

> Openness to change is structural in nature. Complementing the psychological and environmental variables of advocacy and resources, it involves openness particularly in an institution's norms and its distribution of power. Every college and every department has a general attitude about the limits of tolerable innovation, and its sanctions against violations of this norm range from ostracism to censure, suspension, and expulsion. (31, p. 5)

The above statements represent extreme, but not isolated impressions. In fact, such comments give support to the growing contention among educators that we are in a period of great innovation, but little change. The point is that while there are many new ideas being promoted and even adopted in our educational institutions, the end result is little alteration in the corpus of education.

The attempts to explain such a phenomena are many. In mass, however, they all point to the conclusion that although innovations are surfacing in unprecedented numbers, one can readily point to evidence that the conflict between the forces for change and those supporting the status quo is equally present in educational institutions (22).

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Need for the Study

In attempting to understand the nature of this change process, many researchers have applied the social interaction change model in their analysis. The most recent model in this area is that of Rogers and Shoemaker (63). Their model of the innovation-decision process consists of a revised paradigm of Rogers' earlier model (64) and identifies four critical stages in the adoption process: knowledge, persuasion, decision, and confirmation. Variations of this model have been used in agriculture, anthropology, medicine, and more recently education (21, 54, and 10).

In the areas of agriculture, anthropology, and medicine, the adoption studies have generally dealt with the diffusion and adoption of technical innovations or products among individual farmers or doctors residing in a particular community, state, or society. In the area of education, these studies have primarily dealt with adoption rates of innovations in school systems (9).

Gross challenged the relevance of this model for explaining the success or failure of the implementation of innovations in schools or other types of organizations. He stated,

> Its lack of utility is due to certain of its assumptions which are not applicable to the implementation of organizational innovations. One of its basic assumptions is that during any of the intermediate stages between awareness and use, the individual is free to decide himself whether the

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> innovation shall be tried, whether it should be continued. . . . This assumption does not apply to major educational innovations in most school situations, for example, those in which teachers are asked to redefine their roles by their superordinates, or in cases where compensatory programs for lower-class urban schools have been designed by top administrators and teachers must carry them out. Moreover, the adoption of a particular program by administrators does not necessarily mean that it will be instituted or implemented at the school level. . . . Further, the Rogers model is concerned with the adoption of simple technological innovations by individuals, and it assumes that they can try out innovations on a small scale without the help or support of other persons. Many educational innovations, however, cannot be tried on a small scale and cannot be implemented by teachers unless they have the cooperation and support of their colleagues. (27, pp. 21-22)

The logic of the above criticism suggests that innovations in organizations require some new assumptions and variations in research approach. Carlson supports this need when he cites only two studies (16 and 20) which have paid any attention to concepts related to organizational theory in the study of diffusion of educational innovations. He concluded,

> Social structure has been neglected in studies of educational innovations. The reasons are largely the same: the school system has been taken as the adopting unit and social structure deals not with relationships among school systems but with relationships among people. (9, p. 23)

In this same regard, Carlson also cited a neglect of values or culture and the compatibility or fit between the culture of a group or personality and the elements of the innovation.

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> As far as the compatibility of educational innovations with the culture of a group is concerned, we draw a blank, inasmuch as no researcher has drawn upon culture or values to aid in accounting for the spread of educational innovations or rates of adoption. (9, p. 25)

A further need in diffusion research is to deal with attitudes toward innovations apart from adoption behavior. The essential point is that an individual's perceptions of an innovation are likely to change after he or his organization adopts it. If his actual experience with the innovation is satisfactory, his perceptions probably will become more favorable. For this reason, many of the research studies completed on perceptions of innovations and their rate of adoption have a very serious weakness. The positive relationship between perceptions and rate of adoption may partly be an artifact of the tendency for individuals who have adopted an innovation to rationalize their decision in terms of relatively positive perceptions (63, p. 169).

Thus, the research technique of measuring perceptions in retrospect by asking respondents to recall how they perceived an innovation at some previous time is questionable at best. What is needed to overcome this methodological defect is an attempt to gather data on perceptions of innovations before they are actually adopted (63).

Still another need in this regard is to question the assumption that organization members are automatically

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and uniformly resistant to the introduction of innovations. Gross challenged this "resistance-to-change" assumption and stated,

> We believe it will be more heuristic to assume that in most organizations members will vary in their degree of resistance or receptivity to innovations. Moreover, for a specific organization some members may be positively predisposed to certain kinds of innovations and negatively predisposed to others. Our research experience leads us to conclude that investigators of the introduction or the implementation of an innovation would be well advised not to treat the degree to which members of an organization are initially resistant to change as an "organizational given," but as a matter requiring empirical examination. (27, p. 204)

Two final needs or perhaps cautions in conducting such research are (1) to avoid the temptation of viewing resistance to change as irrational behavior, and (2) to avoid any preconceptions of such resistance as necessarily detrimental to the organization. Havelock stated,

> The image of the recipient of new knowledge is that while he is greatly affected by such enduring characteristics as his values and deep personality needs acquired during his early socialization experiences, while he is greatly affected by the particular situation in which he finds himself, he is also a person who makes rational choices, i.e., decisions based on an evaluation of alternatives in terms of knowable priorities. These rational choices may seem to the outsider to be quite irrational, but the individual more often than not is aware of his alternatives. And, for this reason, opposition to a particular innovation may be desirable. (29, p. 42)

Also in this regard, Likert (45) cited a frequent finding of behavioral scientists: that nearly everyone regards his own behavior as sensible and justifiable.

In other words, people are usually behaving in ways that make sense to them, based on their understanding of the circumstances in which they find themselves. Of course, that same behavior may seem quite irrational to someone else. According to Likert, the difference probably lies in the fact that they are not making the same assumptions about those circumstances. To occupy the same physical environment is not necessarily to see it the same way or to share the same attitudes toward it.

And, as Klein argued,

> What is often considered to be irrational resistance to change is, in most instances, more likely to be either an attempt to maintain the integrity of the target system to a real threat, or opposition to the agents of change themselves. This may be especially true where changes are irreversible and far reaching, thus ensuring the prolongation of error as well as accuracy. (40, pp. 500-01)

In view of the above discussion, there exists a need to study individual attitudes toward change apart from adoption behavior and as rational reactions of an individual within a social system.

Statement of the Problem

The primary problem of this research is to determine what factors contribute to the variability in the degree of internalization of a curriculum innovation among faculty in the College of Engineering. And, since there is evidence to support a discrepancy between

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attitudinal and behavioral variables, the innovation-decision stage prior to actual experience with the innovation has been chosen for this study.

Purpose of the Study

The primary purpose of this study is to measure the degree to which faculty in the College of Engineering have internalized the proposed curriculum innovation--the Bachelor of Arts in Engineering Program (see Appendix A). An additional purpose is to explore the relationship of several independent variables which might help explain the degree of variability in internalization among the faculty. In specific terms, these variables are job satisfaction, leadership styles of department chairmen, the relative advantage and compatibility of the innovation, group cohesiveness, internal communications, and the decision-making process itself.

The focus of the study is strictly on faculty perceptions and should provide valuable information for understanding the innovation decision process from the perspective of members of an educational institution. These findings can also have the practical advantage of aiding those in the College of Engineering whose responsibility it will be to implement the proposed innovation or plan future ones.

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Scope of Study

The population selected for this study is the full-time faculty in the College of Engineering at Michigan State University. This population was selected for two basic reasons.

First, the Bachelor of Arts in Engineering Program represents an innovation of major significance in engineering education at Michigan State University. It is a totally new innovation and represents an attempt by the College to assume leadership in this area. If successful, this new curriculum could represent a prototype for colleges across the country.

A second reason for selecting this faculty is that they represent a target system at a strategic phase in the innovative-decision process. Since the program has not been implemented at this time, attitudes toward this innovation are not contaminated by experience with the actual innovation. A study at this critical stage represents an opportunity to study attitudes in isolation from specific behavior with the innovation itself.

Theoretical Assumptions

One initial and general assumption underlying this research is that the educational change process is just as critical to the implementation of an innovation as the content of the desired change itself. The

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adoption of an innovation in an organization is not an automatic process. It is a dynamic one. A process in which both the innovation and the accepting system or individual is altered.

In making some summary comments on educational innovations, Miles supported this position when he stated: "A kind of axiom seems visible in almost any of the studies reported: educational innovations are almost never supported on their merits" (54, p. 635).

The importance of this assumption is that it emphasizes the receiver variable in the adoption process. As Rogers stated:

> It is the receiver's perceptions of the attributes of the innovation and not the attributes as classified by experts or change agents, which affect their rate of adoption. Like beauty, innovations exist only in the eye of the beholder. And, it is the beholder's perceptions which influence the beholder's behavior. (64, p. 138)

Most attempts to understand the change process from the receiver's or target system's perspective have used the communication and diffusion model which emphasizes the message effects on the receiver. In this regard, communications is defined as the process by which messages are transferred from a source to a receiver. An oversimplified but useful model of this process is called S-M-C-R-E: a source (S) sends a message (M) via certain channels (C) to the receiving

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individual (R), who responds or reacts to this stimulus with an effect (E) (64).

In this model, the receiver is the target of communication and the selective mechanisms of the receiver are important determinants of effectiveness in specific communication acts. As research has demonstrated, we tend to expose ourselves only to those messages that are consistent with our current thinking (selective exposure). Further, communication messages are filtered through previously held attitudes and beliefs which often, without our knowing, warp our perceptions of a source and/or of a message. We also tend to perceive in accordance with what we already believe, filtering out that which is alien (selective perception). And, finally, we tend to remember best that which agrees with, or is consistent with, our current attitudes (selective retention) (64, pp. 30-31).

As Rogers and Svenning concluded,

> The receiver is the most important element in the communication process as he is the target of the source's communication. The source's skill in tuning his selectivities to the receiver's attitudes, knowledge, communication skills, and background is vital to effective communication. If the source's message is not designed to get through to the receiver, he might as well not have bothered for he communicates only with himself. (64, p. 31)

In transferring this communication model to the diffusion model several essential facts are altered. By definition, diffusion is the process by which innovations

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spread among members of a social system. And, in diffusion, messages deal primarily with new ideas. This fact sets the diffusion process somewhat apart from the general communication process.

The ultimate objective in the diffusion context is overt behavior change. Many communication messages are directed toward increasing knowledge among receivers and/or changing their attitudes. Diffusion messages, however, go one step further in that their desired end is the adoption or rejection of new ideas, the actual use or refusal to use an innovation.

Diffusion research shows that the crucial elements in the diffusion process are (1) the innovation (2) which is communicated through certain channels (3) over a period of time (4) among members of a social system. The resemblance between the diffusion model and the S-M-C-R-E model of communication is obvious in this description. One significant disparity, however, is the addition of the social system variable.

The net result of such a process is a decision by members of the target system to either accept or reject the innovation. The model of this innovation-decision process is described by Rogers (63) as having four stages. There is the knowledge stage, where the individual is exposed to the innovation's existence and gains some understanding of how it functions. This is followed

by the persuasion stage, where the individual forms a favorable or unfavorable attitude toward the innovation. The third stage is the decision where the individual engages in activities which lead to a choice to adopt or reject the innovation. And, finally there is the confirmation stage, where the individual seeks reinforcement for the innovation-decision he has made, but he may reverse his previous decision if exposed to conflicting messages about the innovation.

In applying this adoption model, the emphasis is clearly upon the attitudes and perceptions of the individual. Such responses, however, are not formed in isolation. The diffusion process includes the social system element. And, since it is unlikely that all social system members will respond to the adoption process in like manner, some assumptions need to be offered as explanations of any such variations.

While an individual's own psychological characteristics are critical variables in understanding his attitude toward change, it is also necessary to understand his relationship with the change agent and the change agent attempts to influence the individual. Kelman (39) presented a particularly useful model for understanding such a relationship.

Building on a great deal of literature on attitude change, Kelman proposed three influence processes

and the manner in which individuals react to such influences. One process he called "compliance," where an individual accepts influence from another person or group because he hopes to achieve a favorable reaction from the other. When an attempt at such control is made, the individual will typically react with external conformity, but maintain his private attitudes without any significant change. A second process is "identification" where an individual adopts behavior derived from another person or a group because this behavior is associated with a satisfying relationship to this person or group. Again, it should be noted that this response does not necessarily change an individual's private attitude and such identification continues only as long as the relationship is attractive to the individual. A final process is referred to by Kelman as "internalization," which occurs when an individual accepts influence because the induced behavior is congruent with his value system. It is the content of the induced behavior that is intrinsically rewarding. This process does not require the continuance of any external force or relationship in order for it to be maintained. Because the new information is accepted and internalized, it is maintained by the individual without further external influence.

This last process of internalization is especially critical in this study, since faculty participation will

be voluntary and in addition to present responsibilities. In the paradigm of innovation-decisions, the decision in the College of Engineering is a collective-contingent decision. Operationalized, this is a decision voted on by the College Curriculum Committee, but with individual adoption choices being made by the faculty member with regard to his participation in the implementation phase. Internalization, or the extent to which a faculty member perceives the innovation or change as relevant and valuable to his role performance in the organization, is central in this study.

As stated in the purpose of this study, it is assumed that engineering faculty will vary in the degree to which they have internalized this curriculum innovation. The next logical need then is to explore some factors which might help explain such variability.

Perhaps the most obvious variable to be considered is the perception the faculty have of the innovation itself. According to Rogers the five major attributes of innovations are: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability (63, p. 137). Havelock in his review of the literature on such classification found it helpful to make the distinction, also made by Barnett (5), between intrinsic and extrinsic characteristics. Intrinsic characteristics are those which are inherent

in an innovation, while extrinsic characteristics are those which have meaning only in the context of specified audience or adoption settings (29, p. 38). This study, with its focus on the faculty and their perceptions, will concentrate only on the extrinsic characteristics of relative advantage and compatibility.

The general definition of relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes (63). The degree of relative advantage is usually expressed in economic terms. This is true because in most cases, innovations are in the form of new products, procedures or methods of doing things more efficiently and economically. Thus, the motivating factor is usually financial reward. With educational innovations, however, it is rather difficult to promote adoption of new ideas on the basis of financial gain. In fact, many curriculum innovations, if they are adopted, cost more than the existing methods or at least require a significant reallocation of existing resources. This does not mean that innovations in education are void of this specific attribute. What is required is that factors other than cost must be studied. These might include such aspects as status, psychological gain, or other nonmaterial costs and rewards. As Lon Hefferlin concluded:

> Every organizational change is linked to individual change and that the common denominator of all advocates for change is their perception that the

> potential benefits of change outweigh the liabilities. . . . All of us support changes when we sense more is to be gained from them than from maintaining the status quo, and we resist them if we have more to lose from adopting the unknown and the unfamiliar than we have to win. (31, p. 4)

The concept of relative advantage is thus a viable one in understanding educational innovations, but one which requires some additional study beyond sheer economics.

The second attribute of innovations to be studied is compatibility. Rogers defines compatibility as the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receiver (63). It is important to bear in mind that "compatibility" of an innovation with different parts of the receiver system can be judged only by the perception of its members and may or may not have any objective validity. Nevertheless, any innovation implying or requiring important value changes in acceptors will encounter difficulty, since more than the nature of the innovation itself is at stake (54). An extreme position on this subject was taken by Hearn when he stated:

> Changing people is not an academic exercise that can be accomplished by memoranda. It is a process that tampers with people's cherished value systems. As persons and as a group, innovators represent a real threat to the psychological, social, and economic "health" of many individuals. (30, p. 360)

The assumption then is that values, when seen as highly integrated and persuasive attitudes, tend to

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be important determinants of an individual's decision to adopt or reject an innovation--provided that the innovation is seen as conflicting with, or supporting the values. Generally, the literature indicates that when innovations run counter to important values (such as religious beliefs in a supernatural being) to values regarding the elements being changed (sacredness of cattle [60]) or to values about social customs (Moslem women's purda [49]) the innovation will be rejected.

While these examples are not reflective of values in the educational institution, the applicability to values in education would seem logical. Carlson (10) in studying programmed instruction and Evans (22) in studying instructional television give support to the assumption that educators will respond in terms of their value orientations as well.

Another set of variables that will be explored for their relationship with internalization are organizational variables. Although social scientists have for many years studied the process of the diffusion of new ideas through a social system and the eventual acceptance and adoption of the ideas by the social system, higher education has shown little if any interest in studying change in its own organizational context.

A social system or social organization has been given various definitions. Griffiths (26) has succinctly

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defined it as "an ensemble of individuals who perform a task sanctioned by the society in which it functions, in which its members perform interrelated and coordinated functions, in order that one or more tasks may be completed." For the purpose of this study, the College of Engineering was considered a social system, and therefore, fit within Griffiths' construct.

One variable to be studied in this regard is the leadership style of department chairmen. This variable was selected because industrial studies have indicated that the immediate work environment or social climate plays a determining role in employee attitudes toward change and performance, and that the social climate is partly a function of leadership behavior. In the business or industrial organization the first-level supervisor is viewed as the logical change agent. For the purposes of this study, an analog between the first-level supervisor and the department chairman is being assumed.

Davis supports the central role of department chairmen when he states:

> Although faculty may lend support and give consensus to change, it is the administrator or head of the department who promotes or prevents innovation because he is powerful. It is not due to his monopoly on imagination, creativity, or interest in change, but simply because he has the authority to precipitate a decision. (16, p. 117)

Another social system variable to be explored is that of group cohesiveness. Again, the basis for this

concept is industrial research. And, the general position is that response to change is a characteristic of the work group. Furthermore, these studies indicate that the primary group may be a determiner of member attitudes and performance, particularly with regard to change. The classic work in this area was done by Seashore (67) where he showed that groups will lower or raise their productivity on the basis of the members' cohesiveness and conformity to certain norms. The assumption then is that individuals, who, for any one of a number of reasons, are strongly attracted to other members of a group will be greatly influenced by the norms of the group. If the norms of the group are congruent with the influence attempts, the likelihood of acceptance is very great. On the other hand, if a deviation from the group norms is required, the group will be resistant to the attempted change (29). This study will explore the academic department as the primary group for faculty and relate group cohesiveness in this context with internalization of the innovation.

Still another variable to be explored is that of job satisfaction. Herzberg, et al., (32) identified ten on-the-job factors in employee attitudes of job satisfaction: (1) intrinsic aspects of the job, (2) supervision, (3) working conditions, (4) wages, (5) opportunity for advancement, (6) security,

(7) company and management, (8) social aspects of the job, (9) communication, and (10) benefits. These factors were presented in order of the number of times they were mentioned in about 150 studies. The difficulty with these aspects of job satisfaction, however, is that their relationship with attitudes toward change are not readily apparent. If one conceives of internalization of an innovation as reflecting the desire to avoid, through change, unpleasant aspects of the job, a negative relationship between internalization scores and job satisfaction scores would be predicted. There is some support in the literature for this position in that early adopters of innovations are usually marginal to the system and tend to violate the norms of the community. In fact, as Hearn contended, "most real innovators (about 2 1/2%) end up being transferred or fired" (30, p. 359). From another point of view, however, it may be speculated that internalization reflects a high degree of adjustment to the work situation, including inevitable changes in procedures and working conditions. Beginning with this assumption, a positive relationship would be predicted.

Two final and related variables to be explored are decision-making styles and internal communications. Perhaps the most accepted and researched concept in social psychology is that of participative decision-making.

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Lowin provided a precise definition of this process when he stated:

> By participative decision-making we mean a mode of organizational operations in which decisions as to activities are arrived at by the very persons who are to execute those decisions. Participative decision-making is contrasted with the conventional hierarchial mode of operations in which decision and action functions are segregated in the authority structure. (48, p. 68)

The stress on participation is usually based on the common sense notion that individuals who have some control over their own work will be more committed to and satisfied with the functions required to perform their job. This premise is then generalized to the adoption of innovations where it is concluded that such adoption is facilitated by involving those who actually use the innovations in the adoption-rejection process.

While this view of participation has numerous advocates, strong criticism of participative decision-making is developed by Gross. He stated:

> . . . evidence to test the relative effectiveness of strategies of initiation that stress participation in comparison with other methods, for example, imposition from the top, is not available. Most proponents of subordinate participation use as the basis for their advocacy of this approach personal experience, logical argument, or the findings of a few empirical studies. (27, p. 26)

The basic position taken by Gross is that the assumption of increased participation resulting in greater acceptance of or increased commitment to an innovation is too broad of a generalization to accept

without continued empirical evidence. Participation can mean real influence or just involvement and subordinates can lack the competence or even the desire to participate in major organizational changes.

Thus, while the "participation principle" initially proposed for industrial management (45) would also appear valid for educational systems, there appears to be a need for additional validation of this fact.

Perhaps the most recent research done in this regard was Havelock's (28) study of Highway Safety Researchers and Decision Makers. In this study both styles and roles of decision-making were examined. In the area of styles, he generated brief descriptions of research-based, autocratic, informal influence, bureaucratic, rational, power struggle, consensus-compromise, and opinion balance decision styles and compared a specific decision with decisions in general. These methods go beyond the more general areas of participative or authoritarian types so often used. These styles or categories also appear to be applicable for decisions made in educational institutions and will be one measure of the decision process under study.

The final variable of formal communications is taken as the transmission of information initiated by management for "consumption" by all individuals within the formal organization. In this sense, the communicative

act is here delimited to the downward flow. In this particular research setting, this form of communication is additionally limited in that it is differentiated from specific "job knowledge" because it does not constitute an immediate and necessary prerequisite for effective work performance on the part of the engineering faculty.

Nevertheless, a management decision to introduce a college-wide curriculum innovation offers a logical reason for launching a communications program. As Jacobson and Seashore (35) indicated, communications are important because of their function in a situation where attitudes are not yet crystallized. In a naturalistic setting where implementation is still to be accomplished, the assumption of a functional relationship between formal communications and internalization seems legitimate.

In summary, it is concluded that not only is there a need to study internalization within the organizational context, but that ample research is available to guide such a study in terms of established theory. And, following Katz's (38) categorization of field studies it can be affirmed that this study represents a combination of both an exploratory and an hypothesis-testing study. It is exploratory in attempting to find

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out what relationships exist and hypothesis-testing to the extent that it will attempt to obtain proof for the predicated relationships.

Statement of Hypotheses

In view of the above discussion, it will be the purpose of this study to explore some specific relationships between the concept of innovation internalization and the variables of relative advantage, compatibility, job satisfaction, leadership styles of department chairmen, group cohesiveness, internal communications, and the decision-making process.

The following statements of hypotheses constitute the exact nature of such a study.

Hypothesis 1:

The greater the degree of relative advantage of the innovation, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 2:

The greater the degree of compatibility of the innovation, with faculty values, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 3:

The greater the degree of job satisfaction, as reported by the faculty member, the more likely he is to internally accept the innovation.

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Hypothesis 4:

The greater the degree of group cohesiveness, as perceived by the faculty member, the less likely he is to internally accept the innovation.

Hypothesis 5:

The greater the level of formal communications concerning the innovation, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 6:

Faculty who score their department chairman high on the Human Relations Scale will internalize the curriculum innovation to a greater degree than faculty who score their chairman low on this scale.

In regard to the variable of decision-making styles, no specific hypothesis is being stated. Neither decision scale is appropriate for summating items and represents an effort to explore such conditions in a more qualitative fashion. Nevertheless, the absence of any specific statistical hypothesis should not detract from the relevance of this aspect of the study.

Overview of the Study

A review of the relevant literature is presented in the following chapter. Chapter III contains a description of the population, scale development, pertinent pretest results, and an explanation of the methodological procedures. The findings are described in

Chapter IV. The summary and conclusions as well as a discussion of the findings and their implications for educational practice are discussed in Chapter V.

CHAPTER II

REVIEW OF LITERATURE

Introduction

As was noted in Chapter I, proposed innovations in education are a continuing phenomena. Yet, there have been continuing criticisms of educational institutions for what has been termed a "lag" in adopting new innovations.

In attempting to understand such "lag" in adoption, individuals have traditionally been the units of response and the focus has primarily been upon individual, intra-personal variables, largely to the exclusion of social structural and organizational variables. As Rogers contended,

> It has been erroneously assumed that because individuals were the units of response, individuals need also be the units of analysis. But the point is that teachers do work in organizational settings like schools, even if farmers do not. And, the organizational environment does have an important influence on teachers' innovative behavior. (9, p. 67)

In this study, the basic concern with individuals as units of analysis has been abandoned in favor of relations between individuals. Such an approach seems

consistent with the basic communication process which involves a series of transfers of messages from sources to receivers. One noted example supporting this approach is offered by Mortimore (56) in his analysis of the diffusion of innovations to teachers in Thai government secondary schools. Mortimore found very low correlations, most of which were not significant, between fifty-one independent variables and (1) teacher's awareness of new educational innovations, (2) favorable attitudes toward these new ideas, and (3) innovativeness. One reason suggested for the low relationships is the fact that structural effects were almost totally ignored. The fifty-one variables, mostly drawn from U.S. educational diffusion studies, measured individual characteristics and attitudes, but paid no attention to school effects on teacher behavior. As Mortimore concluded,

> In other words, the analysis treated the teachers as if they did not work in schools, and as if the school did not have a considerable effect on each teacher's diffusion behavior. Yet it is one's fellow school teachers with whom one interacts most about innovations. Their characteristics and beliefs thus have great effect on one's knowledge, attitude, and adoption of educational innovations. (56, p. 73)

The approach of this study is to explore the structural or organizational elements in the diffusion process as units of analysis. And, in order to meaningfully represent the theory and research supportive of this approach, this chapter will be divided into several distinct segments.

The initial segment outlines briefly the traditions of diffusion research with an emphasis on the area of educational studies. The following segment presents the basic concepts and operational definitions applicable to educational diffusion research. The third segment reviews the organizational theory underlying the hypotheses of this study, while the final segment reviews actual research based upon organizational analysis of diffusion.

Traditions of Diffusion Research

In attempting to condense the broad spectrum of diffusion research, it is apparent that the problems of diffusion and dissemination have been studied in various kinds of research traditions. And, although such research has focused on common phenomena, the contents and variables are inevitably diverse.

In their book (63, pp. 48-69), they discuss anthropology, early sociology, rural sociology, education, industrial and medical sociology, and marketing as the seven major research traditions. The various intellectual traditions and their respective contributors which have studied the diffusion process are presented in Table 2-1.

In stating general observations concerning this research tradition, Gross concluded that: (1) they generally deal with the spread or adoption of rather simple technical innovations such as hybrid seed,

TABLE 2-1.--Comparison of the major diffusion research traditions

	Diffusion Research Tradition	Number of Empirical Publications Available	Typical Innovations Studied	Method of Data Gathering and Analysis	Main Unit of Analysis	Major Types of Findings
1	Anthropology	69	Technological ideas (steel ax, the horse, water-boiling, e.g.)	Participant and non-participant observation and the case study approach	Tribal or peasant villages	Consequences of innovations; relative success of change agents
2	Early sociology	10	City manager government postage stamps, ham radios	Data from secondary sources and statistical analysis	Communities or individuals	S-shaped adopter distribution; characteristics of adopter categories
3	Rural sociology[a]	480	Agricultural ideas (weed sprays, hybrid seed, fertilizers, e.g.) and health ideas (vaccinations, latrines, e.g.)	Survey interviews and statistical analysis	Individual farmers in rural communities	S-shaped adopter distribution; characteristics of adopter categories; perceived attributes of innovations and their rate of adoption; communication channels by stages in the innovation-decision process; characteristics of opinion leaders.
4	Education	71	Kindergartens, driver training, modern math, programmed instruction	Mailed questionnaire, survey interviews, and statistical analysis	School systems or teachers	S-shaped adopter distribution; characteristics of adopter categories
5	Medical sociology	76	Medical drugs, vaccinations, family planning	Survey interviews and statistical analysis	Individuals	Opinion leadership in diffusion; characteristics of adopter categories; communication channels by stages in the innovation-decision process
6	Communication	87	News events, agricultural innovations	Survey interviews and statistical analysis	Individuals	Communication channels by stages in the innovation-decision process; characteristics of early and late knowers, of adopter categories, and of opinion leaders
7	Marketing	64	New products (a coffee brand, the touch-tone telephone, clothing fashions, e.g.)	Survey interviews and statistical analysis	Individual consumers	Characteristics of adopter categories; opinion leadership in diffusion
8	Other traditions[b]	227	--	--	--	--
Total		1,084				

[a]The rural sociology tradition actually includes seventy publications that are, strictly speaking, in the subtradition of extension education.

[b]Includes general sociology, agricultural economics, psychology, general economics, geography, industrial engineering, and several others.

Source: Diffusion Documents Center, Michigan State University, July, 1968
Rogers and Shoemaker, 1971, pp. 50-51.

tranquilizers, or audio-visual aids; (2) the agricultural studies have focused on the spread or adoption of innovations among individual farmers residing in a particular county, state, or region; (3) the studies of medical innovations have primarily dealt with their diffusion and adoption by doctors in a single community; (4) the anthropological studies have focused on the spread of such practices as the use of new tools, wells, and modern farming techniques within nonindustrial societies; and (5) the education studies have primarily dealt with adoption rates of innovations within school systems (27, p. 20).

Although Gross presented this summary as a general observation, his analysis was clearly a criticism of this diffusion research tradition. It was his position that while such studies may be useful in understanding the adoption of simple innovations among aggregates of individuals, they are of little value in explaining the implementation of organizational innovations.

While Gross' position may reflect simply a difference in research approach, it does serve to focus attention upon one of the most prevalent traditions in diffusion research--the primacy given characteristics of individual adopters. At the Diffusion Document Center at Michigan State University, after reviewing

2,400 empirical findings from the diffusion research on file, representing fourteen main research traditions, researchers were able to identify fifteen separate variables that were positively related to the dimension of innovativeness (65). They are as follows: (1) education, (2) literacy, (3) income, (4) level of living, (5) knowledgeability, (6) attitude toward change, (7) achievement motivation, (8) aspirations for children, (9) cosmopoliteness, (10) mass media exposure, (11) contact with change agents, (12) deviance from norms, (13) group participation, (14) interpersonal communication exposure, and (15) opinion leadership.

In addition to the diffusion research traditions and these fifteen dimensions of innovativeness, a third indication of diffusion research emphasis is summarized by Rogers (63) in the form of a typology. Table 2-2 shows eight different types of diffusion analyses that are completed or possible and the relative amount of attention paid to each in past inquiry. Of particular note is the emphasis on variables related to individual innovativeness. More than half (58.4%) of all of the empirical generalizations reported deal with this variable.

As noted in Table 2-1, education represents one of the larger traditions. The majority of educational diffusion studies, however, has been carried out at one

TABLE 2-2.--Types of diffusion research analysis completed or possible

Type	Dependent Variable	Independent Variables	Unit of Analysis	Number and Percentage of Generalizations of This Type in the MSU Diffusion Documents Center
1	Rate of adoption of an innovation in a social system	Attributes of innovations (e.g., compatibility, etc.) as perceived by members of a system	Innovations	82 (1.2%)
2	Rate of adoption of innovations in different social systems	System norms; characteristics of the social system (e.g., concentration of opinion leadership); change agent variables (e.g., their strategies of change); types of innovation-decisions	Social systems	159 (2.3%)
3	Attributes of innovations as perceived by members of a social system (e.g., complexity, compatibility, etc.)	Innovativeness and other characteristics of members of a social system	Members of a social system	0[a]
4	Innovativeness of members of a social system	Characteristics of members (e.g., cosmopoliteness); system norms and other system variables; communication channel usage	Members of a social system	3,974
5	Earliness of knowing about an innovation by members of a social system	Characteristics of members (e.g., cosmopoliteness); system norms and other system variables; communication usage	Members of a social system	301 (4.5%)
6	Opinion leadership in diffusing innovations	Characteristics of members (e.g., cosmopoliteness); system norms and other system variables; communication channel usage	Members of a social system	220 (3.2%)
7	Communication channel use (e.g., whether mass media or interpersonal)	Innovativeness and other characteristics of members of a social system (e.g., cosmopoliteness); system normsl attributes of the innovations	Members of a system (or the innovation-decision)	458 (6.7%)
8	Consequences of the innovation	Characteristics of members and the nature of the social system	Members or social system	16 (0.2%)
	Others	—	--	1,601 (23.5%)
				6,811 (100%)

[a]There are no generalizations in which the dependent variable is attributes of innovations per se, although the Kivlin and Fliegel study of larger and smaller-sized farmers is a close approximation.

Source: Rogers and Shoemaker, 1971, pp. 72-73.

institution, Columbia University's Teachers College, under the guidance of one man, Paul Mort. As Carlson contends, "Probably eighty to eighty-five percent of the work done was done under his direction from the late thirties until the early sixties, and virtually all of the research was carried out by his doctoral students" (9, p. 3).

In the vast majority of educational diffusion studies, the adopting unit has been the local school system. A very few studies have considered adoption by individual teachers. Even where school systems were analyzed, however, very limited attention was paid to concepts related to organizational variables. The most general concepts have been: (1) financial characteristics, (2) personnel factors, (3) student characteristics, (4) community characteristics, and administrative factors (9, p. 7).

With respect to the latter category, the variables are usually use of standing committees by school boards or methods of board selection. In terms of staff characteristics, the variables can be divided into three groups: (1) those concerned with personal factors, such as age, sex, and marital status, (2) those concerned with professional factors, such as amount of education, and experience in educational organizations, and (3) those concerned with group characteristics of the staff, such as social cohesiveness and morale. The use of

the last two mentioned variables has been exceedingly rare. The other variables appear in great abundance (9, pp. 7-11).

Subsequent to the Mort tradition, such researchers as Carlson and Brickell have focused more upon teachers, rather than simply on administrators and on within school, as well as school to school, diffusion. One of the more recent efforts in this regard was Carlson's (10) analysis of modern math among school administrators in Pennsylvania and West Virginia. In this study, Carlson examined six social structure variables, three concerning involvement and three related to status, for their relationship to the adoption rate of modern math (54, pp. 337-38).

With the exception of the above mentioned study and studies by Davis (16), Lin (46), and Sprunger (69), little attention has been paid to concepts related to organizational theory in educational institutions. In fact, such paucity of research led Rogers to conclude that while education is one of the larger traditions in terms of the number of studies, it is one of the lesser traditions in terms of its contributions to understanding the diffusion of innovations or to a theory of social change (63, pp. 57-58).

In summarizing the traditions of diffusion research, it is evident that organizations and structural

variables have been ignored as units of analysis. This is particularly significant in education as educational innovations move through complex organizations. As Carlson concluded,

> We do not have many other diffusion research traditions in which an equally appropriate emphasis could be placed upon social structural variables as they affect the diffusion of ideas. Such organizationally-linked variables ought to be a focus of inquiry, rather than ignored, as they largely have been to date. (9, p. 9)

In the absence of any substantial traditions of educational diffusion research, the necessity of borrowing general concepts from diffusion traditions is apparent. The following section will describe the basic concepts germane to this study.

Basic Concepts of Diffusion Research

Research shows that the fundamental elements in the diffusion process are (1) the innovation (2) which is communicated through certain channels (3) over a period of time (4) among members of a social system. This model was mentioned in Chapter I and will now be expanded upon.

One of the basic assumptions of this study is that the actual characteristics of an innovation are secondary to its adoption. What does seem to matter is the individual adopter's perceptions of the innovation. This assumption is consistent with past research and relates to the five attributes of innovations as outlined

by Rogers and Shoemaker (63). The five characteristics relevant to adoption are: (1) relative advantage, (2) compatibility, (3) complexity, (4) divisibility, and (5) communicability. For the purposes of this study, only research relevant to the first two concepts of relative advantage and compatibility will be examined.

Most of the research examining attributes of innovations has emanated from studies of farm practices and concentrated on economic factors. Lionberger (47) cited the amount of capital required for adoption, the compatibility of the new practice with existing procedures, the communicability of the new practice, and the extent to which the new practice can be adopted gradually (47, p. 364).

The major contributors in this regard, however, have been Fliegel and Kivlin (25). In 1960, they studied adoption histories of 229 commercial dairy farmers in Pennsylvania. In their study, 11 attributes of 59 new farm practices were correlated with 4 of the relationships significant at the 0.05 level. These attributes were relative advantage, compatibility, complexity, and reduction in time. The variables of initial cost, continuing cost, cost of operation, and increased earnings were not only insignificant, but negatively correlated.

While the diffusion research pertinent to attributes of innovation emphasizes economic

considerations, one exception in educational studies was that of Evans (22). In his study of ITV, he examined both relative advantage and compatibility. Economic considerations were included, but other advantages such as reduced teaching load and more time for research were also included. In terms of compatibility with faculty values, the effects of ITV on the role of teachers was closely studied.

In this study, Evans predicted that the attitude of university professors toward ITV would be negative. In his analysis he stated:

> The professor's general reluctance to desert tried-and-true teaching methods, along with his firm belief that only through personal contact can the student be properly motivated, predict his reluctance to accept ITV as a vehicle for teaching. As a result, we should not be too surprised that virtually every educational institution which has attempted to use ITV in its curricula has encountered massive hostility on the part of its faculty, and, not infrequently, from its administration. (22, p. 68)

By analyzing data elicited by the Osgood Semantic Differential, Evans plotted both the direction and extent of faculty resistance. Five ITV concepts were examined with the general reactions being unfavorable to all five. Only "television supplemented by small discussion sections for large classes" elicited a noteably favorable response.

In attempting to understand such resistance, Evans examined open-ended questions concerning ITV.

While this analysis was broad in scope, the strongest reason for opposing ITV centered around the lack of personal contact with students. Some respondents did admit that ITV was economical, effective, and efficient (from the university's standpoint), but still felt that an instructor might be justified in fearing it as an innovation which might lead to widespread unemployment of classroom teachers (22, p. 71).

Another example of such resistance is provided by Carlson in his study of programmed instruction. Carlson concluded:

> Programmed instruction does not give the teachers as much opportunity to perform as they apparently desire; it does not give them sufficient opportunity to teach. In their eyes, because teaching means performing, using programmed instruction is not teaching. (11, p. 83)

The relevance of the above research to this study is the support it gives to the subjective nature of the diffusion process. In this study, the extrinsic characteristics of relative advantage and compatibility with the receiver system are examined. Rogers defines relative advantage as the degree to which an innovation is perceived as better than the idea it supersedes, and compatibility as the degree to which an innovation is perceived as consistent with existing values and past experiences of the receivers (63, p. 37). In an academic community, a new curriculum that cannot meet these two

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In addition to attributes of the innovation itself, a second basic assumption of diffusion research is that the diffusion process has distinct phases. While consensus concerning the exact nature of these phases has not been reached, Havelock (29) identified three schools of thought: The Social Interaction Perspective, the Research, Development, and Diffusion Perspective, and the Problem-Solver Perspective.

The Social Interaction model emphasizes the diffusion process once the innovation is available to a potential adopter. Proponents of this model are not concerned with how the innovation becomes available, but rather with the sources of information that appear to be most influential at each stage of the adoption process. One example of this model is Coleman's work in medical sociology (15). Coleman's model included the five phases of awareness, interest, evaluation, trial, and acceptance. This model is also supported by Wilkining (75), Lionberger (47), and was similar to Rogers' earlier model (64).

A second model is the Research, Development, and Diffusion approach where the primary attention remains on the efforts of the sender as the innovation is diffusing through the target group. Unlike the first

model, the invention and design of the innovation (usually by specialists outside the client system) is of particular interest. One example of this model is that of Guba and Clark (13) where research, development (invention and design), diffusion (disseminate and demonstrate), and adoption (trial, installation, and institutionalization) represent the four general phases. Other educational research utilizing such a model are Hopkins and Clark (12), Brickell (8), and Miles (54).

The third model reviewed by Havelock was the Problem-Solver Perspective. The central focus here is on the efforts of the receiver to solve his own problems. The change process is self-initiated and diagnosis of the problem is accomplished within the target system itself. The most noted example of this model is Lewin's unfreezing (developing a need for change), moving (diagnosis and examination of alternatives) and freezing (stabilization and termination of change relationship). Several other examples listed by Havelock were Watson (74), Mackenzie (50), and Jung and Lippitt (36).

Perhaps the most popularized model of the three is the Social Interaction Model with Rogers as its chief proponent. His five-stage paradigm, however, has two difficulties: (1) the transition from the awareness to adoption may not follow the time sequence suggested, and (2) the transition from the interest stage to the evaluation stage is difficult to distinguish (63, p. 13).

In view of these criticisms, Rogers and Shoemaker (63) have retermed the individual adoption process an innovation decision process defined as the mental process through which an individual passes from first knowledge of an innovation to final decision to adopt or reject the innovation (63, p. 13). They redefined the five "stages" as four "functions," implying a cumulative sequence of events, and conceptualize the functions as (1) knowledge (awareness), (2) persuasion (attitude formation and/or change), (3) decision (adoption or rejection), and (4) confirmation (reinforcement). Figure 1 depicts the paradigm of the innovation-decision process.

Specifically pertinent to this study is the persuasion function where the individual forms a favorable or unfavorable attitude. This attitude, however, is not formed in isolation nor is it completely predictive of actual adoptive behavior. These two aspects are critical to this study and deserve additional comment.

A formal organization differs from other kinds of social systems in that the power structure in it is clearly delineated, roles and positions are well-defined, and compliance behavior in accordance with the position held and fulfillment of hierarchial demands are usually in effect.

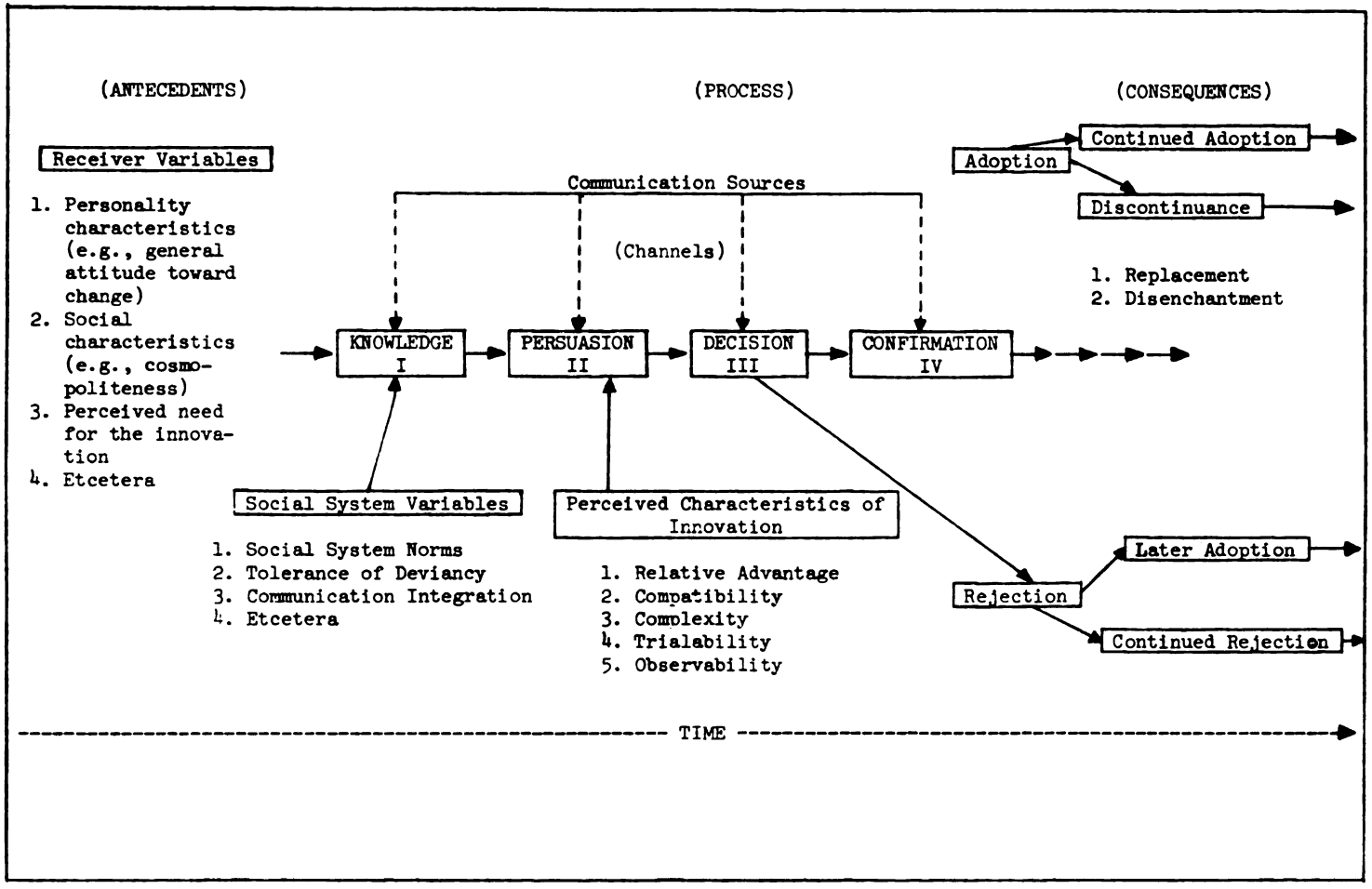

Figure 1.--Paradigm of the Innovation-Decision Process

[a]For the sake of simplicity we have not shown the consequences of the innovation in this paradigm but only the consequences of the process.

Source: Rogers and Shoemaker, 1971, p. 102.

This is especially pertinent in educational institutions where the decisions to adopt innovations are made by the administration with implementation often expected by a separate segment of the academic community. This specific aspect of a bureaucratic structure is critical in education where the system makes the decision to adopt or reject, not the individual.

In system decisions, the social system exerts primary influence over the determination of innovation adoption or rejection. Rogers and Shoemaker outline three types of system decisions, each with varying degrees of control over the eventual user of the innovation.

1. The authority decision, where the individual is ordered to adopt or reject the innovation according to a decision of those higher in the hierarchial power structure.
2. The contingent decision, where the individual may adopt or reject a new idea, but only after the system has made an enabling adoption decision.
3. The collective decision, where the individuals comprising a social system participate, either directly or through representation, in the verdict to accept or reject an innovation. Once the decision is made, all members of the social system must abide by the system's collective decision. (63, pp. 54-55)

In view of these conceptualizations of the decision process, the contingent decision has the most relevance for this particular research. The College Curriculum Committee adopted the new curriculum innovation, but participation by individual faculty will be optional. This factor is critical to the success

of the new program and supports the need to go beyond the system's adoptive decision in predicting the success of the innovation.

As mentioned in Chapter I, Kelman (39) in his discussion of social influence and opinion change proposed and partially validated three distinctive processes from which adoptive behavior may be induced. In the "compliance" situation, the adoptive behavior is observed only when surveillance of the influencing agent is in effect. In the "identification" situation, the adoptive behavior will persist as long as the individual's relationship with the influencing agent continues. In the "internalization" situation, the adoptive behavior will be retained as long as the issue at hand is perceived as relevant to the values of the individual.

Internalization is thus defined as "the extent to which a member perceives the innovation or change as relevant and valuable to his role performance in the organization" (46, p. 11). In contrast to internalization, compliance is defined as the use of the innovation, whether the member sees the innovation as relevant or irrelevant to his role performance in the organization. Using Barnard's (4) concept, the adoption of innovations belongs to the group of orders for actions in the "zone of indifference" where compliance is the level of response.

Thus, it is essential to measure the degrees of innovation internalization among members in an organization in addition to studying their adoptive behavior so as to determine the actual effect of the innovation in the formal organization. This is especially critical where the contingent decision model places the burden upon individual adopter attitudes.

A second reason to study adoption beyond the systems level is the discrepancy between attitudinal and behavioral changes. The typical diffusion study investigates the adoption rate, innovativeness, and other concepts which are operationally defined in terms of the length of time during which an innovation has been behaviorally adopted. Social psychologist, Festinger (23, 24), however, has empirically demonstrated that under certain conditions behavioral change does not imply attitudinal change. This discrepancy further implies the need to investigate the two variables independently in an innovation diffusion study.

With these basic concepts as background, it can be concluded that while it is difficult to specify in a priori terms what characteristics of an innovation--vis a vis the adopting system--will block or aid innovativeness, perceived attributes of the innovation are important. As Miles stated:

> Other things being equal, innovations which are perceived as threats to existing practice, rather than mere additions to it, are less likely of

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> acceptance; more generally, innovations which can be added to an existing program without seriously disturbing other parts of it are likely to be adopted. (54, p. 638)

A sequel to this statement is the assumption that innovations implying or requiring important value changes in acceptors will encounter difficulty, since much more than the nature of the innovation is at stake.

Research also supports the position that adoptive behavior, while dynamic, is not necessarily random. It is orderly and can be conceptualized as proceeding through distinct phases or functions. In this study, the persuasion function is being arbitrarily isolated for study. This is a result of the unique nature of the research setting and of the desire to control for the discrepancy between attitudes and behavior.

And, finally, it is concluded that system decisions do not guarantee individual support by potential adopters. There are levels of support with internalization marking the highest level of congruity between system and individual adoption decisions.

With these basic concepts as background, the social system as a unit of analysis will now be examined. The theory of organizational change provides the basis for this analysis and will be summarized as pertinent to this study.

Organizational Change

In discussing the diffusion of a new curriculum innovation, the context is that of a planned and deliberately managed change process. While there are always random occurrences and natural circumstances that relate to this process, planned change begins with a recognition of a need for change and innovation and devises steps to achieve this end.

The change process examined in this study is set within the social system of an academic community--a social structure which establishes the boundaries within which innovations diffuse. Such a structure acts to impede or facilitate the rate of diffusion and adoption of new ideas through what is called "system effects." The basic notion underlying system effects is that norms, social statuses, and hierarchial arrangement of a social system influence the behavior of individual members of the system.

One central feature of such organizational change is the role of leadership in the organization. Leadership behavior serves both as a stimulus and a model for much behavior in the organization (45, 7), and for that reason it is a major determinant of internal barriers to knowledge dissemination and use. Havelock (29, p. 27) summarized the role of an administrator as one who can (1) exhort his subordinates to seek out more information

from other subunits, (2) direct subordinates to use understandable terms when communicating with others, (3) amend role demands so that his subordinates are more functionally interdependent, (4) manipulate rewards to favor knowledge flow among subunits, (5) train subordinates to value and utilize knowledge from other subunits, and (6) create structural modifications to stimulate information passage by greater number of linkages and channels.

Whether or not the leader will be able to accomplish such knowledge facilitation is dependent on both situational constraints and his leadership skills. Katz (38) and Mann (52) suggest that three sets of skills are essential for effective leadership: technical proficiency, organizational ability, and an understanding and ability to relate to people.

This third leadership skill (human relations) has received considerable attention and relates directly to the department chairmen leadership style as outlined in Chapter I. The basic assumptions here are that the social climate of an organization is a product of leadership and that such a climate for change is functionally related to the adoption or rejection of innovations. Likert has supported this position when he stated:

> A supportive leadership climate creates the conditions that lead to a full and efficient flow of relevant messages in all directions throughout the organization. This full and open flow of useful information provides accurate data to guide action, to call attention to problems as they arise, and to assume that sound decisions based on all available facts are made. (45, pp. 238-39)

What Likert and others have advocated is a communication system that facilitates the free flow of innovations in the organization, and encourages organizational members to discuss the innovations with their superiors. The predicted outcome is a climate more receptive of change.

While there have been no studies in higher education researching this point directly, industrial research on leadership and social climate is extensive. Of primary importance are the studies of the Survey Research Center, University of Michigan. This programmatic research on the relationship of supervision to productivity and morale frequently suggests that immediate interpersonal relations between supervisor and subordinate and among work group members, rather than broader organizational variables and company policies, may be the more important determiners of productivity, morale, and response to change (72, p. 10). Mann (53), for instance, concluded that change is best accomplished by utilizing the "work family" as an agency through which to administer change, and emphasized "employee-oriented" as opposed to "production-oriented" supervision

as being conducive to acceptance of change. Herzberg, Mausner, Peterson, and Capwell (32) expanded this concept of "employee-oriented" supervision and identified specific practices which may be denoted by such an orientation. Trumbo (72) summarized these to include: (1) being sympathetic on both work and personal problems of the employees; (2) sharing information with employees; (3) being less critical of employees; (4) being willing and able to help employees in their work while maintaining a leadership position; (5) allowing greater participation in decision-making among employees; (6) being consistent in giving orders and maintaining discipline; (7) letting employees know where they stand in their job progress; (8) giving general rather than close supervision; and (9) interacting socially with employees.

If one looks beyond the industrial terminology, it is not difficult to transfer the broader concept of a social climate to the educational institution and to explore it as a variable in the change process in this context.

Davis made some efforts in this regard and concluded:

> . . . that when attempting to effect innovation in a college, the participation by the faculty in decision-making becomes an important variable since faculty involvement enlists the assistance and power of the formal and informal groups to enforce the decisions to adopt an innovation. (16, p. 118)

Davis also concluded that there were indications based on results to support Brickell's findings that,

> Although faculty may lend support and give consensus to change, it is the administrator or head of the department who promotes or prevents innovation because he is powerful. It is not due to his monoply on imagination, creativity, or interest in change, but simply because he has the authority to precipitate a decision. (8, p. 503)

The only other effort to study organizational variables in educational change was Lin's (46) study of three innovative Michigan high schools. He found that innovation internalization correlated with twenty-two organizational variables. Three of these variables (psychological distance between teacher and principal, vertical communication, and perceived change orientation of the principal) all support the assumption that the behavior of individuals in authority positions in an organization effect the social climate of the organization and the employees' reaction to educational innovations.

A second and interrelated systems variable suggested by studies of organizational change is the impact of the primary group on employee behavior, particularly with regard to change. At least as early as the Hawthorne studies, the existence of primary group formations and their influence on employee attitudes and performance has been noted. In 1955, Seashore (67) studied group cohesiveness in factory work groups and demonstrated that primary groups and their norms are

related to employee attitudes and level of production. Further evidence for the power of the group in influencing individual attitudes and performance comes from laboratory studies of group dynamics. While it is impractical to summarize the host of relevant studies, it should be sufficient to recall the research of Festinger (23) on forces toward uniformity in group communications, and the work of Festinger, Schachter, and Back (24) on the conditions determining the power of the primary group to enforce standards.

As was the case with leadership styles, very little attention has been paid to this concept of group cohesiveness in studying educational innovations. Lin (46), however, found that when a teacher's feeling of security in the school system in high, his perceived degree of group cohesiveness will be positively correlated with his degree of internalization (46, p. 26).

Basically, the literature shows that individuals, who for any one of a number of reasons, are strongly attracted to other members of the group (cohesiveness) will be greatly influenced by the norms of the group. Extending this assumption to the academic department as the primary group, any threat to the group norms would be expected to effect the rate of internalization.

One additional system effect receiving much attention in organizational change has been "participation";

the inclusion and active involvement of individuals who are effected by decisions in the decision-making process. This decision-making process was described by Lin when he stated:

> Decision-making takes place when the initiators of innovations consider alternative new practices and ideas, when the intermediate disseminators (or "gatekeepers") make their choices among innovations legitimized by the initiators and transmit the selected parts, features, or information about the innovations to filter down to the receiving or adopting units, and when the adopting units assess the assets of the innovations filtered down to them and decide to what extent they want to adopt or internalize the new ideas and practices. (46, p. 107)

The basic concept purported here is that adoption of innovations is facilitated by involving those who actually use the innovations in the adoption-rejection decision-making process. Experimental small group studies and information from large-scale industrial concerns emphasize that participation in the innovation decision by those who are involved in using the innovation leads to more positive and secure adoption.

Lin and others (46) found that willingness to accept change is positively correlated with the teacher's level of participation in decision-making within the school. This finding supports earlier studies of Lewis (44) and Pelz (62), both of whom contend that group decision is important in effecting change in an individual. When the group makes a decision, each member of the group feels more deeply involved than if he had

made the decision by himself or if he had the decision imposed on him. The process of group decision seems to be a factor which helps overcome individual resistance to change (14, 73). The Maier and Hoffman (51) study offers evidence that a sense of shared participation in the solution of problems directly affecting group members is a more meaningful method of motivating change than offering external incentives. In educational systems where it may be difficult to offer financial and other extra benefits, faculty discussion and participation in decision-making may be the most efficient and effective way of ensuring acceptance of change. Once a group has arrived at a decision to act, the members, even though they may act as individuals, accept the group decision and act in accordance with it (42). The "participation principle," initially proposed for industrial management (45) is also valid for educational systems. If individuals feel they have been influential in securing adoption of an innovation, they will make a greater effort to see that the innovation operates successfully. In effect, the decision audience and the adoption audience are so closely allied that they share, to some extent, the same identity.

The Lewin (43), Coch and French (14), and other studies concerning decision-making in small groups indicate that individuals become more committed to an

innovation, and carry out a more careful adoption of the innovation, if they feel they, rather than the authority structure, have made the decision. It follows that faculty involvement in innovative decisions ensures greater acceptance of decisions, a more positive attitude toward adoption, and a greater effort in implementing adoption.

The most recent research consulted for this present study was Havelock's (28) study of Highway Safety Researchers and Decision-Makers. As mentioned briefly in Chapter I, Havelock attempted to go beyond the general term "participation" and operationalize various decision-making styles within an organization. It was his objective to uncover deficiencies in the highway safety decision-making process. On the whole, he was unsuccessful. Respondents most favored the "opinion balance" style and rejected the notion that decision-making was dominated by single individuals or that it worked as a routine administrative process. A large majority also rejected the notion that it was a power struggle (28, p. 85).

Regardless of these specific findings, the approach of decision-making styles in relationship to attitudes toward an innovation is a useful and reasonable approach. Social change is facilitated by an egalitarian approach. Argyris summarized the potential benefits of such an approach when he stated:

> Participation is desired (from those affected by the change) in order to (1) decrease resistance to change, (2) develop the most effective processes for a lasting change within the organization, and (3) represent more adequately the needs of the participants involved in the change. (2, pp. 91-93)

In summary, the general point of this discussion on organizational change is that the properties of the target system in existence prior to the introduction of an innovation operate to reject, modify, accept, and maintain the innovation. The change process will thus move at varying rates in different social systems, dependent upon the nature and extent of such system effects.

Social System

Most diffusion research has concentrated on the individual as the adopting unit almost to the exclusion of studying the social system as the adoption unit. The central theme of this study, however, is that adoption decision-making in complex organizations must differ in some important ways from individual adoption decision-making. As Havelock stated:

> If we focus our concern on what goes on inside the receiver, we are going to find many barriers to effective utilization, but we should not forget that the individual consumer of knowledge does not live in a world of his own. On the contrary, he is served by a social system, a vast network of individuals and groups, which inhibits, filters, and facilitates the flow of knowledge to him. (29, p. 47)

In the previous section specific facilitators or system effects were discussed. In this final section, the emphasis will be upon some actual research exploring the social system as a unit of study. Such research is limited, but several studies have provided the theoretical base for this study.

The central research exploring internalization was Lin's (46) study. The setting for his study was three Michigan high schools which had adopted a schedule modification throughout all their schools. It was Lin's basic assumption that the adoption model was not applicable in formal organizations where compliance behavior would indicate adoption, but fail to represent actual teacher attitudes toward the innovation. To remedy the inadequacy of this model, a new paradigm of innovation dissemination and diffusion was presented. It consisted of five components: (1) the source of information, (2) the dissemination or diffusion process, (3) the receiver of information, (4) the impact of dissemination and adoption, and (5) the control system. On the receiver system, three elements were specified and internalization was singled out as the major focus in the study.

Before examining the results of this study in detail, however, two differences in this present study and that of Lin's deserve attention. First of all, the

decision to adopt the innovation (schedule modification) was not an optional decision on the part of the high school teachers. The innovation was adopted by the administration with compliance required of all teachers. In this study, however, the engineering faculty will adopt on an individual and voluntary basis. This aspect of the research setting makes the concept of internalization particularly meaningful to those who must implement the program.

A second difference between the studies is that Lin studied an innovation already adopted by the organization. While adoption might only have been an index of compliance, there is the concern that an individual's perceptions of an innovation are likely to change after he adopts it. This positive relationship between perceptions and rate of adoption may partly be an artifact of the tendency for individuals who have adopted an innovation to rationalize their decision in terms of relatively positive perceptions. In this study, the concept of internalization will be examined prior to adoption and free from actual experience with the innovation itself. In this regard, internalization is examined as a predictor rather than as a consequence of adoption.

Based on Kelman's (39) concept of internalization, Lin studied psychological distance, relevant new

information about the innovation, feedback, group norms, feeling of security, information level, and participation as independent variables related to internalization. The results showed that in terms of the amount of contribution in explaining the degree of internalization, the order of the independent variables was: (1) participation, (2) information level, (3) relevant new information about the innovation, and (4) group norms (46, p. 62). While the other three independent variables were in the predicted direction, the required level of statistical significance was not reached.

In addition to this major finding, Lin also established the theoretical independence of internalization as a concept. Since this variable was new and only indirectly supported by the literature, a major concern of his study was the viability of internalization in diffusion research. As Lin concluded:

> This study investigated a new dependent variable in innovation diffusion in formal organizations; namely, internalization. It appears that it is a meaningful concept in the research context. . . . There is no significant relationship found between internalization and innovation awareness or innovation adoption, which demonstrates the need of isolating the concept along with the other two "classical" variables in future diffusion research in formal organizations. (46, p. 79)

In 1965, Davis used a case study method to examine innovative and noninnovative liberal arts colleges. The problems outlined by Davis were as follows: (1) What personal variables characterize individuals in an

innovative college? (2) What features of the organizational normative structure operate to promote innovation? (3) What are the factors within the relationship between the individuals and the organization which account for the college's receptivity to educational innovativeness?

Based upon his sample of one innovative and one noninnovative liberal arts college, Davis (16, p. 114) indicated there was reason to believe that the adoption process for a collegiate institution is similar to other research findings regarding noncollegiate institutions. A college seems to go through the same "stages" of adoption as reported by other diffusion researchers. His findings also appeared to verify Mort's (55, p. 326) observations that colleges, like other organizations, if reluctant to adopt one innovation tend to be reluctant to adopt other innovations.

One of the findings most germane to this study was the extent of faculty involvement in policy determination. Davis found that the innovative faculty participated to a greater degree in policy decisions than the faculty at the noninnovative college. Statistical significance was even greater when considering the difference in faculty involvement in the hiring and tenure regarding faculty.

Finally, Davis (16, p. 118) concluded that when attempting to effect innovation in a college, the participation by the faculty in decision-making becomes an important variable since faculty involvement enlists the assistance and power of the formal and informal groups to enforce the decisions to adopt an innovation. This finding tends to support a similar theory as outlined by Katz (37).

One other study relating to diffusion of innovations in higher education was done by Sprunger (69). He studied the effect administrative, organizational, and/or personal-psychological characteristics had in relation to innovativeness in student personnel programs.

The results of this study gave tentative support to the theory that these variables are significant in separating innovative from noninnovative programs. Sprunger was unable, however, to determine which variables were the most potent in identifying significant differences between the two programs. As Sprunger concluded:

> Although there have been few innovation research studies which have studied the social system as the unit of adoption, the evidence available from these studies has indicated that innovation is not composed of a single variable or a small number of related variables, but is far more complex. The evidence from this study gave further support to this premise and the concept that the behavior of organizations and of the individuals who make up those organizations forms a unified whole. (69, p. 104)

While Sprunger was unable to identify individual and independent variables related to innovativeness, he supported Lin's (46) contention that the individual adoption model was inadequate for social system research. The complexity of a social system demands more precise definitions, constructs, and identification of variables (69, p. 105).

Summary

Since a paucity of literature existed investigating the institution as the adoption unit, a number of theoretical aspects of organizational change have been presented. It was emphasized that social change takes place in the structure and function of a social system and proceeds at different rates to either adoption or rejection.

While such a process is not haphazard, social change does involve alteration. As Rogers stated,

> As evidence of change we must be able to observe some modification, variation, or transformation in the structure or function of the social system. There must be some measureable and recognizable difference in the system. (64, p. 27)

As new ideas and inventions arise within a social system, their essence is communicated to its members and an innovation-adoption decision is made. Such decisions, however, are not made in isolation. There are certain conditions that facilitate or deter such

adoption. Research draws attention not only to the attributes of the innovation itself, but also to "system effects" which act as filters in the diffusion process. A number of these filters were examined and related to this specific study.

And finally, a new model for studying diffusion was introduced which emphasized the inadequacy of the individual adoption model. The basic research was that of Lin (46) and stressed "internalization" as a concept independent of adoption. This concept was considered especially relevant in studies of formal organizations where compliance to authority was an inadequate index of actual attitudes. The present study provides such a research context.

CHAPTER III

DESIGN OF THE STUDY

Introduction

Statements concerning the purpose and objectives of the study and a general overview of the plan to be followed were presented in Chapter I. More detailed consideration is given in this chapter to describing the population to be studied, scale development and instrumentation, procedures employed in collecting the data, and statistical techniques used in analyzing the collected data.

Population

The population under study is the full-time faculty in the College of Engineering at Michigan State University. Not included in this group are the Dean and the Assistant Dean of the College, the Dean of Student Affairs and his staff, the Coordinator of Continuing Education for the College, and the Director of the Division of Engineering Research.

Since the total number in the remaining population is relatively small (N = 90), no sampling is involved.

Rather, the total population represents the unit of study. One exception to this format is in regard to the variable of department chairmen leadership styles. For obvious reasons, the chairmen will not respond to this one scale, thus reducing the total respondents possible to eighty-three for this one area. While there are some difficulties involved with this relatively small population (see comments under limitations of the study), this factor should minimize problems associated with generalizations and eliminate any problems usually involved with sampling.

The data were collected by means of a questionnaire (a copy of which is included in Appendix F) with the respondents remaining completely anonymous. This approach was taken to assure the faculty that the results would not be used by the administration of the college for evaluation purposes and to increase the likelihood of their response.

Limitations of the Study

This study is limited by the normal deficiencies accompanying the use of any "self-report" instrument or questionnaire. Concerns about the instrument itself such as reliability, validity, and encouragement of response bias are particularly pronounced, however, in the absence of a standardized and previously tested

instrument. The comments in the following section on instrumentation will acquaint the reader with this author's efforts to minimize such limitations.

This limitation of a newly constructed instrument is further accentuated by the size of the population. While using the entire population as the unit of study eliminates sampling difficulties, the size (N = 90) prohibits extensive pretesting of the instrument itself. Pretesting on a limited scale, however, is involved and will be discussed later in this chapter.

Securing the cooperation of the respondents in completing and returning the instrument is another central concern of the researcher. This is especially significant in this study, since the use of the entire population eliminates the possibility of drawing additional samples, and the efforts to preserve anonymity greatly reduce specific follow-up procedures. To reduce this limitation the approval and reaction of the Dean of the College and the Administrative Council of the College were requested and granted. These individuals were informed of the nature and purpose of the study and were assured that no results would be used for personal appraisal. Nevertheless, as Martin Trów warns, teachers and administrators tend to be resentful and suspicious of survey methods because of the "structured questions about complicated issues, the forced choices among

limited alternatives, above all the sense that they are being studied rather than consulted, through methods that appear to them mechanical and stereotyped" (71, pp. 350-51). These possible obstacles place high priority on questionnaire construction, perceived relevancy and importance of the issue being examined, and the nature of the contacts with the respondents, both initially and with appropriate follow-up procedures.

Instrumentation

In attempting to control and minimize the effects of the limitations mentioned above, heavy emphasis was placed on the development and construction of the eight scales. The greatest emphasis was placed on identifying previously constructed and validated scales used in comparable research, extensive discussions with representatives of the population being studied, assistance from authorities in the field of questionnaire design and survey research, and a pretest of seven randomly selected members of the faculty. The following descriptions of each scale relate the results of these efforts.

Internalization

As stated earlier, the concept of internalization is defined as the extent to which a member perceives the innovation or change as relevant and valuable to his role performance in the organization.

The concept of internalization was developed by Kelman (39) and studied in laboratory situations where the antecedents of social influence were manipulated. Since the present study is not in the laboratory controlled research format, another example of work with this concept was sought. The most relevant study in this regard was Lin's (46) conducted among high school personnel.

In assessing the internalization of an innovation (schedule modification) Lin sought responses to four statements: (1) "Schedule modification could constitute an improvement in educational practices in any school," (2) "I think schedule modification represents an improvement in educational practices at my school," (3) "I think schedule modification is unnecessary in our educational system," and (4) "To me, schedule modification is one of the worst things to come into our educational system" (46, pp. 90-91).

In evaluating the relevance (both empirical and theoretical) of the concept internalization, Lin found that internalization was significantly correlated with twenty-two other variables which did not include innovation awareness or adoption behavior. He further concluded that since the particular innovation investigated affected the complete teaching staff of a school, the adoptive index should have no variability. It was

precisely this unique institutional factor which made the variable, innovation internalization, significant and meaningful (46, pp. 74-75).

In terms of theoretical support, Lin cited Homans' concepts of sentiment, interaction, and activity in the human group (34). In his study, Lin claimed that innovation internalization was the scale to assess the sentiment given to a particular innovation. In this same regard, he drew on Parsons' (61) concepts of ideas, desires, and values. The cognitive term "idea" was translated in diffusion terminology as innovation awareness of knowledge, while desires and values were classified as affective in nature. In diffusion terms, these were seen to parallel interest and internalization. While Lin recognized the problem of empirical proof for mutual exclusiveness of the two concepts, he concluded that internalization was closely related to the affective phenomenon theorized by Kelman (46, p. 75).

And, finally, Lin found no significant interaction effects among certain psychological, personality, communication behavioral, and informational variables upon innovation internalization. This, coupled with the above findings, led this researcher to conclude that innovation internalization was a meaningful concept in the research context.

In developing the instrument for use in this study, Lin's design for measuring internalization was used as the basis for four of the six individual items. As mentioned previously, however, this study deals with perceptions prior to adoption, and with a situation where the decision to actually adopt rests with the individual faculty member.

In this regard, the writer attempted to develop a scale of six items which would reflect internalization in relationship to the proposed curriculum innovation. Specifically, the areas developed were: (1) engineering education, (2) the actual decision to implement, and (3) personal involvement in the implementation phase. A general and a specific question were designed to measure these levels of internalization.

In selecting the appropriate scaling technique to measure the dependent variable of internalization, two alternatives were considered. One of these was Guttman's Scalogram which is

> . . . based on the assumption that a single, unidimensional trait can be measured by a set of statements which are ordered along a continuum of "difficulty of acceptance." That is, the statements range from those which are easy for most people to accept to those which few persons would endorse. Such scale items are cumulative, since the acceptance of one item implies that the person accepts all those of lesser magnitude (those less difficult to accept). To the extent that this is true, one can predict a person's attitude towards other statements on the basis of knowing the most difficult item he will accept. (77, p. 126)

In developing the items for measuring the dependent variable, a similar logic was used. That is, items reflecting varying degrees of internalization were constructed with the most general item being placed first and the most specific item second in each of the three areas. The mere logic of such an item format, however, is not sufficient to claim that a Guttman Scalogram is in existence. The demand-criteria of unidimensionality and reproducibility in the Guttman approach require rigid pretesting and often result in a high mortality rate for trial items. Furthermore, the limitation of an initially small population, in this instance, precludes the extensive pretesting required. And, finally the purpose of this study is not to examine the unidimensionality of the attitude nor to construct a standardized instrument for future use; rather it is simply to establish a relatively reliable index of the dependent variable.

In view of these limitations a second alternative was reviewed and selected for use in this study. The scale involved is Likert's Method of Summated ratings which consists of a series of opinion statements about some issue. A person's attitude is measured by asking him to indicate the extent of his agreement or disagreement with each item. Hence, an item score of "1" indicates a positive response, "2" a positive-neutral

response, "3" a neutral response, "4" a negative-neutral response, and "5" a negative response. A person's attitude score is simply the sum of his individual ratings.

In using this technique, one limitation should be noted. Likert does not assume equal intervals between scale values. For example, it is quite possible that the difference between "agree" and "strongly agree" is much larger than the difference between "agree" and "undecided." This means a Likert scale can provide information on the ordering of people's attitudes on a continuum, but it is unable to indicate how close or far apart different attitudes might be (77, p. 126).

Relative Advantage and Compatibility

In developing the scales for measuring perceptions of the relative advantage and compatibility of the innovation, the writer took advantage of the experiences of those who initiated the innovation. Since November of 1969, four faculty members and one administrator in the College of Engineering worked on the design of the Bachelor of Arts program. And, during these deliberations they held meetings with each of the seven departments in the College to inform faculty and solicit their reactions to such a program.

The twenty items (ten for each of the two variables) were developed as a result of conversations

held with these five individuals. In their view, these twenty items clearly represent the issues raised by the faculty and should thus guarantee a high content validity for the two scales.

The statements contained in these scales are designed to facilitate comparing opinions regarding faculty perceptions of the relative advantage and compatibility of the innovation. And, for the purpose of scoring and analysis, the Likert technique was again used. The numerical scoring values assigned to relatively favorable statements ranges from 1 for a "Strongly Agree" response through 5 for a "Strongly Disagree" response, with the scoring values being reversed for relatively unfavorable statements. The lower total scores and group means will thus represent greater agreement with the relatively favorable expressions and disagreement with the unfavorable statements. Possible response-set bias was thought to be reduced by generating both favorable and unfavorable statements within the two scales, and by randomly listing all of the items in the scale set.

Leadership Styles

In developing the department chairman leadership scale, two major sources were used as references. In 1948, Nelson (59) developed the original Leadership Inventory consisting of twenty-five situational

descriptions representing salient problems common to supervisory personnel. For each situation there were four alternatives indicative of behavior or attitudes consistent with four ideal styles or patterns of leadership. Nelson presented evidence for the logical validity of the alternatives and the consistency of the four leadership patterns which they reflect: Bureaucratic-regulative (A), Autocratic-directive (B), Idiocratic-manipulative (C), and Democratic-integrative(D).

The definitions of the four leadership concepts of the Leadership Inventory are summarized on the following page. The evidence from prior research by Nelson supports the assumption that the Leadership Inventory meaningfully differentiates differences in the social climate of work groups to the extent that this concept is reflected in the leadership style of the supervisor.

In a 1958 study, Trumbo (72) built upon Nelson's work with several significant changes. Where Nelson had presented each of twenty-five situations twice with "A-D" and "B-C" pairs of alternatives, Trumbo combined the alternatives into twenty-five four-choice items, reducing the total number of items and responses by one-half.

In addition to this technical alteration, Trumbo also attempted to develop a second index of the leadership climate, but this time from the employees'

DEFINITIONS OF FOUR LEADERSHIP PATTERNS[1]

A. The Bureaucratic-Regulative Concept. This department chairman emphasizes formal organization and believes he should depend upon top management for guidance and support. His job is to be a loyal representative of management policy and to carry out rules and regulations as directly and completely as possible. Toward this end he would avoid personal relationships with his faculty that may weaken his official status or make him less objective and impartial in assigning, directing, rating and promoting faculty.

B. The Autocratic-Directive Concept. This department chairman emphasizes technical organization and believes he should depend upon his own professional knowledge and personal capacity. His job is to get the work out and it is his responsibility to modify, improve, and reinterpret top management programs so that they will fit his needs. He is less concerned with official status than personal status and tries to make himself felt and respected by the faculty through his practical knowledge and ability to give faculty specific directions on their own assignments.

C. The Idiocratic-Manipulative Concept. This department chairman emphasizes personal organization and believes he should depend upon his knowledge of individual psychology to get the most from every faculty. His job is to administer regulations in a flexible manner adapted to the individual needs of the faculty and at the same time to stimulate, guide, and develop all faculty to carry out these assignments to the best of their ability. Toward this end he would maintain a friendly personal relationship with each faculty member to study his individual interests, needs, and abilities through which he may be controlled and developed.

D. The Democratic-Integrative Concept. This department chairman emphasizes informal organization and believes he should depend upon his ability to organize the faculty into a cooperative team whose codes, standards, and goals will guide individual faculty. His job is to keep the group informed of their official rights and duties and help them to develop their individual abilities and interests into an effective human organization through which the work is done. Toward this end he maintains an informal two-way relationship with faculty, giving information and soliciting and respecting their opinions about the work situation.

H.R.I. HUMAN RELATIONS--INDEX. This is a combined score based on the frequency of all choices that

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[1]Adapted from Nelson and Trumbo.

> indicate more personal contact or interaction with the employees. Specifically the choice of Idiocratic (C) and Democratic (D) statements over Bureaucratic (A) and Autocratic (B) statements provide a measure of the general tendency toward a human relations point of view.

perspective. The rationale for this index was relatively straightforward. His goal was to construct an instrument which was the logical equivalent of the Leadership Inventory, but designed to obtain an evaluation of the supervisors from the nonsupervisory employees.

Although in some instances the construction of this second index by Trumbo involved little more than a change from first to third person in the wording of Nelson's items, this was not generally the case. In some instances, items were deleted which were not felt to be relevant for the employees. In other cases, the essence of the item was kept, but it was simplified to reduce reading difficulty level. Finally, some completely new items were constructed which seemed to be indicative of the same leadership styles, but which presented more salient problems to the nonsupervisory employees (72, pp. 62-63).

In this present study, this letter index is used to assess department chairman leadership style as perceived by their respective faculty. With the exception of one item which appeared irrelevant and was deleted, the essence of the other nineteen items developed by

Trumbo is preserved. The alterations were in wording and terminology, substituting department chairman for supervisor and faculty for employee. Other similar changes consist of inserting salary for pay, instructions for orders, and college for company. It was felt that these changes, while necessary, were insignificant and would not require pretesting for logical validity and consistency.

While no objective behavioral criterion is available whereby the empirical validity of the perceptions of supervisor items can be determined, evidence was presented by Trumbo as to the construct validity of the items.

The approach used in his analysis was identical with that used by Nelson with the Leadership Inventory. The consensus of judges, who are "experts" in the sense of being professional social scientists, served to suggest the degree of consistency and patterning among the item alternatives.

Two groups of judges were used in Trumbo's research. The first group of five judges had the benefit of definitions of the four leadership styles, while the second group of five judges did not. Each group was asked to sort the alternatives into four groups to represent a consistent pattern of leadership behavior. The results of these judgments are summarized on the following page (Table 3-1).

TABLE 3-1.--Summary of results of sortings by judges with and without definitions of leadership categories[a]

Alternatives Scored As	5 Judges with Definitions Placed: A	B	C	D	5 Judges without Definitions Placed: A	B	C	D
Bureaucratic (A)	95	5	0	0	88	9	1	2
Autocratic (B)	5	89	4	2	6	74	19	1
Idiocratic (C)	0	4	89	7	6	15	70	10
Democratic (D)	0	2	7	91	0	2	11	87
Total	100	100	100	100	100	100	100	100
% Correct Placement	95	89	89	91	88	74	70	87

[a]As reported by Trumbo (72, p. 75).

As Trumbo concluded,

> It is evident that the judges with definitions were highly consistent in their sorting of the alternatives and agree well with the categories as they were scored in the four subscales. Furthermore, it should be noted that, except for the two reversals between B and D, all of the errors were reversals between adjacent categories. The fact that four reversals occur between B and C and two between B and D, while none occurred between A and C or A and D, suggest the A-B-C-D order on an overall scale. (72, p. 75)

The data for judges without definitions followed the same pattern as that for the informed judges, but the percentages of agreement are uniformly lower. This fact is important, since it indicates that, while the naive judge who is given a definite set to find four

consistent patterns in the item alternatives is able to do so with fairly high agreement, the items were not so transparent that the population for whom they were designed would readily identify the patterns.

Job Satisfaction

Another scale included in the questionnaire is designed to assess directly the attitudes of the faculty toward fourteen specific aspects of their job. It was not assumed that these factors were necessarily the most important, either theoretically or empirically, for the faculty member's overall satisfaction with his work. The items were selected, however, to sample attitudes toward a number of different facets of the work environment, including: The work itself, the college, job communications, supervision, salary, and social relations. The rationale for the items is presented in Table 3-2. The items will be checked on a five-choice scale with the following alternatives:[1] (1) completely satisfied, (2) very satisfied, (3) quite satisfied, (4) somewhat satisfied, and (5) not satisfied.

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[1]It will be noted that the alternatives are predominately positive. The rationale for selecting these alternatives, which provide finer discriminations at the positive pole, is based on the evidence that the majority of employees indicate satisfaction with their jobs, when asked the question directly.

TABLE 3-2.--Rationale for the twelve items included in the job satisfaction check-list

Attitude Object	Specific Aspects	Check-list Item: "How satisfied are you with":
The job	Qualitative job demands	The level of performance required of me on my job
	Responsibility demands	The amount of responsibility I have on my job
	Pacing demands	The pace at which I work on my job
The college	The college	The college I work for
Communications	Quantity of information	The amount of information I get
	Quality of information	The accuracy of information I get
Supervision	Interpersonal relationship	The kind of relationship I have with my department chairman or dean (if department chairman)
	Department chairman's performance	The way my department chairman or dean (if department chairman) handles his job
Reward	Salary	The salary I get on my job
Change	Administration of change	The way changes are handled around here
Social relations	Co-workers	The people I work with (or near)

These items are included for two purposes. Each item provides a single-item index of attitudes toward a specific aspect of the job.

Secondly, the items are designed to be combined into an index of general job satisfaction. For this purpose it is necessary to determine the internal consistency of the items. Scores of "1" through "5" are assigned to the five alternatives with the most positive alternative as "1" and the negative alternative as "5." Thus, it is assumed that low item or composite scores are indicative of high satisfaction, and high scores of low satisfaction, or dissatisfaction.

In developing the items, Trumbo's study (72) was again used as the major reference. Two of his items, dealing with job security and number of employees supervised, were excluded as inappropriate. The essence of the remaining fourteen, however, was maintained with only minor changes in wording being made. These changes were similar to those made in the Leadership Inventory with college replaced by company, department chairman substituted for supervisor, and salary instead of pay. Again, the assumption is that by adopting a previously constructed and tested instrument extensive pretesting would be unnecessary.

Decision-Making Styles

In developing the scales to measure the variable of decision-making styles, the research of Havelock and Markowitz (28) was used as the central reference. Through personal visits, phone conversations, and reviewing this research with Havelock, it was determined that the basic format used with highway safety researchers and decision-makers was relevant for studying the decision process in higher education.

In approaching the question of "styles," Havelock first tried to generate some brief descriptions that would characterize styles or overall orientations to decision-making. The research-based "informed" decision type was the initial description developed, but social theory and popular thinking about decisions suggested other types, e.g., decisions controlled essentially by the power and will of one individual (autocratic), decisions based primarily on public opinion, decisions based on a logical balance of trade-offs as in decision theory (28, p. 78). After considerable pretesting and rewriting, Havelock arrived at the eight descriptions of decision types presented in Table 3-3.

In their research, Havelock and Markowitz (28) asked the respondents to classify both decisions in general and a specific decision made during the previous year according to these styles. This study differs only

TABLE 3-3.--Descriptive definitions of eight decision styles[a]

Decision Style	Item Description
Opinion Balance	We weigh the evidence objectively, but research is only one source; public opinion and what the public and industry will accept are equally important factors.
Rational Steps	We start with a clear definition of the problem, establish priorities and concrete objectives, plan and execute a step-by-step procedure for reaching these objectives.
Concensus-Compromise	We move by consensus; everybody has a chance to be heard, and we compromise on points of disagreement.
Informal Influence	It is a matter of informal influence. Personal relationships and the persuasion of certain key influentials play the biggest role in decisions.
Research Based	We weigh the evidence objectively; research information plays the biggest role in decisions.
Power Struggle	It is a power struggle; the people who have the most muscle (rank or influence in the college) usually win-out.
Autocratic	The top man makes the decision, and the rest follow him; it is strictly a chain of command.
Bureaucratic	It is a purely administrative process; the rules are laid out in advance, each man knows what his role is supposed to be and follows it routinely.

[a]As described by Havelock (29).

slightly from this format in that the respondents will not have a choice of a specific decision. The decision of specific interest in this study is the College Curriculum Committee's decision to implement the Bachelor of Arts in Engineering program. One other minor change relates to the description of the "power struggle" style of decision-making. The original description referred to "money, legal staff, and lobbying power." These descriptive terms were considered inappropriate for the context of this study and were replaced by the words "rank" and "influence" in the college.

Group Cohesiveness

As was mentioned earlier, group cohesiveness is a social system variable most often studied in the industrial context. In this study, it is assumed that the faculty reference group is the academic department and that identity with this unit represents a potential barrier to change. Perhaps the most noted advocate of this position is Dressel (19) who views departments as rigid and isolated political blocs, which through decentralization have eroded central authority for decision-making and planning. They operate on a basis of vested interest and scholarly specialization which by nature resist and inhibit administrative leadership. Even those who favor the departmental structure cite this unit as

the basic level of faculty interaction and identity. Anderson (1) argues that the department provides an effective status system and safeguard to outside pressure, and establishes a locus of power to which faculty can relate. It appears that, despite the fact that educators differ in their support of the academic department, there is agreement concerning the centrality and importance of this unit as a primary group for faculty.

A second assumption involved with this variable is that cohesiveness in the department is a source of need satisfaction for the faculty, and that change may be perceived as a threat to this source of need satisfaction. This assumption leads to the hypothesis of an inverse relationship between internalization and this variable.

In attempting to measure this variable, the prior research of Seashore (67), Trumbo (72), and Lin (46) were all used. The actual scale was developed by Seashore and adapted by the latter two researchers.

The form used in this study is patterned after Lin's with only minor changes in wording being made. Once again the Likert method of scaling will be used with a composite score being calculated as an overall measure of perceived group cohesiveness.

Formal Communications

Since the proposed program was initiated and planned over a three-year period, the communications process was an integral part of this development. This is especially pertinent in this study which relates to the diffusion and not the adoption process. The critical difference here is that adoption usually refers to a product, while diffusion studies are concerned with how innovations spread.

While the literature on communications is voluminous, one particular source served as the basis for this scale. In 1961, Nangle (58) related the effectiveness of communications in preparation for organizational change in an insurance company. In this study, it was reasoned that differential response to change and readiness to accept changes in one's job were partially influenced or conditioned by the degree to which one was factually informed about the proposed change (58, p. 74). The three basic assumptions underlying such a hypothesis are: (1) being informed about a change can be thought of as reflecting the act of self-preparation for the change; (2) the way in which events are interpreted when they occur is frequently determined by the way in which the individual was prepared for the event; and (3) the mechanism of perceptual defense operates in such a

fashion as to cause people to select information which presents facts in harmony with the current views and beliefs of the individual.

In applying such assumptions to the development of a scale, it must again be emphasized that the individual respondents are being asked their perceptions of the formal communications process. Such a self-report technique may or may not reflect the actual communications process.

In developing the actual scale, Nangle's research was used as a model. Some minor changes in wording were made in order to reflect the change in the research context. The intent of the scale in measuring the formal communication process, however, was the same.

Pilot Study

Since most of the scales were either newly developed or adapted from previous research, it was considered necessary to conduct a pretest to study and strengthen the reliability of the scales. The format for this segment of the study followed three distinct phases.

The initial phase consisted of a series of personal interviews with the five-member ad hoc committee that designed the proposed curriculum. The focus of these sessions was on the refinement of the relative advantage and compatibility scales. Through their

individual contacts with faculty at the department level, they were able to compare the items with their perceptions of the key issues. These comments were especially helpful in establishing the content validity of these two scales.

The second phase involved the actual responses of seven faculty in the college who were selected at random and represented each department. Each individual completed the instrument and participated in a personal interview concerning the study. A system of random probing was used to assist in revising certain items. Each individual was asked why he responded in a certain fashion to assure that he was responding to the intended nature of the question. Each session lasted approximately one hour and concentrated on the content validity of the scales.

The third phase of the pretest involved a computer analysis of these seven completed questionnaires. Since the data collected in the study were qualitative, consisting of ratings, attitudes, and likes and dislikes, it was desirable to quantity such data. The Method of Reciprocal Averages (RAVE) was used for this purpose. The mathematical basis for this technique is given in Torgenson (70, pp. 338-45) under the heading of principal components scaling. The procedure employs the a priori set of item response weights assigned and transposes them to a weighting scheme which maximizes the internal

consistency of the instrument. The method assumes that a single variable underlies all items in each scale of the instrument and that the investigator knows to some degree which item responses are related to the underlying variable. According to Mosier, the weighting scheme produced has the following properties:

1. The reliability of each item and the internal consistency of the weighted inventory are maximized.
2. The correlation between item and total score is maximized.
3. The coefficient of variation is maximized.
4. The correlation between item and total score is proportional to the standard deviation of the item weights for that item.
5. Questions which bear no relation to the total score variable are automatically weighted so that they exert no effect on the scoring. (57, pp. 35-39)

This pattern of weighting was helpful in two respects. First of all, an item which had no relation to the objectives of the questionnaire received equal weights for all its responses and could thus be identified for elimination or revision. Secondly, items whose responses differentiated between high and low scoring subjects received weights having a large range of values. This range is proportional to the degree of discrimination of the item responses, and also facilitated the elimination or revision of items. Items with responses spread across only two scale values were identified as contributing little to the scale and were eliminated. The

corrected reliability of all scales and the uncorrected (unweighted) reliability of each scale are shown on Table 3-4.

TABLE 3-4.--Hoyt internal consistency reliability coefficients on pretest

Scale	Coefficient
Total instrument[a]	0.9774
Internalization[b]	0.9378
Group Cohesiveness[c]	0.7259
Relative advantage[c]	0.6792
Compatibility[c]	0.5805
Leadership styles[c]	0.8687
Job satisfaction[c]	0.9240

[a]Maximum reliability after weighting

[b]Dependent variable

[c]Independent variables

Collection of the Data

The data used in this study were collected in four stages. On April 26, 1972, a copy of the instrument, along with a cover letter explaining the purposes of the study and instructions for returning the completed questionnaire (see Appendix F), was delivered to each respondent's mailbox in his departmental office. One week later, a second letter (see Appendix D), accompanied by another copy of the instrument, was again delivered to each respondent's department. And, again after one

week, a third letter (see Appendix E) was sent to the non-respondents. Finally, during the week of May 15, 1972, a telephone follow-up was conducted to determine those who, for whatever reasons, would not respond. Table 3-5 provides information on the collected and uncollected instruments.

As can be seen from this table, slightly better than 83 per cent of the possible respondents returned completed and usable questionnaires. Forty-seven usable returns were received previous to the follow-up letter and questionnaire being distributed. Of the remaining forty-three, eleven (12.2%) returned completed and usable instruments in response to the initial follow-up. Six of the other thirty-two possible participants (6.7%) returned completed and usable forms after the second follow-up. Two additional returns were dismissed as unusable: one because only two of the scales were completed; another because almost every response was in the undecided or neutral categories. Either the individual did not feel qualified to respond or he deliberately responded in this fashion.

Of the remaining twenty-four, 11 (12.2%) responded to the third follow-up.

This final input brought the total of usable responses to seventy-five (83.3%) and marked the completion of the data collection phase of the study. Two

TABLE 3-5.--Summary of participating and nonparticipating subjects

	Total	% of Total
Early returns (before 1st follow-up)	47	52.2
Return after 1st follow-up	11	12.2
Return after 2nd follow-up	6	6.7
Return after 3rd follow-up	11	12.2
Total usable returns	75	83.3
Unusable returns	2	2.2
No response	13	14.4
Total nonparticipants	15	16.6
Total population	90	100.0
Nonparticipants	15	16.6
Total N in analysis	75	83.3

more questionnaires were returned subsequent to the treatment of the data, but were not included in the study.

Treatment of the Data

As was stated in Chapter I, the need and purpose of this study are bound together in an effort to relate existing theory to a specific innovation diffusion process and to aid those who will implement the new curriculum. The treatment of the data is an attempt to facilitate this dual purpose.

In terms of the specific hypotheses outlined in Chapter I, a multiple regression analysis was employed. That is, the analysis will determine how much of the variation in one variable (the dependent variable) above the variation which may be accounted for by its mean, may be accounted for by a group of other variables (called the independent variables). The multiple correlation coefficient (R) or the square of the multiple correlation coefficient (R^2) may be used as such a measure. R^2 may be defined as the proportion of the sum of the squared deviations from the mean of the dependent variable accounted for by the independent variables. The least squares nature of R^2 comes from leaving as little variation unexplained as possible.

In applying this statistical technique, no assumptions regarding the dependent variable and the

group of independent variables are needed to estimate R^2 if R^2 is estimated by least squares; that is, if R^2 is merely regarded as a proportion. However, in order to infer to an underlying population R or R^2, it is necessary to make assumptions regarding the distribution of the dependent and independent variables. For the treatment of these data it is assumed that the independent variables are fixed variables and that the dependent variable is a normally distributed random variable with (1) mean based on the value of the independent variables for each observation, (2) constant variance over all observations, and (3) independence between observations.

In addition to examining simple correlations between the dependent and each independent variable, the analysis will also explore multiple correlations. It is of interest in this study to compare the amount of overall variation with respect to the dependent variable that can be explained by the extrinsic variables of the innovation (relative advantage and compatibility) with that of the organizational variables (group cohesiveness, job satisfaction, and leadership styles). While no hypotheses were established in this regard, such exploration is important in studying the value of organizational variables in diffusion research.

While such treatment of the data is central to the personal concerns of the writer, additional analysis

is warranted for those in the college who will bear the responsibility for implementing this specific innovation. In this regard, a more descriptive analysis in terms of frequency distributions, means, and standard deviations will be performed. Such information will enable the administrators of the program to assess the level of interest in the program and some of the prevailing attitudes and perceptions about it. Specifically, this analysis will apply to the following scales: (1) internalization, (2) relative advantage, (3) compatibility, (4) internal communications, and (5) decision styles with respect to the new curriculum.

Summary

A brief description of the population participating in this study was presented in this chapter. Procedures used in the scale development and final design of the instrument, the pretest phase, and collecting the data were also described. Finally, the methods employed in statistically analyzing the data were identified and discussed.

CHAPTER IV

ANALYSIS OF DATA

Introduction

As outlined in the previous chapter, the analysis of data has three specific purposes: (1) to test hypotheses in terms of simple correlations, (2) to explain the variance in the dependent variable in components due to the effects of various independent variables, and (3) to present descriptive information pertinent to the explanations of the hypotheses.

The basic statistical technique employed to accomplish these purposes was the multiple correlation analysis using the "least squares delete" format. The goal of this approach was to predict a maximum of variance in the dependent variable, internalization. Since only one study actually explored this variable, the success of this approach is not confirmed. Rogers (63), however, summarized multiple correlation studies with innovativeness as the dependent variable. Table 4-1 represents a summary of thirty-six such studies. While the percentage of explained variance has increased over the

TABLE 4-1.--Summary of multiple correlation analyses of innovativeness[a]

	Investigator	Respondents	Percentage of Variance in Innovativeness Explained (%)	Number of Independent Variables Utilized
1	Copp (1956)	Kansas farmers	50.0	5
2	Fleigel (1956)	Wisconsin farmers	32.0	6
3	Copp (1958)	Wisconsin farmers	52.0	4
4	Rogers (1957a)	Iowa farmers	17.0	5
5	Armstrong (1959)	Kentucky farmers	42.1	3
6	Ramsey and others (1959)	New York dairy farmers	9.6	4
7	Hobbs (1960)	Iowa farmers	29.7	7
8	Sizer and Porter (1960)	West Virginia farmers	25.9	4
9	Straus (1960)	Wisconsin farmers	33.6	3
10	Kimball (1960)	Michigan farm families	25.0	6
11	McMillion (1960)	Large farmers in New Zealand	39.9	5
12	Rogers and Havens (1961b)	Ohio farmers	56.4	5
13	Flinn (1961)	Truck growers in 7 Ohio communities	56.6	4
14	Cohen (1962)	New Jersey families	54.8	3
15	Rogers and Havens (1962a)	Ohio farmers	64.1	5
16	Deutschmann and Fals Borda (1962b)	Colombian farmers	56.3 (and 68.9 when using 27 variables)	8
17	Junghare (1962)	Farmers in India	23.8	7
18	Madigan (1962a)	Heads of households and other males in the Philippines	17.1	3
19	Neill (1963)	Ohio farmers	40.5	6
20	Havens (1963a)	Colombian farmers	47.3	3
21	Flinn (1963)	Truck growers in Ohio	64.1	5
22	Jain (1965)	Farmers in Canada	50.3	7
23	Haring (1965)	Wisconsin farmers	50.2	34
24	Andrus (1965)	U.S. consumers	41.0	21
25	Rogers (1966a)	Colombian farmers in five communities	From 24.1 to 39.0	6
26	Morgan and others (1966)	U.S. household heads	16.0	5
27	Beal and Sibley (1966)	Guatemalan Indian farmers	78.0 (42.0 when using 6 variables)	51
28	Moulik and others (1966)	Farmers in India	81.0	4
29	Whittenbarger and Maffel (1966)	Colombian farmers	44.4	5
30	Ramos (1966a)	Colombian farmers	12.9	9
31	Singh (1966b)	Indian farmers	63.5	6
32	Wish (1967)	Retail food stores in Puerto Rico	87.5	35
33	Chattopadhyay and Pareek (1967)	Indian peasants	59.0	3
34	Herzog and others (1968a)	Brazilian peasants	43.0	13
35	Roy and others (1968)	Indian farmers	50.0	15
36	Ascroft and others (1969)	Nigerian peasants	42.0	13

[a]Source: Rogers and Shoemaker, 1971, p. 193.

years, most attempts have achieved only average results. Also apparent from this summary is the total absence of any educational research employing this statistical technique.

Nevertheless, one distinct advantage of this approach is that it discloses the degree to which each independent variable is related to internalization, while controlling the effects of all other independent variables. This yields an indicant of the novel contribution of each independent variable in explaining internalization. Multiple correlation methods also assist in untangling the complex webs of interrelationships among the independent variables as they relate to internalization (63, p. 192). Sprunger (69) also supported this view in his analysis where such interrelationships made it impossible to determine the potency of any one specific independent variable.

Hypotheses Testing

Subsequent to the review of the literature and the pretest phase of the study, six statistical hypotheses were stated. The purpose of these hypotheses was to explore the specific relationships between the concept of internalization and the variables of relative advantage, compatibility, job satisfaction, leadership styles of department chairmen, group cohesiveness, and internal communications.

The following restatements of these hypotheses and the findings will constitute the initial phase of this analysis.

Hypothesis 1:

The greater the degree of relative advantage of the innovation, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 2:

The greater the degree of compatibility of the innovation with faculty values, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 3:

The greater the degree of job satisfaction, as reported by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 4:

The greater the degree of group cohesiveness, as perceived by the faculty member, the less likely he is to internally accept the innovation.

Hypothesis 5:

The greater the level of formal communications concerning the innovation, as perceived by faculty, the more likely he is to internally accept the innovation.

Hypothesis 6:

Faculty who score their department chairman high on the Human Relations Scale will internalize the curriculum innovation to a greater degree than faculty who score their chairman low on this scale.

The correlation matrix presented in Table 4-2 indicates the relationship of each of the seven variables to all variables. A correlation coefficient of 0.2245 is significantly different from zero at the 5 per cent level of confidence (17, table of significant values, p. 306).

The first column of this table indicates that the hypotheses concerned with the relationships between the independent variables of relative advantage, compatibility and formal communications, and the dependent variable of internalization were all confirmed. In terms of relative advantage, the correlation coefficient of 0.82 was clearly dominant. The effects of this variable in the regression equation are also pronounced.

This high correlation between internalization and relative advantage supports the assumption that the actual characteristics of an innovation are of little importance when compared with the individual's perceptions of the same. The engineering faculty had definite opinions concerning the potential impact of the new curriculum, which relate directly to their attitudes toward the program. The areas creating the greatest concern were those related to the negative effects of the new curriculum on the status of the standard engineering program in the eyes of other universities and employers. Sixty per cent of the respondents, for instance, felt that students in the standard

TABLE 4-2.--Combined correlation matrix with criterion included

Variable/Hypothesis	C	H_1 - 1	H_2 - 2	H_3 - 3	H_4 - 4	H_5 - 5	H_6 - 6
Internalization[b]	1.000						
H_1 - 1 Group Cohesiveness	-0.035	1.000					
H_2 - 2 Relative Advantage	0.819[a]	0.021	1.000				
H_3 - 3 Compatibility	0.655[a]	0.123	0.777[a]	1.000			
H_4 - 4 Leadership Style	0.031	0.003	0.041	0.219	1.000		
H_5 - 5 Formal Communications	0.237[a]	-0.026	0.275[a]	0.229[a]	-0.179	1.000	
H_6 - 6 Job Satisfaction	0.009	0.454[a]	-0.011	0.021	0.263[a]	0.171	1.000

[a]A correlation coefficient significantly different from zero at the 5 per cent level of confidence.

[b]Criterion (Dependent Variable).

program would have their employment opportunities jeopardized by the new and less sophisticated program, while 55 per cent felt that other universities would lower their evaluation of the present engineering program. On the positive side, 56 per cent saw the new program as a means for increasing drastically reduced enrollments, and 56 per cent felt that the new program was a necessary response to societal needs in technology.

This high correlation between relative advantage and internalization also supports the need to consider variables other than economics when examining the concept of relative advantage of innovations. While the impact of the new program on college resources was examined, the more intangible areas of academic prestige, quality of education, and social responsibility were also pertinent concerns. In spite of the fact that the consequences of effects of educational innovations are often difficult to isolate or evaluate, faculty perceptions of such consequences are nevertheless distinguishable.

The independent variable having the second highest correlation with internalization was compatibility. In this study, the compatibility of the new curriculum with faculty values and past experiences was stressed. While the content validity of this variable was high, however, it evidenced a high correlation with the previously discussed variable of relative advantage.

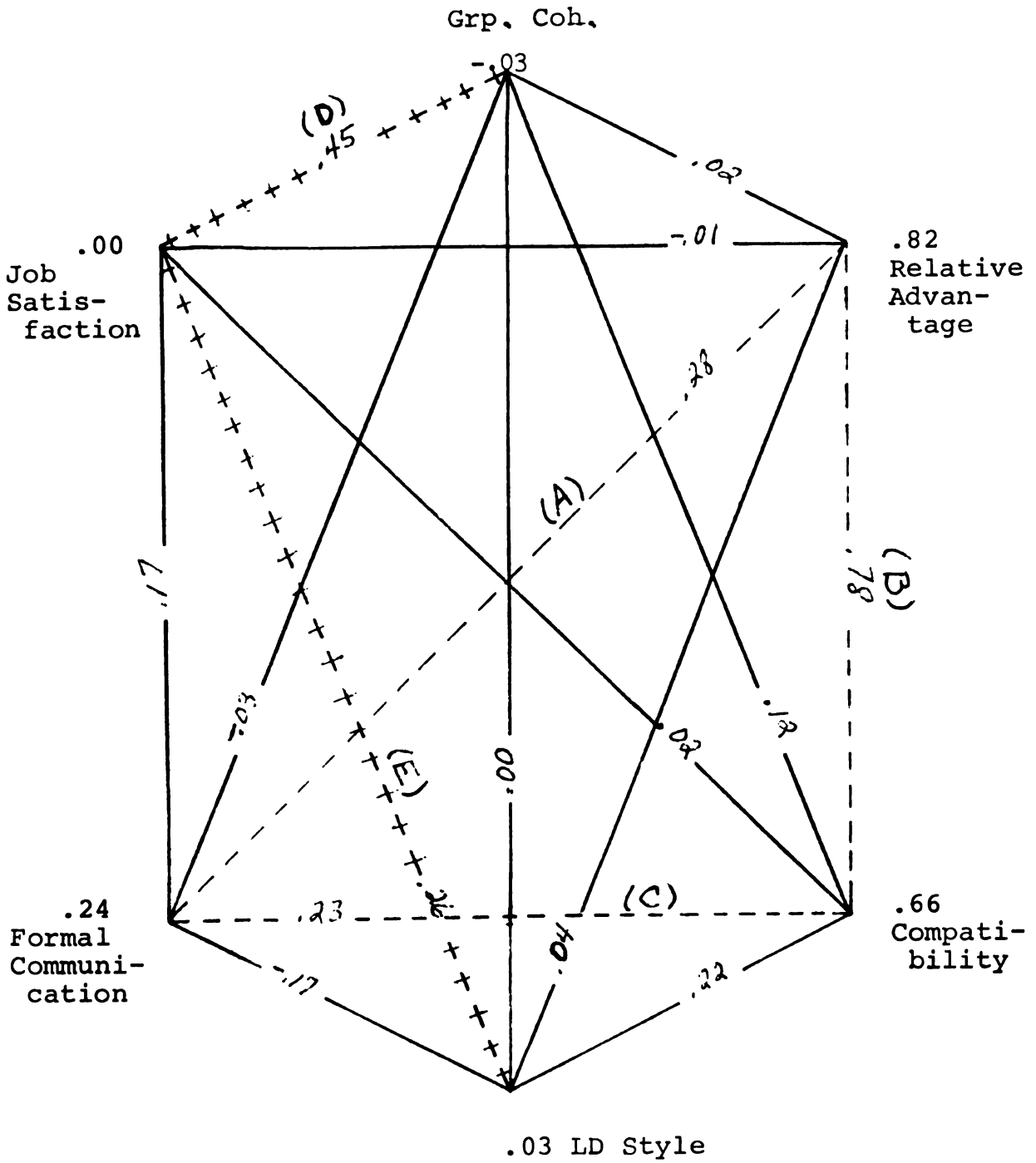
This fact suggests that compatibility was not a completely independent variable. Its early deletion in the regression equation will explain this factor more thoroughly. Despite its lack of independence, however, the response to specific items of this variable made several value perceptions quite clear. On the negative side, 49 per cent of the faculty anticipated a reduction in the strength of individual academic disciplines, 44 per cent anticipated lowering of teaching and academic standards, and 45 per cent predicted an erosion of departmental autonomy as a result of the new program. On the positive side, 46 per cent anticipated additional support for the value of teaching in the college, and 63 per cent predicted a new and valuable interaction with students. Once again, while the actual consequences of this program may not produce such results, the faculty have distinct perceptions in this regard.

The third hypothesis supported was the positive relationship between formal communications and internalization. While this independent variable was the weakest of the three obtaining statistical significance, it gave support to the communications model in the diffusion process. One example of this communications model is the two-step flow theory (37) where the innovation is communicated to some individual or representative of the adoption unit and then to this unit's members for either

adoption or rejection. In this case, the department chairmen were the initial recipients and the departmental faculty the secondary receivers. As evidenced by the responses to the specific question on discussion at the departmental level, this linkage was indeed weak. Forty-eight per cent of the faculty, for example, responded that the new curriculum was either "not often" or "never" discussed at their departmental level. It was also evident from this study that the communications output with respect to this program was not increased. Sixty-eight per cent of the faculty saw no change in the amount of information received, while over 17 per cent felt they received even less information than usual. And, finally, of the information communicated about the program there were still apparent difficulties. Over 45 per cent of the faculty felt that they had received only "some of" or "only a little bit of" the information available.

As was the case with compatibility, formal communications also exhibited significant relationships with the independent variable of relative advantage. A graphic representation of these and all the relationships between all variables is demonstrated by Figure 2.

As evidenced by the dotted lines marked (A-B-C), the three variables (relative advantage, compatibility, and formal communications) that correlated significantly with the dependent variable also correlated significantly



---A, B, C, Indicate correlations significant at .05 level with variables significantly correlated with internalization.

+++D, E Indicate correlations significant at .05 level with variables not significantly correlated with internalization.

Figure 2.--Graphic representation of relationships between all variables.

and positively with each other. The critical relationship (0.78) is that between relative advantage and compatibility. While the nature of the questions would suggest such a relationship, this fact does not reduce the need to design variables with greater independence and construct validity.

One other set of relationships portrayed by Figure 2 relates to the independent variables of job satisfaction, group cohesiveness, and department chairman leadership styles. While none of the hypotheses involving these variables was confirmed, their interrelationships were quite apparent. The dotted lines labeled (D-E) show a significant correlation between both group cohesiveness and job satisfaction and department chairmen leadership style and job satisfaction.

Some assistance in understanding this relationship is provided by the descriptive data. The lack of relationship between internalization and leadership styles of department chairmen is better understood by the lack of variance in this independent variable. The mean for each question was calculated, for instance, with only one of the sixteen questions having a mean above 3.0 on a 4.0 point scale. In terms of actual concepts, these results displayed bureaucratic (1) and autocratic (2) styles as predominant in the college. The

idiocratic (3) style was evident in only one situation, with the democratic (4) style absent on a college-wide basis.

In relating these results to job satisfaction, the descriptive data shows similar results. On the question pertaining to the degree of satisfaction, each faculty member felt with faculty-department chairman relationships, 23 per cent were only "somewhat satisfied," while 16 per cent were "not satisfied." An even stronger response was evidenced on the question related to how the department chairman handles his job. Twenty-eight per cent were only "somewhat satisfied," while 20 per cent were "not satisfied." These results are especially significant since four of the five response choices were positive and only one negative.

Thus, there existed a definite style of leadership in the College. And, such behavior was a specific segment of faculty job satisfaction. These relationships suggest that a research design involving social system variables must investigate more complex relationships than simple correlations. Leadership styles, for example, might require that the faculties' perceptions of leadership styles be combined with their approval of such behavior. A study by French and Hill (33) found that in departments where faculty reported relatively greater power for the chairman, the faculty satisfaction

and productivity were also relatively higher. Bachman (3) also reported that satisfaction measures correlated positively and significantly with the use of expert power and referent power, but negatively with reward power and coercive power.

What seems to be important is that faculty satisfaction does not decrease under conditions of power if such power is based upon actions which are considered appropriate by those who must provide compliance. As Dressel concluded:

> The implications of these two studies are that satisfaction is not based on pure autonomy and lack of structure. An assumption frequently found in the literature is that faculty resent hierarchic influence over their actions. Research thus far does not confirm this assumption. (19, pp. 247-48)

Such controversy over the exact impact of leadership style suggests that such a variable by itself is inadequate for predicting internalization, but an important variable relating to job satisfaction.

Similar inferences can be made in terms of group cohesiveness as a social system variable. In a decentralized structure like an academic department, the primary group influence may be related to other secondary variables. Seashore (67) found, for instance, that when a member's feeling of security in the organization was high, group cohesiveness and productivity were positively correlated. Lin (46) explored this same

interaction between group cohesiveness and security in relation to internalization. From this present study it appears that the interaction between job satisfaction and group cohesiveness would have to be considered in relationship to internalization.

In summary, three hypotheses were supported at the 0.05 level of significance and three were not supported by the data. In addition, the lack of independence between the variables suggests that more complex relationships were involved. This complex nature of social system variables will be more precisely described in the following explanation of the multiple regression analysis.

Multiple Regression Analysis

A second purpose of this analysis is to determine the relative potency of each independent variable in explaining the variance in degrees of internalization. To accomplish this, the "least squares delete" routine was employed. In the deletion process, an initial least squares equation is obtained using all of the independent variables. One variable is then deleted from the equation and a new least squares equation estimated. A second variable is deleted and the least squares equation is recalculated. This procedure of stepwise deletion of variables continues until a variable selected as a candidate for deletion meets the predetermined stopping

criterion. Table 4-3 below presents the multiple correlation (R^2) which would be obtained if X_i were deleted from the Least Squares Equation and the equation were recalculated.

TABLE 4-3.--Multiple correlation obtained from Least Squares Delete Equation

Variable	R^2
Group Cohesiveness	0.6734
Relative Advantage	0.4601
Compatibility	0.6776
Leadership Style	0.6790
Formal Communications	0.6790
Job Satisfaction	0.6767

The beginning estimate of explained variance was 0.6790. This result meant that the amount of variance explained by all the independent variables collectively was approximately 68 per cent of the total variance in the dependent variable. While there is no absolute criterion available to evaluate this percentage, the results of other similar research represented previously by Table 4-1 suggests a high degree of success. In view of this estimate only the deletion of relative advantage has any significant effect upon the total explained variance. In fact, this one variable plus any one other variable explain the total variance in the dependent variable. The potency of this variable is thus congruent

with its 0.82 correlation with internalization as explained in the previous section.

The above summary, however, does not mean that all the other variables are equally potent in the regression equation. Table 4-4, for instance, shows the significance and order of deletion of each of the variables and their simple correlation coefficients.

TABLE 4-4.--Variable significance, order of deletion, and simple correlations

Variable	Significance	Correlation
Leadership Style	.9820	.03
Formal Communications	.9810	.24[a]
Compatibility	.5880	.65[a]
Job Satisfaction	.4880	.01
Group Cohesiveness	.2820	-.03
Relative Advantage	<.0005	.82[a]

[a]Significant at .05 level

The significance column on the above table refers to the least likeliest variable to discriminate between levels of the dependent variable. While all but relative advantage were candidates for deletion, leadership styles was clearly the prime candidate.

Also evident from this table is the effect that lack of independence among variables has in the regression equation. While one might have expected leadership style to be deleted early due to its insignificant correlation

with internalization, the next two variables were not quite so obvious. Both formal communications and compatibility were significantly correlated with internalization. As mentioned earlier, however, these variables along with relative advantage were also highly correlated with each other. The effects of this interrelationship are exposed by this analysis. Thus, while compatibility and formal communications explained part of the variance, they were repetitious of much of the variance explained by relative advantage.

One other set of hypotheses tested by the multiple regression analysis was the null hypotheses, H_o, that variable X_i can account for none of the variation in the dependent variable (above that accounted for by the remainder of the independent variables and the overall mean of the dependent variable) against the alternative, H_1, that X_i can account for variation in the dependent variable (above that accounted for by the remainder of the independent variables and the overall mean of the dependent variable).

Table 4-5 shows that the null hypothesis was not supported in all cases. Stated statistically, the sum of the squared deviations from the mean of the dependent variable was accounted for by the independent variables. This finding again supports the complex nature of the variables studied. While certain variables were not

TABLE 4-5.--Analysis of variance summary

AOV	SS	df	MS	F	P
Beginning Estimate					
Regression	1533.70	6	255.62	23.98	< .0005
Error	724.96	68	10.66		
Total	2258.67	74			
x(5) Leadership Style Deleted					
Regression	1533.70	5	306.74	29.19	< .0005
Error	724.97	69	10.50		
Total	2258.67	74			
x(5)/x(6) Formal Communications Deleted					
Regression	1533.70	4	383.42	37.02	< .0005
Error	724.98	70	10.36		
Total	2258.67	74			
x(5), x(6)/x(4) Compatibility Deleted					
Regression	1530.10	3	510.03	49.70	< .0005
Error	728.56	71	10.26		
Total	2258.67	74			
x(5), x(6), x(4)/x(7) Job Satisfaction Deleted					
Regression	1524.73	2	762.36	74.79	< .005
Error	733.94	72	10.19		
Total	2258.67	74			
x(5), x(6), x(4), x(7)/x(2) Group Cohesiveness Deleted					
Regression	1518.37	1	1518.37	149.73	< .0005
Error	740.29	73	10.14		
Total	2258.67	74			

highly correlated with the dependent variable directly, they were important when combined with other variables in the regression analysis.

In summary, the multiple regression analysis determined that 0.68 of the total variance in the dependent or criterion variable was explained by the six independent or predictor variables. Once more, the analysis revealed that relative advantage was the most potent predictor accounting for approximately 0.22 of the total explained variance. A third and related finding was that relative advantage plus any one other variable could explain the 0.68 variance in the dependent variable. This equality among the remaining variables did not infer an insignificant role for these variables. When the F-test analysis was completed, each null hypothesis was unconfirmed. The other independent variables were significant in explaining the variance in the dependent variable, but only in combination with the other variables in the regression equation.

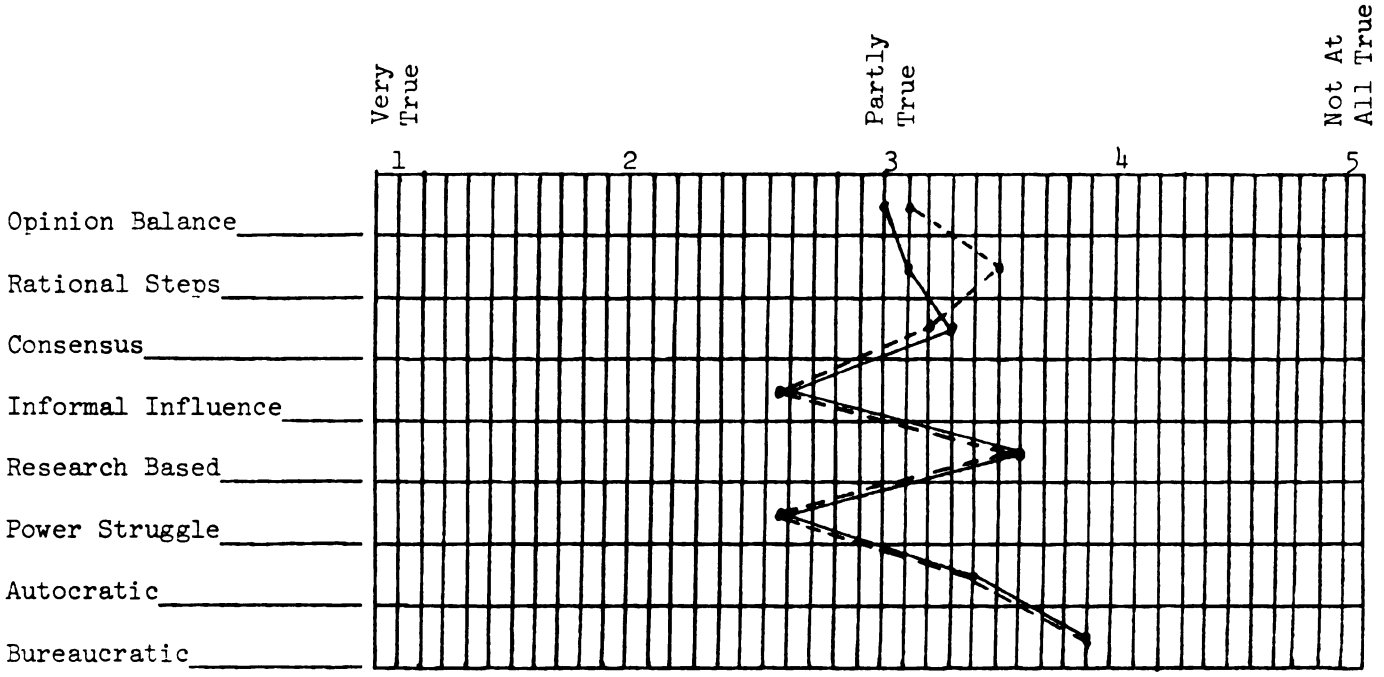
The third segment of this analysis applies to the decision-making styles in the college and the presentation of other descriptive statistics not reported in the test of hypotheses and multiple regression analysis. Since this segment has direct relevance for the implementation phase of the new curriculum, specific inferences rather than generalizations will be made.

Decision-Making Styles

One final research concern not incorporated into the research hypotheses focused on decision-making styles in general and with specific reference to the new curriculum. The efforts in this regard were basically exploratory in attempting to operationalize the broad nature of decision-making as a concept.

The most obvious result of this investigation was that the decision to implement the new curriculum paralleled decisions in general with regard to style or approach. There was some slight evidence of variance with regard to a "rational steps" approach. Both mean responses, however, were on the negative side of the continuum. Figure 3 represents the total findings in this regard.

While these results were unable to isolate any significant difference in approaches, specific styles were apparent within the College. The most noticeable trends were the relatively high rankings given "informal influence" and "power struggle" styles and the lack of predominance of the "research based," "autocratic," and "bureaucratic" styles. Since no effort was made to obtain faculty approval of the various styles, no definite qualitative judgments are possible. It was apparent, however, from the job satisfaction scale (57 per cent of the faculty were either only "somewhat



_____ Decision Pertaining to New Curriculum

--------- Decisions in General

Figure 3.--Decision styles in general and with reference to new curriculum--mean responses

satisfied" or "not satisfied" with the way changes were handled) that the predominance of the "power struggle" and "informal influence" approaches were not totally acceptable. Tables 4-6 and 4-7 present the percentage distributions of each of the eight styles. It is evident from these results that participative decision-making is not the model presently operating in the College of Engineering.

The results of this research suggest that a deficiency in the decision-making process has been uncovered. Without relating these findings to the dependent variable of internalization, however, it is difficult to interpret the exact impact of such decision styles. Gross (27), for instance, concluded:

> In summary, our review of the literature reveals the use of change agents and participation are generally believed to be strategic with respect to the successful initiation of change proposals, and that it is assumed that a strategy of initiation involving a change agent and subordinate participation typically leads to the successful implementation of innovations. However, there is a paucity of research evidence to support either of these propositions. There is even less evidence to support the propositions that participation is positively related to variables such as the clarity of an innovation, the morale of the staff, and its commitment to an innovation and these variables are positively associated with implementation. (27, p. 29)

Such a viewpoint suggests that the logical extension of the present research effort would be to relate the

TABLE 4-6.--How College of Engineering decisions are made: Decision styles pertaining to new curriculum (percentage distribution)

	Very True (1)	(2)	Partly True (3)	(4)	Not at All True (5)	Total	Mean Response
	%	%	%	%	%	%	
Opinion Balance:	1	22	57	16	4	100	2.99
Rational Steps:	4	28	32	23	13	100	3.13
Consensus-Compromise:	1	15	44	32	8	100	3.31
Informal Influence:	12	39	32	9	8	100	2.62
Research Based:	0	15	41	28	16	100	3.45
Power Struggle:	21	33	22	12	12	100	2.60
Autocratic:	7	12	28	41	12	100	3.40
Bureaucratic:	3	7	23	36	31	100	3.88

TABLE 4-7.--How College of Engineering decisions are made: Decision styles in general (percentage distribution)

	Very True (1)	(2)	Partly True (3)	(4)	Not at All True (5)	Total	Mean Response
	%	%	%	%	%	%	
Opinion Balance:	0	22	47	27	4	100	3.12
Rational Steps:	3	12	37	29	19	100	3.49
Consensus-Compromise:	0	19	45	29	7	100	3.24
Informal Influence:	16	31	37	13	3	100	2.56
Research Based:	0	11	36	36	17	100	3.60
Power Struggle:	19	35	25	13	8	100	2.57
Autocratic:	4	13	37	31	15	100	3.44
Bureaucratic:	3	7	21	37	32	100	3.89

various styles to the dependent variable. The operationalized decision-making styles should be of great assistance in this regard.

Summary

The test of hypotheses was confirmed with reference to three specific relationships. The relationships between relative advantage, compatibility, formal communications, and the dependent variable of internalization were all positive and significant at the .05 level of significance. The variables involved in these relationships, however, displayed a high degree of interrelationships and signified a lack of total independence among the variables.

While the variables of group cohesiveness, job satisfaction, and department chairmen leadership styles exhibited no significant relationship with internalization, their potency as social system variables was quite pronounced. The positive and significant relationships between group cohesiveness, leadership styles and job satisfaction revealed the complex nature of social system variables and the need to go beyond simple correlation designs.

In terms of the multiple regression analysis, a substantial portion of the total variance in the dependent variable was identified. And, out of the 68 per cent of variance explained, the variable of relative

advantage proved to be the most potent. It was further developed that relative advantage plus any one other variable could explain the 68 per cent of the variance identified.

The potency of relative advantage, however, did not detract from the significance of the other independent variables in the regression analysis. When the null hypothesis, H_o, that each variable accounted for none of the variation in the dependent variable (above that accounted for by the remainder of the independent variables and the overall mean of the dependent variable) was tested, it was unsupported with regard to each variable. Such results again exposed the complex nature of the social system variables involved and supported the multiple regression analysis approach for examining relationships between variables.

And, finally, decision styles were explored in an effort to more specifically detail the decision-making process. The results proved the general styles of the College and the decision styles involving the new curriculum to be quite congruent. Further analysis, however, revealed two dominant styles. On both the decision scales, "power struggle" and "informal influence" styles dominated. While no evaluative judgments were possible with regard to internalization, a lack of participative decision-making was evident.

The analysis, thus, gave substantial support to a research effort designed for analyzing the social system in the diffusion process. The impact of this approach for future research and a total overview of the study are presented in the final chapter.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

In this chapter, a general summary will be presented to include the problem under study, a description of the population, methodology, and major findings. Based upon the major findings, some conclusions will be presented. And, finally, implications for future research and educational practice will be stated.

Summary

While curriculum changes are either being accomplished or strongly advocated in most academic disciplines, the need for revisions in engineering education has been especially acute. Declining enrollments, irreversible attrition patterns, and negative attitudes toward engineering technology have all served to focus attention on nontraditional approaches to engineering education.

One response to this educational void was the design of a new engineering curriculum at Michigan State University. This program, the Bachelor of Arts in

Engineering, was developed to bridge the gap, so popularized by C. P. Snow, between technology and society. The product would be a new technologist aware of science and its applications in nontechnical areas, and qualified to function in vocations such as managers, political advisors, and technical writers for business and industry.

Although this program was new, it was designed to co-exist with the traditional engineering programs at Michigan State already in existence. Such an approach would require the use of existing resources and incorporate the present teaching faculty as joint instructors in the two programs.

Thus, the question at the time of the research study centered on the attitudes of the faculty toward this program prior to its actual implementation. Specifically, the primary purpose was to measure the degree to which engineering faculty internalized the proposed curriculum innovation--the Bachelor of Arts in Engineering.

This initial purpose resulted in the exploration of relationships between internalization and six other independent variables. The attempt was to explain any variability in the degree of internalization by analyzing the variables of relative advantage and compatibility of the innovation, formal communications, group

cohesiveness, leadership styles of department chairmen, and job satisfaction as predictors of internalization.

Consistent with the communications and diffusion models used to study innovations, the focus of this research was clearly on faculty perceptions of the issues in an effort to emphasize the receiver and social system variables in the adoption process.

One of the basic assumptions underlying this approach was that the diffusion and adoption of innovations within a social system required a different approach than that used in individual adoption studies.

The basic diffusion model utilized by Rogers (63), for instance, terminated with the adoption phase. An individual's use of a product or new practice was a result of a multi-phased process, culminating in voluntary decision. Within an organization, however, adoption is often not an individual or voluntary decision with actual adoption representing only formal compliance rather than actual acceptance.

With respect to this latter point, the concept of internalization was utilized to determine the faculties' attitudes toward the new curriculum. The concept of internalization used in this study was originally developed by Kelman (39) and studied by Lin (46) as the extent to which a member perceives an innovation or change as relevant and valuable to his role performance in the organization.

It was assumed, in this regard, that even though an organization adopted an innovation, it was erroneous to conclude that each individual within the organization would demonstrate the same level of acceptance. The central or determining factors of such acceptance were referred to as system effects which acted to impede or facilitate the rate of diffusion and adoption.

In order to provide a theoretical base for examining such system effects, it was found that an interdisciplinary combination of findings from diffusion and social system research represented the most fertile base upon which to draw supportive evidence. Ample research was found which strongly supported the theory that the social structure of an organization establishes the parameters within which innovations diffuse. Thus, the norms, social statuses, and hierarchial arrangements of the social system were examined for their influence on the innovative-decision process of the individual system members.

To study the exact impact of such system effects upon the level of internalization, seven scales were constructed to measure the criterion of internalization, and the predictor or independent variables of relative advantage, compatibility, job satisfaction, formal communications, group cohesiveness, and leadership styles of department chairman.

Since most of these scales were not adapted from diffusion studies focusing on higher education, careful development of specific items was required. To facilitate this scale development, a pilot study was conducted among randomly selected faculty in the College. The central purpose of this pretest phase was the development of high content validity scales. The method of Reciprocal Averages (RAVE) was used for this purpose and guided the development of the final instrument.

The population studied was the full-time faculty in the College of Engineering at Michigan State University. The total number of faculty qualifying was ninety. Deliberately excluded were all administrators, the committee members who designed the new curriculum, and the seven respondents on the pretest.

The major reason for selecting this population was the research advantage it presented. Since the new curriculum was not implemented at the time of the study, faculty perceptions of the innovation were necessarily isolated from any experience with the new program. This feature permitted study of a specific phase of the innovation-decision process in a field-study context.

A second reason for selecting this population was the critical nature of such a curriculum innovation. Declining enrollments and negative attitudes toward technology are features of engineering education effecting

all such colleges. A successful implementation of the new curriculum could thus represent a prototype for other engineering schools.

Research methodology in this study was broadly defined. It included the decisions made with regard to design, operationalization of variables, data collection and processing, and analysis. In a broad sense, the research method was the complete operationalization process of the conceptual or theoretical scheme.

The basic treatment of the data was accomplished by a multiple regression analysis. This particular technique facilitated the testing of six directional hypotheses in addition to determining the relative potency of each independent variable in the regression equation. This approach also facilitated the identification of complex relationships between variables and their combined impact upon the dependent variable. This latter attribute proved to be especially helpful in approaching the social system as the unit of analysis.

The results of this study confirmed the three directional hypotheses involving relationships between the criterion of internalization and the three independent variables of relative advantage, compatibility, and formal communications. The specific hypotheses confirmed were:

Hypothesis 1:

The greater the degree of relative advantage of the innovation, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 2:

The greater the degree of compatibility of the innovation with faculty values, as perceived by the faculty member, the more likely he is to internally accept the innovation.

Hypothesis 5:

The greater the level of formal communications concerning the innovations, as perceived by faculty, the more likely he is to internally accept the innovation.

While the other three directional hypotheses were not significant at the .05 level, an analysis of the correlation matrix revealed significant relationships between job satisfaction and the variables of group cohesiveness and leadership styles. It was this set of relationships that emphasized the need for a design incorporating more complex relationships than the simple correlations involved in this study.

With reference to the multiple regression analysis .68 of the variance in the dependent variable of internalization was explained by the six independent variables utilized. It was further discovered that the variable of relative advantage was the most potent variable in the regression equation. In fact, this

one variable combined with any other single variable could account for the .68 of the variance identified.

One final area of discovery involved decision-making styles in the College of Engineering. When Havelock's (28) decision-making styles in general were compared with decision-making styles with reference to the new curriculum, very little discrepancy was revealed. What was evident, however, was the predominance of "power struggle" and "informal influence" styles of decision-making. Since no hypotheses were purported with respect to these styles, no specific relationships between decision-making and internalization were describable. It was clear, however, that participative decision-making models were not operative in this specific organizational context.

Conclusions

Based upon an analysis of the data collected to test the hypotheses and problems of this study, several major conclusions can be presented.

The central concept and criterion variable of this study was that of internalization. This concept was developed by Kelman (39) and placed major emphasis on the individual and his reaction to some kind of persuasive or change attempt. The research supporting this concept was conducted under controlled conditions and focused on the individual's predispositions to

change. This research, however, presents only a partial picture of the change process. Individuals change their attitudes or resist change not only on the basis of their own psychological characteristics but, also, on how these characteristics relate to the change agent's relationship to them and how the change agent attempts to influence them.

This latter focus relates directly to the organizational change process where adoption decisions are not isolated choices, but the result of a myriad set of complex relationships. The change agent's relationship with the potential adopter is not a direct and reciprocal one. There are a series of filters (system effects) which translate the change message and determine the form of the innovation the adopter receives and ultimately acts upon.

The attempt of this research was to extend the concept of internalization from the individual and psychological context to the corporate and structural context of an educational institution. The strategy involved was that since neither the "control-compliance" or "attraction-identification" processes where adequate to identify an individual's private attitudes toward an innovation, the process of internalization provided the most direct knowledge utilization strategy.

The results of this study provided support for the use of this attitude concept in the organizational context. An investigation of how change is introduced into a system, how the members of the system react to the change, and the perceived consequences of the change are necessary, if not sufficient, ingredients in understanding the process of institutional change. Such an investigation is particularly important where the individual adopter makes the final decision in support of the innovation. While the organization must make the initial decision to adopt the innovation or at least to tolerate its use within the organization, the individual in a contingent innovation model, makes the ultimate choice concerning the innovation. The organizational decision enables the individual to adopt, but the private attitudes of the individual are the prevailing forces.

The concept of internalization provides an encouraging approach to predicting individual adoption where compliant behavior is not required. As internalization requires neither the manipulation of organizational rewards or punishments nor the presence of strong source-adopter identification, it reflects the greatest congruence between organizational goals and member beliefs and attitudes. The degree to which this level of internalization is present and identifiable it represents a positive requisite for planned organizational change.

The specific findings of this study identified substantial variance in the level of internalization among engineering faculty. And, by relating specific independent variables to such variance, the nature of internalization relevant to the proposed innovation was revealed. Based on this general finding and the specific conclusions drawn in the analysis of results phase, it is considered possible to justify the following implications:

1. The concept of internalization is relevant in the organizational context in measuring the congruence between individual and institutional goals.
2. The concept of internalization relates to more than just the private attitudes of the individual. It also represents the impact of the change process as filtered through the organizational system.
3. When the individual is the functional unit of adoption, the level of internalization provides predictive input in planning for the implementation phase of the organizational change.
4. The hypotheses confirmed lend support to the theory that individual perceptions rather than objective validity of innovations are the most

critical. Since much more than the innovation is at stake, threats to the individual, to vested interests, and to the established social structure are natural components of resistance.

With reference to this latter statement, however, a caution established in the introduction bears repeating. While it is easy to adopt a stance which implies that "change is good--resistance is bad," such resistance may be a carefully thought-out position. As Mann and Neff concluded,

> A potential receiver's reactions to a proposed innovation are a function of matters such as the amount of control he has over his own destiny, how ambiguous he sees the situation ahead to be, and how much trust he places in local authority figures. The user then engages in "search behavior" to assess the likely net consequences of adopting the innovation. A good deal of ambivalence can be expected; this serves as personal and organizational defense. (52, p. 157)

And, as Klein suggests,

> Just as individuals have their defenses to ward off threat, maintain integrity, and protect themselves against the unwarranted intrusions of others' demands, so do social systems seek ways in which to defend themselves against ill-considered and overly precipitous innovations. (41, p. 30)

The identification of resistance must thus be separated from any inherent qualitative judgments concerning such resistance. The faculty perceptions of the negative consequences of the innovation may be accurate assessments.

Another general conclusion drawn from this study is that research focusing on the social system as the unit of analysis deserves greater attention. Although the hypothesis relating formal communications to internalization was the only one confirmed, the descriptive data and multiple regression analysis supported the potency of such an approach. What is needed is the refinement through factor analysis of each of the variables to produce more reliable and valid scales. Such scales would also assist with the development of more complex hypotheses required for analyzing social system variables.

A further conclusion supported by the research was the need to separate internalization from adoption within an organization. Even though the organization had made the adoption decision with reference to the new curriculum, individual faculty attitudes were obviously not congruent. This is especially true where individual adopters make contingent decisions concerning the innovation.

A final conclusion evident from the data is the possibility of operationalizing decision-making styles. Participative decision-making, while supported as a concept, often lacks research-based support. The major deficiency has been the somewhat ambiguous definition of decision-making applied. Participative decision-making at times implies extensive influence while at

other times casual involvement is enough. It is also often assumed that the participative style is the most preferable. By operationalizing various styles, faculty preferences could be quantified and ultimately related to the dependent variable of internalization.

Recommendations for Further Research

The most apparent need in this regard is to design longitudinal studies of this nature. While statistical significance of hypotheses is an encouraging result of such research, the actual behavior of these respondents is not known. Separating attitudes from actual behavior serves one research goal, but emphasizes the need to gather similar data following actual implementation of the program.

A second research need is to construct scales with greater independence. One of the major limitations of this study was the relatively small size of the population. This factor prohibited extensive pretesting and the examination of interrelationships between variables. The impact on this study was repetitious explanations of the same variance in the dependent variable.

It was also apparent from this study that not enough is known about the process of internalization. This was only the second study to examine this variable, requiring the scale to be developed with little empirical

evidence as a base. Greater attention to the construct validity of this concept would greatly facilitate future research. More knowledge about internalization as a concept would also assist in the development of additional and more specific hypotheses.

A final research need is a more thorough understanding of system effects, especially within educational institutions. Since very few innovation research studies have studied the social system as the unit of adoption, precise organizational variables have yet to be defined. What this study supported was the position that innovation is not composed of a single variable or a small number of related variables, but is far more complex. Such complexity requires more involved hypotheses and more discriminating analysis.

Implications for Educational Practice

Since the research context for this study was an actual field situation, the results have direct implications for those whose responsibility it is to implement the program. While a separate report was submitted for this purpose, several implications deserve attention.

The decision to implement this new curriculum was an optional-contingent decision. Specifically, even though the college approved the new program,

individual faculty will participate on a voluntary basis. Thus, in terms of developing a strategy for implementation, the degree of internalization prevailing within the College is critical. The most concern expressed pertaining to this variable was the faculty's uncertainty over whether sufficient alternatives to the new program had been considered, and a relatively low desire to participate directly in the teaching functions of the new program. While 100 per cent participation is not required for successful implementation, this latter factor suggests that numerous faculty are yet to be convinced about the relative merits of their participation.

In attempting to understand such reservations, the relative advantage and compatibility scales were quite instructive. As analyzed in the previous chapter, faculty anticipate a specific impact from the new program. If the administration of the College seeks maximum participation, the reservations expressed by these scales must be addressed. Any implementation strategy that ignores the reality of such a situation encourages continued reservations about the program.

In a more general sense, the implications of these findings accent the need to incorporate existing diffusion research into studies of organizational change. If barriers or facilitators to implementation are to be understood, more rigorous and systematic analyses of

organizations undergoing change must be accomplished. The subjective reports of a change experience by practitioners must yield to the generation and testing of hypotheses from supportive research and theory.

Gross (27, p. 38) supports such a position by stressing the process rather than product nature of implementation. Even if initial resistance could be assumed, such a position ignores three possible and subsequent conditions. The first condition is that organizational members who are not resistant to change may encounter a number of obstacles in their efforts to implement an innovation. A second is that members of an organization depend upon the formal leadership to assist in overcoming such obstacles, and such assistance may or may not materialize. And, a third condition is that members initially favorable to organizational change may later develop a negative attitude to an innovation as a consequence of the frustrations they experience in attempting to implement the change.

While all or none of these conditions may be operative in a specific situation, they serve to challenge the position that members of an organization are initially resistant to change and that it is the ability of management to overcome such resistance that accounts for the success or failure of the innovation. Such a position

ignores the dynamic and continuing nature of the change process and the effects of organization variables on individual decisions.

Thus, designing the actual change is only one facet of the change process. As was the situation in this present research, often only relatively few members actively participate in the planning of the innovation. Such change agents must, therefore, give deliberate attention to how they plan to integrate the innovation into the on-going system with minimal disruption. This is not an automatic process and involves the identification of those elements in the system which are directly involved and those only peripherally involved in the change. The challenge is to make the innovation an integral part of and contribute to the effectiveness of the operating system.

In Retrospect

The original thrust of this research was to combine an exploratory approach with one testing predicted relationships. The effort was not only to describe a particular change situation, but to analyze it.

As the study developed, however, it became apparent that there existed a paucity of comparable research. This factor placed some obvious restrictions on the development of hypotheses from an established

research base, and required a research methodology adapted from several research sources outside the context of higher education.

As a result of such methodological constraints, the study emphasized more of an exploratory than an hypotheses-testing approach. While directional hypotheses were developed and tested, only simple correlations were examined. The multiple regression analysis was used to supplement the design in an attempt to explore the relative potency and pertinence of the variables selected for study.

Such an approach proved legitimate and supported the strength of the variables selected as predictors. The results compared well with other social science research findings and suggested some general directions for future research.

The burden now rests with such future research. It is hoped that this study will act as a stimulus for continued analysis and more critical examination of the educational institution as a distinct context for the diffusion and adoption of innovations.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Anderson, Lester G. Education for the Professions. Sixty-first NSSE Yearbook, Part II. Chicago, Illinois, 1962.

2. Argyris, Chris. Interpersonal Competence and Organizational Effectiveness. Homewood, Ill.: I-Dorsey, 1962.

3. Bachman, Gerald; Bowers, David; and Marcus, Philip M. "Basis of Supervisory Power." Control in Organizations. Edited by A. Tannenbaum. New York: McGraw-Hill, 1968.

4. Barnard, Chester I. The Functions of the Executive. Cambridge, Mass.: Harvard University Press, 1938.

5. Barnett, Homer G. "The Acceptance and Rejection of Change." Explorations in Social Change. Edited by George K. Zollschan and Walter Hersch. Boston: Houghton and Mifflin Company, 1964.

6. Bennis, Warren G.; Benne, Kenneth I.; and Chin, Robert. The Planning of Change. New York: Holt, Rinehart and Winston, Inc., 1969.

7. Bowers, David, and Seashore, Stanley. "Predicting Organizational Effectiveness With a Four-Factor Theory of Leadership." Administrative Science Quarterly, 1966, pp. 238-63.

8. Brickell, Henry M. "The Local School System and Change." Perspectives on Educational Change. Edited by Miller. New York: Appleton-Century-Crofts, 1966.

9. Carlson, Richard O. "Summary and Critique of Educational Diffusion Research." Paper presented at The National Conference on the Diffusion of Educational Ideas, East Lansing, Michigan, 1968.

10. Carlson, Richard O. Adoption of Educational Innovations. Eugene, Oregon: University of Oregon, 1965.

11. _____. "School Superintendents and Adoption of Modern Math: A Social Structure Profile." Innovation in Education. Edited by Matthew Miles. New York: Bureau of Publications, Teachers College, Columbia University, 1964.

12. Clark, David L., and Hopkins, John E. "Roles for Research, Development, and Diffusion: Personnel in Education: Project Memo #1--A Logical Structure for Viewing Research, Development and Diffusion Roles in Education." CRP Project No. X-022, April, 1966.

13. Clark, David L., and Guba, Egon C. "An Examination of Potential Change Roles in Education." Paper presented at the Symposium on Innovation in Planning School Curricula, Curlie House, Virginia, October, 1965.

14. Coch, Lester, and French, John R. P., Jr. "Overcoming Resistance to Change." Human Relations, I (1948), 512-32.

15. Coleman, James S.; Katz, Elihu; and Menzel, Herbert. Medical Innovation: A Diffusion Study. New York: Bobbs-Merrill, 1966.

16. Davis, Richard H. "Personal and Organizational Variables Related to the Adoption of Educational Innovations in a Liberal Arts College." Unpublished Ph.D. dissertation, University of Chicago, 1965.

17. Downee, N. M., and Heath, R. W. Basic Statistical Methods. New York: Harper & Row, Publishers, 1959.

18. Dressel, Paul L.; Johnson, Craig F.; and Marcus, Philip M. The Confidence Crisis. San Francisco: Jossey-Bass Inc., 1970.

19. Dressel, Paul L. College and University Curriculum. Berkeley, Calif.: McCutchan Publishing Corporation, 1968.

20. Eibler, Herbert John. "A Comparison of the Relationships Between Certain Aspects or Characteristics of the Structure of the High School Faculty and the Amount of Curriculum Innovation." Unpublished Ph.D. dissertation, University of Michigan, 1965.

21. Eicholtz, G., and Rogers, E. "Resistance to the Adoption of Audio-Visual Aids by Elementary School Teachers: Contrasts and Similarities to Agricultural Innovation." Innovation in Education. Edited by Matthew B. Miles. New York: Bureau of Publications, Teachers College, Columbia University, New York, 1964.

22. Evans, Richard D. Resistance to Innovation in Higher Education. San Francisco: Jossey-Bass, Inc., 1968.

23. Festinger, Leon. A Theory of Cognitive Dissonance. Evanston, Ill.: Row, Peterson, and Co., 1957.

24. _____; Schachter, Stanley; and Back, Kevin. Social Pressures in Informal Groups. New York: Harper, 1950.

25. Fliegel, Frederick C., and Kivlin, Joseph E. "Farm Practice Attributes and Adoption Rates." Social Forces, XL, No. 4 (1962), 364-68.

26. Griffiths, Daniel E. "Administrative Theory and Change in Organizations." Innovation in Education. Edited by Matthew B. Miles. New York: Bureau of Publications, Teachers College, Columbia University, 1964.

27. Gross, Neal; Gracquinta, Joseph B.; and Bernstein, Marilyn. Implementing Organizational Innovations: A Sociological Analysis of Planned Educational Change. New York: Basic Books, Inc., 1971.

28. Havelock, Ronald G., and Markowitz, Elizabeth A. A National Problem-Solving System: Highway Safety Researchers and Decisionmakers. Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, Ann Arbor, May, 1971.

29. Havelock, Ronald G. Planning for Innovation Through Dissemination and Utilization of Knowledge. Institute for Social Research, The University of Michigan, Ann Arbor, 1971.

30. Hearn, Norman E. "The Where, When, and How of Trying Innovations." Phi Delta Kappan, LII, No. 6 358-61.

31. Hefferlin, J. B. Lon. Reform and Resistance. Research Report Number 7, American Association for Higher Education, 1971.

32. Herzberg, F.; Mausner, B.; Peterson, R.; and Capwell, D. Job Attitudes: Review of Research and Opinion. Pittsburg, Pa.: Psychological Services of Pittsburg, 1957.

33. Hill, Winston W., and French, Wendell L. "Perceptions of Power of Department Chairmen by Professors." Administrative Science Quarterly, II (1967), 548-74.

34. Homans, George. The Human Group. New York: Harcourt, Brace and World, Inc., 1950.

35. Jacobson, E. H., and Seashore, S. E. "Communication Practice in Complex Organizations." Journal of Social Issues, VII (1951), 28-40.

36. Jung, Charles, and Lippitt, Ronald. Utilization of Scientific Knowledge for Change in Education. CRUSK, University of Michigan, Ann Arbor, 1967.

37. Katz, Elihu. "The Two-Step Flow of Communication: An Up-to-Date Report on an Hypothesis." Public Opinion Quarterly, XXI (1957), 61-78.

38. Katz, O. "Field Studies." Research Methods in the Behavioral Sciences. Edited by L. Festinger and O. Katz. New York: The Dryden Press, 1953.

39. Kelman, Herbert C. "Compliance, Identification, and Internalization." Journal of Conflict Resolution, II (1958), 51-60.

40. Klein, Donald. "Some Notes on the Dynamics of Resistance to Change: The Defender Role." The Planning of Change. Edited by Warren G. Bennis, Kenneth D. Benne, and Robert Chin. New York: Holt, Rinehart, and Winston, Inc., 1969.

41. _____. "Some Notes on the Dynamics of Resistance." Concepts of Social Change. Edited by G. Watson. Washington, D.C.: NTL Institute for Applied Behavioral Science, 1967.

42. Levine, J., and Butler, S. "Lecture vs. Group Decision in Changing Behavior." Journal of Applied Psychology, XXLVI (1952), 29-33.

43. Lewin, Kurt. "Group Decision and Social Change." Readings in Social Psychology. Edited by Theodore M. Newcomb and Eugene L. Hartley. New York: Holt, Rinehart and Winston, 1958.

44. Lewis, Oscar. "Medicine and Politics in a Mexican Village." Health, Culture, and Community. Edited by Benjamin D. Paul. New York: Russell Sage Foundation, 1955.

45. Likert, Rensis. New Patterns of Management. New York: McGraw-Hill, 1961.

46. Lin, Nan. "Innovation Internalization in a Formal Organization." Unpublished Ph.D. dissertation, Michigan State University, 1966.

47. Lionberger, Herbert F. Adoption of New Ideas and Practices. Ames: Iowa State University Press, 1960.

48. Lowin, Aaron. "Participative Decision Making: A Model, Literature Critique, and Prescriptions for Research." Organizational Behavior and Human Performance, III, No. 1 (February, 1968), 68-98.

49. Luschinsky, Mildred Stroop. "Problems of Cultural Change in the Indian Village." Human Organizations, XXII, No. 1 (Spring, 1963), 66-74.

50. Mackenzie, Gordon N. "Curricular Change: Participant, Power and Processes." Innovation in Education. Edited by Matthew B. Miles. New York: Bureau of Publications, Teachers College, Columbia University, 1964.

51. Maier, N. R. F., and Hoffman, L. R. "Financial Incentives and Group Decision in Motivating Change." Journal of Social Psychology, LXIV (1964), 369-78.

52. Mann, Floyd C., and Neff, Franklin W. Managing Major Change in Organizations. Ann Arbor, Mich.: Foundation for Research on Human Behavior, 1961.

53. Mann, Floyd, and Dent, J. "The Supervisor: Member of Two Organizational Families." Harvard Business Review, XXLII, No. 6 (1954), 103-12.

54. Miles, Matthew B., ed. Innovation in Education. New York: Bureau of Publications, Teachers College, Columbia University, 1964.

55. Mort, Paul R. "Studies in Educational Innovation From the Institute of Administrative Research." Innovation in Education. Edited by Matthew B. Miles. New York: Bureau of Publications, Teachers College, Columbia University, 1964.

56. Mortimore, Frederic J. "Diffusion of Educational Innovations in the Government Secondary Schools of Thailand." Unpublished Ph.D. dissertation, Michigan State University, 1968.

57. Mosier, Charles I. "Machine Methods in Scaling by Reciprocal Averages." Proceedings, Research Forum. New York: International Business Machines Corporation, 1946.

58. Nangle, John E. "The Effectiveness of Communications in Preparation for Change in an Insurance Company." Unpublished Ph.D. dissertation, Michigan State University, 1961.

59. Nelson, C. W. "The Development and Evaluation of a Leadership Attitude Scale for Foreman." Unpublished Ph.D. dissertation, University of Chicago, 1949.

60. Niehoff, Arthur H. "Theravada Buddhism: A Vehicle for Technical Change." Human Organization, XXIII (1964), 108-12.

61. Parsons, Talcott. The Social System. New York: Free Press, 1951.

62. Pelz, Edith B. "Discussion, Decision, Commitment, and Consensus in 'Group Decision.'" Human Relations, VIII (1955), 251-74.

63. Rogers, Everett M., and Shoemaker, Floyd F. Communication of Innovations: A Cross-Cultural Approach. London: Collier-Macmillan, 1971.

64. Rogers, Everett M., and Svenning, Lynne. Managing Change. Burlingame, Calif.: OPERATION PEP, 1969.

65. Rogers, Everett M., and Stanfield, David. "Adoption and Diffusion of New Products: Emerging Generalizations and Hypotheses." Paper presented at the Conference on the Application of Sciences to Marketing Management, Purdue University, July 12-15, 1966.

66. Rogers, Everett M. Diffusion of Innovations. New York: The Free Press of Glencoe, Inc., 1962.

67. Seashore, Stanley E. Group Cohesiveness in the Industrial Work Group. Ann Arbor: Institute for Social Research, 1954.

68. Snow, C. P. "Miasma, Darkness, and Torpidity." New Statesman, XLII, No. 1587 (1961), 186.

69. Sprunger, Benjamin E. "An Investigation of the Characteristics Which Differentiate Innovative From Non-Innovative College Student Personnel Programs." Unpublished Ph.D. dissertation, Michigan State University, 1968.

70. Torgerson, Walter S. Theory and Methods of Scaling. New York: John Wiley & Sons, Inc., 1962.

71. Trow, Martin. "Survey Research and Education." Survey Research in the Social Sciences. Edited by Charles Y. Glock. New York: Russell Sage Foundation, 1967.

72. Trumbo, Donald A. "An Analysis of Attitudes Toward Change Among the Employees of an Insurance Company." Unpublished Ph.D. dissertation, Michigan State University, 1958.

73. Vroom, Victor H. Some Personality Determinants of the Effects of Participation. Englewood Cliffs, N.J.: 1961.

74. Watson, Goodwin. "Resistance to Change." Concepts for Social Change. Edited by G. Watson. Washington, D.C.: NTL Institute for Applied Behavioral Science, 1967.

75. Wilkining, Eugene A. "The Communication of Ideas on Innovation in Agriculture." Studies of Innovation and of Communication to the Public. Edited by E. Katz, et al. Stanford University, School for Communications Research, 1962.

76. Wriston, Henry M. Academic Procession. New York: Columbia University Press, 1959.

77. Zimbardo, Philip, and Ebbesen, Ebbe. Influencing Attitudes and Changing Behavior. Reading, Mass.: Addison-Wesley, 1969.

APPENDICES

APPENDIX A

A PROPOSAL FOR DEVELOPMENT OF A BACHELOR OF ARTS DEGREE IN ENGINEERING AT MICHIGAN STATE UNIVERSITY

February 17, 1971

APPENDIX A

A PROPOSAL FOR DEVELOPMENT OF A BACHELOR OF ARTS DEGREE IN ENGINEERING AT MICHIGAN STATE UNIVERSITY

1. Purpose

It is the intent of this program to provide educational opportunities for undergraduate students to develop a basic understanding of technology and apply it to a broad range of non-technical areas. The graduate would not be an engineer in the accepted sense of the word, as competence in an engineering discipline would be exchanged for a general awareness of technology and a reasonable competence in a designated application area. It is anticipated that these graduates would aid in bridging the communication gap between the technical and non-technical portions of society in vocations such as managers, political advisors, technical writers, etc. The B.A.E. degree is not designated to replace either the traditional engineer or the non-technical graduate.

2. Objectives

The B.A.E. program is designed to develop a new kind of technologist who is:

1. knowledgable of the impact of technology in society;
2. technically capable of recognizing how analytical tools are utilized in the solutions of problems;
3. aware of theoretical constraints under which new developments must work;

4. able to aid in the application of these techniques to societal problems; and

5. competent in a specific area of application.

3. Implications

The proposed B.A.E. program is indeed timely for there is evidence which suggests that some engineering colleges are expressing an interest in, but not developing a thrust toward, the establishment of undergraduate programs of this nature. The program is considered to have far reaching implications and ramifications in its operations and applications.

The program implies a new concept in engineering education, not simply a patch in the old fabric. It could serve as a model or pilot program for adoption at other engineering schools with supportive application areas. Based on preliminary discussions with some junior colleges in the State of Michigan, it would appear that the B.A.E. program would provide a viable option for a significant number of their students. Junior colleges, without the capabilities to offer regular engineering programs, could also make a significant contribution to society by development of similar programs.

The B.A.E. program requires a limited number of new courses in engineering expertise for application to several non-technical areas. These courses would provide the potential for the development of a minor in Engineering for students in many other areas of the University who do not wish to deviate from their traditional programs to

the extent required by the B.A.E.

Another implication of the B.A.E. is in the curriculum structure, for it implies the need for close cooperation among academic disciplines. The opportunity for interaction between faculty representing technical and non-technical areas is viewed as a logical outgrowth of this program.

4. Rationale

Much has been written lately about the separation of technology and society since C.P. Snow first popularized the subject. If, indeed, the current drift continues, this division may become one of our nation's most critical problems and a deterrent to the solution of technologically based social problems. Warnings are arising from every area with a certain consistent theme.

> "American universities - primarily in the engineering, science and business schools - merely train people to run the country's technologies; they do not educate people to design, build, and serve sociotechnological systems - in other words, to fulfill the needs and ambitions of society."[1]

> "But, if succeeding generations are to be better prepared than we, they must have broader experiences with the application of knowledge derived from humanities and social sciences in the context of society's technical problems."[2]

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[1] "To help students more, help society more", Erich Jantsch, Innovation, No. 4 (Sept. 1969)

[2] Myron Tribus, the Assist. Sec. of Commerce, address to the American Astronautical Society (1970).

> "a) There is increasing concern about the need to choose among technological alternatives and evolve new technologies in support of broad social goals.
>
> b) The traditional concern with man-machine systems has broadened to include relationships between physical systems and human systems.
>
> c) New public works endeavors must now consider social cost and returns, in addition to economic cost and returns."[3]

Two solutions may be envisioned: one, to "socialize" the engineer and scientist; and two, to expand the technological understanding of the non-technical individual. Colleges and universities have long recognized the need to provide a core of requirements for all students to insure some exposure to several academic disciplines. A report from the State University of New York at Buffalo suggests some of the difficulties encountered in insuring this academic awareness.

> "In most universities the attempt is made to bridge this gap by requiring undergraduates to take a distribution of courses which forces students to spend a part of his time in the 'other' world. This procedure has been ineffective. The humanists and social scientists seek the courses which have a minimum of quantitative work and, if at all possible, avoid laboratory courses. They typically take a minimum number of courses and seek those which are closest to their fields of interest. The student interested in natural science or engineering usually takes a series of introductory courses in social sciences and humanities and in the process develops a distaste for these areas. The net result is that the university effectively deepens the division between the two groups."[4]

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[3] "Knowledge into Action: Improving the nation's use of the social sciences", Report of special committee on the social sciences of the National Science Board, N.S.F. (1969)

[4] Socio-technical Collegiate Workshop Committee Report, State Univ. of New York at Buffalo, Feb. 1970.

A great deal of effort has been expended in engineering education over the last fifty years on the problem of providing the engineering graduate with a suitable humanistic social education along with his technical development. It is sad to note that one recent survey concludes,

> "In summary, there is little sign as yet that either new programs, or the new-found status of humanists and social scientists, is even beginning to meet the challenges of change in our technological culture and in the role of the engineer within it. Most revisions of program appear to be matters of minor adjustment rather than major overhaul. Very few involve liberal arts people together with engineers in the kind of mutual planning which the challenge makes imperative. And there are few attempts to give the student a sense of the overall picture - the interactions and interrelations within the context in which he will live as a person and work as a professional man. Nor does one find much awareness of the importance to the whole enterprise of involving the engineering student in the life of the campus, both its culture and its controversy."[5]

Perhaps some of the difficulties with these solutions is that they attempt to change the whole segment of either the technical or non-technical community. There will always be some in the scientific and technical fields who are so engrossed in their investigations that they do not ask about the secondary consequences of the technology being introduced. There will also be those in the non-technical fields who will be equally involved in their work and will have little interest in technology. Society needs both of these extremes and the

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[5] J. Eng. Educ., 59, (Dec. 1968) p. 314.

communication between them must come from others.

The new program proposed here will attempt to provide a suitable mixture of technical and social training to provide technically aware and liberally educated individuals who will then be able to communicate between the two extremes. A Bachelor of Arts in Engineering (B.A.E.) is proposed as a possible solution to some of these problems.

5. Background

During the past year and a half, the College of Engineering has studied its capability to offer such a program, the support available from other parts of the University, the attitude of students toward such a program, the degree designation and has conducted a market survey of industry and government for employment opportunities.

The reasons for developing and administering the program under the auspices of the College of Engineering are as follows:

1. The engineering college is uniquely capable of offering an awareness of technological capabilities and limitations. It is considered easier for the engineer to make the transition from the technical to the non-technical than the other way around. It might be argued by analogy that this type of hybrid program shound be centralized in Engineering.

2. There is a strong desire among some of the College staff to start such a program and this motivation seems to be lacking elsewhere in the University at this time.

3. The College of Engineering has most but not all of the

resources and staff to carry on such a program without jeopardizing its main function in engineering education.

The degree designation of such a program must in some manner indicate the difference between this graduate and the professional engineering graduate. It was, therefore, proposed that the degree designation be a Bachelor of Arts in Engineering. Those graduates desiring further training would normally enter a graduate or professional school in their application area. The B.A.E. student desiring graduate work in engineering would need to complete the traditional professional courses in the engineering field of his choice.

A means was sought to determine to what extent this proposed program would be in keeping with the current mood of young people. Discussions with High School and University students suggested that a reasonable number of students would be attracted to this program.

Questionnaires were sent to executives in major industries throughout the United States and administrators in local, state and the federal government. One hundred eighty-four replies were received with many letters of explanation and indications of employment opportunities for such students. These replies were evaluated as favorable, unfavorable or neutral and the results are summarized below.

	Favorable	Unfavorable	Neutral
Industry	(90) 78%	(13) 11%	(12) 11%
Government	(52) 73%	(5) 7%	(14) 20%

6. Curriculum

The proposed curriculum is organized in three major blocks, each of which makes an essential contribution to the emerging whole. The three blocks include basic science and humanities studies to lay the groundwork for the studies to follow. Two parallel blocks - the engineering core for attaining "technological awareness" and the area of application for placing this awareness in a useful relation to society - become the major structural elements in the student's conceptual framework.

The basic sciences and humanities include one year sequences in each of the following: American thought and language, humanities, social science, mathematics, physics and an additional year in either statistics, mathematics or a physical or life science.

The application core will be a major area of interest developed in conjunction with business, social science, communication arts, political science, et cetera. It is envisioned that the courses comprising the application area will be selected from those typically taken by a major in that area. This will enable the B.A.E. student to obtain a definite degree of competence in the application area.

In addition about fifteen percent of the course work will be free electives which may be used to augment either of the major blocks or to gain additional diversification.

BACHELOR OF ARTS IN ENGINEERING

1. University Requirements

ATL 111, 112, 113	9 credits
HUM 241, 242, 243	12
SS 231, 232, 233	12
Nat. Sci. satisfied from elected credits	
HPR	(3)
	-- 33 + 3 credits

2. MTH 111, 112, 113 — 15

-- 15 credits

2. One year of Physics

PHY 237, 238, 239, and 257, 258, 259 — 12

-- 12

4. One year of course work in statistical, mathematical, physical or life science — 9-12

-- 9-12

5. Engineering

40 credits in the College of Engineering giving a broad range of understanding of Engineering. The courses will cover the areas of computer science, communications, electronics, mechanics, materials, systems, design, thermo fluids, environmental sciences, and the interrelationships between technology and society. — 40

-- 40

6. Application Area

40 credits in an area of interest outside engineering, mathematics or the sciences; for example, business, social science, communication arts, political science, et cetera.

--40

7. 28-31 credits of free electives, some of which may be used to augment either the application area or engineering.

--28-31

7. Technological Core and Course Development

The engineering core will consist of a coordinated set of courses which will be integrated with the basic sciences, humanities and the application block to meet the objectives of the B.A.E. program. This core may be considered in three phases.

The initial phase will be composed of two types of courses which will be weakly interlocked. Early in his development, the student will take introductory courses to stimulate interest in the interrelationships between technology and society. These will introduce the concept of sociotechnical research intended to disclose the benefits and risks to society emanating from alternatives in the development of science and technology. The second type of course is intended to acquaint the student with analytical approaches to problems and the concepts of mathematical modelling. Simple models will be introduced with application to physical systems and socio-economic systems.

The intermediate phase of the engineering core will be devoted to gaining a technological awareness. The B.A.E. student will gain

enough insight into each technical area to become aware of the analytical tools used, the theoretical constraints under which new developments must work and the potential for utilization of this area to solve technologically derived problems in society. Although the primary thrust in this phase will be to gain technical awareness, courses in the history of technology, engineering communications and present sociotechnical interactions will also be taken to maintain the basic focus of the B.A.E. program.

The third phase will be project type courses which will attempt to examine practical interactions between the student's application areas and technology in today's society. These courses will not follow a set format but will vary depending upon the student's application areas. The purpose will be to bring together the various parts of the B.A.E. program into a cohesive whole.

Each portion of the engineering block would be developed and evaluated in view of the general objectives of the B.A.E. program. Particular concern would be given to establishing a common terminology between the technical areas, utilizing the previous coursework of the students and stressing the application of each technical area to current problems.

8. Organization and Administration

An appropriate organizational and administrative structure would be constructed to facilitate the design, development, trial, and evaluation of the program and would include two basic functions:

1. curriculum development

2. operational administrative

The administrative operational function would be the responsibility of the College of Engineering. A coordinating committee, including engineering and non-engineering faculty and cutting across departmental lines, would supply appropriate direction on matters concerning programs, instruction, and development.

Academic advising for students in the program would be the responsibility of the College of Engineering. Hopefully, it would be possible to establish a liaison person in each of the colleges offering application areas to provide a connecting link between the College of Engineering and these areas. Each academic adviser would have available to him the full complement of resource faculty in all areas in order to properly guide the student in developing an effective program.

APPENDIX B

INTRODUCTORY LETTER

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF ENGINEERING · OFFICE OF STUDENT AFFAIRS · ENGINEERING BUILDING

April 10, 1972

Dear Faculty Member:

The purpose of this letter is to focus your attention on a research project to be conducted on a college-wide basis during the last week of April. The basic purpose of this research will be to survey faculty opinions regarding the proposed Bachelor of Arts in Engineering program and attempt to identify factors that might explain any variation in such opinions. The results of this research will serve as the foundation for my Ph. D. dissertation in the department of Administration and Higher Education.

Since all of you were not equally involved in the planning of this new program, a few background comments might be helpful as preparation for the study.

The history of this proposed program extends back to November, 1969, when the Ad Hoc Committee on Attrition and Retention began their initial consideration of alternative education programs for the College. Since that initial phase, the proposed Bachelor of Arts program has progressed in its development, receiving tentative approval on February 17, 1972 from the University Curriculum Committee.

The next steps in the development of this program are course development and finally implementation. These are crucial phases in this program and the reason for this study. If implementation is to be successful, your involvement and support are obviously necessary. The information you provide will make your concerns visible and greatly facilitate this objective.

Attached you will find a brief statement concerning the objectives of this new program. They are included to refresh your memory concerning the proposed curriculum and should assist in making your responses more meaningful.

I look forward to your participation.

Sincerely,

R. Dale Lefever

R. Dale Lefever
Assistant to the Dean

RDL:cag

PROPOSED CURRICULUM
BACHELOR OF ARTS DEGREE IN ENGINEERING
AT MICHIGAN STATE UNIVERSITY

The proposed B.A.E. program will be designed to develop a new kind of technologist who is:

1. knowledgeable of the impact of technology in society;
2. technically capable of recognizing how analytical tools are utilized in the solution of problems;
3. aware of the technical constraints under which new developments must work;
4. able to assist in the application of these techniques to societal problems; and
5. competent in a specific area of application.

In order to meet these objectives, a curriculum consisting of four major blocks of coursework will be organized. The four blocks include: (1) basic work in the sciences and humanities to lay the groundwork for the studies to follow; (2) a core of engineering courses to provide "technological awareness"; (3) a non-engineering area of application; and (4) a block of electives to provide additional diversity to the student's program. More complete descriptions of these areas are provided below.

1. Basic Block (69-72 credits)

   The basic sciences and humanities include one year sequences in each of the following American thought and language, humanities, social sciences, mathematics (through MTH 113), physics (physics without calculus) and an additional year in either statistics, mathematics or a physical or life science.

2. Applications Block (40 credits)
   The application core will be a major area of interest developed in conjunction with business, social science, communication arts, political science, et cetera. It is envisioned that the courses comprising the application area will be selected from those typically taken by a major in that area. This will enable the B.A.E. student to obtain a definite degree of competence in the application area.

3. Technical Block (40 credits)
   The engineering core will consist of a coordinated set of courses which will be integrated with the basic sciences, humanities and the application block. This core may be considered in three phases.

The initial phase will be composed of two types of courses which will be weakly interlocked. Early in his development, the student will take introductory courses to stimulate interest in and awareness of the interrelationships between technology and society. The second type of course is intended to acquaint the student with analytical approaches to problems and the concepts of mathematical modeling. Simple models will be introduced with application to physical systems and socio-economic systems.

The intermediate phase of the engineering core will be devoted to gaining a technological awareness. The B.A.E. student will gain enough insight into each technical area to become aware of the analytical tools used, the theoretical constraints under which new developments must work and the potential for utilization of this area to solve technologically derived problems in society.

The third phase will be project type courses which will attempt to examine practical interactions between the student's application areas and technology in today's society. The purpose will be to bring together the various parts of the B.A.E. program into a cohesive whole

4. Electives (31-34 credits)

In addition to the three academic blocks fifteen percent of the course work will be free electives which may be used to augment either of the major blocks or to gain additional diversification.

APPENDIX C

ORIGINAL LETTER

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF ENGINEERING · OFFICE OF STUDENT AFFAIRS · ENGINEERING BUILDING

April 25, 1972

Dear Faculty Member:

During the week of April 10, 1972, you received a letter introducing you to a research project to be conducted in the College of Engineering. Through the cooperation of a group of engineering faculty in a pretest, the preparations for this study have been completed and the final instrument is now enclosed for your completion. This study has been endorsed by my doctroal committee and approved through the Dean and Department Chairman's Group of this College. The results will serve as the foundation for my Ph.D. dissertation in the department of Administration and Higher Education.

The basic purpose of this research is to study the proposed Bachelor of Arts in Engineering program from the perspective of the total faculty in the College. The attached instrument is designed to record the degree to which faculty differ in their opinions toward this proposed program and to identify various individual and organizational factors which might help explain any such variation. It is in this regard that your cooperation is requested.

Specifically, you are requested to read carefully the directions in each section of the instrument and respond to each item. Since the value of such a study depends upon the frankness and care with which you respond, complete anonymity (no coding of any kind) will be observed throughout the study. Your identity will be unknown, even to myself and neither individual faculty nor their departments will be identified in the published results. These extreme efforts are made to encourage your response and thereby increase the value of the study.

Your completing and returning the instrument in the enclosed campus mail envelope by Tuesday, May 2, 1972, will be greatly appreciated. Also, attached you will find a signature card to be forwarded separately to indicate your participation in the study and guide subsequent follow-up procedures where required.

Thank you for your consideration and cooperation in this important matter.

Yours truly,

Dale Lefever

Dale Lefever
Engineering Adviser

DL:cag

Attachment

APPENDIX D

FIRST REMINDER LETTER

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF ENGINEERING · OFFICE OF STUDENT AFFAIRS · ENGINEERING BUILDING

May 3, 1972

Dear Faculty Member:

Last week you received a request for your participation in a research project focusing on faculty perceptions of the proposed Bachelor of Arts in Engineering program. My review of the signature cards indicates that you have not yet forwarded a copy of the questionnaire. If you have completed and returned a copy of the questionnaire, please disregard this letter and simply return the attached signature card. This signature card is my only record of your participation.

Since the study involves the total faculty of this College, the response of each faculty member is crucial. If the further development and final implementation of this new program is to be successful, your concerns must be made visible. Your responses (which will remain completely anonymous) will greatly facilitate this objective.

In view of the importance of your participation, your cooperation is again requested. Please complete the questionnaire and forward it and the signature card as soon as possible. An additional copy of the questionnaire is enclosed for your use if necessary.

I appreciate the time required of you in this effort and look forward to sharing the results of this study with you once the remaining questionnaires have been received.

Thank you,

Dale Lefever

Dale Lefever
Engineering Adviser

DL:cag

Enclosures

APPENDIX E

SECOND REMINDER LETTER

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF ENGINEERING · OFFICE OF STUDENT AFFAIRS · ENGINEERING BUILDING

May 9, 1972

Dear

Since the last week of April, you should have received two requests for your participation in a college-wide research project. This study concentrates on the Bachelor of Arts in Engineering program and attempts to elicit your personal opinions in this regard. And, since this study involves the total faculty in the College, I'm sure you can appreciate how important it is for each individual faculty member to complete and return the questionnaire as soon as possible.

As I mentioned in my initial letter, this study has been endorsed by my doctoral committee and approved by the Dean and Department Chairmen's Group of this College. The opinions of individual respondents and their departmental affiliation will remain completely anonymous throughout the study. The results will be reported on a college-wide basis only.

I would be very grateful if you would take fifteen or twenty minutes to fill out one of the questionnaires previously forwarded to you and return it to me in the enclosed campus mail envelope by Friday, May 12, 1972. This deadline is necessary if the responses are to be analyzed and a report submitted to the faculty before the end of this Spring term.

Thank you for your consideration and cooperation in this matter.

Yours truly,

Dale Lefever
Engineering Adviser

APPENDIX F

FACULTY QUESTIONNAIRE

Section I

THERE ARE NO RIGHT OR WRONG ANSWERS TC THE FOLLOWING QUESTIONS. ALL OF THE QUESTIONS PERTAIN TO YOUR ATTITUDES AND OPINIONS.

CIRCLE THE NUMBER OF THE CNE RESPONSE FOR EACH QUESTICN THAT MCST ADEQUATELY REPRESENTS YOUR PRESENT FEELINGS.

	I strongly agree.	I agree.	Undecided.	I disagree.	I strongly disagree.
1. Generally speaking, programs like the proposed Bachelor of Arts in Engineering represent a necessary addition in the field of engineering education.	1	2	3	4	5
2. As presently designed, the Bachelor of Arts in Engineering program represents a necessary addition in engineering education in this College.	1	2	3	4	5
3. Our College should have more thoroughly explored other alternatives before deciding to implement the proposed Bachelor of Arts in Engineering program.	1	2	3	4	5
4. The College Curriculum Committee made the right decision in approving the proposed Bachelor of Arts in Engineering program.	1	2	3	4	5
5. The faculty of this College should actively support and participate in the further development of the Bachelor of Arts in Engineering program.	1	2	3	4	5
6. I desire to be personally involved (teach-develop courses) in the implementation of the Bachelor of Arts in Engineering program.	1	2	3	4	5

Section II

THE FOLLOWING 4 ITEMS DEAL WITH YOUR PERCEPTIONS OF YOUR FACULTY WORK GROUP. CIRCLE THE NUMBER OF THE ONE RESPONSE FOR EACH STATEMENT THAT MOST ADEQUATELY REPRESENTS YOUR PRESENT OPINIONS CONCERNING THIS ISSUE.

7. I feel I am really a part of my departmental faculty group.	1	2	3	4	5
8. If I had the chance to obtain the same position for the same salary in another engineering college, I would consider moving.	1	2	3	4	5
9. In my opinion, the faculty in my department get along with one another better than those in other departments in this College.	1	2	3	4	5
10. In my opinion, the faculty in my department really help each other with their work as compared with faculty in other departments in this College	1	2	3	4	5

Section III

THE FOLLOWING 16 ITEMS DESCRIBE AREAS OF POTENTIAL IMPACT OF THE BACHELOR OF ARTS IN ENGINEERING PROGRAM. CIRCLE THE NUMBER OF THE ONE RESPONSE FOR EACH STATEMENT THAT MOST ADEQUATELY REPRESENTS YOUR PRESENT OPINIONS CONCERNING THESE ISSUES.

		I strongly agree.	I agree.	Undecided.	I disagree.	I strongly disagree.
11.	The B.A.E. program will help alleviate the undergraduate enrollment problems in the College.	1	2	3	4	5
12.	The B.A.E. program will lower the prestige of our present engineering program in the eyes of other universities.	1	2	3	4	5
13.	The B.A.E. program will compete with the present engineering programs for limited college resources.	1	2	3	4	5
14.	The B.A.E. program will decrease the attractiveness of our present undergraduate program with future employers.	1	2	3	4	5
15.	The B.A.E. program represents a necessary response to society's need for technically trained and socially aware individuals.	1	2	3	4	5
16.	The B.A.E. program will compete with the regular program for our undergraduate enrollments.	1	2	3	4	5
17.	The B.A.E. program will improve the general image of engineering within the university community.	1	2	3	4	5
18.	The B.A.E. program will provide students with a sound and marketable education.	1	2	3	4	5
19.	Faculty participating in the B.A.E. program will be rewarded on an equal basis with faculty in existing programs.	1	2	3	4	5
20.	The implementing of the B.A.E. program will lead to a professional division between non-B.A.E. and B.A.E. faculty.	1	2	3	4	5
21.	The B.A.E. program will decrease the strength of individual academic disciplines in the College.	1	2	3	4	5
22.	The B.A.E. program will require faculty to lower their teaching and academic standards for a new group of students.	1	2	3	4	5
23.	The presence of the B.A.E. program will strengthen and give support to the value of teaching in this College.	1	2	3	4	5
24.	The B.A.E. program will lead to an erosion of departmental automony in this College.	1	2	3	4	5
25.	The B.A.E. program will provide faculty with valuable interaction with a new group of students.	1	2	3	4	5
26.	The B.A.E. program will conflict with faculty time for research and professional development.	1	2	3	4	5

Section IV

Some department chairmen are more likely to handle certain situations in one way than in another way. Each has his own style.

Check the one answer which best describes the way your department chairman would usually handle each of the following situations.

NOTE: (1) This information will not identify any individuals or departments or serve as an evaluation in any respect; (2) Respond in terms of the individual who was chairman during the 1970-71 school year.

27. When a question arises about how something should be done, my department chairman is most apt to:

_____A. Insist that the individual must adjust to the situation in his own way.
_____B. Insist that, rules or no rules, everything be done in the department chairman's way.
_____C. Insist that the department faculty must come to a common agreement about the situation.
_____D. Insist everything be done according to college rules and regulations.

28. When my department chairman finds someone disagreeing with him, he is most apt to:

_____A. Refer to his own experience and know-how to back up his opinions.
_____B. Get agreement on his ideas by influencing certain individuals.
_____C. Refer to the college policy and procedures to back his opinions.
_____D. Go along with the decision of the department faculty in deciding the issue.

29. My department chairman would prefer to hire:

_____A. A person who is ambitious and bright.
_____B. A hard worker, who doesn't need much supervision.
_____C. A person who is open-minded and willing to share responsibility.
_____D. A person who is agreeable and willing to follow rules.

30. Ratings and promotions in this department seem to be based on:

_____A. A person's records which show his professional skills and accomplishments.
_____B. A person's length of service and experience in the department.
_____C. A person's ambition and ability to learn.
_____D. Recommendations by both department chairmen and faculty.

31. My department chairman is most apt to give out new assignments and information by:

_____A. Discussing them with the faculty, getting the faculty comments and questions.
_____B. Sending or posting a written notice for every faculty member.
_____C. Explaining the assignments to each one concerned individually.
_____D. Telling each faculty member about them if he feels it is necessary.

32. My department chairman seems most interested in developing his ability to:

_____A. Properly make reports, handle paperwork, etc.
_____B. Handle any problems of work flow, teaching schedules, etc.
_____C. Understand faculty ideas, interests and standards.
_____D. Deal with the individual faculty "diplomatically."

33. My department chairman seems to feel that the "ideal" department chairman should:

_____A. Not use his authority - respect the faculty opinions.
_____B. Not make a snap judgment - be systematic and impartial.
_____C. Have faculty respect his authority - make prompt, firm decisions.
_____D. Avoid unnecessary conflicts - give praise and personal attention.

34. My department chairman tries to get the work accomplished by:

_____A. Carefully directing and disciplining faculty.
_____B. Appealing to the individual's desire for self-improvement.
_____C. Following plans for scheduling assignments in detail.
_____D. Trying to get faculty to work together as a team.

35. My department chairman seems to be most interested in:

_____A. A neat, well-regulated department.
_____B. A friendly, well-integrated faculty.
_____C. An efficient well-controlled department.
_____D. An ambitious, competitive spirit among faculty.

36. If we decided on a new way to handle part of our responsibilities, our department chairman would probably:

_____A. Tell us to go ahead if he was sure it would be more efficient.
_____B. Talk to us individually to see how each of us felt about it.
_____C. Urge us to go ahead if no one had any questions about it.
_____D. Insist that we wait until he had consulted the dean about it.

37. If a disagreement were to arise - say, about teaching load - my department chairman would probably:

_____A. Emphasize the loyalty we owe to the college.
_____B. Emphasize the need for cooperation by the faculty.
_____C. Emphasize that the ambitious person gets ahead in the long run.
_____D. Emphasize the need to follow his work schedule to get the work accomplished.

38. My department chairman seems to depend most on:

_____A. His knowledge of college policies and procedures.
_____B. His ability to work with the faculty as a group.
_____C. His ability to influence people to do what has to be done.
_____D. His professional knowledge in his discipline.

39. If one of us continued to confront our department chairman with a minor complaint, he would probably:

_____A. Talk the problem over and try to understand the person's feelings.
_____B. Direct him to the next appropriate level of authority.
_____C. Help him to become interested in something more constructive.
_____D. Tell him politely but firmly that the complaint was unreasonable.

40. If I suggested an improvement in the department, my department chairman would be most apt to:

_____A. Urge me to put it directly into a written suggestion.
_____B. Urge me to talk it over with the others for their comments.
_____C. Ask to have time to go over it before he makes any comments.
_____D. Go over it with me; point out that this is the way to get ahead.

41. In general, my department chairman seems to have the following effect on the faculty:

_____A. He seems to create an "I don't care" attitude.
_____B. He seems to make people antagonistic toward him.
_____C. He seems to create cooperation among the faculty.
_____D. He seems to create competition between faculty.

42. The last time there was a change in our assignments, my department chairman:

_____A. Talked to each individual about the changes in his responsibilities.
_____B. Asked the faculty how the problem should be handled.
_____C. Read (or posted) the instructions which he had received.
_____D. Told us how he thought the change should be handled.

Section V

The following questions have to do with the communication processes of the College as they relate to the Bachelor of Arts in Engineering program. Please check the one item that most adequately represents the situation as you perceive it.

43. Of the information communicated about the proposed B.A.E. program, I think I have received:

_____A. All of it.
_____B. Most of it.
_____C. Some of it.
_____D. Only a little of it.
_____E. None of it.

44. The information I have received from the College about the proposed B.A.E. program can best be described as:

_____A. Factual and definite.
_____B. Fairly definite.
_____C. Uncertain or vague.
_____D. Too general and uncertain.
_____E. I haven't received any information.

45. I have participated in informal discussions with fellow faculty about the proposed B.A.E. program:

_____A. Very often.
_____B. Often.
_____C. Sometimes.
_____D. Not often.
_____E. Never.

46. The B.A.E. program has been discussed formally at my department level:

_____A. Very often.
_____B. Often.
_____C. Sometimes.
_____D. Not often.
_____E. Never.

47. When the recent decision was made to implement the B.A.E. program, the faculty of this College received:

_____A. Much more information from the College than usual.
_____B. Somewhat more information from the College than usual.
_____C. About the same amount of information from the College as usual.
_____D. Somewhat less information from the College than usual.
_____E. Much less information from the College than usual.

48. I can recall first hearing that the College had decided to implement the B.A.E. program:

_____A. More than a year before it was decided.
_____B. Several months before it was decided.
_____C. Just before it was decided.
_____D. Only after it was decided.
_____E. I didn't know it was decided.

Section VI

The following check list gives you the opportunity to express some of your likes and dislikes concerning your job. In the right-hand column below is a list of factors which may affect the overall satisfaction you have on your job. In the left-hand column next to each factor, place a check mark under the statement which best expresses your personal satisfaction with the factor as it applies to your job.

completely satisfied	very satisfied	quite satisfied	somewhat satisfied	not satisfied	
					49. The college I work for.
					50. The amount of information I get.
					51. The accuracy of the information I get.
					52. The level of performance required of me on my job.
					53. The amount of work required of me on my job.
					54. The kind of relationship I have with my department chairman or Dean (if department chairman).
					55. The way my department chairman or the Dean (if department chairman) handles his job.
					56. The salary I get on my job.
					57. The way changes are handled around here.
					58. The amount of responsibility I have on my job.
					59. The people that I work with (or near).
					60. The pace at which I work on my job.

Section VII

Below is a list of ways in which decisions are often made. How does each of these processes compare with decision making as you know it in the College of Engineering? CHECK BOTH SCALES FOR EACH ITEM.

	For the Decision to Implement B.A.E. Program					For Decisions in College of Engineering in General				
	Very true		Partly true		Not at all true	Very true		Partly true		Not at all true
61. We start with a clear definition of the problem, establish priorities and concrete objectives, plan and execute a step-by-step procedure for reaching these objectives	1	2	3	4	5	1	2	3	4	5
62. We move by consensus; everybody has a chance to be heard, and we compromise on points of disagreement	1	2	3	4	5	1	2	3	4	5
63. It is a power struggle; the people who have the most muscle (rank or influence in the college) usually win-out	1	2	3	4	5	1	2	3	4	5
64. It is a matter of informal influence. Personal relationships and the persuasion of certain key influentials play the biggest role in decisions.	1	2	3	4	5	1	2	3	4	5
65. We weigh the evidence objectively; research information plays the biggest role in decisions.	1	2	3	4	5	1	2	3	4	5
66. We weigh the evidence objectively; but research is only one source; public opinion and what the public and industry will accept are equally important factors	1	2	3	4	5	1	2	3	4	5
67. The top man makes the decision, and the rest follow him; it is strictly a chain of command	1	2	3	4	5	1	2	3	4	5
68. It is a purely administrative process; the rules are laid out in advance, each man knows what his role is supposed to be and follows it routinely	1	2	3	4	5	1	2	3	4	5