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THE MANAGEMENT OF POLYDISCIPLINARY TEAMS

by

DIANE GERTRUDE LAYTON

C.E.E.G.P., McGill University, 1971

B.A., Vanderbilt University, 1974

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Department of Healthcare & Epidemiology

The University of British Columbia

Vancouver, Canada V6T 1W5

Date 4/10/80

## ABSTRACT

The purpose of this study was to examine the influence of personality specialization on the research and work attitudes of disciplinarians in socio-medical related fields. The study involved the development and testing of specialist characteristics and attitudes relevant to the management of polydisciplinary research in academic settings.

Personality specialization of the individual disciplinarian was hypothesized to be associated with specific attitudes toward research and styles of organizing work in team situations. Specifically, hypotheses tested the relationships of Person and Thing orientation and attitudes toward

- a) Analytic or Holistic approaches to research methodology
- b) and Mechanistic (Type I) or Organic (Type II) approaches to work organization.

In addition, information was collected on a number of demographic and career variables to test for confounding and moderating influences on the study's hypotheses.

In order to test the four Hypotheses, an analytic field survey was conducted and data was collected from academic specialists in 32 fields of specialization employed at the University of British Columbia. The measuring instrument of the study was a structured mailed questionnaire. A previously constructed Person and Thing Construct Scale (Frost & Barnowe 1976) was employed to measure the independent variable of personality specialization. Scales measuring the dependent variables of Research Mode and Organizational Style were constructed based on correlational and factor analytic techniques. A descriptive profile of the study sample was compiled.

The effects of personality variables were assessed in two ways. For the Research Mode, correlational relationships and differences in mean scores among sub-populations of specialists were explored. For the organizational data, correlational relationships and differences in the frequencies of specialist types falling into categories of the criterion variable were examined. In addition to the hypothesized relationships concerning Person and Thing specialists, two other specialist types were examined in relation to the dependent variables.

In the general study population Person and Thing specialists did not associate differently with either the Analytic or Holistic research approaches or with the Organic (Type II) or Mechanistic (Type I) organizing styles.

Person and Non-Specialist types were found to significantly differ in their attitudes toward interpretive strategies for research. Thing specialists and Generalist personality types were found to vary considerably in their attitudes toward 3 out of 4 research mode factors.

Within the female portion of the study sample, Person specialists were found to prefer a Type II organizing approach while Thing specialists preferred a Type I approach. This was as predicted in Hypotheses III and IV of the study.

The study found significant differences in Person and Thing orientation between males and females and High and Low Academic Rank groups. Females had a higher mean Person score than Males and the Low Rank group a higher mean Person score than the High Rank group.



Significant differences were also found in male and female attitudes toward the Analytic approach to Research, women being more Analytic than men. There were notable differences in research orientation between those having past non-university employment experience since receiving their terminal degree compared with those who had gone right into academia. Those with other employment experience being more Holistic in their research orientation.

Individuals of Low and High Academic ranks had significantly different preferences for organizing. The Low Rank group preferring the Type I approach compared to the High Rank group who slightly prefer Type II.

Another organizational finding of significance was the difference between those having experienced collaborative research compared with those who hadn't. Those without collaborative experience preferring Type I and those with experience preferring Type II.

The study Findings are discussed in relation to their generalizability, requirements for future work and alternative hypotheses. The study results are interpreted in relationship to the management issues of assembling and coordinating polydisciplinary teams. Specific recommendations for member selection and team composition are made.

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## THE MANAGEMENT OF POLYDISCIPLINARY TEAMS

## I. BACKGROUND OF THE STUDY

The impetus for systematic developments on the top of the management of polydisciplinary research can be traced to the experience of organizational, operational, and interpersonal difficulties which have emerged in the process of initiating and administrating polydisciplinary efforts of one form or another (Luzski 1957, Herzog 1959, Blackwell 1955, Caudill and Roberts 1951, Kast and Rosenzweig 1970, Newell et al. 1975).

### 1:1 Definition of Polydisciplinary Research

Heckenhausen (1972) defines disciplinarity as "the specialized scientific exploration of a given homogeneous subject matter, resulting in incessant formulations and reformulations of the present body of knowledge about the subject matter." Disciplinary development and divergence occurs along seven criterion levels which together define the scientific attributes of a given discipline. Intra-disciplinary divergence takes place along some but not all of these criterion levels.

The criteria of a discipline include:

- 1) its material field - objects of specialization in a discipline,
- 2) its subject matter - the point of view from which a discipline looks upon its material field,
- 3) level of theoretical integration and maturity - understanding, prediction and explanation of phenomena and events involving the subject matter,

- 4) methods - approaches to the observables of a subject matter; ways in which observables are transformed into data for more specific problem solving,
- 5) analytical tools - for the construction of empirical feedback processes,
- 6) application - of the discipline in fields of practice,
- 7) historical contingencies - extra - disciplinary forces that control material resources and determine the climate for growth, as well as the norms of the scientific community which influence research interests and theoretical pre-occupations over time (Heckenhausen, 1972).

Polydisciplinary research involves the collaboration of two or more disciplinary specialists along one or more criterion levels of their respective disciplines in a problem solution process. The word 'polydisciplinary' has been suggested by Newell et al. (1975) as a cover term for the numerous terminological and phenomenological concerns associated with the experience of disciplinary collaboration.

The extent to which polydisciplinary collaboration occurs among disciplinarians is characterized in the literature by a series of typologies, based on the relative nature and degree of integration found among the individuals and the disciplines involved in the activity (Blackwell 1955, Newell et al. 1975, Jantsch 1970, Heckenhausen 1972, Mason 1976). Jantsch's typology is most illustrative:

- 1) Disciplinarity - specialization in isolation,
- 2) Multi-disciplinarity - no integration strategy,
- 3) Pluri-disciplinarity - cooperation without organizational context,
- 4) Cross-disciplinarity - organized cooperation with polarization  
towards one discipline,
- 5) Inter-disciplinarity - organized cooperation and intergration by  
higher level concepts,
- 6) Trans-disciplinarity - multi-level cooperation, synthesis and new  
concepts developed (1970).

#### 1:2 State of the Problem Area in the Literature to Date

The problem area falls into the general category of "research into the management of research." A good portion of the work done in the area has been concerned with the management of industrial research teams (Litterer 1970, Shepard 1954, Pelz and Andrews 1966, Fincher 1965, Smith 1954). Most of the industrial studies into the management of research focus on identifying and developing the creative aspects of research environments (Pelz and Andrews 1966, Fincher 1965, Shepard 1954, Smith 1954, Litterer 1970, Lynton 1969). The majority of the empirical work has looked at dimensions of the organizational research environment and attributes of the individual scientist which are conducive to productivity and satisfaction.

The theoretical orientation of this work links specific attributes in the individual to preferences for certain types of work



environments (Moos 1973, Holland 1966, Little 1972, Summer 1976, Likert 1961, Burns and Stalker 1961, Pelz and Andrews 1966). The rationale behind this approach being that research productivity is a function of both the research environment and the motivational and intellectual characteristics of the researcher.

Several recent literature reviews of the field corroborate the finding that there is a theoretical and empirical void concerning the organization and management of polydisciplinary research in academic settings (Newell et al. 1975, Birnbaum 1975, Mason 1976, Gillespie 1976). Findings in the industrial setting are not easily generalizable to the academic setting because of normative, incentive, professional, organizational and production differences. It has been observed that the institutional context in which research takes place is a major factor in shaping the organization and management of the research process (Caudill and Roberts 1951, Luzski 1957).

The historical and case study approach characterizes much of the existing work on the topic of polydisciplinary research in the academic setting. The studies reviewed tend to describe polydisciplinary projects administered by trial and error. Topics of concern include member relationships, complaints, organizational conditions, pressures and structures (Maybry 1966, Stringer 1970, Blackwell 1955, Caudill and Roberts 1951, Luzski 1957, Bennis 1956, Marquis 1971, Kest, Rosenzweig and Stockman 1970). Consequently, the contributions of this work tend to be of a descriptive and proscriptive nature. However, this experiential

material is basic to the development of more systematic approaches in the area (Newell et al. 1975, Birnbaum 1975, Gillespie 1976, Mason 1976). More recent developments in the area have begun to focus on specific aspects of organizational control relevant to small, complex, professional teams.

### 1:3 Historical and Institutional Context

The emergence of polydisciplinary research is best understood within the context of the expanded functional and administrative differentiation which has taken place in most public universities in North America during the last 35 years. It is frequently cited that the modern public university has three major functions in society; to teach, to perform research and to provide service models (Mason 1976). These goals are diverse and are not necessarily mutually supportive.

Gabarino (1970), in an article on the organization of university research, documents that prior to the 1940's, universities were comparatively simple organizations. However, since W.W. II most public universities have experienced rapid growth and change in their size, complexity, social and research functions. Price (1972) relates changes in the traditional university structure to demands of post-industrial societies. The epoch is marked by:

- 1) the elevation of the service economy,
- 2) the pre-eminence of the professional and technical classes,

- 3) the centrality of theoretical and empirical knowledge  
as a source of innovation and policy formulation,
- 4) the possibility for self-sustaining technological growth,
- 5) the creation of a new intellectual technology.

To this list we must add the increasing complexity and interdependence of the phenomena and problems associated with socio-technical progress. Federal governments and business often provided the problems and the funds for university research. This process contributed to organizational and personnel conditions which gradually changed the face of the university (Kerr 1963, Bush 1953, Gabarino 1970). Mason (1976) observes that during the last few decades universities have been continually providing the "intellectual fuel" for social, health, economic, resource and defense innovations.

The origins of polydisciplinary research are difficult to place chronologically. Bush (1953), in a discussion of traditional and modern forms of scientific teamwork, suggests that the idea of "team attack" is not very new. It is not surprising that the earliest polydisciplinary efforts occurred in applied fields like agriculture, defense, health and water resource management. Experimentation with polydisciplinary teams grew out of applied requirements for the generation and synthesis of new types of knowledge technologies.

However, it was recognized at an early stage that the traditional academic departments could not provide the neutral ground where different disciplinary specialists could collaborate (Ikenberry and Friedman, 1972). The traditional structural and functional sub-units of the university

organization are the departments, faculties and schools. These divisions lie along disciplinary and professional boundaries. They serve to separate areas of academic specialization while also functioning as the working infrastructure of university organizations. Several authors agree that the locus of power and the ability to control rewards is vested in the department, even though the university has experienced much elaboration. The central focus of the department is usually a discipline. Ikenberry and Friedman (1972) suggest that departments often resemble guilds; admission depends on the reasonable congruence of the candidate's disciplinary training, conceptual and methodological orientation with the majority view of the department. Within this setting, disciplinary responsibilities, loyalties and rewards represent the norm.

The "compartmentalism and reward process" characterizing departments is continuously referred to as a major deterrent to the coordination of polydisciplinary research. Decisions on recruitment, promotion and tenure rest in the department. Consequently, the personnel decisions of departments often bear directly on the opportunities and incentives faculty have to participate in cross-disciplinary endeavors. Therefore, non-traditional requirements for scientific teamwork required alternative structural forms for relating research personnel.

Kerr (1963) observes that for about 20 years, universities accepted the research centres and projects as proposed by faculty members and government agencies, making day to day adjustments as were needed and possible. University commitments to these expanded functions took form

in facilities, equipment, the development of new fiscal and administrative arrangements, as well as the advent of new classes of non-teaching, research and administrative professionals (Gabarino 1970, Kerr 1963). Often the funding of major research projects specified the development of a separate and autonomous organizational mechanism to manage the collaborative situation. These events contributed to increased bureaucratization, structural elaboration and the big business of university research. This institutional and functional development continued steadily, uninterrupted until the end of the "Golden Age" of funding in the late sixties.

Institutes and Centres often evolved as the formal, administrative arrangements for housing programmatic activities, like polydisciplinary research, within the organizational structure of the university. It should be noted that much informal polydisciplinary research also goes on within universities, but it is usually sub-organizational and transitory. Cross-disciplinary ties of this nature can be sustained for short periods of time and for small numbers within the conventional university structure. However, both Ikenberry and Friedman (1972) and Gillespie (1976) suggest that polydisciplinary research of a larger and longer scale requires increased organizational control to insure a product.

In 1972, Ikenberry and Friedman found that there were approximately 5,000 Institutes and Centres located at American Universities. They document the development of these type of units within the last 25 years. In a survey of 900 Institutes and Centres at 51 Land Grant

campuses in the U.S., polydisciplinary research institutes were not in the majority. However, the usefulness of the Institute and Centre mechanism is that of a formal organizational alternative for housing polydisciplinary activities within the university structure. In contrast to the specialist functions of the departments, Institutes are usually mission oriented and restricted in their functional mandates (Mason 1972, Ikenberry and Friedman 1976). They range in size from small (less than 30), semi-voluntary organizations, to large bureaucracies. They are generally de-centralized, semi-permanent, autonomous units linked into the hierarchy of universities at various horizontal and vertical levels.

#### 1:4 The Administrative Context of Polydisciplinary Research

The university environment, sponsors, academic departments and faculty present a series of constraints to the management of polydisciplinary endeavors from an administrative perspective. Emery and Trist (1965) have suggested that there is a causal texture to the organizational milieu which involves the degree of cooperation and options for survival that types of environments impose upon specific organizations.

The organizations which house polydisciplinary research in the university represent a diversified phenomena. Their impetuses, designs, dynamics and their products exhibit many more differences than they do similarities. They vary in relation to the university

setting in which they are found, according to the problems they are organized to solve and with the limits placed on them by their funding agencies. They are as unique as the individuals who run them and the teams they create.

Ikenberry and Friedman found that the majority of Institutes and Centres had research as their major concern. In general, they assist research in one of the following ways:

- 1) perform research directly;
- 2) work to facilitate the research of others,
- 3) assemble resources toward the achievement of a research task (1972).

Mason (1976), Ikenberry and Friedman (1972) and Gillespie (1976) all suggest that there must be a 'critical mass' of support for polydisciplinary endeavors among a core group, faculty, university administration and sponsors before they get off the ground.

Core support for these types of effort seems to evolve in three general ways:

- a) pooled group - develops out of loose consortia-type arrangements among faculty who wish to increase faculty dialogue, go outside disciplinary boundaries and who occasionally want to perform interdisciplinary research.

- b) nurtured groups - involve the gradual development of a research team through processes of staff selection. Several categories seem to exist; i) charismatic leader groups, ii) senior, well respected leader groups, iii) common enemy groups, iv) common needs groups.
- c) mandate groups - polydisciplinary efforts created through the mandate of some authority and/or the availability of special area study funds.

Obtaining faculty support for polydisciplinary endeavors involves communication, territorial, collegial recognition and endorsement problems (Gillespie, 1976). Affiliation with an Institute or Centre usually involves a joint appointment with an allied department. The career path for the professional academic typically progresses by achieving specialized expertise and in demonstrating a contribution to a disciplinary field. Centres and Institutes do not enjoy the same degree of legitimation as do departments within the university community. Consequently, these structures can offer few of the traditional career rewards and incentives. Therefore, departmental affiliation remains one of the major factors in career advancement for the individual academic.

However, Ikenberry and Friedman (1972) associate a new breed of academic entrepreneur with these kinds of non-traditional endeavors.



They link this development to the rapid growth in academic professionalism since W.W. II. Gabarino (1970), in an analysis of the market for academic research, contends that the rapid growth in the demand for research quickly exceeded the reserach capacity available from traditional academic faculty. This resulted in the diversification of faculty types and talents. Hagstrom (1965) observes that similar to other professions, science is characterized by the splitting of the professional role into the roles of administrator and the technician. "Leaders necessarily becoming politicized and oriented toward obtaining funding, access to facilities and coordinating the efforts of others. The technicians becoming means oriented, interested in performing their specialized skills for extrinsic scientific rewards" (Hagstrom, 1965).

Yet Luszki (1957) found, in a seminar attended by polydisciplinary researchers, that difficulty is often experienced in achieving leadership for these types of endeavors which provides the necessary direction and at the same time develops the potentialities of team members.

Ikenberry and Friedman (1972) suggest that administrative support for these activities is linked to a concern for institutional development. Characteristically, administrators have little to do with the internal functioning of these units. This is borne out by the general lack of administrative policies concerning the emergence, support, evaluation, and dissolution of these units in North American universities (Larkin, 1975). Kerr (1963) suggests that "this is partly a function of the fact that administration of the modern university comes about by force of circumstances and not by choice."

University administrations' assessment of current and future research needs, developments and fiscal support shape administrative policies toward facilitating research in the university (Gabarino, 1970, Newell et al. 1975). Newell et al. (1975) suggests that "the administration of a university is concerned with the management of research generally and not with specific research endeavors." This process includes the impact of research on the university; both internally (accounting, space and resource allocation) and externally (relationships with governments, granting agencies, patents, quality and output of sponsored research, copyrights). Thompson (1969) has mentioned the potential disciplinary bias of university administrators in the distribution of discretionary funding and support for new research developments within the university.

Polydisciplinary research units have often emerged before universities can provide the required budgetary and fiscal services to meet their needs. As a result of their rapid proliferation and unusual status; they are not well integrated into the mainstream of university politics and power (Westwater 1974, Ikenberry and Friedman 1972). These units are "often misunderstood within the university organization because of their special functions distrusted because of their special status and poorly linked with those subunits with which they have no affiliation" (Burling 1976).

Pfeffer and Salanick (1974) have shown that power differences among subunits within a large, U.S., research-oriented university have resource allocation consequences in terms of amounts and types of

of internal funds distributed to the sub-units in the institutional budgeting process. "The departments and the professional faculties constitute the traditional structure of the university and the interdisciplinary institute is not generally recognized as having a legitimate call upon a share of university funds (Westwater 1974).

This increases the polydisciplinary research units dependence upon external sources of funding. Problems obtaining external support for polydisciplinary research are quite common. Issues relating to sponsorship focus predominately on receiving returns for investments. Luszki (1958) has suggested that applied research is often more expensive than basic research Newell et al. (1975) have demonstrated that a commitment of time and money is required for a non-research phase of team development.

In addition to obtaining funding, types of available funding may be more or less appropriate to the group research process. It is often mentioned in polydisciplinary case studies that funding stipulations often add unnecessary and antagonistic pressures to the group research task (Luszki 1958, Caudill and Roberts 1951, Blackwell 1955). It is also difficult to obtain block grants which provide the length of time necessary for applied, group research problems (Dorcey 1976, Mason 1976). Some funding agencies simply do not support polydisciplinary endeavors. Others, including the National Science Foundation, have sponsored management studies into its functioning in order to provide a more rational basis for management and selection policies (Birnbaum 1975).

1:5 Summary

In summary, polydisciplinary research and other non-traditional, university activities and administrative mechanisms can be traced to three types of initiatives:

- 1) outside initiatives, primarily federal governments and special interest groups,
- 2) grass root developments within faculty,
- 3) university administrations.

These sources of initiative can be linked to various historical forces and vested interests:

- 1) national security and problems of post-industrial societies,
- 2) professional and personal career drives of faculty,
- 3) administrative concerns for institutional development (Ikenberry and Friedman 1972).

These developments have resulted in what Kerr (1963) calls the "multiversity"; institutions characterized by structural dicotomies, disciplinary orientations, fractionalized power, status differences and varying norms of academic professionalism. Consequently, he suggests "there is a type of lawlessness in any large university, with many separate sources of initiative and power...", and "where the dominant value system is realized mostly through research..." "These several competing visions of true purpose, each relating to a different layer of history, a different web of forces cause much of the malaise in universities today" (Kerr 1963).

By way of introduction to the research topic of this study, it is being suggested that the emergence of polydisciplinary research and the formal administrative mechanisms associated with it, are part of the general process of functional and structural elaboration which has gone on within universities in response to the needs of a post industrial age. We have also reviewed some of the major constraints operating within the academic setting which influence the administration of polydisciplinary research units. Recent cuts in university funding will place additional pressures for organizational and personnel changes within this environment. These new pressures will require increasingly effective modes for organizing polydisciplinary research in academic settings if it is to compete as a viable format for producing research knowledge.

## II. THEORETICAL FOCUS OF THE STUDY

### 2:1 Statement of the Problem

The purpose of this study is the development and testing of specialist characteristics and attitudes relevant to the management of polydisciplinary research in academic settings. In reviewing the literature, one finds the recurring theme that organizational coordination is difficult to achieve in these types of efforts. Problems in management involve difficulties in assembling and coordinating human and material resources toward an objective accomplishment (Mason 1976). Of the many managerial problems cited in the literature on polydisciplinary research, this study focuses on the effects of specialists' characteristics on the potential for organizational conflict. Organizational conflict is understood to be dysfunctional if it seriously inhibits the processes of coordination, productivity, stability and flexibility (Pondy 1967).

The influence of member characteristics on team composition is understood to be a critical management dimension in polydisciplinary research and one worthy of systematic study. The specific aspects of this problem to be looked at include:

- 1) organizational participation of research professionals,
- 2) specialists' attitudes towards alternative modes of research,
- 3) specialists' attitudes towards alternative modes of team organization.

These specialist attributes have provided instances of extreme heterogeneity in attitudes among participants of polydisciplinary teams. If basic indicators for these specialist characteristics can be developed

and their interrelationships tested, they might provide a rational basis for the structuring of polydisciplinary teams. These indicators could potentially be applied to personnel policies concerning recruitment, grouping and workstyle arrangements in the management of the polydisciplinary research situation.

## 2:2 Assumptions of the Study

The approach of this study assumes that it is possible to identify attributes in both the individual and the structure of the polydisciplinary research situation which impede or facilitate productive linkages among individuals and between the individual and the demands of the polydisciplinary research process (Holland 1966). It is recognized at the onset of developing such a rationale, that we are attempting to explain attitudes and behavior on the basis of personality patterns, environmental models and the assembly effect of groups. A more complete explanation of the effects of member characteristics on the potential for organizational conflict should incorporate other influences such as situational, economic and group process variables.

The basic assumptions of this study are that both people and organizational situations can be characterized by their resemblance to one or more types. Little (1972) suggests that it is legitimate to speak of such "types", "if we can show that they comprise highly developed sets of implications which can support inferences about correlative aspects of behavior in different domains." This study takes the potential participant of polydisciplinary research as its frame of reference and considers how s/he would influence, and be impacted by the research team situation.

Moos (1973) suggests that there are psychometric problems associated with assessing psychosocial attributes and environmental characteristics..."but these techniques have been relatively widely used and are potentially important in the identification of salient environmental dimensions...If the goal of institutions in our society is to set up conditions to maximize certain types of behaviors, a most relevant task for social science is the systematic description and classification of environments and their differential costs and benefits for adaption" (Moos 1973). If models for persons and environments can be established and validated, these models can be used to derive a set of useful hypotheses about the adaptive pairings of individuals and situations (Holland 1966, Moos 1973, Summer 1976, Burns and Stalker 1961, Little 1972 and Likert 1961).

### 2:3 The Pairing of Individuals and Situations; Theories of Organizational Participation.

A central premise of personality psychology is the idea that the individual interacts with his environment by breaking it down and organizing it into meaningful patterns congruent with his own needs and psychological makeup (Little 1972, Grey 1977, and Harvey 1961). Consequently, social and physical environments represent stimulus situations for the activities and behavior of the individual (Sherif and Sherif 1969). Examples of stimulus situations in the environment include; objects, other individuals, individuals in groups, social institutions, cultural objects, social norms, language systems, technological objects and values (Sherif and Sherif 1969, Little 1972, Holland 1966 and Moos 1973).



Proponents of environmental and vocational psychology suggest that more precise predictions about human behavior can be made by assessing both the person and their stimulus environment (Holland 1966, Moos 1973 and Little 1972). Moos (1973) contends that different social and physical environments require different types of, "initiatives, adaptive behaviors and preparatory coping mechanisms for the individual to be successful in them." This notion underlies the concept of congruence; agreement between what the individual needs and what the situation provides (Holland 1966).

According to Holland (1966) the pairing of individuals and situations is either congruent or incongruent. Congruency involves situations where the elements in the environment are well suited to the person's coping abilities. Incongruency occurs when the requirements of a situation and the individual's needs are inconsistent. This places a type of environmental stress on the individual, creating a lack of psychological fit between the individual and the situation.

Degrees of congruency vary, some individuals finding some environments more comfortable than others. A basic assumption of this theory and this study is; the juxtaposition of various types of disciplinary specialists and the demands of the polydisciplinary research situation results in varying behaviorial outcomes. At one extreme, it is hypothesized that congruent pairings will intensify desirable outcomes such as; personal stability, vocational and academic achievement and perhaps, creative performance. At the other extreme, incongruent pairings are hypothesized to be less predictable in terms of individual and group outcomes (Holland 1966).

Likert (1961) elaborates on the effects of different degrees of congruency by suggesting, "that when experiences fall short of expectations, we tend to have unfavourable attitudes". Krech (1962) defines attitudes as, "enduring systems of positive or negative evaluations, emotional feelings and pro or con action tendencies with respect to social objects". Holland (1966) theorizes that the individual acquires a number of special predispositions, preferences or habitual ways of coping with situations presented by social, psychological and physical environments. He identifies three aspects of human environments which impact upon the individual:

- a) personalities in the environment,
- b) the physical setting,
- c) special problems and stresses of the environment.

Moos (1973) suggests that the most salient dimensions of an organization are:

- a) other people,
- b) opportunities for self-enhancement,
- c) how the system is controlled, maintained, ordered, clarified and changed.

Consequently, people search for vocational and organizational environments, "that will permit them to exercise their skills and abilities, to express their attitudes and values, to take on agreeable roles to and to avoid disagreeable one " (Holland 1966).

Georgiou (1973) maintains that the basic strategic factor in any organization is the individual. Organization can only be attained based on ascertaining the rewards (needs) which various individuals pursue through participation in groups. Georgiou envisions the organization as a market

place in which incentives are exchanged. The essence of this paradigm is that, "the emergence of organizations, their structure of roles, division of labor, distribution of power as well as their maintenance, change and dissolution can best be understood as the outcome of complex exchanges between individuals pursuing a diversity of goals."

From the perspective of organizational participants, the organization offers inducements for member contributions. So long as the inducements or favorable aspects of the situation are perceived to be equal or in excess of member contributions, members will be more likely to join or remain in the organization. If the organizational situation is perceived as having a low participation-satisfaction incentive, the individual is likely to rule out participation because the conditions in the organizational environment are outside his/her zone of acceptance (Birnbaum 1975).

Implicit in this theory is the "satisfaction-causes-performance" hypothesis. Organ (1977) in a recent literature review of the work done in this area, finds that empirical results are sufficiently equivocal to justify an open mind and continued study in the area. He contends that the "satisfaction-causes-performance" hypothesis merits consideration from the organizational perspective which views reciprocity in social exchange as a normative determinant of much individual behavior in social systems. However, measures of satisfaction are a perceptual matter, defined by private and idiosyncratic evaluations of the individual. Consequently, individuals differ in what they regard as appropriate incentives, contributions and comfortable organizational situations (Summer 1976, Likert 1961, Holland 1966, Moos 1973, Burns and Stalker 1961). Organ suggests that the identification of personality patterns, which relate to such variation, should lend greater predictive power to "reciprocity" as a general theory

in social and organizational sciences.

Caplow (1954) has offered the term "voluntarism" to connote an organization's ability to provide satisfaction for its members and the desire of its members to continue their participation. It is estimated that of all the academics who are potentially involvable in polydisciplinary research, only a fraction would consider doing so (Zachar 1976). Often, "practitioners finding it rewarding continue to develop and promote its practice, while those having unsatisfying experience grew bitter and become harsh critics..." (Newell *et al.*, 1975). Participation in polydisciplinary research, "...is based on the researcher's decision that it will be of personal and scientific profit for him to leave the central area of his discipline and explore the fringes" (Caudill and Roberts 1951).

Summer (1976) suggests that incentives for organizational members to perform stems from a variety of basic motivations and member characteristics. Barnard (1949) also regards the motives of the individuals participating in organizations as the critical determinant of organizational functioning. Summer (1976) observes that different "types" of organizations have built into them certain human processes which result in more or less productivity and satisfaction for their members. Satisfaction depending upon both the characteristics of the individual and the organization. He suggests that organizational situations vary in their effect on:

- a) emotions and attitudes of participants,
- b) technological and economic payoffs,
- c) the psychological atmosphere.

#### 2:4 The Situation; Polydisciplinary Teams as Small Complex Professional Organizations.

Polydisciplinary research teams consist of those academics, professionals, students and non-professionals who provide some needed service in the conduct of a research project. Pelligrino (1970) defines a team as any group of persons cooperatively working together for the attainment of some defined goal. Bennis (1956) observes that when a project is taken on by a group as opposed to an individual, methodologically appropriate rules of social behavior need to be found and formulated. Bush (1953) defines the team requirement as one in which members must submerge some of their own characteristics for the common good.

Gillespie and Gross (1976) have characterized polydisciplinary research teams in academic settings by suggesting that they are small, complex, professional organizations. Small organizations have been defined by Gross and Grambsch (1976) as, "...goal directed systems involving the direct interaction of all members". Gillespie (1976) suggests that the size of small organizations is limited by, "...the face-to-face availability of every member to every other member." Consequently, small organizations range in size from three to thirty members.

The organizational elements comprising small organizations are more elusive than medium or large sized organizations. Formalization of roles and relationships are easily observable in large organizations. Even small changes in membership alter the structure of small organizations because of their size. In larger organizations the basic operational facilitating mechanism is the management hierarchy (Lawrence and Lorsch 1969).

However, the small organization represents a "...relatively simple system compared to large organizations...a small organization operates mainly through the personal relationships of its members and only secondarily through impersonal, institutionalized relationships" (Grey 1977).

Consequently, the nature of the personal relationships in small organizations necessarily effects the organizations basis for coordination, cooperation, structure and the potential for conflict.

"Organizational control is more or less a problem in all organizations. It is more of a problem in organizations comprised of professionals and it is particularly problematic in small, complex organizations which require professionals of different disciplines to coordinate their efforts toward a common goal" (Gillespie 1976).

As Georgiou (1973) suggests, the motives and the characteristics of participating team members have implications for the ways in which the members are likely to restrict and modify the incentives and behavior of others. Conversely, the group atmosphere; its values, the stability of these values, as well as the nature of conformity demanded by the group, determine whether it is likely to have a positive or negative impact upon the behavior of its members (Likert 1961). The viability of small organizations implies the achievement of a basis for coordination developed on good inter-personal interactions and shared values (Caplow 1954). Therefore, a concern for members attributes and the conflict potential inherent in the makeup of polydisciplinary teams becomes central to the effectiveness of these entities.

Newell *et al.* (1975) have observed that because of the nature of their professional membership, no one individual or organizational arrangement can provide all the necessary supervision and direction for polydisciplinary teams. Accordingly, Gillespie (1976) contends that the composition of the team bears directly on the total administrative and technical process of these types of organizations.

The earliest writers in this area suggest that the problem of member characteristics and team composition in polydisciplinary research is of critical importance. The personalities of researchers are thought to be of greater importance in group compared to solo research (Luzski 1957). Blackwell (1955) found on the basis of his collaborative experience, that the choice of staff for polydisciplinary research requires attention to far more than technical training and competence. He provides a series of proscriptive, non-professional qualifications upon which to scrutinize potential group members.

Caudill and Roberts (1951) suggest from their socio-medical research experience that "team members need to be both intellectually and emotionally congenial people". Miller, (1954) writing on research design in group projects, documents that research conducted into social deprivation on isolated military posts, was the product of social process.

Kast, Rosenzweig and Stockman, (1951) in analyzing a ceramics polydisciplinary research project sponsored by N.A.S.A., acknowledge problems associated with the composition of teams, including, differences in styles of research, variances in commitment and competitiveness among team members.

Kluckhohn (1948) observes, "that above all, polydisciplinary research is an inter-personal situation and must be studied in relation to the structure of the situation as well as the individual personalities involved."

Blackwell (1955) emphasizes that in order to "keep competing interests in the interdisciplinary team down, careful staff selection is necessary."

Newell *et al.* (1975) have suggested a series of personnel attributes in hopes of providing principle investigators with criteria for staff selection.

Stodgill (1971) notes that the right of an organization to determine the composition of its membership may be a critical factor in its capacity for survival.

Faculty members have been trained and selected on the basis of their ability to conduct individual research, not for their ability to participate in team effort (Newell *et al.* 1975). Bush (1950) remarks that because of elaborate personality and work patterns developed in the researcher, some individuals are not able to participate in group work. Bennis (1956) points out that because there is a lack of team tradition in science, there is a kind of, "normlessness to polydisciplinary research due to differences among team members concerning:

- a) appropriate formal integrating devices,
- b) research methodologies".



Gillespie (1976) suggests that in the absence of norms governing member interaction, behavioral influences are often carried over from other cultures such as professional associations or the larger institutional setting. In the absence of shared operating norms in polydisciplinary research situations, relations of power, disciplinary and personal rivalries, research methodologies and professional status differences all become central to the process of organizational decision making. Polydisciplinary case studies provide instances of this process in descriptions of organizational conflict, member dissatisfaction and organizational dissolution (Maybry 1966, Stringer 1970, Caudill and Roberts 1951, Kast and Rosenzweig 1970). To the extent that the organizational elements of status, power and authority are carried over from the external organizational environment of the university, polydisciplinary research teams are dependant on both the characteristics of the institutional environment and team members (Gillespie 1976).

Polydisciplinary organizations are complex. Organizational complexity is defined by a high degree of knowledge required to produce the organization's product. It is usually measured by member education or the functional differentiation or specialization of task units (Gillespie and Milleti 1976).

The potential for group conflict in organizations increases with the variety of professionals incorporated (Thompson 1967). Lawrence and Lorsch (1969) have suggested that when organizational members are highly differentiated, it is difficult to achieve cooperation because the individuals have such different ways of thinking and doing things. According to

Thompson (1967), it may be possible to have an organizational membership so divided, that it immobilizes coordinated activity.

Blackwell (1955) observes that developments within fields of specialization frequently have weakened and sometimes destroyed the possibility for inter-field communication. Herzog (1959) comments on the basis of evaluation research experience, that, "specialists are characterized by interprofessional divergences in viewpoints which persist as barriers to communication and consensus and which have to be overcome in any attempt at collaboration". This conflict potential is aggravated in polydisciplinary research due to the interdependencies imposed on team members engaged in intensive type technologies (Thompson 1967). A particular kind of technology is defined by the types and patterns of human activities, equipment, materials, knowledge and experience required to perform a specific task (Gillespie and Milletti 1976). Technologies vary in the degree to which these requirements are known and stable (Summer 1976).

Thompson has defined research as an "intensive-type" technology. An intensive technology is one in which, "a variety of techniques are drawn upon in order to achieve a change in some specified object, the selection, combination and order of application are determined by feedback from the object itself" (Thompson 1967). Intensive technologies are further characterized by the 'reciprocal interdependences' imposed in work processing on the organizational participants. Reciprocal interdependence "does not necessarily mean that each member is dependant on and supports every member in a direct way...yet they may be interdependant in the sense that unless each individual performs adequately, the total is jeopardized" (Thompson 1967).

As a result of this interdependence, intensive technologies require the most costly form of organizational coordination; mutual adjustment among organizational participants. Bennis (1956) observes that team research exposes the organization to constant flux and disequilibrium. Research into the dynamics of problem solving groups looks at the assembly effect of member attributes on problem-solving effectiveness. Maier (1961) has found that for group problem-solving technologies, "the attributes of each individual may be less important than the peculiar composition of backgrounds and experiences represented by various members of the team... Group process variables act to either facilitate or inhibit these compositional effects".

Empirical results of work in this area have shown that the problem solution results of groups composed of members who are homogeneous and heterogeneous along various dimensions produce qualitatively different solutions. The dimensions studied include; sex, personality attributes, values and approaches to problem solving. Heterogeneous groups consistently produce both qualitatively and innovatively better solutions to a variety of problem types (Shepard 1954, Smith 1971, Hoffman 1959, Hoffman and Maier 1961). These results are consistent with Maier's findings in the individual, where the individual with many perceptual directions is more likely to be a successful problem solver than the person who is inflexible and adheres to a single direction. The logical extension of these findings, applied to groups, implies that the multiple perceptions available from members of heterogeneous problem solving groups yields the higher quality solutions. Herein, lies the creative potential to be tapped in polydisciplinary research.

Pelz and Andrews (1966) found that individual research performance was greatest in situations which contained colleagues with both similar and dissimilar personal attributes. However, Hoffman found that the tendency toward individual acceptance of group solutions was especially marked in homogeneous groups. The implication being that groups composed of members with similar attributes apply similar perspectives to the problem and group solutions are consequently more readily available and acceptable to all members of the group (Hoffman 1959).

If, however, member attributes become too extreme, as they often do in polydisciplinary research, the potential for conflict increases. Problem solution processing becomes difficult if not impossible. Hoffman and Maier (1961) designed problems to place strain on heterogeneous groups by exaggerating the differences among group members. These types of problems created greater conflict in the heterogeneous groups than in the homogeneous groups. However, certain heterogeneous groups were able to resolve the conflict. The conflict among participants results from opposing points of view, the expression of which may have either positive or negative effects on organizational coordination (Coser 1956).

Limits to the functional and creative potential in polydisciplinary research seems to be when teams are composed of members with unreasonably extreme attributes in relation to one another. Members may be more or less compatible along dimensions such as personality, sex, approaches to problem solving, values as well as disciplinary and professional operating norms. We are suggesting that the degree of heterogeneity among members of polydisciplinary teams, provides more or less potential for conflict in the group.

In summary, certain problems of organizational coordination in the polydisciplinary research team can be partially explained by the attributes of individual organizational participants, the interpersonal demands of the polydisciplinary research situation and the degree of heterogeneity present in the composition of the research team.

### 2:5 Organizational Participation of Academic Professionals

What is recognized in the literature on polydisciplinary teams is not generally recognized in the work dealing with the organizational participation of professionals. Most of the literature on the organizational participation of professionals focuses on large bureaucratic organizations. This material tends to have an anti-bureaucratic bias and implies that all modes of professional organization are in conflict with bureaucratic-type control systems (Gardner 1975, Likert 1961, Dalton 1970, Aiken and Hage 1968, and Miller 1954).

Recent developments in the area suggest, however, that bureaucratic and professional principles of organizing are not incompatible. What is being increasingly realized is that various types of professionals have different operating norms. These norms vary in:

- a) the way professionals define the task situation,
- b) different tolerances for types of administrative and support systems (Goss 1961, Gillespie and Morrissey 1977, Toren 1976 and Hall 1968).

Several authors have demonstrated that some professionals are more or less amenable to routinization. The greater the discrepancy between the professional's norms and the organization's, the greater the potential for conflict, alienation and dissatisfaction (Gillespie and Morrissey 1977).

Litterer (1970) in a comparative study of research and operating departments in several industries found that the research departments could be generally characterized as being less structured, having fewer hierarchic levels, with broader spans of control, less specificity of performance, fewer and less comprehensive rules than operational departments. Grey (1977) suggests that there is a tendency for autonomous professional organizations to be less structured than either the mixed or the professional department of a larger organization. Luszki (1957) in a symposium of polydisciplinary researchers, found that certain types of organizational structures may be set up implicitly because of the work habits and expectations of those having a major role in the research. This suggests that specialist's attitudes towards the work environment need to be taken into account in structuring the group situation.

Academic professionals are characterized by their specialized expertise, their autonomy in decision making and a loyalty to their speciality (Wilensky 1964). Gaff and Wilson (1968) found academics to be highly task oriented people who derive a great deal of intrinsic satisfaction from their work. Out of the five types of scientists studied, Pelz and Andrews (1966) found that Phds. in academic labs have the highest needs for self-actualization. This group was also found to be the group most strongly involved in their work. Of those academics studied and found to be the highest research performers on several output measures; an individual characteristic which associated significantly with performance was strength of orientation towards ones discipline (Pelz and Andrews 1966).

Several studies have demonstrated that Phds. in both industrial and academic settings overwhelmingly endorse an orientation towards science, rather than toward the organizations in which they work (Pelz and Andrews 1966). Hagstrom (1965) defines the professional scientist as an individual with commitments to his own goals, which implies that s/he is not easily deployed by others. Lynton (1969) also suggests that scientists seek to safeguard their autonomy.

Thompson (1969) observes that the local markets for these occupations are quite limited. To the extent that the individual maintains visibility among colleagues in national and international journals and professional associations, the individual's reputation increases and dependence on a specific organization is decreased.

Miller (1954) contends that the professional researcher wants to choose his problem, be given proprietary rights to publication and have control over his working conditions. Some of the above characteristics have been found to be inconsistent with certain demands of organizational control (Newhauser 1972).

Likert (1961) explains that an, "extended exposure to an education system which emphasizes individual initiative, responsibility and authority... increases the likelihood that these values will be accepted by the individual and carried over into work situations." Consequently, the workstyle characteristics of specialists have important implications for the structure of polydisciplinary teams (Gillespie and Gross 1976).

Fincher (1965) in a review of research on research management, observes that although socio-economic, working conditions and organizational arrangements are recognized as factors effecting research productivity, research on the general structural variables has been noticeably neglected. Shepard (1954) has suggested that administrative realities in the research situation are an important part of the social environment and their effects on behavior require investigation. The administrative arrangements of polydisciplinary research situations evolve in response to the need for assigning specific responsibilities and for developing organizational means to integrate individuals and the interdisciplinary effort (Kast and Rosenzweig 1970). Consequently, disciplinary specialist's attitudes towards alternative forms of organizing work will be explored by this thesis.

Summer (1976) has observed that individuals vary in their need for structure, defined as "stable expectancies". "Situations may be understructured or over structured in relation to an individual's zone of acceptance." Varying degrees of flexibility or routination in organizational situations present varying probabilities that certain behaviors may be restricted or encouraged through participation (Summer 1976, Organ 1977).

Katz and Kahn (1966) have found that members of formal organizations do respond to visible organizational pressures; the negative consequences of increased organizational size on workers job attitudes is well documented.

Argyris (1957) has written extensively concerning the conflict between individual needs for self-actualization and processes imposed on the individual in bureaucratic organizations. (Likert 1961, Gardner 1975 and Mason 1976) have all found that an individual member of an organization will always interpret an interaction between himself and the organization in terms of his background, culture, experiences and expectations.



Shepard (1954) found, in a study of a M.I.T. group research lab, that the individual researcher's attitude towards the lab provided the basis for collaboration. Birnbaum (1975), in a study of 40 independent variables which effected the in-process performance of polydisciplinary teams, found that the researcher's attitude towards the project was the most important performance variable.

Mason (1976), based on his study of the polydisciplinary institutes at the University of Washington, suggests that the basis of coordination in these enterprises does not lie in administrative manipulation, nor in collective collegial action. It lies with the individual researcher. Pelz and Andrews (1966) in their study of scientists in five types of organizational settings, found that these research environments varied in their degree of organizational flexibility. Measures of individual research performance within these five settings varied most significantly with individual motivational factors.

Mason (1976) found that a major basis of formal and informal structure in polydisciplinary institutes, related to the world view, research philosophy, personality and drive of the director. He also found that disciplinary differences in experience and administrative orientation created operational barriers in the research process.

Ikenberry and Friedman (1972) suggest that men tend to define tasks and the structure of tasks in terms of their conceptual frame of reference and personal competencies. Academic research professionals import various work standards into the group research situation. Consequently, Gillespie (1976) hypothesizes that the "face-to-face" nature of these small organizations may require at least compatible working styles among members.

He suggests that the most important factor in putting a small organization together, is to select and combine the right people.

In order to be successful, small organizations, "must structure or control member relations such that different perspectives fuse together in a complementary and productive way" (Gillespie 1976). For instance, he found that polydisciplinary teams displaying a 'status concordant' group organization were more successful in obtaining research funding, than those which displayed a 'status disconcordance' between administrative roles in the organization and the disciplinary status of members of the team. Status concordance was based on an objectively determined status ranking of all disciplines at the University of Washington.

Pelz and Andrews (1966) found that individual research performance was greatest when:

- a) there was a difference between what the researcher desired in terms of autonomy and flexibility and that which the organizational setting provided.
- b) colleagues in the immediate reserach environment included those whose attributes were both similar and dissimilar to the researcher.

These findings, coupled with those relating to team heterogeneity in problem solving groups, suggest that a research environment should incorporate enough diversity to maintain a creative tension among individuals and between individuals and the structure of the situation. However, evidence from the experience of polydisciplinary resarch teams and environmental psychology, suggests that these differences must be controlled in the research environment. Otherwise, the individual's tolerance for the

polydisciplinary situation may be ruled out; coordinated activity becoming impossible.

In conclusion, Toren (1966) and others have suggested that the demand for new forms of professional combinations require that we focus on, "...various patterns of inter-penetration and cooperation implied by these modes of organizing." In particular, this study looks at the implications of specialists' attitudes towards alternative work organizing styles..

### III. SPECIALIZATION AND THE SPECIFIC VARIABLES OF THE STUDY:

Campbell (1969) has observed that the characteristics of a discipline are never perfectly realized in any given disciplinary specialist. The attributes of disciplinary specialists are better explained by theories of personality attraction and professional socialization. These include explanations of the complex personality characteristics and developments which accompany processes of selection, recruitment, training and maintenance of the disciplinary professional's identity. Although these processes may be applied generally, we are concerned with the characteristics of a particular type of occupational specialization; that associated with the career development of disciplinary specialists.

#### 3:1 Theories of Personality Attraction to a Speciality:

Theories of personality stress a basic orientation of individuals to their worlds. These characteristics identify special, distinctive aspects of the individual personality which are referred to as "core aspects of personality; those relatively unchanging, universal attributes of psychological man" (Maddi 1968). Personal constructs which seek to define personality are "pervasive in personality research; finding expression in such notions as introversion/extroversion, etc." (Little 1972). Personality theory suggests that certain "discernable groups of social responses in the individual are the result of these innate or learned attributes." (Likert 1932).

Applied to disciplinary specialists, attraction theory suggests that the individual develops a characteristic, selective orientation towards the total environment and that psychological man opts for some competencies at the expense of others (Little 1972, Holland 1966). Little (1972) defines personality specialization as "the process through which objects in the environment become selectively attended to by man."...To say a person is a specialist is to imply;

- a) that s/he is interested in and positively oriented toward a set of objects or events.
- b) that s/he spends a comparatively large portion of available time in activities involving the speciality.
- c) that his/her way of thinking about these objects, ideas or events is comparatively advanced.

The concept of the specialist thus seems to translate quite readily into effective, cognitive and behavioral terms..." (Little, 1972).

An extension of this perspective, relevant to this study and found in vocational psychology, suggests that people choose fields of study and careers which are consonant with their personality structure (Holland 1966, Little 1972, Gaff & Wilson 1968). Consequently, membership in specific academic and professional specialties may be partially explained by the differential attraction and recruitment of persons with reasonably developed personality patterns. There is some empirical evidence to substantiate this theory of attraction. Vocational choice research deals with the characteristics of individuals choosing alternative specialities.

Research conducted at M.I.T. looked at the interest differences among 250 engineers engaged in four specialist activities in 21 industrial research labs. Results of the study included significant differences among the four groups in individual orientations towards people, things, ideas and economic incentives. Sales engineers were low in their interest in ideas and theory and were high in economic incentives. Development engineers had a high interest in things and administrative engineers were highly oriented towards people. Research engineers were high in their orientation towards ideas and theory and low in their interest in people and economic incentives (Shepard 1954).

There are a number of studies which have focused on interest and personality factors as related to speciality choice in medicine. These studies have looked at socio-demographic factors, measures of academic ability, medical G.P.A.s, class rank, personality and interest factors. These studies have generally been successful in identifying significant personality associations with speciality choice (Marmon 1976).

For example, in a longitudinal study of 2,500 medical students from 28 medical schools in the U.S., Shumacher identified, on the basis of personality and interest tests administered at entrance to medical school, distinct groups of individuals choosing particular specialities at the end of medical school. Shumacher found distinctive differences in personality and interest factors between groups of individuals choosing full-time practice compared to those who chose full-time or part-time academic careers. The academically oriented group appeared to have higher theoretic/artistic,

lower practical economic, higher social welfare and dominance needs than those choosing full-time practice careers. Within this academically oriented group, the psychiatry group appeared to have higher theoretic/artistic interests and higher social welfare interests than the surgery or medicine groups. The academic medicine group apparently has higher social welfare interest than the academic surgery group (Shumacher, 1976).

In a longitudinal study of choice of major in business school, Frost and Barnowe (1976) assessed personality and situational influences on choice of major. They compared student responses to the business school experience on the basis of the students' orientation to persons and things. The hypothesis that personality orientation predisposes students to be positively influenced by teachers in person and thing oriented fields was partially supported. Thing specialists appeared to be more influenced by considerations like salary and employability. Students oriented to people appeared more influenced in their choice of major by teachers than did the thing oriented students. Thing specialists appeared to be more introverted than person specialists. There was some support that person orientation may influence performance in courses.

Little (1972) in a series of personality studies of Canadian and British university students majoring in different fields, found reliably different personality orientations among students in the physical, social and humanities areas.

Summarizing, theories of personality attraction and vocational choice emphasize that individuals exhibit particular patterns of personality. These attributes include identifiable orientations towards preferred interests and competencies which can be associated with the selective channeling of dispositions and abilities into fields of specialization.

### 3:2 Specialization and Theories of Professional Socialization:

As previously discussed in the section relating theories of personality, Gaff and Wilson (1968) contend that persons with particular patterns of interests and values are attracted to intellectual cultures and vocational settings which are consonant with their predispositions.

Theories of professional socialization suggest that even if the pre-occupation with a special area did not exist before entrance to training, the experience of disciplinary socialization constrains one to acquire or further develop particular competencies. Grey (1977) points out that the experience of education, apprenticeship and work have a strong influence on producing and sustaining professional identity. This experience involves, "an extended period of socialization, in which a psychological and social commitment to the particular professional career is developed" (Mills 1966). The result of this process is what Holland (1966) describes as, "the way of life associated with a particular occupational class...of which the obvious work activities are only a small part." Membership in particular occupations endows members with certain attributes and attitudes (Grey 1977).

In a study of the effects of graduate education, Heiss



(1969) found that the experience of graduate school effectively socialized students into separate academic cultures. Greenwood (1957) provides an insight to explain this finding. He suggests that advanced educational socialization consists of exposure to, "systematic theory and a wide knowledge of a specialized technique." Everything inside of the professional's education, "from idioms to ideologies" contrains one to fit the standard norm as prescribed by a profession (Heiss 1969).

This produces a situation, "where each profession has its limited field of expertise, special environment and a group psychology..." (Greenwood 1957). This contributes to what Campbell (1969) observes among academic professionals; "the creation of a disciplinary ethnocentrism."

Acquisition of this specialized perspective requires personality involvement and the learning of esoteric language and meaning systems. "In general, the harder and longer the period of educational socialization, the more techniques, culture and deep attributes which are learned" (Grey 1977).

The experience of disciplinary socialization involves what Petrie (1976) calls, "the adoption of the cognitive map of a discipline". This cognitive map includes basic concepts, modes of inquiry, problem definitions, observational categories, representation techniques, standards of proof and types of explanations (Petrie 1976, Janetch 1970, Heckenhausen 1970). A major portion of the literature discussing polydisciplinary collaboration, elaborates

on the consequences of differences among disciplines along these dimensions. In terms of characterizing individual specialists, these philosophical and observational differences contribute to varying specialist attributes, scientific attitudes and work styles (Thompson 1969, Petrie 1976, McGrath 1970, Gillespie 1976, Mason 1976, Newell *et al.* 1975).

Others have also recognized that these cognitive differences are associated with fields of specialization and are then translated into the social context of science (Campbell 1969, Thompson 1969, Hagstrom 1965, Bennis 1956).

Hagstrom (1965) and Polanyi (1969) suggest that science, like other professions, is governed by the principle of mutual control. "The scientist is both subject to criticism by all others and encouraged by their appreciation of him. This is how scientific opinion is formed...which enforces scientific standards and regulates the distribution of professional opportunities" (Polanyi, 1969). Reif (1961) has observed, "that to constitute scientific knowledge, there must be individual contributions which are verifiable by other scientists and usable by them for further extrapolation...". The very nature of scientific work implies the need for the recognition; the value of one's work by others in the field." At advanced levels of disciplinary specialization, only scientists in one's field can understand and judge the merits of individual contributions. Reif concludes by suggesting that the academic carries out his work in setting where he is, "extra-ordinarily dependent on the good opinion of others and where his reputation becomes translated into many concrete personal consequences" (Reif, 1961).

However, approaches to science, as specified in particular disciplines at particular times, cover a restricted range of acceptable scientific activity. Consequently, the process of, "rewarding social recognition in exchange for information," tends to produce individual conformity to different goals among disciplinarians (Hagstrom, 1965).

Consequently, differences among individuals from disciplines extend beyond speciality orientation and subject matter into the realm of values, norms of scientific behavior, approaches to seeking and verifying knowledge. Thompson (1969) even suggests that individuals may become over socialized to the tenets of their discipline, limiting their perceptual horizons and sources for insight. Spaulding and Turner (1968), in a study of disciplines and political orientation, found that party preference is affected by information gained in academic specialization. Gaff and Wilson (1968) looked at faculty orientations toward educational values, teaching styles and lifestyles. They found validation for the concept of distinct academic cultures. Newell *et al.* (1975), looking at management problems associated with polydisciplinary teams, found that because of their training, some disciplinarians were inherently intolerant of other disciplines and those within the same discipline often claimed superiority over certain areas within the same discipline.

Gillespie (1976) and others have documented status differences among disciplines within an academic community. These status differences are often demarcated by differential rewards, prestige and influence within the university setting. Thompson (1969) suggests that these status differences are related to the various truth strategies associated with specific disciplines. Hagstrom (1965) relates these differences to the influence of specific disciplines outside of the

academic community, especially those disciplines associated with professional schools.

In summary, theories of professional socialization and social control applied to disciplinary specialists, suggest that professional specialization at this advanced level also effects the cognitive, affective and behaviorial attributes of the individual. Consequently, different academic groups have reliably different orientations to the content and structure of reality, as well as the pursuit and verification of knowledge. As Gaff and Wilson (1968) suggest, there is little in the training of a specialist which prepares him/her for polydisciplinary communication. Instead, the process of intense identification with the speciality renders most scholars uncomfortable and inept outside of the social context of their field.

### 3.3 Implications of Methodological and Theoretical Orientations of Specialists on the Organization of Polydisciplinary Research:

Simmons and Davis (1957) found that methodological differences among disciplinarians presented the greatest problem in the collaborative effort. Newell and Mar (1976), in a study of interdisciplinary modeling groups, found that differences among disciplinarians placed integrative limits on the feasible numbers of disciplines which could be involved in a modeling effort. Stringer (1976), in a case study of engineering applied to health systems, found that conceptual differences among participants were difficult to reconcile because of the styles of thought resulting from the patterns of training in each profession. Leonard (1972), in an interdisciplinary

project applying bio-medical engineering to heart surgery patients, found that the problem solving and practical concerns of hospital administrators, engineers and physicians varied drastically.

Mabry (1966), as social-historian to an international polydisciplinary study of medical utilization, observed that, "methodological safeguards had to be guaranteed to individual participants for a variety of idiosyncratic and professional motivations, in order to resolve organizational conflicts."

Several authors suggest that these problems are the result of the professionals different attitudes to the apparatus of research (Mason 1976, Herzog 1959, Hagstrom 1965). Marx and Suchman (1967), in an article concerning the systematic relations between health and behaviorial sciences, suggest that the significant differences between the orientation, contents, potential contribution and the personnel of various fields needs to be taken into account in order to arrive at factors which make the pairings of fields more or less appropriate for utilization. They propose a conceptual continuum, consisting of two axi, the theoretical and the methodological. They hypothesize that it should be possible to identify the tendencies, general orientations and gross techniques of various fields along these continuums. Using the continuums, the fundamental congruence or incongruence of individuals and their approaches could be assessed. The applied concern being to increase the productivity of collaborative efforts in teaching, research and service.

Weiss (1966) has suggested that there are two alternative approaches to the study of complex situations; the analytic and the holistic. According to Weiss, each of these approaches to problems defines its own type of research goals and methodology. He hypothesizes that in practice, researchers tend to fall into one or the other of these two approaches.

Mason (1976) found evidence for distinctions among researchers concerning the degree to which they define, "the wholeness of a problem and their integrative use of methodology." Thompson *et al.* (1969) have suggested that different truth strategies and sets of methodological approaches guide the search for knowledge and the elimination of error within the modern university. They define a truth strategy as, "the set of rules a researcher applies to assemble information and determine its significance." These authors also pose conceptual continua, consisting of two axes; designed to indicate the extent to which reasoning and empiricism guide strategies for seeking truth among the disciplines. A given truth strategy may range from high to low on its reliance on empiricism. Similarly, a given strategy can range in its reliance on a system of codified reasoning. Empiricism relates to the types of experimental feedback mechanisms employed. Codified reasoning concerns how explicitly the discipline's body of knowledge is arranged in systems.

Thompson *et al.* (1969) suggest that truth strategies have impact for the grouping of disciplinarians in academic departments, interdisciplinary efforts and in the organizational structure of the university, in general. This is because adherents of a truth

strategy tend to feel that theirs is the most useful, if not the only proper strategy. Consequently, specialists feel comfortable with other adherents of their strategy, but less so with representatives of another strategy.

Thompson *et al.* (1969) observe that because there are relative organizational deprivations and rewards associated with each truth strategy, these distinctions form the basis of antagonisms and conflict within this institutional setting. They hypothesize that the degree of faculty politics is positively correlated with the heterogeneity of faculty attitudes and that pluralism of truth strategies underlies many issues in faculty conflict and governance.

In summary, the literature suggests that disciplinary specialists can be characterized by their attitudes toward the apparatus of research. This contention will be explored in this study because of its bearing on the conflict potential in polydisciplinary research efforts.

### 3:4 Specialization as the Independent Variable of the Study:

In order to study the implications of specialists' attitudes toward approaches to research and styles of work organization, we will specify the meaning of these variables as used in the study.

Building upon the content of theories of personality and professional specialization developed earlier; the experience of acquiring a discipline can be partly understood as an extension of the more general process of "psycho-specialization". This process manifests in one's personality orientation to specific objects and events in the environment. Consequently, Little (1972) defines the academic

specialist as one, "who engages in projects which involve him at the behaviorial, cognitive and affective levels, which takes place over fairly long periods of time, which bring him/her into contact with persons, things and institutions which define his/her speciality." Given the numerous kinds of objects towards which individuals may be attracted, several authors suggest, "the study of elements which partition environments in some basic and primary way" (Little 1972, Forst and Barnowe 1977, Roe 1956, Rosenberg 1952). These authors have all suggested that "persons and things" represent primary elements in human environments. A major contention of this approach is that assessment of an individual's orientation towards persons and things will facilitate predictions about his/her encounters with other dimensions of human environments.

#### 3:4:a Empirical Evidence

Several studies reporting on peoples preferences for dealing with social or non social objects, show consistant differences among the individuals who vary along these attributes. Rosenberg (1952) found that there were significant differences between person oriented and thing oriented individuals remaining in the teaching profession over time. Person oriented individuals were more likely to remain teachers than thing oriented individuals. Little (1972) found that college students, identified by their personality orientation towards persons and things, perceived social environments differently. Person specialists tended to construe the shopping mall setting in terms of the attributes of people within the setting. For example, they described the setting using the personalities of people observed and types of social interaction



seen. Thing specialists tended to focus their descriptions on the characteristics of the physical setting, details like spatial layout.

Person and thing personality orientations have been found to correlate highly with a significant number of scales from two well validated measures of vocational interest, the Strong Vocational Interest Blanks and the Vocational Preference Inventory. (Campbell 1970, Holland 1958). On the V.P.I., person specialists have been found to be characterized by high scores on social interest and scale dimensions such as enterprising and self-control. Thing specialists score higher on realism and masculinity (Little 1972, Frost & Barnowe 1977).

On the S.V.I.B., the mean P/T scores for 52 occupational samples has been calculated. These results show that person-thing measures are assessing differences in orientation towards the interpersonal and the mechanical-physical domains (Little 1970).

There is some limited evidence that person-thing orientation can predict certain aspects of interactional behavior. In an analysis of role behaviors in small groups involving the expression of positive and negative emotions; person orientation was found to correlate significantly with the expressiveness of positive affect (Little 1972). It has also been predicted, though not explored, that thing orientation will correlate with more task oriented strategies during social interaction.

Little (1972) has developed a series of summary characteristics found to be associated with person or thing oriented individuals:

a) Person Specialists - have preferences for activities involving affiliative, empathetic and nurturant behaviors. Their academic pursuits are most often literary and social service fields, where they place a high value on the relevance of studies to humanity.

b) Thing Specialists - express interest in a wide range of encounters with physical objects, machines, artifacts and things. They have tendencies toward mechanical, manipulative and analytic behaviors. Thing oriented people have strong preferences for order, clarity and practicality. They are more likely to pursue academic fields such as physical and applied sciences, where stress is placed on rigor.

On the basis of the work which supports the validity of these personality constructs, this study assesses disciplinary specialists' orientations towards persons and things. It is a major contention of this thesis that assessment of disciplinary specialists' personality orientation towards persons and things will be associated with specific attitudes towards work style arrangements and research modes. Using disciplinarians' orientation towards persons and things as the independent variable of specialization, two hypothetical relationships will be explored in the study:

a) Person and Thing orientation in relation to Analytic and Holistic approaches to research.

b) Person and Thing orientation in relation to Type One and Type Two styles of work organization.

### 3:5 Dependent variables - Study Area One; Person and Thing Orientation in Relation to Alternative Approaches to Research:

It has been suggested that the tenets of specialization theory, elaborated on earlier, should be reflected in academic professionals' behavior (Little 1972, Thompson *et al.* 1969, Campbell 1969, Kilmann and Mitroff 1976). Little (1972) explored vocational and personality data on

famous twentieth century psychologists and found dimensions of "personalistic" versus "physicalistic" construct usage in theorists' works. High person scores were associated significantly with a more holistic, personal, qualitative, dynamic theoretical-methodological position. Low person scores stressed an objective, elementarist, transpersonal, quantitative and static orientation in academic work. A significant correlation was found between person orientation and tendencies to stress personalistic constructs in formal theorizing.

These distinctions in theory and method approaches correspond quite readily to the methodological and theoretical continua proposed by Marx and Suchman 1967, Thompson *et al.* 1969, and Weiss 1966. For example, Thompson *et al.*'s (1969) description of the SCIENTIFIC\*ANALYTIC truth strategy corresponds conceptually to the method and theory characteristics associated with the "Physicalistic" or "thing" orientation found in Little's (1969) and Frost and Barnowe's (1977) studies. While Thompson *et al.*'s (1969) DIRECT\*INSPIRATIONAL truth strategy closely approximates a more "personalistic" orientation to research.

Thompson *et al.*'s (1969) DIRECT\*INSPIRATIONAL strategy is characterized by an empirical and reasoning approach guided by an ever increasing intimacy with the phenomena under study. The most general criteria for this approach is, "relative and meaningful knowledge based on a high reliance on judgement". In contrast, the SCIENTIFIC\*ANALYTIC strategy sets the researcher apart from the phenomena under study. There is more emphasis on the collection of evidence with experimental control, as well as systematic theorizing based on logical completeness.

Weiss's (1966) definitions of ANALYTIC versus HOLISTIC research approaches are substantively similar to the DIRECT-PERSONALISTIC and SCIENTIFIC-PHYSICALISTIC distinctions proposed by Little (1969) and Thompson *et al.* (1969). Weiss's (1966) ANALYTIC approach is characterized by the process of identifying independent, dependent and intervening variables and usually some attempt at quantitative measurement of linkages. This approach does not attempt to deal with objects or events in their full concreteness, but rather, produces situationally limited generalization.

Alternatively, Weiss's (1966) HOLISTIC approach is more concerned with the identification of system relationships. This viewpoint tends to explain phenomena in terms of the action of the system, rather than in terms of some intersection of causal factors. This leads to the development of models or typologies of systems and the study of the organization of elements in these systems.

Finally Marx and Suchman (1968) have suggested a dicotomy along methodological and theoretical continua which closely approximates the content of these other sets of definitions. Marx and Suchman's (1967) GENERAL-QUANTITATIVE approach is concerned with the formulation of general laws or theories, while their SPECIFIC-QUALITATIVE approach tends to focus on understanding specific cases. The GENERAL-QUANTITATIVE approach focuses on actuarial or probabalistic predictions based on efficiency or rational type models. The SPECIFIC-QUALITATIVE approach uses more introspective research techniques. Predictions are made using functional or type models.

Building upon the similarity of these method-theory constructs and their tentative association with the personality orientation of the disciplinary specialist, the study asks:

WHETHER DISCIPLINARY SPECIALISTS, WHO ARE PERSON OR THING ORIENTED, HAVE DIFFERENT ATTITUDES TOWARDS ANALYTIC AND HOLISTIC APPROACHES TO RESEARCH?

### 3:5:a Hypotheses of Study Area One:

The specific hypothesis to be explored in relation to this question is:

A) An individual's personality orientation towards persons or things will be associated with specific research approaches:

I) Person specialists will be associated with Holistic approaches to research.

II) Thing specialists will be associated with Analytic approaches to research.

Summarizing, "Our visions, our stories if you will as...scientists are as much a description of us, our psychological types, as they are of the things we study" (Mitroff and Kilmann 1976).

### 3:6 Dependent Variables - Study Area Two; Person and Thing Orientation in Relation to Alternative Work Styles:

This section develops the relationship between the disciplinarian's personality orientation and attitudes toward the operating norms of alternative work situations. In the sections of the thesis discussing the structure of organizational situations and their effects upon individuals' incentives for participation, we developed the idea that individuals define tasks in terms of their own frame of reference and personal competences. Reiterating briefly, the net effect of various types of organizational designs establishes boundaries that define interpersonal relationships within which organizational participants must operate (Ikenberry and Friedman 1972).

In Ikenberry and Friedman's (1972) survey of institutes and centres at American universities, they identified three types of organizational designs; the standard type, the adaptive type and the shadow institute or centre. The criteria defining these types were:

- a) the extent to which resources were stored in the organization,
- b) the degree to which procedures were specified,
- c) the degree of organizational stability.

The standard type describes a highly structured, formalized, impersonal approach to organization. Roles and responsibilities are more clearly specified than in the adaptive type of organization. The adaptive type is collegially organized and more ambiguous in its definition of procedures, roles and responsibilities. The shadow type is less an organizational design than it is a latent network of persons and contacts.

Mason (1976), in his study of the institutes and centres at the University of Washington, expanded Ikenberry and Friedman's typology into six types of organizational design which varied from one another along the dimensions of:

- 1) communications flow,
- 2) authority,
- 3) power,
- 4) responsibility and accountability.

Mason's typology, and by implication Ikenberry and Friedman's, were recognized by Mason as varying along an organic-mechanistic design continuum. Burns and Stalker (1961) offer the organic-mechanistic design continuum to describe the structural extremes which organizations assume empirically. Burns and Stalker's typology is based on seven implicit organizational design dimensions:

- 1) definition of organizational components,
- 2) task and functional specificity in the organization,
- 3) environmental conditions and adaptations to change,
- 4) social and work process arrangements,
- 5) information processing and decision making practices,
- 6) conflict and control patterns,
- 7) personal commitment to the organization.

Likert (1961) has proposed an organizational design typology similar to that of Burns and Stalker. This typology defines alternative organizational structures on the basis of the nature of member relationships, which can range from authoritative to participative. Summer (1976) presents still another organizational typology consisting of three basic designs. He suggests that each of these types offer an array of economic,

technological, communication, control and member-satisfaction trade-offs inherent in their design. His description of the three organizational designs is substantively similar to the continua proposed by Burns and Stalker and Likert. However, Summer notes that these three types of work style arrangements can be recognized in small groups as well as large organizations.

Using the convention of the descriptive dicotomy, all of these typologies define organizational design on the basis of contrasting organizing principles. In order to expand on the PHYSICALISTIC versus PERSONALISTIC aspects of the contrasting organizational designs, we will use a composite of organizing principles from all of these typologies. For the sake of simplification, we have combined these principles under the headings of TYPE ONE and TYPE TWO organizational designs.

TYPE ONE is designed on the basis of impersonal, concrete, directive and task specific organizing principles. In contrast, TYPE TWO functions on the basis of personalistic, more generalized roles, cooperative and expedient operating norms. Within TYPE ONE situations, individual status and tasks are defined so that the individual's sphere of responsibility and accountability is well understood. TYPE TWO situations require a more ambiguous and dynamic definition of roles. This situation demands much more personal interaction to define activities. In TYPE ONE organizations, there is much less interpersonal communication and involvement required of the individual participant.

In TYPE TWO organizations, much joint decision-making takes place. In this situation the sources of organizational conflict are predominantly related to problems of mutual adjustment among participants. In contrast, sources of conflict in TYPE ONE organizations tend to be threats to personal autonomy and territorial encroachment.

In TYPE TWO organizations the work process is largely non-routine. In TYPE ONE the work processes are more likely to be outlined and guided by more impersonal standards of performance.

Likert (1961) suggests that TYPE ONE organizations provide, "physical security, status and economic incentives", in return for participation. TYPE TWO situations, "provide for motivational forces arising from group processes, economic and ego gratifying experiences".

Summer (1976) relates varying personal tolerances for the organizing principles inherent in these alternative organizational designs. He suggests that individual attitudes toward control, specificity, authority, their tolerance for ambiguity, willingness to invest oneself and requirements for personal growth, will all bear on the individual's satisfaction with different types of organizational designs. Mitroff and Kilmann (1976) found that individuals with specific personality types described ideal organizational situations similar to their personality orientations.

Building upon these ideas and on the presence of PHYSICALISTIC norms governing TYPE ONE organizational designs and the PERSONALISTIC norms inherent in TYPE TWO designs; it seems reasonable to ask: WHETHER DISCIPLINARY SPECIALISTS, WHO ARE PERSON OR THING ORIENTED, HAVE DIFFERENT ATTITUDES TOWARDS ALTERNATIVE SETS OF ORGANIZING PRINCIPLES?

### 3:6:a Hypotheses of Study Area Two:

The specific hypothesis to be explored in relation to this question is:

B) An individual's personality orientation towards persons or things will be associated with specific attitudes toward alternative types of work principles.

III. Person specialists will be associated with preferences for TYPE TWO organizing principles.

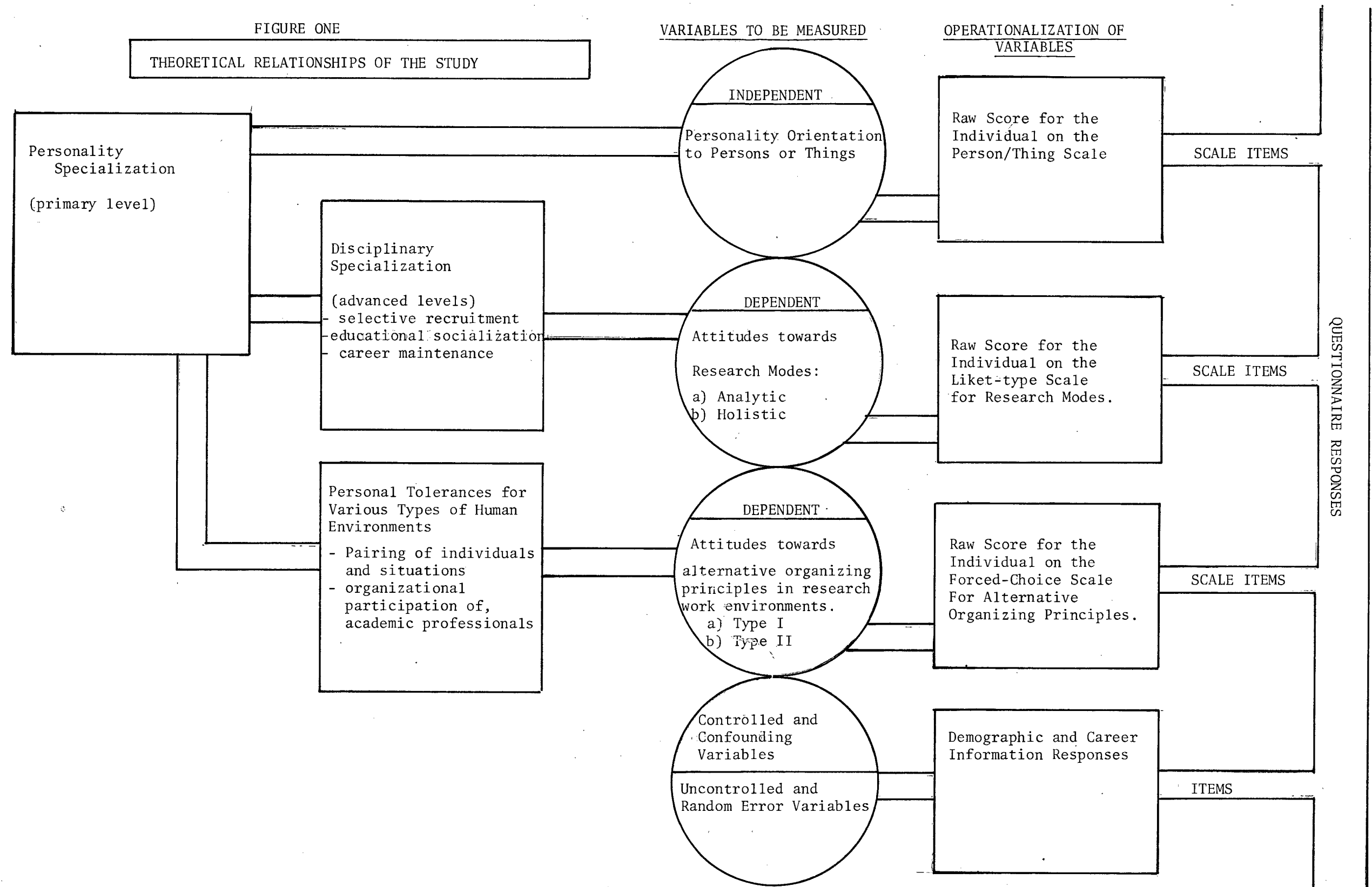
IV. Thing specialists will be associated with preferences for TYPE ONE organizing principles.

In summary, this study area proposes a set of hypotheses relating disciplinary specialists' personality orientation to persons or things and their attitude towards alternative modes of organizing work environments.



FIGURE ONE

## THEORETICAL RELATIONSHIPS OF THE STUDY



#### IV. OPERATIONALIZATION, MEASUREMENT AND DATA COLLECTION PROCEDURES OF THE STUDY

##### 4:1 Objective of the Study

The objective of this thesis is to study the influence of specialization on the research and work attitudes of disciplinarians in socio-medical fields. Specifically, the study looks at a series of hypothesized relationships between the personality attributes of disciplinary specialists and their attitudes toward:

- 1) two alternative approaches to research; the Analytic and Holistic.
- 2) two alternative modes of research team organization; Type I and Type II.

##### 4:2 Study Design

Studies which are primarily concerned with discovering or testing associations between variables are descriptive, rather than exploratory or experimental in nature (Jahoda et al. 1951). In order to explore the hypothesized relationships, this study takes the form of an "analytic field survey". The analytic survey differs from the census type of survey in that it is set up so that relations among factors or variables can be observed rather than enumerated (Oppenheim 1966).

In this particular study, personality specialization in the individual disciplinarian is thought to be associated with specific attitudes towards research and styles of organizing in work situations. Personality specialization being the independent variable and attitudes toward research modes and organizational styles the dependent variables of the study. (See Figure 1).

#### 4:3 Operationalization of the Independent Variable, Personality

##### Specialization:

The human personality is a very complex phenomenon, but for the purposes of measurement, personality is defined as, "the organization of a collection of human traits...A trait is a characteristic of the individual revealed through recurring behaviors in different situations and is thought to be a relatively enduring phenomenon" (Kerlinger 1973).

The specific personality trait examined by this study is the individual's cognitive and affective orientation towards persons and things (Little 1972). Personality orientation towards persons and things will be assessed using a Person-Thing Construct Scale. Person and Thing Scales have been developed independently by both Little (1972) and Frost and Barnowe (1976). This particular study uses Frost and Barnowe's scale.

The P-T Scale is self-administering, consists of 24 items and takes approximately 4 to 8 minutes to complete. An individual's orientation towards person and things is operationally defined on the basis of raw scores obtained from responses to the scale's items. The scale is composed of 12 person and 12 thing dominated statements. The respondents are asked to indicate the degree to which they identify with the activity described by an item along a five point favorable-unfavorable continuum. The scaled values for each of the 12 P-T items are then summed separately to give two raw person and thing orientation scores. These sums are standardized by dividing the total raw score by 12. This procedure results in the individual's person and thing scores for analytical use.

The P-T scale discriminates among individuals according to four primary specialist types:

- 1) Person Specialist - an individual who indicates a high concern for affective, cognitive and behavioral involvement with people.
- 2) Thing Specialist - an individual who indicates a high affective, cognitive and behavioral involvement with things.
- 3) Generalist - an individual who indicates a high affective, cognitive and behavioral involvement with both persons and things.
- 4) Non-specialist - an individual who indicates a low affective, cognitive and behavioral involvement with persons and things. Concerned with predicting their own behavior. They are perhaps better regarded as self-specialists (Little 1976).

Various methods are available so that combinations of person and thing orientations can be calculated. In this study, an individual is assigned to one of the four primary specialist types on the basis of whether he/she falls above or below the mean Person and Thing scores for the study sample.

#### 4:3:a Validity of the P-T Construct Scale

Campbell and Fiske (1959) suggest that two kinds of evidence about a measure are necessary before one is justified in using it to examine relations to other variables:

- 1) evidence that different measures of the constructs yield similar results,
- 2) evidence that the construct as measured can be differentiated from other constructs.

#### 4:3:b Convergent Validity:

Analysis of the overlap between Frost and Barnowe's and Little's scales has been performed. Fairly high correlations between the respective Person ( $r=.64$ ,  $s=.001$ ,  $n=396$ ) and the Thing scales ( $r=.52$ ,  $s=.001$ ,  $n=396$ ) has been found across a total sample of Canadian business school students, Canadian mining managers and Canadian resource scientists (Frost and Barnowe 1976). A non-significant correlation between Frost and Barnowe's Thing scale and Little's Person scale was found ( $r=.02$ ). A small significant correlation between Frost and Barnowe's Person scale and Little's Thing Scale was obtained ( $r=.10$ ,  $s=.05$ ,  $n=396$ ). The authors attribute this significance to a large sample size. These findings suggest that the two instruments are tapping fairly similar aspects of the individual's personality orientation.

In addition to the above, Frost and Barnowe performed factor analysis on both scales administered to a sample of Canadian business school students in 1977 ( $n=485$ ). Using oblique rotation and specifying two factors for both scales, the following results were obtained. On Frost and Barnowe's scale, all person-related items loaded on one factor and all of the thing items loaded on the other. Little's scale had one person-item and three thing-related items fail to load on either factor. A more complex factor analysis, using principal axis with oblique rotation, yielded more factors for each of the P-T scales. Frost and Barnowe's yielded 6 principal factors and Little's yielded 7. While distinct, each of the 13 factors retained either a person or thing emphasis.

#### 4:3:c Discriminant Validity:

Relationships between the P-T scales and other measures of personality have also been explored. Both Little's and Frost and Barnowe's studies have produced evidence that person and thing orientations are two, independent, internally consistent personality dispositions. Frost and Barnowe found little overlap between person and thing orientation and several previously developed measures of personality. Using measures of Introversion-Extraversion (Bendig 1962), Ambiguity Tolerance<sup>ce</sup> (MacDonald 1970) and a modified version of a Locus of Control Scale (Rotter 1966, Collins 1974); the relationships between the two sets of Person-Thing scales and the above measures of personality were explored. The only correlation above  $r=.30$  involved the introversion-extraversion scale and both Person scales (Frost and Barnowe 1971).

Some interesting personality patterns emerged from this work. Thing specialists were found to be better at disembling figures from their contexts than Person Specialists. Generalists were also better at this task than Person Specialists. Person specialists and generalists were more extraverted than Thing specialists. Generalists were found to be more tolerant of ambiguity than either Person or Thing Specialists.

#### 4:3:d Reliability of the Person-Thing Scale:

Results from different types of reliability studies of the P-T scales are also available. In Frost and Barnowe's studies of their own and Little's P-T scales, they found split-half and Cronbach's alpha coefficients to be satisfactorily high on both scales (1977). Little has tested the reliability of his P-T Scale on British, American and Canadian subjects. Split-half reliability coefficients in these studies were all above  $r=.72$ .

Little also presents evidence for the reliability of his scale based on correlations between self-ratings, peer ratings and P-T scale scores. He found general support for the view that the Person-Thing scale is "tapping a domain that does not rely upon the Person-Thing Scale method alone" (1972).

#### 4:3:e Summary

By attempting to link the Person-Thing Construct with attitudinal correlates of research modes and work organizing styles, this study is a further test of the validity and reliability of the thought and instrumentation behind specialization theory.

#### 4:4 Operationalizing the Dependent Variables:

For purposes of measurement, attitudes are defined as organized predispositions to think, feel, perceive and behave toward categories of phenomena in certain ways (Kerlinger 1973). The specific attitudes assessed as dependent variables in this study are:

- a) attitudes toward alternative modes of defining and observing empirical phenomena.
- b) preferences for alternative organizing strategies in research team situations.

#### 4:4:a The Research Mode:

An individual's orientation towards approaches to research is operationally defined on the basis of raw scores obtained from responses to a Likert-type scale developed for the study. A Likert (1961) scale is an attitude measuring technique which requires the subjects to place themselves on an continuum in relation to a series of statements. The objective of

the construction procedures for Likert Scales is to arrive at a pool of statements which are measuring the same attitude(s).

In this study, attitudes toward Analytic and Holistic approaches to research are measured by asking the respondent to place themselves on a 5 point favorable-unfavorable scale in relation to a series of statements concerning research. Each Research Mode item is designed so that persons with different points of view in regard to a particular approach to research, should respond to the item differentially.

The scoring procedure for the Likert scale is based on the decision that a favorable disposition towards one of the two research approaches rates a high score (5) and a favorable attitude towards the other research approach rates a low score (1). For purposes of scaling, a favorable attitude toward the Holistic mode is given a high score and a favorable attitude toward the Analytic mode is scored low. The raw score for individuals on the Research Mode variables is obtained by summing the scaled scores on the individual items which represent each of the alternative research approaches. The procedure used to obtain reliable Research Mode dimensions is elaborated in the discussion of the results derived from the factor analysis of the research mode (Section 5:8).

#### 4:4:b Operationalization of Organizational Approaches:

An individual's orientation towards alternative organizational approaches is operationally defined by a ratio score obtained on a forced-choice scale developed for the study. The scale is designed so that each scale-item consists of a conditional statement and two alternative endings. Each alternative ending representing Type I or Type II organizing approaches. The scale is self-administering. For each item, the subject is asked to allocate five points unequally among the two alternatives presented.



This forced-choice procedure was chosen because it best approximated the theory that organizations vary in form along a single continuum (Burns and Stalker 1961).

An individual's orientation towards Type I and Type II strategies is derived by summing the preference points allocated to the items representing Type II strategy and dividing that number into the total number of points allocated to both alternatives. Assuming that attitudes are normally distributed, a favorable attitude toward Type II is considered to be a score that falls above the sample mean on the organizational ratio. Those individuals falling below the mean are considered as having a favorable attitude toward Type I organizing style.

#### 4:4:c Other Variables:

An important part of the analytic survey design is the effort to control for as many confounding and error sources as possible. The study attempts to control for these variables by gathering information on demographic and experience characteristics of the study sample (See Appendix A.5).

#### 4:5 Questionnaire Construction:

The questionnaire items designed to tap attitudes toward research modes and work styles were produced in the following manner. An initial item pool was created for both construct areas from definitional statements found in the literature.

After an initial screening for clarity by two behavioral scientists familiar with the concepts, a panel of three judges was selected. These judges were asked to rate the statements of each pool on the basis of definitional criteria provided by the researcher, using a modified Q-Sort Methodology. The raters were graduate students from a variety of disciplinary backgrounds. Each rater was given paragraphs adopted from the literature describing the contrasting types of research modes and organizing principles. The raters were then asked to sort a series of statements, typed on three by five cards, on the basis of the degree to which each item agreed with a definitional alternative. This process was carried out separately for the two constructs. Raters were asked to place the item-cards into one of five piles. Piles one and two were to be used if the statement agreed strongly or slightly with the Analytic/Type II definitions. Pile three was used for statements which seemed unclear, ambiguous or representative of either alternative definition. Piles four and five were to be used if the statement was slightly or strongly indicative of the other definitional extremes, the Holistic/Type I alternatives.

A Spearman's Rank Order Correlation Coefficient was calculated for each item pool in order to estimate the degree of similarity among the ranking of the items by the three rates. Inter-rater correlation coefficients were all above  $r=.89$  for both the Research Mode items and the Organizing Style items. This method also allows for a visual inspection of the scores for individual items across raters. Depending on the variability in scores for an individual item, the items were maintained, rewritten or dropped altogether.

The modified item pools were submitted to a second Q-Sort employing three new raters. Spearman Rank Order Correlation Coefficients were calculated. For the research mode the inter-rater correlation coefficients were all above  $r = .85$ . For Organizing styles all of the correlations between raters were above  $r = .98$ . These items, along with the items of the Person-Thing Construct Scale, became the variables used to measure the hypothesized correlational relationships of the study.

The first draft of the questionnaire was submitted to a panel of judges, consisting of two behavioral scientists and two physicians, experienced in questionnaire design. On the basis of their recommendations, a second draft of the questionnaire was developed. This draft was submitted to a small pre-test.. The population of the pre-test study consisted of disciplinary specialists in a range of fields similar to the study's sample. Seven questionnaires were distributed and comments were received from all of the participants. On the basis of the criticisms found in the pre-test, the questionnaire was revised again. This revision, along with the cover letters, constituted the copy of the questionnaire used in the study (See Appendix A.0).

#### 4:6 Sample:

The study sample was selected in a purposive, non-random fashion. Subjects were chosen from a population of academic specialists employed as faculty in socio-medical related fields at the University of British Columbia as of September 1978. Professionals employed in these disciplinary areas were chosen because they can be considered potential participants in a variety of polydisciplinary socio-medical research issues.

Very little work has focused on the management problems of polydisciplinary health research. The Lalonde Report (1974) clearly identifies the inter-relatedness of health problems as they manifest themselves as research issues in the areas of environment, human biology, lifestyle and healthcare organization. Much of this research is best accomplished within the framework of the disciplines. However, there are pressing socio-medical problems which the health field faces and cannot be solved in the isolation of specific disciplines.

A list of fields judged potentially involvable in socio-medical research related to the child served as a basis for selecting a core group of 17 professional areas (Tonkin 1976). A faculty payroll list with the names and addresses of the individuals hired by the university was obtained. Using this list, the study population was expanded to include 33 academic fields and a sample of 594 individual specialists. Cost constraints prevented the research from sampling a larger range of sampling units (academic fields). Consequently the sample has been selected in a non-random fashion, eliminating some relevant areas of specialization.

Consequently, sources of random error in the study have not been well controlled due to the method of sampling. The study is limited in its generalizability because of:

- a) its purposive, non-random sampling technique,
- b) its respondents are a self-select group in an already biased sample.

Nevertheless, a large number of fields and individuals have been surveyed. Therefore, the sample studied will provide a good basis for generating hypotheses that may be applied to a more systematically sampled population in the future.

#### 4:7 The Measuring Instrument and Data Collection Techniques:

The measuring instrument of the study is a structured attitude and attribute questionnaire. It is self-administering and takes about 30 minutes to complete. It consists of four parts and a brief introduction. The first section, measuring the independent variables, consists of 24 items. The second and third sections measure the dependent variables and consist of 20 Research Mode and 10 Organizational items respectively. The last section consists of 16 demographic and career related questions.

The questionnaire was delivered to the study population by campus mail. Mail questionnaires are widely used in many types of surveys. The major weakness in the use of the mailed questionnaire is low response rates. Those returning the questionnaire differ from non-respondents (Charach 1975). Consequently, the following efforts were taken by the researcher to influence response rates.

Two cover letters accompanied the questionnaire, one from the students's thesis advisors endorsing the project and one from the researcher explaining the nature and objectives of the study (See Appendix A(6)).

Enclosed in the questionnaire package was an envelope with the researcher's address, enabling the respondent to return the questionnaire with little effort and at no cost. In addition, the study sample was

guaranteed anonymity. No coding or identification system was maintained. This approach necessitated the repeated mailing of all reminders to the total sample because no record of returned questionnaires was maintained. The use of followups is a demonstrated technique for increasing response rates to mailed questionnaires (Charach 1975).

The timing and format of the study's follow-ups were:

- 1) Day One-one half of the questionnaires delivered to one half of the sample.
- 2) Day Two-second half of the questionnaires distributed to the other half of the sample.
- 3) Day Six-remainder note sent out to study sample.
- 4) Day Twelve-second copy of questionnaire sent to total sample.
- 5) Day Sixteen-Final reminder note sent to all of sample.

Questionnaire length is often considered to be a factor in response rates (Charach 1975, Dillman, D. et al. 1974). The final draft of the questionnaire was eight pages. An effort to get the respondents to follow the response format of the questionnaire was made by providing an area for open-ended comments on the questionnaires design and content.

The questionnaires were returned to the researcher by Campus Mail in care of the Department of Healthcare and Epidemiology. The researcher was the only individual to open or code the responses in a pre-coded column on the questionnaire.

## V. ANALYTIC PROCEDURES OF THE STUDY

### 5:1 Outline of Procedures

The analytical procedures used in the study were chosen in order to determine the direction and strength of influence personality specialization has on specialist's attitudes towards:

- 1) alternative research approaches.
- 2) opposite modes of work organization.

The study hypothesizes that particular personality types, assessed by the Person-Thing Construct Scale, will be associated with preferences for specific research modes and work organizing styles. The thrust of the analysis focuses on correlations between the independent variables of personality orientation and the dependent variables of attitudes toward research and work.

The analytical process carried out by the study takes the following form:

1. Descriptive profile of the response sample.
2. Reliability checks on the scales used to measure the Independent Variables.
3. Steps to generate the dimensions of the Dependent Variables to be used for testing hypotheses.
4. Reliability checks on the Dependent Variables.
5. Correlational analysis.
6. Testing for statistical differences among specialist groups in regard to attitudes toward research and work organization.

In addition to the hypothesized relationships of the study concerning Person and Thing Specialists, two other specialist types are also examined in relation to the study's dependent variables. The confounding variables of age, sex, academic rank, non-university employment since terminal degree and collaborative experience with other fields are also considered in the analysis.

The effects of the personality variables are assessed in two ways. In the research mode, correlational relationships and differences in mean scores among sub-populations of specialists on the dependent variables were explored. For the organizational preference data, we examined correlational relationships and differences in the frequencies of specialist types falling into the two categories of the criterion variable.

### 5:2 Study Sample

Out of the 594 individuals contacted by the study, 53% of the sample was accounted for in one of the following ways. Out of these 314 cases, 270 or 45% were usable questionnaires. The remaining 44 cases could not be used in the study for one of the following reasons.

Table 1. BREAKDOWN OF NON-USABLE QUESTIONNAIRES BY REASON OF NON-PARTICIPATION.

REASON	NUMBER OF CASES	90
No longer at U.B.C.	28	63%
Refusal	15	34%
Death	1	2%
TOTAL	44	100%



Eighteen percent of the usable responses did not identify their departmental affiliation. Two percent of the usable questionnaires indicated primary affiliation with a department other than those polled by the survey. Table 2 compares the Relative Percentage each disciplinary field contributed to the original sample with the Relative Percentage each field contributed to the response sample. This comparison gives a general indication of the representativeness of the study population.

Out of the 32 disciplines surveyed, 26 fields responded. Nursing was the field heard from most often. Table 3 presents the Relative Frequency Response Rate per Discipline. The Demographic and Career Experience characteristics of the study sample are enumerated in Table 4 .

### 5:3 Distribution of Person and Thing Scores:

Out of the 270 cases, Person Scores were obtained for 233 cases. Thing scores were obtained for 229 cases. The descriptive statistics for these study variables appears in Table 5.

It was possible to calculate both Person and Thing Scores for 212 out of the 270 cases. Each of the 212 individuals were assigned to a Specialist orientation according to the following criteria. Depending on the individual's scores on both scales the case was assigned to one of four specialist groups for analysis purposes:

Person Specialists - if Person Score  $\geq 2.90$  and Thing Score  $\leq 3.02$ .

Thing Specialists - if Person Score  $< 2.90$  and Thing Score  $\geq 3.02$ .

Generalists - if Person Score  $\geq 2.90$  and Thing Score  $\geq 3.02$ .

Non-Specialists - if Person Score  $\leq 2.90$  and Thing Score  $< 3.02$ .

Table 2. PERCENT EACH DISCIPLINARY FIELD CONTRIBUTED TO THE ORIGINAL SAMPLE COMPARED TO THE PERCENT EACH FIELD CONTRIBUTED TO THE STUDY SAMPLE

DISCIPLINARY FIELD	ORIGINAL PERCENTAGE	SAMPLE PERCENTAGE
Law	6	3
Physical Education	5	4.4
Rehabilitation Medicine	2.1	2.2
Political Science	4	2.2
Anthropology/Sociology	6	5.2
Psychology	7	7
Home Economics	2	.0
Economics	6	2.2
Psychiatry	5	2.6
Physiology	2	1.5
Pharmaceutical Sciences	5	4.1
Pharmacology	2	1.9
Social Work	4	4.1
Nursing	10	10
Dentistry	6	5.6
Pediatrics	5	3.7
Pathology	2	3.2
Surgery	3	1.9
Obstetrics	1.3	0
Ophthalmology	1.3	1.1
Medicine	4.3	6.7
Medical Genetics	1	.4
Anatomy	2	1.1
Audiology and Speech	1	0
Community and Regional Planning	2	.7
Anaesthesiology	.1	0
Linguistics	1	1.5
Neurological Sciences	.5	1.1
Medical Microbiology	.3	0
Special Education	1	1.9
Cancer Research	.7	0
Bioresource Engineering	.7	.7
Diagnostic Radiology	.7	0
Total	100%	80% (Indicated) 20% (Other or Not Indicated)
		100%

Table 3. RESPONSE RATE OF EACH CONTRIBUTING DISCIPLINE, SIZE OF SAMPLED GROUP BY DISCIPLINE AND ACTUAL NUMBER OF STUDY RESPONDENTS BY DISCIPLINE.

DISCIPLINARY FIELD	RESPONSE RATE PER DISCIPLINE %	ORIGINAL SAMPLED GROUP	ACTUAL NUMBER OF RESPONDENTS
Law	21	38	8
Physical Education	44	27	12
Rehabilitation Medicine	46	13	6
Political Science	29	21	6
Anthropology/Sociology	38	37	14
Psychology	48	40	19
Home Economics	0	14	0
Economics	17	36	6
Psychiatry	25	28	7
Physiology	31	13	4
Pharmaceutical Sciences	39	28	11
Pharmacology	36	14	5
Social Work	46	24	11
Nursing	47	57	27
Dentistry	41	37	15
Pediatrics	32	31	10
Pathology	75	12	9
Surgery	25	20	5
Obstetrics	0	8	0
Ophthalmology	38	8	3
Medicine	69	26	18
Medical Genetics	17	6	1
Anatomy	30	10	3
Audiology and Speech	0	6	0
Community and Regional Planning	22	9	2
Anaesthesiology	0	1	0
Linguistics	66	6	4
Neurological Sciences	100	3	3
Medical Microbiology	0	2	0
Special Education	71	7	5
Cancer Research	0	4	0
Bioresource Engineering	50	4	2
Diagnostic Radiology	0	4	0
		594	216
		(Other)	6
		(No indication)	48
			270

Table 4. DEMOGRAPHIC AND CAREER CHARACTERISTICS OF THE STUDY SAMPLE

CHARACTERISTIC	FREQUENCY	RELATIVE PERCENT
Rank:		
Full Professor	60	22.2
Assoc. Professor	77	28.5
Assist. Professor	100	37.0
Research Assoc.	6	2.2
Lecturer	4	1.5
Instructor	16	5.9
Other	3	1.1
No response	4	1.5
	<u>270</u>	<u>100%</u>
Age:		
20's	6	2.2
30's	109	40.4
40's	77	28.5
50's	57	21.1
60's	10	3.7
no response	11	4.1
	<u>270</u>	<u>100%</u>
Sex:		
males	174	64.4
females	79	29.3
no response	17	6.3
	<u>270</u>	<u>100%</u>
Number of Disciplinary Speciality Areas:		
1	105	38.9
2	103	38.1
3	34	12.6
4	12	4.4
no response	16	5.9
	<u>270</u>	<u>100%</u>
Years of Formal Education:		
0-5	15	5.6
6-10	180	66.7
11-15	56	20.7
16-20	9	3.3
21 plus	4	1.5
no response	6	2.2
	<u>270</u>	<u>100%</u>

Table 4. (Continued)

CHARACTERISTIC	FREQUENCY	RELATIVE PERCENT
Non-University Employment Before Terminal Degree:		
yes	162	60
no	104	38.5
no response	4	1.5
	<u>270</u>	<u>100%</u>
Non-University Employment Since Terminal Degree:		
yes	82	30.4
no	185	68.5
no response	3	1.1
	<u>270</u>	<u>100%</u>
Collaborative Experience with Colleagues in Own Discipline:		
yes	214	79.3
no	50	18.5
no response	6	2.2
	<u>270</u>	<u>100%</u>
Collaborative Experience with Colleagues from other Disciplines:		
yes	179	66.3
no	87	32.2
no response	4	1.5
	<u>270</u>	<u>100%</u>
Average Number of Disciplines Involved in Collaboration:		
one	59	21.9
two	75	27.8
three	26	9.6
four	9	3.3
five or more	7	2.6
no response	94	34.8
	<u>270</u>	<u>100%</u>

Table 4. (Continued)

CHARACTERISTIC	FREQUENCY	RELATIVE PERCENT
Research Productivity Estimate for Collaborative Research:		
Highly productive	56	20.7
Productive	101	37.4
uncertain	19	7.0
unproductive	2	..7
Highly unproductive	1	.4
no response	91	33.7
	<u>270</u>	<u>100%</u>
Length of Collaborative Projects:		
1-6 mos.	19	7.0
6 mos. - yr.	58	21.5
1-3 yrs.	64	23.7
3-5 yrs.	18	6.7
5 yrs plus	18	6.7
no response	94	34.4
	<u>270</u>	<u>100%</u>

Table 5. DISTRIBUTIONAL BREAKDOWN OF THE FOUR SPECIALIST GROUPS

SPECIALIST GROUP	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY %	CUMULATIVE FREQUENCY %
Person Specialists	56	20.7	26.4
Thing Specialists	46	17.0	48.1
Generalists	60	22.2	76.4
Non-Specialists	50	18.5	100.0
Missing	58	21.5	

#### 5:4 Inter-Item Correlational Analysis of Person and Thing Scales:

The Person and Thing scales were each looked at separately in an inter-item correlational analysis using Pearson Product Moment Correlation coefficients. This was done to see how each of the Person and Thing questionnaire items related to the total scale dimension it was supposed to be measuring.

Each of the items of the Person scale correlated positively with the Person scale. All of the Person items correlated above  $r=.44$  at the .001 level of significance.

Each of the items of the Thing scale correlated positively with the total Thing scale. All of the Thing items correlated with Thing orientation above  $r=.48$  at the significance level .001, with the exception of two items. Item one ( $r=.26$ ) and item 18 ( $r=.22$ ) correlated at the .001 level of significance.

The results of the inter-item correlational analysis suggest that each of the items of the Person and Thing scales seem to be related rather well to the dimensions they were designed to measure.

### 5:5 Inter-Scale Correlational Analysis:

A second Pearson Product Moment Correlation was performed using the entire Person and Thing scales. This bivariate correlation was carried out to see if the Person and Thing scales were related to each other.

The Person and Thing scales were found to be essentially uncorrelated. ( $r=.072$   $n=212$   $s=.148$ ) This finding contributes to the already existing evidence that the Person and Thing scales are tapping two distinct personality constructs.

### 5:6 Reliability Tests on Person and Thing Scales:

Two types of reliability tests were performed on both scales. Reliability is the accuracy or precision of a measuring instrument (Kerlinger, 1973).

In the Split-Half reliability test, scores obtained on one half of a scales items are compared to the scores obtained for the same individuals on the items making up the other half of the scale. The resulting reliability coefficient is an indication of the internal consistency of the scale (Sellitz et al. 1976).

The Spearman-Brown Split-half reliability coefficient for the Person scale was  $r=.756$ ,  $n=233.12$  items. The Spearman-Brown coefficient for the Thing scale was  $r=.768$ ,  $n=229$ , 12 items.



Table 6. DESCRIPTIVE STATISTICS OF THE PERSON AND  
THING SCALES.

STATISTICS	PERSON SCALE	THING SCALE
Mean	2.90	3.02
Mode	3.25	3.16
Median	2.96	3.03
Maximum	4.30	4.58
Minimum	1.47	1.00
Range	2.91	3.58
Standard Deviation	.644	.613
Skewness	-.232	-.109
Variance	.414	.375

Cronbach's alpha Reliability coefficients were also calculated for the Person and Thing scales. Alpha measures essentially the same thing as the split-half coefficient. If all the splits for a test were made, the mean of the coefficients obtained would be alpha (Cronbach 1951).

Alpha for the Person scale was  $a=.808$ ,  $n=233$ , 12 items. Alpha for the Thing scale was  $a=.761$ ,  $n=229$ , 12 items. Reliability coefficients above the .70 level are generally considered to be satisfactory indicators of the reliability of a measuring instrument.

#### 5:7 Correlational Analysis of the Research Mode Items:

The following steps were taken in order to explore the construct validity of the Analytic and Holistic concepts found in the literature and to generate reliable dimensions of the Research Mode for use in the analysis.

A Pearson Product-Moment correlation matrix was constructed. This is a technique which measures the relationships between all possible pairs of questions. In this case, the research mode section of the questionnaire is composed of 20 questions so the correlation matrix consists of 20 items by 20 items.

Out of the 400 paired possibilities, 55 pairs of questions were significantly related at the  $s=.001$  level. These coefficients ranged in value from a high of  $r=.49$  to a low of  $r=.18$ . Out of the 55 pairs, only eight correlations were above the .35 level. These correlation values are low and there is no readily apparent pattern to be observed within these 55 significant relationships.

Consequently, the 20 items of the research mode were subjected to a variety of factor analytic techniques.

"Given an array of correlation coefficients for a set of variables, factor analytic techniques enable us to see whether some underlying pattern of relationships exists such that the data may be rearranged or reduced to a smaller set of factors or dimensions " (Rummel 1970).

#### 5:8 Factor Analysis of the Research Mode Items:

This thesis uses factor analysis in two ways:

1) To test for the existence of the hypothesized dimensions of the research mode in terms of expected numbers of significant factors and the loadings of particular items.

2) To construct indices for measuring specific attitudes toward research.

The factoring techniques applied to the research mode data are found in the subprogram Factor in the SPSS Manual (Nie, H. et al. 1975). The factor model used in the analysis is Principal factoring with iteration (Pa2). This classical approach to factoring rests on the assumption that the observed correlations are mainly the result of some underlying regularity in the data. In this particular factor model, a variable is thought to be influenced by "various determinants", some of which are common to other variables in the matrix and some of which are unique. Therefore any correlation between two variables is assumed to be due to a common influence. This approach to factoring is concerned with patterning all the variation in a set of variables

whether common or unique.

PA2 automatically replaces the main elements of the correlation matrix with communality estimates. The principal diagonal in a correlation matrix usually contains the correlation of a variable with itself, which is always 1.0. Communality estimates are measures of the variation of a variable that is common to all the other variables in the matrix (Rummel 1970).

Two factor matrices are produced by factor analysis, the unrotated and rotated factor matrices. The "unrotated factors define the most general patterns of relationships in the data. The rotated factors delineate the distinct clusters of relationships in the data" (Rummel 1970). The goal of any rotation is to obtain some theoretically meaningful factors and if possible, the simplest factor structure underlying the data.

The rotational techniques chosen to arrive at terminal factor solutions for this study are based on the judgement of the researcher concerning the theoretical and practical needs of this particular research problem.

#### 5:8:a Orthogonal Rotation Specifying Two Factors:

The initial factoring procedure specified two factors with a minimum eigen value of 1.0 and orthogonal rotation to vari-max solution. The two factor approach was employed to see if the 20 items of the research mode loaded differentially according to the two hypothesized research dimensions.

Factor one accounted for 76% of the variation in the research mode variables and Factor two accounted for 24%. Thirteen of the 20 items correlated to some degree on both factors. Out of the seven unambiguous loadings, 6 loaded on Factor one and 1 loaded on Factor two. All but one of the thirteen double loadings correlated predominantly with one or the other factor.

The research mode items loading above .40 on Factor one included questions 1,4,9,11,12,17 and 19. All of these statements were designed to measure an Analytic approach to research. Factor two was composed of three items loading above the .40 level; including questions 10,14 and 20. Each of these statements were designed to tap a Holistic research approach. These results provide some evidence for the existence of the two conceptually distinct approaches to research.

#### 5:8:b Orthogonal Rotation Specifying Free Factors:

A more complex factor analysis was also performed on the 20 research mode items. A free factor determination with a minimum eigen value of 1.0 and orthogonal rotation to a vari-max solution was specified. A free factor determination allows the researcher to establish the actual number of meaningful, independent patterns of relationships existing among the research mode variables.

Four factors accounted for 66% of the variance in the data. Factors one and two accounting for 54.8% of the total variance. In order to define a "salient" research mode dimension, items which loaded at .40 and above on any given factor are chosen. Items falling below .40 are not included in the definition of a factor.

Factor one consisted of items 2,4,5,6,13,14 and 16. All but one of these items (#4) were designed to define the Holistic approach to research. Factor Two consisted of 6 items: 1,9,10,11,12 and 19. All of these items, with the exception of item 10, were Analytic in their approach to defining research. Factor three is composed of one item, number 7. This question deals with the need for specificity in testing for relationships in research. Factor Four loads with two items, 17 and 20. Both of these items are concerned with interpretative strategies for research.

The free factor rotation introduces two new dimensions for defining the research mode, but the Analytical and Holistic dichotomy holds up fairly well.

#### 5:8:c Oblique Rotations:

In order to explore further the hypothesized research mode dimensions, oblique rotation techniques were employed. Oblique runs specifying two and free factors were performed.

"Oblique rotation seeks the best definition of both the correlated and uncorrelated patterns of variables in the data" (Rummel 1970). The rationale being that factors are rarely independent of one another in reality.

In the two factor approach, specifying an oblimin solution, the two factors were again found to resemble the Analytic and Holistic dimensions in content. The two factor oblique rotation found the two factors to be essentially uncorrelated with one another,  $r=.065$ .

In the free factor matrix, 6 factors loaded with a minimum eigen value above 1.08, accounting for 53% of the total variance in the data. Factor one and Factor six retain the Analytic and Holistic configurations. Factor Two is concerned with the level of generality for research models. Factor 3 focuses on the influence of study settings on research. Factor 4 is concerned with the testing of specific relationships in research. Factor five is concerned with personal judgement in research.

Relationships between the six factors of the oblique solution were generally found to be low. The highest factor correlation was between Factor one and Factor six at the .34 level. This suggests that the Analytic and Holistic Factors and therefore these approaches to research, are somewhat related.

#### 5:9 Generating the Dimensions of the Research Mode for Use In Analysis:

The results from the oblique rotations produced factor structures substantively similar in content to the orthogonal rotations. Because the factor correlations of the oblique rotations were generally low, use of the two and four factor orthogonal models seemed to provide factor structures most appropriate for testing the research mode hypotheses.

Consequently, those items loading .40 and above in each of the orthogonal factor matrices became the questionnaire items used to measure the study's research mode dimensions. Within the Two Factor model, ten of the twenty research mode questions are used to measure the dependent variables. The Four Factor model employs 16 of the original 20 items. These items, weighted by their loadings on each of the factors, form continuous scales for assessing attitudes towards dimensions of the research mode.

In the Two Facator Model the following items and their corresponding factor loadings make up each of the Research Mode dimensions:

FACTOR ONE-HOLISTIC MODE

- Item 10 - It is more important to describe phenomena in their approximate  
.43 complexity than it is to measure relationships between a few specific variables.
- Item 14 - Research should be more concerned with describing and  
.59 understanding the nature and action of phenomena under study than with quantification.
- Item 20 - Research should embody qualitative methodologies which rely  
.49 on the interpretative skills of the scholar.

FACTOR TWO-ANALYTIC MODE

- Item 1 - All research is best performed under controlled conditions,  
.58 such as those found in lab or field experiments or clinical trials.
- Item 14 - Research should involve carefully planned manipulations that  
.62 isolate separate variables operating within the study situation.
- Item 9 - In study situations, one should always remain objectively  
.49 detached from the phenomena under study.
- Item 11- Prestige should be accorded scientific work only to the  
.46 degree to which the practitioner has been able to pursue hypothesis testing in an experimental <sup>ear</sup>research strategy.
- Item 12- A research project should involve quantitative assessment of  
.47 the phenomena under study.
- Item 17- The analysis of research data should involve testing predicted  
.50 relationships for statistical significance.



- Item 19 - Research can best be accomplished by looking at part of  
 .45 a problem using a limited number of study variables.

In the Four Factor Model, the Research Mode dimensions are generated using the following configurations of questionnaire items.

FACTOR ONE-HOLISTIC MODE

- Item 4 - Research should involve carefully planned manipulations  
 .46 that isolate separate variables operating within the study situation.
- Item 5 - The selection, weighting and interpretation of data should  
 .50 depend considerably on personal judgement.
- Item 6 - In order to arrive at explanations, researchers should attempt  
 .86 to build general models of the phenomena under study.
- Item 13 - Researchers should remain open to elements of serendipity  
 .62 (unexpected discoveries) and personal intuition within the research process.
- Item 14 - Research should be more concerned with describing and  
 .62 understanding the nature and action of phenomena under study than with quantification.
- Item 16 - A researcher should define the scope of research issues in  
 .74 a comprehensive manner.
- Item 2 - In studying observable situations, one should become  
 .51 intimately involved and familiar with the phenomena under study.

FACTOR TWO-ANALYTIC MODE

- Item 1 - All research is best performed under controlled conditions,  
.67 such as those found in lab or field experiments and clinical trials.
- Item 9 - In studying situations, one should always remain objectively  
.76 detached from the phenomena under study.
- Item 10 - It is more important to describe phenomena in their  
.76 approximate complexity than it is to measure relationships between a few specific variables.
- Item 11 - Prestige should be accorded scientific work only to the  
.43 degree to which the practitioner has been able to pursue hypothesis testing in an experimental research strategy.
- Item 12 - A research project should involve quantitative assessment  
.73 of the phenomena under study.
- Item 19 - Research can be best accomplished by looking at part of a  
.76 problem using a limited number of study variables.

FACTOR THREE-SPECIFICITY MODE

- Item 7 - The researcher should attempt to test specific relationships  
-.79 acting in study situations.

FACTOR FOUR-INTERPRETATIVE MODE

- Item 17 - The analysis of research data should involve testing  
.44 predicted relationships for statistical significance.
- Item 20 - Research should embody qualitative methodologies which  
.53. rely on the interpretative skills of the scholar.

Table 7. DESCRIPTIVE STATISTICS OF THE RESEARCH  
MODE VARIABLES

TWO FACTOR MODEL				
STATISTIC	FACTOR 1	FACTOR 2		
Mean	3.15	2.56		
Mode	3.33	2.71		
Median	3.17	2.53		
Kurtosis	-.203	-.064		
Minimum	1.00	1.00		
Maximum	5.00	4.42		
Range	4.00	3.42		
Standard Deviation	.773	.677		
Standard Error	.049	.043		
Skewness	.034	.221		
Variance	.598	.458		
FOUR FACTOR MODEL				
	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
Mean	3.32	2.8	2.05	2.59
Mode	3.16	2.66	2.00	3.00
Median	3.29	2.79	2.00	2.64
Maximum	4.83	4.66	5.00	4.50
Minimum	2.00	1.33	1.00	1.00
Range	2.83	3.33	4.00	3.50
Kurtosis	.532	-.265	.122	-.304
Skewness	.266	.120	.775	.028
Standard Deviation	.434	.676	.744	.713
Standard Error	.028	.043	.047	.045
Variance	.188	.457	.554	.508

Individual scores on each of the Research mode dimensions are obtained by summing the scaled responses to each of the items composing a dimension. These raw scores are then standardized by dividing the total score on each dimension by the number of items in a dimension. These standardized scores are the measures used in the correlational and hypothesis testing procedures dealing with attitudes towards research.

#### 5:10 Reliability of the Research Mode Scales:

After factor analysis, Cronbach's alpha reliability coefficients were obtained for the 2 Factor Model of the research mode. Cronbach's alpha for Factor One or the Holistic mode is  $\alpha = .623$ , number of cases = 251, number of items = 3. Cronbach's alpha for Factor Two or the Analytic mode is  $\alpha = .75$ , number of cases = 243, number of items = 7. These reliability coefficients are fairly high and indicate satisfactory reliability of the factors.

The alpha reliability coefficients for the four factor model are as follows:

Factor One (Holistic) - Alpha = .285 n=249 items = 6

Factor Two (Analytic) - Alpha = .668 n=246 items = 6

Factor Three (Specificity) - No Alpha n=254 items = 1

Factor Four (Interpretation) - Alpha = .300 n=254 items = 2.

The two factor model provides a much more reliable instrument for tapping attitudes toward aspects of the research mode, than the four factor model.

### 5:11 Development of the Organizational Ratio Scale:

An inter-item correlational analysis was performed on the items of the organizational scale. This was done separately for each of the 10 items composing the subdimensions of the scale. The purpose of this procedure is to see how each of the TYPE ONE and TYPE TWO questionnaire items correlated with the organizing style it was supposed to be measuring.

The 10 TYPE ONE items correlated positively and significantly (above  $s=.001$ ) with the total TYPE ONE scale. The Pearson Product-Moment correlation coefficients were all above .32, with the exception of the last item (j) dealing with how to handle organizational conflict,  $r=.20$ ,  $n=250$   $s=.001$ .

All of the TYPE TWO items also correlated positively and significantly ( $s=.001$   $n=247$ ) with the TYPE TWO scale above  $r=.32$ . Item J was the exception correlating at  $r=.20$ ,  $s=.001$ . Consequently, the decision was made to drop item J from the construction of the Organizational Ratio scale, since it was the only item substantially below the  $r=.30$  level. The final organizational scale used to calculate organizational ratio scores for use in the analysis is composed of 18 items, 9 assessing attitudes toward Type One organizing style and 9 assessing Type Two organizing style.

#### TYPE ONE

1. In order to determine the goals, methods and activities of research work, decision making powers should be limited to those few individuals in leadership positions.
2. Regarding the characteristics of a person who fills a particular job, research employers should always emphasize tasks and work roles only.

3. Within a research project, activities such as written records of internal meetings, procedures, memos progress reports and personnel reviews should always be maintained to regulate and control the flow and quality of work.
4. Research projects which do require collective effort should be tackled by having each worker do his/her own work and then have one person with expertise and experience consolidate the results.
5. When considering work relationships and job assignments in a research project, staff members should always be designated a particular job and status according to their level of expertise and research experience.
6. Decisions in the organization of research should be carried out on the basis of administrative and fiscal procedures set up initially to guide a project's human and non-human resources all the way along.
7. As far as managing a research staff is concerned, research employees should be regularly monitored by their superiors in order to insure ongoing productivity.
8. In any research project, research working plans, schedules and personal responsibilities should be adhered to as closely as possible.
9. Research tasks should be defined and coordinated by initially breaking down tasks to match areas and levels of personnel expertise.

#### TYPE TWO

1. In order to determine the goals, methods and activities of research work, decision-making powers should extend to all research workers on a project.

2. Regarding the characteristics of a person who fills a particular job, research employers should always provide opportunities for the individual to develop his/her own potential.
3. Within a research project, activities such as written records of internal meetings, procedures, memos, progress reports and personnel reviews should not be overly emphasized.
4. Research projects which do require collective effort should be tackled by means of group discussion and interaction; assembling the product as a team.
5. When considering working relationships and job assignments in a research project, staff members should always assume responsibilities which interest them and be treated as peers.
6. Decisions in the organization of research should be carried out on the basis of what is expedient and makes sense at the time.
7. As far as managing a research staff is concerned, research employees should be able to make their own work rules as long as they get the job done.
8. In any research project, research working plans, schedules and personal responsibilities should not be too rigid.
9. Research tasks should be defined and coordinated by the continuous interaction of staff members during all phases of a project.

5:12 Reliability of the Organizational Ratio Scale:

Cronbach's Alpha was employed to test the reliability of the organizational scales sub-components. The reliability coefficient for both Type One and Type Two sub-scales was  $\alpha = .588$ ,  $n = 250$ ,  $N = 247$ .

number of Items = 9. This reliability coefficient is only moderately high. In otherwords, the organizational ratio scores obtained in the study contain more error variance than desirable. This can partially be attributed to the lack of precision in the newly developed scale.

#### 5:13 Distribution of Organizational Ratio Scores:

As previously outlined, the raw score on the organizational ratio scale represents a proportional distribution of unequal points between the two organizing structures. Since the number of points given to one alternative is a function of those points allocated to the other approach, the organizational ratio score used in analysis is derived in the following manner.

Table 8. ORGANIZATIONAL RATIO SCALE FORMULA

Organizational	Sum of points allocated to Type II items
=	Sum of points allocated to both Type I and Type II alternatives
Ratio	

The individual's preference for Type One and Type Two is determined by whether s/he falls above or below the organizational ratio mean for the study population. If the score of the individual



is above the mean, the individual is considered to have a Type II attitude toward work structure. If the person's score falls below the mean, the person is considered to have a Type I orientation to work structure. As a result of this bivariate designation, attitude toward work is treated as a dichotomous variable in the analysis.

Out of the 270 respondents, 248 valid scores for the organizational ratio were derived. Out of the 248 cases, 134 (54%) of the sample preferred a Type I approach, compared to 114 (46%) individuals who preferred a Type II approach. The descriptive statistics for the Organizational Ratio Scores appear on the following page.

In summary, the preceding section outlines the analytical procedures used to prepare the data for testing the study hypotheses. The methods and results of these tests are elaborated on in the following section.

Table 9. DESCRIPTIVE STATISTICS OF THE ORGANIZATIONAL RATIO  
SCALE RESULTS

---

STATISTIC	
<hr/>	
Mean	.536
Median	.527
Mode	.467
Standard Deviation	.134
Variance	.018
Minimum	.111
Maximum	.889
Range	.778
Skewness	.043
Kurtosis	-.141

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## VI. THE RESULTS OF THE STUDY

### 6:1. Research Mode Correlational Findings:

Pearson Product Moment Correlation coefficient  $r$  was used to describe the degree of linear association between the personality and research mode variables of the study. Correlations were carried out using both the 2 and 4 factor Research Mode models.

Table. 10 . PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS:  
RELATIONSHIPS BETWEEN THE PERSON AND THING SCALES  
AND THE RESEARCH MODE SCALES. TWO FACTOR MODEL

PERSONALITY SCALES	RESEARCH SCALES	
	ANALYTIC	HOLISTIC
Person Scale	$r = .0428$	$r = -.0617$
	$n = 203$	$n = 203$
	$p = .27$	$p = .19$
Thing Scale	$r = -.0908$	$r = -.1598$
	$n = 200$	$n = 199$
	$p = .10$	$p = .012$

In the Two Factor model, Person Orientation was not significantly correlated with either the Analytic or Holistic dimensions of the Research Scale. Thing Orientation is not significantly correlated with the Analytic dimension of the Research Scale. There was a slightly negative, significant relationship between

Thing orientation and the Holistic mode of  $r = -.16$ ,  $p = .07$ . This was not predicted by the study but is the logical inverse of Hypothesis I. (Hypothesis I - Person Specialist's will be associated with Holistic Approaches to Research)

With the exception of this negative correlation between Thing Orientation and the Holistic Mode, none of the study's correlations in the general sample were as hypothesized.

Table 11. PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS:  
RELATIONSHIPS BETWEEN THE PERSON AND THING SCALES  
AND THE RESEARCH MODE SCALES. FOUR FACTOR MODEL

PERSONALITY SCALES	RESEARCH SCALES			
	FACTOR 1 Holistic	FACTOR 2 Analytic	FACTOR 3 Specificity	FACTOR 4 Interpretation
Person Scale	$r = .61$	$r = -.14$	$r = -.30$	$r = .15$
	$n = 143$	$n = 113$	$n = 137$	$n = 117$
	$p = .001$	$p = .07$	$p = .001$	$p = .05$
Thing Scale	$r = -.05$	$r = -.001$	$r = -.03$	$r = .03$
	$n = 121$	$n = 102$	$n = 118$	$n = 105$
	$p = .30$	$p = .49$	$p = .37$	$p = .35$

In the four factor model, relationships between the personality scales and the dimensions of the research mode are more clearly defined.

The Person scale correlates positively and significantly with the Holistic approach to research ( $r = .61$ ,  $p = .001$ ). This relationship is predicted in Hypothesis One. Factor Two, representing the Analytic approach to research, is slightly negatively correlated with the Person scale ( $r = .14$ ,  $p = .07$ ). Although not predicted, this relationship is the logical inverse of Hypothesis I. Specificity in research, Factor 3, was also moderately negatively correlated with the Person scale ( $r = -.30$ ,  $p = .001$ ). This relationship is one that could be expected considering the more general methodology of the Holistic approach to research. Factor Four is slightly positively correlated with Person orientation ( $r = .15$ ,  $p = .05$ ). This factor is weighted toward utilizing the scholars skills for interpretation.

None of the four research dimensions correlated significantly with the Thing scale. The slightly negative correlation found with the 2 factor approach to Holistic research retains its direction but loses its magnitude and significance. Personality orientation as measured by the Thing scale seems generally unassociated with attitudes to research.

#### 6:2 Hypothesis Testing Relating to the Research Mode

The study population was sub-divided into four categories of specialists derived from the Person-Thing Construct Scale. The mean, sum and standard deviation for each of the Research mode dimensions was calculated for each group of specialists. This was done for both the two and four factor models of the Research Mode.

Table 12 . PERSON AND THING ORIENTATION SCALES BROKEN DOWN BY  
SUBSPECIALTIES; CROSSBREAKS BY SCORES ON THE  
DIMENSIONS OF THE RESEARCH MODE: TWO FACTOR MODEL

SUBSPECIALITIES	RESEARCH MODE DIMENSIONS		
	Factor One (Holistic)	Factor Two (Analytic)	STATISTIC
Person Specialists	3.55	3.20	mean
	56	56	count
	199.0	179.14	sum
	1.56	2.15	Std. dev.
Thing Specialists	3.37	2.84	mean
	46	46	count
	163.67	130.43	sum
	1.82	1.79	Std. dev.
Generalists	3.27	3.03	mean
	60	60	count
	196.33	181.86	sum
	1.28	1.70	Std. dev.
Non-Specialists	3.71	3.60	mean
	50	50	count
	185.33	180.00	sum
	1.97	2.47	Std. dev.

Table 13. PERSON AND THING ORIENTATION BROKEN DOWN BY SUB-SPECIALTIES: CROSS BREAKS BY SCORES ON THE DIMENSIONS OF THE RESEARCH MODE: THE FOUR FACTOR MODEL

SUBSPECIALITIES	RESEARCH MODE DIMENSIONS				Statistic
	Factor 1 Holistic	Factor 2 Analytic	Factor 3 Specificity	Factor 4 Interpretation	
Person Specialists	3.48	3.30	2.45	3.03	mean
	56	56	56	56	count
	194.83	184.60	137.00	169.50	sum
	1.16	1.93	1.74	1.62	Std. dev.
Thing Specialists	3.55	3.37	1.91	2.77	mean
	46	46	46	46	count
	163.50	155.00	88.00	127.50	sum
	1.24	2.06	.76	1.18	Std. dev.
Generalists	3.74	3.22	2.60	2.63	mean
	60	60	60	60	count
	224.33	193.40	156.00	157.50	sum
	1.64	1.42	1.89	1.08	Std. dev.
Non-Specialists	4.05	3.48	2.82	3.10	mean
	50	50	50	50	count
	202.50	174.00	141.00	159.50	sum
	1.90	1.98	2.23	2.27	Std. dev.

In order to see if the different types of specialists varied significantly in the mean values obtained on each of the research dimensions, Students T-tests were performed using both the Two and Four Factor Research Models. According to Hypothesis I and II we would expect to find the following relationships:

- I. Person Specialists will be associated with Holistic approaches to research.
- II. Thing Specialists will be associated with Analytic approaches to research.

The following results were obtained using the two and four factor models. (Tables 14 and 15)

Both of the study's Research Mode hypotheses (I and II) were unconfirmed in the general study population using both the Two and Four Factor Models. In the two factor model there was considerable difference between Person and Thing specialists' attitudes toward the Holistic Factor. Although not a significant relationship at the .05 level, it is a predicted tendency to be noted in the means of the two groups ( $\bar{P_x} = 3.55$ ,  $\bar{T_x} = 3.37$ ).

In the Four Factor model, the only research dimension differentiating the two test groups is their attitude toward testing for specific relationships in research. Person specialists have a much higher, though not significant, mean specificity score ( $\bar{P_x} = 2.45$ ) than Thing Specialists ( $\bar{T_x} = 1.91$ ).



### 6:3 Comparison of Other Specialist Groups on the Dimensions of the Research Mode:

In addition to the hypothesized relationships of the study, all combinations of specialist groups were compared for significant differences in their population means on the research mode dimension. These relationships were tested using both the Two and Four Factor research models applying the Student's T-test.

It is important to acknowledge that using a large number of T-tests increases the likelihood of some significant findings on a chance basis. However, statistical comparison of the sub-specialist types, not included in the formal hypotheses of the study, were explored in order to seek further clarification of the relationship between different types of personality specialization and various approaches to research.

However, no significant differences were obtained at the .05 significance level among any of the other specialist groups using the two factor research model. Thing specialists and Generalists varied noticeably ( $T=-1.53$   $P=.12$ ) in their attitudes toward the Analytic mode to research. Thing specialists being less Analytic in their preferences than Generalists.

In the Four Factor model, two significant differences in attitudes toward research were found. Person specialists and non-specialists were found to be significantly different ( $T=1.92$   $P=.05$ ) in attitudes toward Factor Four (interpretation). Non-specialists

Table 14 . TWO FACTOR RESEARCH MODEL, RESULTS OF STUDENT'S  
T-TESTS COMPARING SPECIALISTS ATTITUDES TOWARDS  
RESEARCH

SPECIALIST COMPARISON GROUPS		RESEARCH MODE DIMENSIONS	
		Factor 1 (Holistic)	Factor 2 (Analytic)
Hypothesis I and II	Person Specialists compared to Thing Specialists	t = .64 df = 91 s = .53	t = 1.25 df = 93 s = .22
* = separate variance estimate			
-2 tailed probability			
	Person Specialists compared to Generalists	t = 1.13 df = 109 s = .26	t = -.79* df = 104 s = .43
-pooled variance estimate			
	Person Specialists compared to Non-Specialists	t = -.72 df = 96 s = .47	t = -.45 df = 90 s = .65
-except where noted			
	Thing Specialists compared to Generalists	t = -.24 df = 98 s = .80	t = -1.53 df = 97 s = .12
	Thing Specialists compared to Non-Specialists	t = -.28 df = 85 s = .64	t = -1.07 df = 83 s = .28
	Generalists compared to Non-Specialists	t = -.28 df = 101 s = .78	t = .26 df = 96 s = .79

Table 15 . FOUR FACTOR RESEARCH MODEL: RESULTS OF STUDENT'S  
T-TESTS COMPARING SPECIALISTS ATTITUDES TOWARDS  
APPROACHES TO RESEARCH

SPECIALIST COMPARISON GROUPS		RESEARCH MODE DIMENSIONS			
		Factor 1 (Holistic)	Factor 2 (Analytic)	Factor 3 (specificity)	Factor 4 (Interpretation)
Hypothesis I and II	Person Specialists compared to Thing Specialists	t = .36 df = 96 s = .71	t = .31 df = 90 s = .76	t = 1.07 df = 97 s = .28	t = .36 df = 96 s = .71
	Person Specialists compared to Generalists	t = .17 df = 107 s = .86	t = -1.50* df = 85.07 s = .13	t = -.45 df = 107 s = .65	t = 1.25 df = 110 s = .21
	Person Specialists compared to Non-Specialists	t = -1.06 df = 96 s = .29	t = .87 df = 94 s = .38	t = -.36 df = 96 s = .72	t = 1.92 df = 95 s = .05
	Thing Specialists compared to Generalists	t = .57 df = 97 s = .57	t = -2.23 df = 96 s = .02	t = -1.48 df = 100 s = .14	t = .84 df = 102 s = .40
	Thing Specialists compared to Non-Specialists	t = -.73 df = 86 s = .47	t = -1.32 df = 84 s = .19	t = -1.31 df = 89 s = .19	t = 1.55 df = 87 s = .12
	Generalists compared to Non-Specialists	t = -1.30 df = 97 s = .19	t = .42* df = 74.14 s = .67	t = .06 df = 99 s = .95	t = .86 df = 101 s = .39

scoring significantly higher on the mean value for this research dimension.

Thing specialists and Generalists were found to vary significantly in their attitudes toward Factor 2 (Analytic) at the ( $T = -.2.23$   $P = .02$ ) level. Thing specialists being more likely to prefer the Analytic approach than Generalists.

#### 6:4 Organizational Correlational Findings:

The correlational method employed to test for the predicted associations between Person and Thing orientation and organizational preferences is the Point Bi-serial correlation coefficient. The Point Bi-serial coefficient is a measure of correlation estimating Product Moment type correlational relationships for variables with the following attributes:

- i) one variable is measured in a graduated continuous fashion. (Person and Thing scales)
- ii) the other variable is in the form of a discrete dicotomy. (Organizational Preferences)

The Point Bi-serial correlation coefficient indicates the magnitude of linear association between two variables but not the direction of the association. Using McNemar's (1962) formula the following rpb's were found: The Person Scale correlates with the Organizational scale  $rpb = .47$   $n = 248$ . The Thing Scale correlates with the Organizational scale  $rpb = .16$   $n = 248$ .

The Person scale seems to be a better predictor of organization preferences than the Thing scale

#### 6.5 Hypothesis Testing Related to Organizational Preferences:

In order to test for the strength of the relationships found in the organizational correlations the following procedures were employed. Chi square tests were performed to see if the frequency of different types of specialists, broken down by their organizational preferences, varied significantly from an expected frequency if the null hypothesis of "no difference in organizational preference among specialist types" is assumed. In other words we are testing Hypothesis III and IV by assuming that the Hypothesized differences will not be found.

Hypothesis III. Person Specialists will be associated with preferences for Type II organizing principles.

Hypothesis IV. Thing Specialists will be associated with preferences for Type I organizing principles.

Ho. There will be no difference in Person and Thing specialists' preferences for Type I or Type II organizing principles.

In order to perform the Chi square tests, 2 x 2 contingency tables were constructed. Both the Person and Thing scales are continuous scales, so it was necessary to divide the study population according to whether or not the individual scored above or below the mean on each of the two scales in order to perform the Chi square test.

The adequacy of the means as a dividing line for partitioning the population was checked using a scattergram of Person and Thing scores plotted with Type I and Type II scores. After a visual inspection of these plots, it was decided that the means were an appropriate partitioning measure.

The Organizational Ratio Mean was used to dicotomize the study population according to whether or not the individual scored high or low in their preferences for Type II approach to organizing. This resulted in the following contingency tables.

Table 16 . PERSON SCORES COMPARED WITH TYPE II ORGANIZING SCORES - CHI SQUARE TEST

	High Type II Score	Low Type II Score	Count Row % Column% Total %	
High Person Score	69 57% 59% 31.7%	52 43% 51.5% 23.9%	122  55%	Corrected Chi Square* = .94649 df = 1 p = .33
Low Person Score	48 49.5% 41% 22%	49 50.5% 48.5% 22.5%	97  44.5%	
	117 53.7%	101 46.3%	218 100%	

Table 17. THING SCORES COMPARED WITH TYPE II ORGANIZING SCORES - CHI SQUARE TEST

	High Type II Score	Low Type II Score	Count Row % Column % Total %	
High Thing Score	61 56% 54% 28%	48 44% 48.5% 22.6%	109  51.4%	Corrected Chi Square* = .43731 df = 1 s = .50
Low Thing Score	52 50.5% 46. % 24.5%	51 49.5% 51.5% 24.1%	103  48.6%	
	113 53.3%	99 46.7%	212 100%	

No significant differences were found between Specialists scoring High or Low on the Person and Thing scales and their preferences for either Type II or Type I organizing styles. The Null Hypothesis of no difference among specialist groups was supported. Hypothesis III and IV of the study were not confirmed in the general study population.

#### 6:6 The Effects of Confounding Variables on Independent Variables:

The effects of potentially confounding variables were explored in order to test for their influence on both the independent and dependent variables of the study. The effects of age, sex, academic ranks, non-

university employment since terminal degree and collaborative research experience with specialists from different disciplines were all looked at in the following manner.

In order to test for the effects of these variables on the Independent variables, measuring Person and Thing orientation, a series of Student T-tests were performed. Each of the five confounding variables were dichotomized and the study population divided according to the following criteria:

1. AGE:

Age group I - greater or equal to age 40

Age group II - less than age 40

2. SEX:

Group I - Males

Group II - Females

3. RANK:

Rank Group I - Assistant Professor and below

Rank Group II - Full and Associate Professor

4. COLLABORATIVE EXPERIENCE:

Group I - yes

Group II - no

5. NON-UNIVERSITY EMPLOYMENT SINCE DEGREE:

Group I - yes

Group II - no



Table 18 . EFFECT OF THE CONFOUNDING VARIABLES ON THE INDEPENDENT  
VARIABLES. STUDENT'S T-TESTS ON PERSONALITY ORIENTATION  
AMONG 10 SUB-GROUPS OF THE SAMPLE

* = Significant				
GROUPS COMPARED	SCALE	T-VALUE	DEGREES OF FREEDOM	2-TAIL PROBABILITY
AGE:				
- $\geq 40$	Person Scale	-0.72	222	.470
- <40	Thing Scale	-1.02	219	.307
SEX:				
- Males	Person Scale	-3.99	216	*.000
- Females	Thing Scale	.69	213	.491
RANK:				
- Assistant Professor and below	Person Scale	3.02	227	*.003
- Full and Associate Professor	Thing Scale	-0.01	223	.989
INTERDISCIPLINARY COLLABORATIVE EXPERIENCE				
- Yes	Person Scale	.27	228	.787
- No	Thing Scale	.69	224	.494
NON-UNIVERSITY EMPLOYMENT SINCE TERMINAL DEGREE				
- Yes	Person Scale	.41	229	.680
- No	Thing Scale	-.57	225	.573

T-tests were performed to see if the mean Person and Thing Scores for these groups varied significantly. Table, 18 shows the results of these procedures.

Two of the five confounding variables produce significantly different mean scores on the Person Scale. Differences in Academic Rank produced mean differences between Group I ( $\bar{x} = 3.04$ ) ( $p = .003$ ) and Group II ( $\bar{x} = 2.79$ ). ( $n = 112, 117$ ) The low Rank group having a significantly higher mean Person score than the high Rank group.

Sexual differences also produced significantly different mean person scores. Females having a higher mean Person score of ( $\bar{x} = 3.16$ ) ( $n=66$ ) ( $p = .000$ ) and males having a mean score of ( $\bar{x} = 2.79$ ) ( $n=152$ ) Person scores did not vary significantly with age, employment or types of collaborative effort. No significant relationships were found among any of the five confounding variables and scores on the Thing scale.

#### 6:7 The Effects of Confounding Variables on the Dependent Variables:

##### 6:7:a The Research Mode:

The effects of the Five Confounding Variables were then looked at in relation to the dependent variables measuring the research mode. The Two Factor Research Mode model was employed in this analysis. Student-T-tests were performed to see if the various attributes of the study population associated differently with particular approaches to research. Table 19 contains the results of this analysis.

Table 19 . EFFECTS OF THE CONFOUNDING VARIABLES ON THE DEPENDENT VARIABLE, ATTITUDES TOWARD RESEARCH

COMPARISON GROUPS	ANALYTIC Scores	HOLISTIC Scores
AGE:		
Age Group $\geq 40 = 1$	T = -.30	T = .82
Age Group $< 40 = 2$	df = 238	df = 240
	sig. = .767	sig. = .412
RANK:		
Asst. Prof. and below = 1	T = -.29	T = .91
Assoc. Prof. and above = 2	df = 238	df = 246
	sig. = .774	sig. = .365
SEX:		
Males = 1	T = 3.55	T = -.95
Females = 2	df = 226	df = 235
	sig. = .000*	sig. = .342
	means;	
	1 = 2.47 (n=158)	
	2 = 2.81 (n=70)	
EMPLOYMENT:		
Non-univ. employment, yes = 1	T = 1.10	T = 1.54
Non-univ. employment, no = 2	df = 239	df = 247
	sig. = .270	sig. = .126*
		means;
		1=3.26 (n=78)
		2=3.10 (n=171)
COLLABORATION:		
Interdisciplinary Collab., yes = 1	T = -.80	T = -1.23
Interdisciplinary Collab., no = 2	df = 238	df = 246
	sig. = .422	sig. = .219

(\* = significant difference  
or approaching significance)

The only finding significant above the .05 level was sexual differences in attitudes toward the Analytic approach to research. Males and females had a significantly different mean Analytic score. Females scoring higher ( $\bar{x} = 2.81$ ,  $n = 70$ ) than males ( $\bar{x} = 2.48$ ,  $n = 158$ ). ( $p = .000$ )

The only other relationship of statistical interest was the difference in individuals who had been employed in non-university settings compared to those who hadn't. These groups varied ( $T = 1.54$ ,  $df = 247$ ,  $p = .12$ ) in their attitudes toward the Holistic mode toward research. Those employed elsewhere, scoring higher on the Holistic Approach to Research ( $\bar{x} = 3.26$ ,  $n = 78$ ) than those who had not been employed in another setting ( $\bar{x} = 3.10$ ,  $n = 171$ ).

#### 6:7:b Organizational Preferences:

The effects of age, sex, rank, non-university employment since degree and collaborative experience with other disciplines were then looked at in relation to the dependent variables of Type I and Type II organizing styles.

In order to test for sub-group differences, Chi square tests were performed comparing the expected versus the obtained frequencies; assuming the Null hypothesis of no differences among the sub-groups. Results from this analysis appear in Table 20 .

Level of academic rank showed differences in attitudes toward Type I and Type II approaches to organizing. Within the Low Rank

TABLE 20 : EFFECTS OF THE CONFOUNDING VARIABLES ON THE DEPENDENT VARIABLE,  
ATTITUDES TOWARD ORGANIZING

		<u>ORGANIZING STYLE</u>		Count row% Total
Sex by Organization Orientation: Corrected Chi square = 1.48, df = 1		TYPE I	TYPE II	
<u>SEX</u>	Males	83(51%)	80(49%)	163 100%
	Females	43(60.6%)	28(39.4%)	71 100%
		126	108	234 100%
<u>Collaborative Experience by Organizational Orientation:</u>		<u>ORGANIZING STYLE</u>		Count row% Total
Corrected Chi square = 9.45, df = 1 sig = .002*		TYPE I	TYPE II	
<u>COLLABORATION</u>	Interdisciplinary Collaboration YES	76 (46.6%)	87 (53.4%)	163 100%
	Interdisciplinary Collaboration NO	56 (68.3%)	26 (31.7%)	82 100%
		132	113	245 100%
<u>Employment by Organization Orientation:</u>		<u>ORGANIZING STYLE</u>		Count row% Total
Corrected Chi square = .138 df = 1 sig = .70		TYPE I	TYPE II	
<u>EMPLOYMENT</u>	Non-University Employment YES	40 (51.3%)	38 (48.7%)	78 100%
	Non-University Employment NO	92 (54.8%)	76 (45.2%)	168 100%
		132	114	246 100%

Table 20 . (Continued)

Rank by Organizational  
Orientation:

Corrected Chi Square = 3.28  
 df = 1  
 sig = .07\*

RANK

	<u>ORGANIZING STYLE</u>		Count row% Total
	TYPE I	TYPE II	
Low Rank	73 (60.3%)	48 (39.7%)	121 100%
High Rank	60 (48.0%)	65 (52.0%)	125 100%
	133	113	246 100%

Age by Organizational  
Orientation:

Corrected Chi Square = .005  
 df = 1  
 sig = .93

AGE

	<u>ORGANIZING STYLE</u>		Count row% Total
	TYPE I	TYPE II	
≥ 40	71 (53.8%)	61 (46.2%)	132
< 40	59 (54.1%)	50 (45.9%)	109
	130	111	241

(\* = significant difference)

group 73 or 60.3% of the group preferred Type I approach, while 48 or 39.7% of the group preferred the Type II approach. Within the Higher Ranking group, the organizational preferences were distributed more evenly, 48% preferring the Type I approach and 52% preferring the Type II approach. (Corrected Chi square = 3.28, df = 1, p = .07)

The organizational preferences of those having experienced interdisciplinary collaboration were significantly different than those who had not experienced interdisciplinary collaboration. (Corrected Chi square = 9.45, df = 1, p = .002) Out of those having collaboration experience 76 or 46.6% preferred the Type I approach and 87 or 53.4% preferred the Type II approach to organizing. Those without collaborative experience preferred Type I 68.3% and Type II 31.7%.

Sexual differences also seem to make a difference in organizational preferences, although not at a statistically significant level. (Corrected Chi square = 1.48, df = 1, p = .22) The male population is fairly evenly divided in their Type I/Type II preferences 80 (49%)/83(51%), while the female population is split 60.6% (43) Type I and 39.4% (28) Type II.

#### 6:8 The Confounding Variables and the Study's Hypothetical Relationships

Finally, the study looks at differences in the hypothesized relationships between personality orientation and attitudes toward research and organizational structures, accounting for the moderating influence of sex, age, academic ranks, collaborative experience and employment experience since receiving the terminal degree.

#### 6:8:a Research Mode Hypotheses

In order to analyze the effects of the confounding variables on the hypothesized relationships between personality orientation and attitudes toward research, a two-way analysis of variance is employed.

Factorial analysis of variance is the statistical method that analyzes the independent and interactive effects of two or more independent variables on a dependent variable (Kerlinger 1973).

A classic experimental approach for factorial designs with unequal cells, found in the S.P.S.S. (Nie et al. 1975) sub-program A.N.O.V.A., was used in this analysis.

In order to perform the two-way analysis of variance, two independent variables and a single criterion variable are specified. The analysis of variance was performed in two stages. The first analysis looks at attitudes toward the Analytic mode of research as the dependent variable. The second set looks at attitudes toward the Holistic mode of research as the dependent variable.

In both stages, personality orientation and each of the confounding variables are designated as the independent variables of the factorial design.

The results of the ten analysis of variance procedures are listed in Table 21. None of the independent or confounding variables significantly effected attitudes toward the Analytic approach to research, either independently or jointly.



However, two relationships of interest emerged when attitudes toward Holistic approaches to research were analyzed. In the two-way anova, specifying differences in employment experience since receiving terminal degree and person or thing personality orientation, the following results emerged.

The additive effect of employment experience since receiving terminal degree and personality orientation on attitudes toward the Holistic Mode is found to be almost significant at the .08 level  $F = 2.550$ . The main effect of employment experience since receiving the terminal degree on attitudes toward the Holistic Mode is significant at the .06 level,  $F = 3.513$ . The main effect of personality orientation on attitudes toward the Holistic approach is not significant ( $P = .39$ ,  $F = .725$ ).

The interaction effect of employment experience and personality orientation on attitudes towards the holistic approach to research is also not significant ( $P = .601$ ,  $F = .275$ ).

These results suggest that different employment experiences (non-university employment versus university employment after receiving the terminal degree) can be significantly associated with different attitudes toward the Holistic Mode of research. This finding applies, regardless of whether one is oriented to persons or things. Personality orientation does not have an important independent effect on attitudes toward the Holistic Research Mode. Nor is the joint effect of personality orientation and employment experience on attitudes toward the Holistic Mode significant.

Table 21 . RESEARCH MODE HYPOTHESES AND FIVE CONFOUNDING  
VARIABLES: RESULTS OF TWO-WAY ANALYSIS OF VARIANCE

\*= significant

Matrix

Holistic Mode by sex, personality orientation

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Main Effects	3.743	2	1.872	2.962	0.057*
sex	2.297	1	2.297	3.634	0.060*
personality	2.407	1	2.407	3.809	0.054*
2-way interactions					
sex personality	0.082	1	0.082	0.129	0.720
explained	3.825	3	1.275	2.017	0.118
residual	53.720	85	.632		
total	57.545	88	.654		

270 cases processed

181 cases missing

Matrix

Holistic mode by Employment since Terminal Degree, Personality orientation;

Source of Variation

Main Effects	3.184	2	1.592	2.550	0.084 @*
employsi	2.194	1	2.194	3.513	0.064*
personality	0.453	1	0.453	0.725	0.397
2-way interactions					
employsi personality	0.172	1	0.172	0.275	0.601
explained	3.356	3	1.119	1.791	0.154
residual	56.824	91	0.624		
total	60.180	94	0.640		

270 cases processed

175 cases missing

Table 21. (Continued)

\* = significant

Matrix

Holistic Mode by Academic rank and Personality orientation:

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Main effects	1.510	2	0.755	1.158	0.319
Rank	0.629	1	0.629	0.964	0.329
Personality	1.109	1	1.109	1.700	0.196
2-way interactions					
rank personality	0.317	1	0.317	0.486	0.488
explained	1.827	3	0.609	0.934	0.428
residual	58.053	89	0.652		
Total	59.880	92	0.651		
270 cases processed					
177 cases missing					

Matrix

Holistic Mode by age and personality:

Source of Variation:

Main effects	1.457	2	0.728	1.079	0.345
age	0.774	1	0.774	1.147	0.287
personality	0.596	1	0.596	0.882	0.350
2-way interactions					
age personality	0.001	1	0.001	0.001	0.973
explained	1.458	3	0.486	0.720	0.543
residual	57.388	85	0.675		
Total	58.846	88	0.669		
270 cases processed					
181 cases missing					

Table 21'. (Continued)

\* = significant

## Matrix

Holistic Mode by Collaborative experience with other fields and personality orientation:

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Main effects	0.895	2	0.447	0.701	0.499
colldiff	0.102	1	0.102	0.160	0.690
personality	0.749	1	0.749	1.172	0.282
2-way interactions					
colldiff personality	0.388	1	0.388	0.607	0.438
explained	1.283	3	0.428	0.669	0.573
residual	57.492	90	0.639		
Total	58.775	93	0.632		
270 cases processed					
176 cases missing					

## Matrix

Analytic Mode by age and personality:

Source of Variation

Main effects	0.433	2	0.216	0.380	0.685
age	0.212	1	0.212	0.373	0.543
personality	0.266	1	0.266	0.468	0.496
2-way interactions					
age personality	0.969	1	0.969	1.704	0.195
explained	1.402	3	0.467	0.822	0.486
residual	47.219	83	0.569		
Total	48.621	86	0.565		

270 cases processed  
183 cases missing

Table 21. (Continued)

\* = significant

## Matrix

Analytic Mode by Collaborative experience with other fields and personality orientation:

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Main effects	0.238	2	0.119	0.212	0.809
colldiff	0.026	1	0.026	0.047	0.829
personality	0.215	1	0.215	0.384	0.537
2-way interactions	0.228	1	0.228	0.407	0.525
colldiff personality	0.466	3	0.155	0.277	0.842
explained	49.380	88	0.561		
residual	48.846	91	0.548		
Total					
270 cases processed					
178 cases missing					

## Matrix

Analytic Mode by Sex and Personality Orientation:

Source of Variation

Main effects	0.829	2	0.414	0.735	0.483
sex	0.490	1	0.490	0.868	0.354
personality	0.144	1	0.144	0.255	0.615
2-way interactions	0.476	1	0.476	0.882	0.350
sex personality					
explained	1.818	3	0.606	1.123	0.344
residual	48.041	89	0.540		
Total	49.859	92	0.542		
270 cases processed					
177 cases missing					

Table 21 . (Continued)

\* = significant

## Matrix

Analytic Mode by Employment since Terminal Degree, and Personality Orientation:

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Main effects	1.342	2	0.671	1.243	0.293
employsi	1.122	1	1.122	2.279	0.153
personality	0.044	1	0.044	0.082	0.776
2-way interactions	0.476	1	0.476	0.882	0.350
employsi personality					
explained	1.818	3	0.606	1.123	0.344
residual	48.041	89	0.540		
Total	49.859	92	0.542		
270 cases processed					
177 cases missing					

## Matrix

Analytic Mode by Academic Rank and Personality Orientation:

Source of Variation

Main effects	0.539	2	0.269	0.484	0.618
rank	0.309	1	0.309	0.555	0.458
personality	0.135	1	0.135	0.243	0.623
2-way interactions	0.866	1	0.866	1.556	0.216
rank personality					
explained	1.404	3	0.468	0.841	0.475
residual	48.412	87	0.556		
Total	49.816	90	0.554		
270 cases processed					
179 cases missing					

The other finding of interest is the relationships of sex and personality orientation on the Holistic Mode. The additive effect of sex and personality differences is significant at the .05 level,  $F = 2.962$ . The main effect of sexual differences on attitudes towards Holistic research is significant at the .06 level,  $F = 3.634$ . The main effect of personality differences on Holistic orientation is significant at the .05 level,  $F = 3.809$ . However, the interactive effects of sex and personality differences on attitudes toward the Holistic Mode is not significant;  $P = .720$ ,  $F = .129$ .

These results suggest that there are independent effects of both sex and personality orientation which influence attitudes toward the Holistic approach to research. In other words, sexual differences effect attitudes toward the Holistic Mode no matter what personality orientation the individual has. Also, personality differences effect attitudes towards the Holistic Mode regardless of sexual gender. However, the effects of sex and personality do not combine to influence attitudes toward the Holistic Mode to any significant degree. They vary independently of one another in their influence on the dependent variable.

#### 6:8:b Organizational Hypotheses:

None of the relationships between Person and Thing specialists preferences for organizational styles were affected significantly by

TABLE 22 . CONTROLLING FOR DEMOGRAPHIC AND CAREER VARIABLES: DIFFERENCES  
BETWEEN PERSON AND THING SPECIALISTS IN TYPE I AND TYPE II  
APPROACHES TO ORGANIZING: Chi Square Tests

CONTROL GROUPS:		CONTINGENCY TABLES		
<u>FEMALES</u>		<u>TYPE I</u>	<u>TYPE II</u>	
Corrected Chi Square = 1.72				
df = 1				
sig = .18				
	Person Specialists	6 (40.0%)	9 (60.0%)	15
	Thing Specialists	5 (83.3%)	1 (16.7%)	6
		11	10	21
<u>MALES</u>				
Corrected Chi Square = .106				
df = 1				
sig = .744				
	Person Specialists	16 (51.6%)	15 (48.4%)	31
	Thing Specialists	17 (44.7%)	21 (55.3%)	38
		33	36	69
<u>Less than 40</u>				
Corrected Chi Square = .021				
df = 1				
sig = .884				
	Person Specialists	11 (45.8%)	13 (54.2%)	24
	Thing Specialists	13 (52.0%)	12 (48.0%)	25
		24	25	49
<u>Older or Equal to 40</u>				
Corrected Chi Square = .018				
df = 1				
sig = .892				
	Person Specialists	12 (50.0%)	12 (50.0%)	24
	Thing Specialists	9 (47.4%)	10 (52.6%)	19
		21	22	43



Table 22 . (Continued)

CONTROL GROUPS		CONTINGENCY TABLES		
<u>Interdisciplinary Collaboration</u>		<u>TYPE I</u>	<u>TYPE II</u>	
YES				
Corrected Chi Square = .012				
df = 1				
sig = .91	Person Specialists	15 (45.5%)	18 (54.5%)	33
	Thing Specialists	14 (43.8%)	18 (56.3%)	32
		29	36	
<u>Interdisciplinary Collaboration</u>				
NO				
Corrected Chi Square = .077				
df = 1				
sig = .780	Person Specialists	16 (51.6%)	15 (48.4%)	31
	Thing Specialists	22 (57.9%)	16 (42.1%)	38
		38	31	
<u>Non-University Employment</u>				
YES				
Corrected Chi Square = 1.63				
df = 1				
sig = .20	Person Specialists	9 (47.4%)	10 (52.6%)	19
	Thing Specialists	1 (12.5%)	7 (87.5%)	8
		10	17	27

Table 22.. (Continued)

CONTROL GROUPS		CONTINGENCY TABLES		
<hr/>				
<u>High Rank</u>				
Corrected Chi Square = .004		<u>TYPE I</u>	<u>TYPE II</u>	
df = 1	Person	9	12	
sig = .20	Specialists	(42.9%)	(57.1%)	21
	Thing	12	14	
	Specialists	(46.2%)	(53.8%)	26
		21	26	47
<hr/>				
<u>Low Rank</u>				
Corrected Chi Square = .038				
df = 1	Person	15	13	
sig = .844	Specialists	(53.6%)	(46.4%)	28
	Thing			
	Specialists	11	9	
		(55.0%)	(45.0%)	20
		26	22	48

controlling for the career and experience variables. The most notable organizational preference difference was between female Person and Thing specialists. Person specialists preferring Type II 60% (6) to Type I 40% (9). Thing specialists preferring Type I 83% (5) to Type II 17% (1). (Corrected Chi square = 1.72, df = 1, p = .18). These findings are consistent with what was predicted in Hypothesis III and IV of the study.

Person and Thing specialists also differed in their organizational preferences within the group having experienced non-university employment. Person specialists preferring a Type I style 47.4% (9) compared to 12.5% (1) of the Thing specialists. Person specialists preferring Type II style 52.6% (10) compared to 87.5% (7) of the Thing specialists. (Corrected Chi square = 1.63, df = 1, p = .20)

The fact that Person specialists slightly prefer the Type II approach is as predicted in Hypothesis III. However, contrary to Hypothesis IV, Thing specialists overwhelmingly prefer a Type II approach.

#### 6:8:c Summary

This section has reported the study's finding. In the last chapter of the thesis the findings are interpreted, the study's limits noted and suggestions for future work are made.

## VII. INTERPRETATION, DISCUSSION AND CONCLUSIONS

The findings of this study suggest that disciplinary specialists can be identified according to specific personality traits and their attitudes towards particular styles of research and work organization.

In the general study population Person and Thing specialists did not associate differentially with either the Analytic and Holistic modes of research or with Type I and Type II organizing styles. However, other categories of specialists, assessed by the Person-Thing Construct scale, showed some statistically significant relationships with the research mode variables. In addition, the effects of moderating variables were found to influence both the independent and dependent variables of the study.

### 7:1 Person and Thing Scales:

This study found additional evidence to support the contention that the Person and Thing Scales are tapping two distinct, internally consistent personality dimensions. Using a study population of disciplinary specialists from a variety of socio-medical fields, the reliability of Frost and Barnowe's (1977) scale was found to be satisfactorily high.

In general, the Person Scale was found to be a better predictor of attitudes toward research and organizational preferences than the Thing scale.

In the Four Factor research model the Person scale correlated positively and significantly with the Holistic Factor ( $r=.61, p=.001$ ). The Analytic Factor was slightly negatively correlated with the Person scale ( $r=.14, p=.07$ ). Specificity in research was also moderately negatively correlated with the Person Scale ( $r=-.30, p=.001$ ). The research interpretation factor (4) was slightly positively and significantly associated with the Person Scale ( $r=.15, p=.05$ ). The Person Scale correlated with the Organizational-Ratio Scale at  $rpb'=.47$ .

In contrast, the Thing scale did not correlate to any significant magnitude with either the research mode or organizational measures. In conclusion, personality as measured by the Thing Scale, seems generally unassociated with attitudes towards research and organizational structure. While personality, as measured by the Person scale, seems moderately associated with attitude measures of research approaches and organizing styles.

The study found differences in the mean Person and Thing scores among various sub-groups of the population studied.

Sexual differences were found to be associated with different personality orientations assessed by the Person and Thing scales.

( $T=-3.99, p=.000$ ) Females were found to be significantly higher in Person orientation than males. Males had a higher mean score for Thing orientation than females, but this finding was not significant. These findings are similar to Frost and Barnowe's findings (1976) that females have higher Person scores and lower Thing scores than men. These orientation differences may be due to differences in socialization.

There was also a significant difference in Person orientation between High and Low academic Rank groups. The High status group (full and associate professors) having a significantly lower Person orientation than the Low status group (assistant professors and below) ( $T=3.02$ ,  $p=.003$ ) This finding suggests that there may be some differential success rate in achieving academic status for those individuals who are less people oriented than their colleagues. This may be related to the fact that these individuals are less interested in social distractions, which allows them to work towards academic goals with more singlemindedness than people oriented individuals.

An alternative explanation to the difference in Person orientation between the High and Low academic Ranks may be that once a High rank is achieved, an individual may no longer have to be so concerned about social relationships, especially among ones colleagues.

## 7:2 Interpretation of the Research Mode Findings:

In general the study found some empirical evidence to support the theory describing the Analytic and Holistic conceptual approaches to research. The different factor analytic techniques applied to the research mode data produced similar patterns of loadings for particular Research Mode items. The Analytic and Holistic dichotomy was found to recur in all four factor rotations, along with dimensions of the research mode not articulated by the study. Although these two dimensions were found to exist, they are not entirely independent of one another. The Analytic and Holistic factors of the Four Factor model correlate at  $r=.34$ .

The Analytic and Holistic scales of the Two factor model correlated  $r=.37$  at the .001 level of significance. These findings are not inconsistent with the theoretical continua proposed by Thompson et al. (1969), Marx et al. (1967) and Weiss (1966). Individuals vary in the degree to which they incorporate either or both of the Analytic and Holistic extremes in their attitudinal approaches toward research.

There was a significant difference in male and female attitudes toward the Analytic approach to research. Females scoring significantly higher than the males on the Analytic dimension of the Two Factor model. This difference suggests that women who achieve academic positions tend to be more Analytical in their approach to research than men. This finding may be related to differential recruitment and performance standards operating for men and women in achieving academic positions ( $T=3.55$ ,  $df=226$ ,  $p=.000$ ).

There was also a notable difference in the research orientation of those individuals who had been employed in non-university settings since obtaining their terminal degree compared to those who had gone right into academia. Those having other employment experience being more Holistic ( $T=1.54$ ;  $df=247$ ;  $p=.12$ ), than the pure academics. This finding may be related to the fact that because of their experience, these individuals may be more open to problem solving approaches other than the "ideal" experimental paradigm prevalent in academia. The problems found outside of the academic setting may orient the individual to a more Holistic approach to problem solving.

Predicted differences in Research Attitudes between Person and Thing Specialists (Hypothesis I and II) were unconfirmed by the general study population, using both the two and four Factor Research Models.

In addition the study found no significant differences among any of the other specialist groups in their attitudes towards the Two Factor model of the Research Mode. Within the Four Factor model, Person and non-specialists were found to be significantly different in their attitudes toward interpretative strategies for research (Factor 4). ( $T=1.92$ ,  $p=.05$ ) Frost and Barnowe and Little have suggested that non-specialist personality types tend to be self-concerned types of individuals. It seems from this study finding that individuals who are other-concerned or people oriented interpret situations, including interpretative strategies, differently from the more ego-centric or self-specialist type of individual. The self-specialists being more concerned with the skills of the scholar being applied to interpretation than the Person specialist.

Thing specialists and Generalists were found to vary significantly in their attitudes toward the Analytic dimension of the Four Factor model. ( $T=2.23$ ,  $p=.02$ ) Thing specialists are oriented to mechanical-physical domains of their environment. Generalist types are highly oriented to both the personalistic and physicalistic domains of their environment. Generalists score lower than Thing specialists on the analytic dimension. This significant difference in attitude towards Analytic research may be related to the greater range of unpredictability in the phenomena which



interests the Generalist compared to the more precise and tangible interest of the Thing specialist. The interest focus of the Thing specialist being more amenable to the manipulative, controlled Analytic approach.

Out of all the specialist sub-groups, Thing and Non-specialists varied the most in their approaches to research. They differed in three of the four research mode factors (2,3,4) at  $p=.20$  level of significance. Thing specialists and Non-specialists do not differ in their attitude toward the Holistic mode. However, the Non-specialist is considerably more Analytic than the Thing specialist. The two types of Specialists also differ considerably in their attitude toward the need for testing specific relationships in research. The Thing specialist being more concerned with specificity than the Non-specialist. The greatest divergence is in choice of interpretative strategies. Factor 10 is made up of two items, one concerned with research interpretation on the basis of statistical significance and the other concerned with interpretation based on the qualitative judgements of the scholar. This factor is weighted in the direction of the qualitative methodology and the Non-specialists score significantly higher on this factor than the Thing specialists. The self-specialists seeming much more concerned with interpreting research results relying on the scholar's perspective.

Finally, the study controlled for the simultaneous effects of the confounding and personality variables on the dependent variables of the research mode.

Different employment experiences were found to be significantly and independently associated with attitudes toward the Holistic approach to research, regardless of personality orientation ( $F=3.513$   $S=.06$ ).

Sex and personality orientation were also found to affect attitudes toward the Holistic Research mode but not in an interactive manner. In other words, both variables of sex and personality affect attitudes toward the Holistic mode, but independent of one another's influence.

(Sex;  $F = 3.634$   $S = .06$ )

(Personality;  $F = 3.809$   $S = .05$ )

### 7:3 Interpretation of Organizational Findings:

In the general study population no significant differences were found among specialists with a high Person or high Thing orientation and preferences for specific organizing styles. Hypotheses III and IV were unconfirmed. However, two variables of career experience related significantly to specific organizational preferences.

Individuals of Low and High academic rank had significantly different perspectives on organizational designs for research teams. The Low ranking group preferring a Type I approach (I- 60.3%/II-39.7%) compared to the High status group, whose preferences were much more evenly distributed between the two alternatives. (I-48%/II-52%) ( $\text{Chi}^2 = 3.28$ ,  $p = .07$ ). As a group however, more of the High status individuals preferred Type II approach to team organization than the Type I approach. This finding might be explained by the accumulation of experience in organizing for research which presumably accompanies the achievement of a High academic rank. This experience may enable a more adaptable, flexible approach to work organization, which the more inexperienced researcher may not be capable or confident enough to pursue.

The other organizational finding of significance was the difference

in organizational preference between those individuals having experienced interdisciplinary collaboration and those that had not. Within the group having experienced it, there was a slight tendency to prefer a Type II approach to organization 87/53.4% compared to the Type I approach 76/46.6%. Those not having experienced interdisciplinary collaborative research felt that the best way to handle team research is through a well defined organizational structure. This group preferred the Type I approach 56/68.3% to 23/31.7%. This difference between the two groups may again be related to the effects of experience on organizing attitudes. Those with knowledge of the real situation having considerably different opinions than those presented with the hypothetical team situation. ( $\chi^2=9.45$ ,  $p=.002$ )

There was also a tendency for sex to be associated with different organizational preferences. This was not a significant finding, but it was a noticeable trend in the data. The male population of the study was split 80-49%-83-51%) in its preference for the Type I and Type II approaches. However, the female population of the study preferred the Type I approach 60.6%/43 to 39.4%/28. ( $\chi^2=1.48$ ,  $p=.22$ )

Considering each of the other organizational preference findings, it seems reasonable to interpret this finding in light of the influence of experience on preference for styles of organizing. The female population may be less experienced than the male study population in organizing for team research, and consequently prefers a more systematic and well defined approach to the work organization situation.

Sex was also found to moderate the findings of the Organizational preference Hypotheses of the study. Within the female population of the

study, Person specialists preferred a Type II approach to organizing 60% to 40%. Thing specialists preferred a Type I approach in 83% of cases compared to only 16% of the cases preferring the Type II approach. Although this finding was only significant at the .18 level, these results are predicted by Hypothesis III and IV of the study. ( $\chi^2 = 1.72$ ,  $p = .18$ )

Within the male population of the study, the organizational preferences of the two specialist types were not significantly different and they were not in the directions predicted in Hypothesis III and IV.

<u>Males:</u>	<u>TYPE I</u>	<u>TYPE II</u>	
Person Specialists	51.6%	48.4%	$\chi^2 = 1.06$ , $p = .744$
Thing Specialists	44.7%	55.3%	

Although the experience of employment in non-university settings since obtaining terminal degree did not influence preferences for specific types of organizing styles directly, it moderates the relationship between personality orientation and organizational preferences ( $\chi^2 = 1.63$ ) ( $s = .20$ ). Within this group, both Person and Thing specialists preferring the Type II approach:

	<u>TYPE I</u>	<u>TYPE II</u>
Person Specialists	47.4%	52.6%
Thing Specialists	12.5%	87.5%

This finding adds to the notion that organizational experience may be a more important influence on organizational preferences for team research than personality.

In summary, the following general results emerged from the study:

1. Evidence was found to support the reliability and validity of the Person-Thing construct scale (Frost and Barnowe 1977, Little 1972)
2. The Person Scale was found to be a better predictor of organizational and research attitudes than the Thing Scale;
3. The study found differences in Person and Thing personality orientation between males and females and between High and Low academic rank groups.
4. The factor analytic techniques of the study provided some evidence for the construct validity of the Analytic-Holistic Research continuum theory.
5. Significant differences in research attitudes were found between male and females and individuals with different post-university employment experiences.
6. The study did not find differences between Person and Thing specialists' attitudes toward Research, as predicted by Hypotheses I and II. However, there were significantly different research attitudes among other types of specialists (Person/Non-specialists and Thing/Generalists).

7. Employment, sex and personality variables were found to independently effect attitudes toward the Holistic Mode of research.

8. Individuals with different academic ranks and those with different interdisciplinary collaborative experiences had significantly different attitudes toward organization.

9. Within the female population of the study, Person specialists were found to prefer a Type II organizing style and Thing specialists preferred a Type I organizing style. This was the only instance where Hypothesis III and IV were confirmed.

#### 7:4 Discussion:

The findings of this study suggest that personality specialization in disciplinarians only partially explains attitudes toward specific research modes. In addition, career and organization experience variables may be more important in predicting preferences for organizing styles than personality specialization.

The findings of the study are limited in their general applicability. The study did not look at a complete range of disciplinary specialists and was limited to one university. In addition, the non-random sampling technique and the response bias operating in the study prohibits the researcher from generalizing beyond the study sample.

A requirement for future studies in this area would be the use of a random sampling strategy, which would take sex and career variables into consideration while partitioning, and generate equal numbers of respondents from a wider range of disciplines.

Other university settings should be surveyed. There may be some recruitment bias unique to U.B.C. compared to other institutions which is reflected in specialists' preferences for types of research.

There was some evidence to suggest that past employment in non-university settings affects a researcher's approach to problem solving. It would be interesting to see if the Analytic-Holistic continuum is appropriate for defining problem solving approaches in other types of organizational settings. In other words, the particular type of research environment may be more important than personality orientation in predicting preferences for research modes.

Additional career and experience variables, including the field of disciplinary affiliation, should be looked at to see what other types of variables effect attitudes toward research. Perhaps these characteristics of the individual effect attitudes more than measures designed to tap "psychospecialization."

The measures designed to tap the Research Mode are subject to problems of reliability. Although some evidence was presented for the construct validity of the Analytic and Holistic dimensions, more work is required in defining and articulating these and other dimensions of problem solving strategies. The Analytic-Holistic continuum may only be appropriate for a certain range of fields. This is suggested by the low response rate in the study of fields like law.

The study also found that specific organization preferences

in disciplinary specialists were not predominantly related to personality orientation. Within the female population of the study the organization preferences predicted by Hypothesis III and IV of the study emerged. Person specialists preferring a Type II approach and Thing specialists preferring a Type I approach.

Instead, the study found that organizational preference is somewhat influenced by sex and career experience variables. In particular, organizational attitudes gained in the process of conducting research seem to influence attitudes toward organizational designs. Those having experienced collaboration with other disciplines having a significantly different organizational outlook than those who hadn't had this type of research experience. Higher status academics also have a significantly different attitude towards organizational preferences than lower status academics. Non-university employment since terminal degree was also found to moderate the organizational preferences of Person and Thing specialists.

In the light of these organizational experience variables, it would be interesting at some future date to see if sexual differences in organizational preference were 'true' sexual differences or the result of different organizational experiences between males and females.

There were problems of measurement and reliability in using a forced-choice scale for tapping attitudes toward organizing for research. Underlying dimensions present in the organization design data could not be derived, so the accuracy of the two scales used in the analysis may be called into question. Future work in this area should focus on developing a more reliable instrument for measuring attitudes toward organizing.



Another problem of the study, noted in critiques of the questionnaires by the study respondents, is the definitional and communication ambiguities in trying to measure ideas such as approaches to research and organizing styles. Many of the comments suggested that these variables are dependent on the specifics of a research problem and situation and are therefore difficult to abstract to general attitudes toward research and organizing.

Some of the response bias in the study may be attributed to the disciplinary bias inherent in both the design and appeal of the questionnaire.

#### 7:5 Conclusions:

The findings of the Research mode section of the thesis provide some insights for moderating the conflict potential of polydisciplinary teams. Contrasting preferences for specific approaches to research can be documented within a population of academic specialists in socio-medically related fields. The presence of these strategy differences should not be ignored by organizers of polydisciplinary teams. Attitudes towards the apparatus of research in the potential participant of polydisciplinary research can be assessed using the following criteria:

- 1) The level of specificity preferred by a researcher for problem solution: general models or testing specific relationships.
- 2) The type of observational strategies preferred by the researcher; experimental or descriptive.

3) The types of interpretative methods to be employed by the researcher; qualitative or statistical.

4) Where the researcher falls along the Analytic-Holistic continuum in conceptualizing a research task.

Decisions concerning recruitment and grouping practices of participants should reflect a policy of trying to minimize extreme divergences among team members along the criteria outlined above if a research product is to emerge. In addition, the leaders of polydisciplinary teams should be aware of potential sexual differences in attitudes toward research. Also, researchers who are self-concerned types of individuals should probably not be grouped with Thing oriented types of specialists because their attitudes toward research vary considerably.

Recommendations to leaders organizing a team of polydisciplinary research should include consideration of the past research and organization experiences of the potential participant. Those with non-university employment since terminal degree, higher academic rank and interdisciplinary collaborative experience will probably have different organizing styles than those without benefit of these experiences. The sex of participants may also make a difference in the individual's expectations for organizational structure. Those individuals associated with the three experience variables of the study tending to prefer a more flexible, Type II style of organizing. Those with less experience seem to prefer a more structured research environment. These attributes of participants should be taken into consideration in grouping and organizing specialists for polydisciplinary teams.

In summary, this study has developed and tested a set of characteristics of disciplinary specialists relevant to the management of polydisciplinary research teams. The study was only partially successful in predicting linkages between personality attributes of specialists and specific research and work attitudinal correlates. However, the study did find several moderating variables which may help to provide guidelines for team composition in polydisciplinary research. The planning concern being to avoid instances of organizational conflict among participants of polydisciplinary research.

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## APPENDIX A.0

## QUESTIONNAIRE DESIGN AND DISTRIBUTION

- A.1 Introduction to the Questionnaire
- A.2 Questionnaire: Section ONE; Person and Thing Scale
- A.3 Questionnaire: Section TWO; Research Mode Scale
- A.4 Questionnaire: Section THREE; Organizational Scale
- A.5 Questionnaire: Section FOUR; Demographic and Career Information.
- A.6 Letters for Distribution

A.1 Introduction to the QuestionnairePOLYDISCIPLINARY RESEARCH TEAMSIntroduction:

The objective of this questionnaire is to study the influence of specialization on individual attitudes towards approaches to research and styles of work organization. The questionnaire is designed to obtain your views concerning:

- a) preferences for various types of leisure and work activities.
- b) ways of organizing and conducting research.

The questionnaire takes about 25 minutes to complete and consists of four sections. The first section is a standardized personality test which looks at individual orientations towards various types of leisure and work activities. The next three sections were developed for this study's purpose. Two sections are designed to obtain information on your attitudes towards organizing and conducting research. The last section of the questionnaire asks for demographic and career information.

Your responses will be handled in an anonymous and confidential manner. In answering the questions, please be as complete as possible and use the response format provided. If you have any comments on the questionnaire or on any individual item, please feel free to place them in the unused margin or in the space provided at the end of the questionnaire.

I would like to thank you in advance for completing the questionnaire and for participating in this study.

Diane G. Layton

A.2 Person and Thing Scale

SECTION ONE

Instructions:

A number of job titles, activities and amusements are listed below. For each, show how you would feel doing that kind of fulltime work or taking part in that activitiy or way of enjoying yourself in your leisure time.

Indicate the extent to which you would LIKE or DISLIKE each kind of work, activity or amusement by placing a mark in the appropriate box to the right of each item.

For jobs don't worry about whether you would be good at the job or about not being trained for it. Forget about how much money you could make or whether you could get ahead. Think only about whether you would like to do the work done on that job.

For activities and amusements, give the first answer that comes to mind. Do not think over or compare various possibilities. Think only about whether you would like to do what is stated.

JOB OCCUPATIONS	Strongly Like 5	Somewhat Like 4	Indif- ferent 3	Somewhat Dislike 2	Strongly Dislike 1
1. Astronomer.....					
2. Church worker.....					
3. Civil engineer.....					
4. Computer operator.....					
5. Elementary school teacher...					
6. Mechanical engineer.....					
7. Receptionist.....					
8. Social worker.....					
9. Statistician.....					
10. YMCA/YWCA staff member.....					
<u>ACTIVITIES</u>					
11. Operating machinery.....					
12. Adjusting a carburetor.....					
13. Interviewing job applicants.					
14. Meeting and directing people					
15. Making statistical charts...					
16. Operating office machines...					
17. Interviewing prospect in.... selling					
18. Organizing cabinets and .... closets					
19. Starting a conversation with a stranger.....					
20. Interviewing clients.....					
<u>AMUSEMENTS</u>					
21. Solving mechanical puzzles..					
22. Being active in a church.... group					
23. Building a radio or stereo.. set					
24. Entertaining others.....					

### A.3 Research Mode Scale

#### SECTION TWO

##### Research Modes

Research attempts to gain solutions to problems by systematically searching for facts and relationships. Every discipline relies on research. However, the practice of research varies from field to field.

Listed below are a number of statements concerning approaches to problems and investigative procedures. Please complete this section of the questionnaire by checking the one category of the five provided which most closely fits your theoretical ideal for conducting research.

Recognizing that your opinion will vary with study circumstances and be hindered by practical constraints, respond to the items on the basis of your preferred approach to conducting research.

1. All research is best performed under controlled conditions, such as those found in lab or field experiments and clinical trials.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

2. In studying observable situations one should become intimately involved and familiar with the phenomena under study.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

3. One should be very skeptical of research founded upon personal intuition, compared to research guided by existing evidence.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

4. Research should involve carefully planned manipulations that isolate separate variables operating within the study situation.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

5. The selection, weighting and interpretation of data should depend considerably on personal judgement.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

6. In order to arrive at explanations, researchers should attempt to build general models of the phenomena under study.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

7. The researcher should attempt to test specific relationships acting in study situations.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_

8. More research dollars should be spent on the development of scientific instruments (ie. hardware and assessment techniques) for the precise measurement of variables.

strongly agree    agree    uncertain    disagree    strongly disagree

\_\_\_\_\_



9. In studying situations, one should always remain objectively detached from the phenomena under study.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

10. It is more important to describe phenomena in their approximate complexity, than it is to measure relationships between a few specific variables.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

11. Prestige should be accorded scientific work only to the degree to which the practitioner has been able to pursue hypothesis testing in an experimental research strategy.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

12. A research project should involve quantitative assessment of the phenomena under study.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

13. Researchers should remain open to elements of serendipity (unexpected discoveries) and personal intuition within the research process.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

14. Research should be more concerned with describing and understanding the nature and action of phenomena under study, than with quantification.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

15. A research plan should try to accommodate as many study variables as possible.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

16. A researcher should define the scope of research issues in a comprehensive manner.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

17. The analysis of research data should involve testing predicted relationships for statistical significance.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

18. The study settings in which research should be performed often increase problems of research design (ie. field studies, survey research, participant-observation).

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

19. Research can be best accomplished by looking at part of a problem using a limited number of study variables.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

20. Research should embody qualitative methodologies which rely on  
the interpretative skills of the scholar.

strongly agree   agree   uncertain   disagree   strongly disagree

\_\_\_\_\_

A.4 Organizational ScaleSECTION THREEOrganizing for Research:

Imagine that you have been given unlimited funds, as principal investigator, to conduct a research project in a problem area of your choice. There are no funding agency stipulations concerning the way in which you design and carry out the research. The only requirements are that the project be completed within a three year period and that you hire a team of three or more experienced researchers to assist you. Faced with these circumstances, there would be a number of decisions to make concerning your general approach to organizing the research team.

Listed below are a number of alternative administrative strategies you might consider. Some alternatives may be equally characteristic of you or equally uncharacteristic. While this is a distinct possibility, never the less, choose the alternative which is relatively more characteristic of you. There are no right or wrong answers. In general, try to relate the situation in the item to your own personal research work experience.

For each item you have five points to distribute in any one of six possible combinations. Be sure that the numbers you assign to each pair of alternatives presented to you in the item sum to equal five.

## EXAMPLE ITEM

In allocating work responsibility within a project, principal investigators should:

A. Assume direct responsibility for all aspects of the work process.

☐ A

B. Delegate complete responsibility to staff members for specific aspects of the work process.

☐ B

1. If A is completely characteristic of what you would do and B is completely uncharacteristic write a "5" on your test under A and a "0" under B, thus:

☐ 5 A

☐ 0 B

2. If A is considerably characteristic of what you would do and B is somewhat characteristic, write a "4" on your test sheet under A and "1" under B, thus:

☐ 4 A

☐ 1 B

3. If A is only slightly more characteristic of what you would do than B is, write a "3" on your test sheet under A and a "2" under B, thus:

☐ 3 A

☐ 2 B

4. Each of the above three combinations may be used in the converse order: that is, for example, should you feel B is slightly more characteristic of you than A, write a "2" on your test sheet under A and a "3" under B, thus and so on for A=1, B=4; or A=0, B=5.

☐ 2 A

☐ 3 B

1. In order to determine the goals, methods and activities of research work, decision-making powers should:
  - A) be limited to those few individuals in leadership positions. ☐ A
  - B) extend to all research workers on a project. ☐ B
2. Regarding the characteristics of a person who fills a particular job, research employers should always:
  - A) provide opportunities for the individual to develop his/her own potential. ☐ A
  - B) emphasize tasks and work roles only. ☐ B
3. Within a research project, activities such as written records of internal meetings, procedures, memos, progress reports and personnel review should:
  - A) always be maintained to regulate and control the flow and quality of work. ☐ A
  - B) not be overly emphasized. ☐ B
4. Research projects which do require collective effort should be tackled by:
  - A) having each worker do his/her own work and then have one person with expertise and experience consolidate the results. ☐ A
  - B) means of group discussion and interaction; assembling the product as a team. ☐ B

5. When considering working relationships and job assignments in a research project, staff members should always:

A) be designated a particular job and status according to their level of expertise and research experience.

☐ A

B) assume responsibilities which interest them and be treated as peers.

☐ B

6. Decisions in the organization of research should be carried out on the basis of:

A) what is expedient and makes sense at the time.

☐ A

B) administrative and fiscal procedures set up initially to guide a project's human and non-human resources all the way along.

☐ B

7. As far as managing a research staff is concerned, research employees should be:

A) regularly monitored by their superiors in order to insure ongoing productivity.

☐ A

B) able to make their own work rules as long as they get the job done.

☐ B

8. In any research project, research working plans, schedules and personal responsibilities should:

A) not be too rigid.

☐ A

B) be adhered to as closely as possible.

☐ B

9. Research tasks should be defined and coordinated by:

A) the continuous interaction of staff members during  
all phases of a project.

☐ A

B) initially breaking down tasks to match areas and levels  
of personnel expertise.

☐ B

10. In organizing for team research situations:

A) one has to accept interpersonal conflict and the  
frustration of working with others.

☐ A

B) conflict can usually be handled by collective attention  
to staff morale.

☐ B



A.5 Demographic and Career InformationSECTION FOURInstructions:

Please fill in or check the appropriate category in order to provide the requested demographic and career information.

1. Academic Title or Rank:

- |                        |                          |                             |                          |
|------------------------|--------------------------|-----------------------------|--------------------------|
| a) full professor      | <input type="checkbox"/> | f) instructor               | <input type="checkbox"/> |
| b) associate professor | <input type="checkbox"/> | g) postdoctoral appointment | <input type="checkbox"/> |
| c) assistant professor | <input type="checkbox"/> | h) other                    | <input type="checkbox"/> |
| d) research associate  | <input type="checkbox"/> | Please specify: _____       |                          |
| e) lecturer            | <input type="checkbox"/> | _____                       |                          |

2. Age \_\_\_\_\_

3. Sex \_\_\_\_\_

4. Please list your areas of disciplinary training and the degree obtained at the appropriate levels of specialization:

MAJOR FIELD

- a) Undergraduate training..... \_\_\_\_\_
- b) Masters level ..... \_\_\_\_\_
- c) Terminal academic or professional..... \_\_\_\_\_
- degree(s)
- d) Post-Doctoral or Specialist training.. \_\_\_\_\_

5. Please list your current disciplinary affiliations (appointments in academic fields) within the university.

- a) \_\_\_\_\_ c) \_\_\_\_\_
- b) \_\_\_\_\_ d) \_\_\_\_\_

6. Please check the number of years of formal education you have completed since first entering university.

- a) 0-5 yrs. ☐
- b) 6-10 yrs. ☐
- c) 11-15 yrs. ☐
- d) 16-20 yrs. ☐
- e) 21+ yrs. ☐

7. Please check the time category which corresponds most closely to the years passed since the completion of your most recent degree.

- a) 0-5 yrs. ☐
- b) 6-10 yrs. ☐
- c) 11-15 yrs. ☐
- d) 16-20 yrs. ☐
- e) 21+ yrs. ☐

8. Have you ever been employed full time for a non-university related organization since beginning your academic training?  
Do not consider short term (less than six months) part-time or summer employment experiences.

Yes ☐ No ☐

9. Have you ever been employed full time for a non-university related organization since obtaining your most recent degree?

Yes ☐ No ☐

10. Please estimate your current distribution of effort (this academic term) using an estimated percentage breakdown of your total working time. Use factors of five in estimating the percentage of your time spent in the following work activities.

Instructions: If no time was devoted to a specific category, place 0% next to the activity. If 5% or less was spent, indicate 5%. If 6-10% was spent indicate 10%. If 11-15% was spent indicate 15% and so on... Please make sure your percentages sum to 100%!

- a) advising students .....\_\_\_\_\_
- b) committee work (within the university).....\_\_\_\_\_
- c) editorial work.....\_\_\_\_\_
- d) service to clients (patients).....\_\_\_\_\_
- e) teaching .....\_\_\_\_\_
- f) consulting (external to university and clinical commitments).\_\_\_\_\_
- g) research.....\_\_\_\_\_
- h) administration (university or departmental related business).\_\_\_\_\_
- i) extra-curricular (speaking, conferences).....\_\_\_\_\_
- j) other.....\_\_\_\_\_

11. Have you had any collaborative research experience working with one or more colleagues from your own field? (ie. the academic discipline you identify with most strongly).

Yes ☐

No ☐

12. Have you had any collaborative research experience working with one or more colleagues from fields other than your own?

Yes ☐ No ☐

The following three questions are to be answered only if you have answered yes to number 12.

13. On the average, how many disciplines, other than your own, have you collaborated with at any one time?

- |                       |                          |
|-----------------------|--------------------------|
| a) one other field    | <input type="checkbox"/> |
| b) two other fields   | <input type="checkbox"/> |
| c) three other fields | <input type="checkbox"/> |
| d) four other fields  | <input type="checkbox"/> |
| e) five or more       | <input type="checkbox"/> |

14. Please list the fields your collaborative research has included:  
(other than your own).

- |          |          |
|----------|----------|
| a) _____ | d) _____ |
| b) _____ | e) _____ |
| c) _____ | f) _____ |

15. Assess the degree to which you feel that, on the average, your collaborative research has been productive. (ie. research goals accomplished to your satisfaction)

highly productive    productive    uncertain    unproductive    highly unproductive

\_\_\_\_\_

16. What was the average length of time these associations existed?

- a) 1-6 mos. ☐
- b) 6 mos. - 1 yr. ☐
- c) 1 yr. - 3 yrs. ☐
- d) 3 yrs. - 5 yrs. ☐
- e) 5 yrs.+ ☐

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COMMENTS

A.6 Letters for Distribution

THE UNIVERSITY OF BRITISH COLUMBIA  
Health Sciences Centre  
Faculty of Medicine,  
Department of Health Care and Epidemiology  
Vancouver, Canada  
V6T 1W5

Dear Faculty Member:

As a M.Sc. candidate in Health Services Planning, I am studying specialist's attitudes towards research approaches and work environments. Research involving specialists from different disciplines and professions has often involved a great deal of conflict. Planning for such endeavors has given little consideration to individual differences in problem solving approaches and personal styles of organizing. Systematic knowledge in this area is relatively scarce. Consequently, your help and cooperation in filling out the enclosed questionnaire is requested.

This study has been approved by the University Committee on Research Involving Human Subjects. The information requested will be used purely for research purposes and individual anonymity is guaranteed. Reminders will be sent to every member of the sample because an identification system is not being maintained. Please return the completed questionnaire in the enclosed self-addressed envelope. If you have filled in and returned the questionnaire, please excuse and ignore the additional reminders.

Thank you for your assistance and the use of your valuable time. A copy of the completed study will be available upon request.

Sincerely,

Diane G. Layton  
Department of Health  
Care and Epidemiology  
Faculty of Medicine

A.6 (Continued)

THE UNIVERSITY OF BRITISH COLUMBIA

REGARDING A STUDY INTO THE MANAGEMENT OF  
POLYDISCIPLINARY TEAMS:

Dear Colleague;

As Chairman and member of Diane Layton's thesis committee, we endorse her study and urge you to participate. The enclosed questionnaire is not lengthy and you are asked to do a minimum of self-reporting. Your response will help provide an important learning experience and information of value to colleagues who are interested in effective forms of organized research effort.

Sincerely,

Dr. V. Mitchell, B.S., M.B.A., Ph.D.  
Faculty of Commerce and  
Business Administration

Dr. G. Szasz, M.D.  
Department of Health Care  
and Epidemiology  
Faculty of Medicine.

A.6 (Continued)

REGARDING THE QUESTIONNAIRE ON  
POLYDISCIPLINARY RESEARCH TEAMS:

Dear Faculty Member;

Last week I sent you a questionnaire designed to study specialist's attitudes towards organizing and conducting research projects. If you have filled out and returned the questionnaire, please accept my thanks and excuse this reminder. If you have not yet completed the questionnaire, I ask that you do so as soon as possible. Your help in carrying out this thesis study is needed and will be deeply appreciated.

Sincerely,

Diane G. Layton  
Department of  
Health Care and Epidemiology



APPENDIX B.O  
FACTOR MATRICES

- B.1      Orthogonal Rotation;  
          Specifying Two Factors
- B.2      Orthogonal Rotation;  
          Free Factors
- B.3      Oblique Rotation;  
          Specifying Two Factors
- B.4      Oblique Rotation; Specifying  
          Free Factors

B.1 Orthogonal Rotation,  
Specifying Two Factors

VARIMAX ROTATED

FACTOR MATRIX

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>
OBRIG1	0.58836	0.25931
OBQUAL2	-0.27310	0.20094
CONANAL3	0.35239	0.25016
CONANAL4	0.62823	0.22348
OBQUAL5	0.11901	0.34727
CONHOL6	-0.26906	0.26794
CONANAL7	0.35908	-0.14161
OBRIG8	0.35556	0.03740
OBRIG9	0.49027	0.26145
OBQUAL10	0.20232	0.43487
CONANL11	0.46905	0.08815
OBRIG12	0.47801	0.21045
CONHOL13	-0.12187	0.23030
CONHOL14	0.20080	0.59225
CONHOL15	0.00307	0.30510
CONHOL16	-0.19066	0.05341
OBRIG17	0.50693	0.06114
OBQUAL18	-0.16527	-0.07702
CONANL19	0.45393	0.09130
OBQUAL20	0.26714	0.49232

## B.2 Orthogonal Rotation;

## Free Factors

VARIMAX ROTATED				
FACTOR MATRIX				
Research Mode Items	Factor 1	Factor 2	Factor 3	Factor 4
OBRIG1	0.39007	0.69961	0.05388	0.15777
OBQUAL2	0.51470	0.36012	0.05801	0.07852
CONANAL3	0.75430	0.43194	0.06091	0.11406
CONANAL4	0.46562	0.27575	0.24589	0.08523
OBQUAL5	0.50201	0.20865	0.00276	0.11528
CONHOL6	0.86186	0.38939	0.13365	0.01853
CONANAL7	-0.23622	-0.11605	-0.79841	0.03186
OBRIG8	0.10198	0.36286	0.17857	0.07096
OBRIG9	0.35702	0.76378	0.03325	0.18309
OBQUAL10	0.33380	0.76917	0.12734	0.09915
CONANL11	0.32456	0.43463	-0.09665	0.17900
OBRIG12	0.38421	0.73234	0.13790	0.15348
CONHOL13	0.62086	0.12135	0.23472	0.09333
CONHOL14	0.54447	0.15702	0.03104	0.17169
CONHOL15	0.78994	0.40469	0.13751	0.05324
CONHOL16	0.74936	0.33697	0.23746	-0.17362
OBRIG17	-0.02430	0.26228	-0.00817	0.44024
OBQUAL18	0.69224	0.59754	0.11465	0.05860
CONANL19	0.35221	0.76436	0.04310	0.00892
OBQUAL20	0.14234	0.02448	0.00352	0.53668

## B.3. Oblique Rotation

## Specifying Two Factors

FACTOR PATTERN

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>
OBRIG1	0.62413	0.11882
OBQUAL2	-0.23717	0.25839
CONANAL3	0.38932	0.16373
CONANAL4	0.65769	0.07476
OBQUAL5	0.17445	0.31174
CONHOL6	-0.22222	0.32285
CONANAL7	0.33188	-0.22010
OBRIG8	0.35767	-0.04462
OBRIG9	0.52749	0.14329
OBQUAL10	0.27114	0.37821
CONANL11	0.47818	-0.02098
OBRIG12	0.50703	0.09632
CONHOL13	-0.08285	0.25254
CONHOL14	0.29536	0.53214
CONHOL15	0.05291	0.29703
CONHOL16	-0.17978	0.09561
OBRIG17	0.51121	-0.05598
OBQUAL18	-0.17600	-0.03745
CONANL19	0.46374	-0.01446
OBQUAL20	0.34462	0.41949

## B.3 (Continued)

FACTOR CORRELATIONS

	Factor 1	Factor 2
Factor 1	1.00000	0.06573
Factor 2	0.06573	1.00000

FACTOR STRUCTURE

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>
OBRIG1	0.63194	0.15985
OBQUAL2	-0.22019	0.24280
CONANAL3	0.40008	0.18932
CONANAL4	0.66261	0.11799
OBQUAL5	0.19494	0.32320
CONHOL6	-0.20100	0.30824
CONANAL7	0.31741	-0.19829
OBRIG8	0.35474	-0.02111
OBRIG9	0.53691	0.17796
OBQUAL10	0.29600	0.39604
CONANL11	0.47680	0.01045
OBRIG12	0.51336	0.12964
CONHOL13	-0.06625	0.24709
CONHOL14	0.33034	0.55155
CONHOL15	0.07244	0.30051
CONHOL16	-0.17349	0.08380

## B.3 (Continued)

FACTOR STRUCTURE

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>
OBRIG17	0.50753	-0.02238
OBQUAL18	-0.17846	-0.04902
CONANL19	0.46279	0.01602
OBQUAL20	0.37219	0.44214

## B.4 Oblique Rotation, Specifying

## Free Factors

FACTOR PATTERN

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>	<u>Factor 5</u>	<u>Factor 6</u>
OBRIG1	0.62823	0.04813	0.03158	-0.05549	-0.04711	0.17748
OBQUAL2	-0.16818	0.21018	-0.17650	0.08945	-0.10719	0.00134
CONANAL3	0.09883	-0.23826	0.02281	0.00820	-0.45716	0.10761
CONANAL4	0.34108	-0.25759	-0.08958	-0.06894	-0.28856	0.13088
OBQUAL5	0.13167	0.22530	-0.23411	-0.06886	-0.37108	-0.02052
CONHOL6	0.17327	0.60879	0.18613	0.08163	-0.06321	0.05041
CONANAL7	0.09777	-0.50284	0.04675	0.07522	-0.09123	-0.01687
OBRIG8	0.27649	-0.08393	-0.18504	-0.03986	-0.02412	-0.02428
OBRIG9	0.27558	-0.12511	-0.16599	-0.11943	-0.42403	0.00499
OBQUAL10	0.14996	0.00940	0.00151	0.19203	0.01161	0.50320
CONANL11	0.56815	0.06899	0.16668	-0.15118	-0.06143	0.00332
OBRIG12	0.13018	-0.08617	-0.03969	-0.34079	0.14357	0.46447
CONHOL13	-0.14533	0.06066	0.10918	0.05211	-0.39931	0.03032
CONHOL14	-0.13760	0.07431	-0.02168	-0.10241	-0.07432	0.77790
CONHOL15	0.00707	-0.00308	-0.35546	0.36551	0.03935	0.27315
CONHOL16	0.01721	-0.03461	0.00912	0.44039	0.00489	-0.00108
OBRIG17	0.10264	-0.11841	-0.16827	-0.49849	0.00753	0.17531
OBQUAL18	0.00661	0.05841	0.43884	0.06328	-0.03225	-0.02559
CONANL19	0.56801	-0.04990	-0.07294	0.12346	0.06690	0.03484
OBQUAL20	0.07543	0.02307	0.01586	-0.06116	-0.27564	0.38248

FACTOR CORRELATIONS

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Factor 1	1.00000	-0.32219	-0.11311	-0.24084	-0.19030	0.34170
Factor 2	-0.32219	1.00000	0.11521	0.15898	-0.10043	-0.04832
Factor 3	-0.11311	0.11521	1.00000	0.01490	0.08186	-0.23664
Factor 4	-0.24084	0.15898	0.01490	1.00000	0.03745	-0.05445
Factor 5	-0.19030	-0.10043	0.08186	0.03745	1.00000	-0.22950
Factor 6	0.34170	-0.04832	-0.23664	-0.05445	-0.22950	1.00000

FACTOR STRUCTURE

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>	<u>Factor 5</u>	<u>Factor 6</u>
OBRIG1	0.69212	-0.16331	-0.08062	-0.21010	-0.21172	0.39618
OBQUAL2	-0.21662	0.26895	-0.14102	0.15665	-0.10770	-0.00479
CONANAL3	0.29481	-0.22545	-0.07859	-0.07612	-0.47456	0.25197
CONANAL4	0.55044	-0.36611	-0.21346	-0.21131	-0.36755	0.35105
OBQUAL5	0.16576	0.18322	-0.24960	-0.08102	-0.43581	0.15791
CONHOL6	-0.03434	-0.59130	0.22079	0.13435	-0.15060	0.04621
CONANAL7	0.24797	-0.50701	-0.02460	-0.03007	-0.04881	0.04662
OBRIG8	0.33036	-0.19707	-0.22281	-0.12213	-0.07938	0.12575
OBRIG9	0.44583	-0.20966	-0.24924	-0.22432	-0.48312	0.24831
OBQUAL10	0.27025	-0.03370	-0.12963	0.13047	-0.12604	0.54051
CONANL11	0.57630	-0.11288	0.10230	-0.27705	-0.16926	0.17701
OBRIG12	0.37590	-0.22373	-0.16758	-0.40635	0.00484	0.50812



FACTOR STRUCTURE (Continued)

<u>Research Mode Items</u>	<u>Factor 1</u>	<u>Factor 2</u>	<u>Factor 3</u>	<u>Factor 4</u>	<u>Factor 5</u>	<u>Factor 6</u>
CONHOL13	-0.10342	0.16699	0.09352	0.08178	-0.37382	0.04070
CONHOL14	0.14553	0.06974	-0.18925	-0.10292	-0.23974	0.75505
CONHOL15	0.04609	-0.00536	-0.41258	0.34462	-0.03978	0.33090
CONHOL16	-0.08004	0.03047	0.01041	0.43112	0.02258	-0.02079
OBRIG17	0.33835	-0.25934	-0.24182	-0.55381	-0.07279	0.28134
OBQUAL18	-0.07970	0.12138	0.44918	0.07770	0.00480	-0.12605
CONANL19	0.56178	-0.23008	-0.14387	-0.02175	-0.04553	0.22653
OBQUAL20	0.26408	0.00008	-0.10400	-0.10657	-0.38109	0.46998