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AN EXAMINATION OF THE RELATIONSHIP BETWEEN SOCIAL STRUCTURAL FACTORS, COMPLEXITY OF THE INFORMATION ENVIRONMENT, INDIVIDUALS' PROCESSING STYLE, AND COGNITIVE STRUCTURE

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N.J. Stoyanoff

A DISSERTATION

Submitted to
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ABSTRACT

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A theory of information processing is presented which explains how individual differences in cognitive structure occur. Data were collected by questionnaire from 99 undergraduate students, and the theory was tested using a linear structural equation model. The results of the data analysis indicate that while there were specification problems with the model, the relationships proposed by the theory were supported.

Accepted by the faculty of the Department of Communication, College of Communication Arts and Sciences, Michigan State University, in partial fulfillment of the requirements for the Doctor of Philosophy degree.

Director of Dissertation

Guidance Committee: __________, Chairman

To Pando Stoyanoff and
Traico Kostoff, whose
lives inspired me to
pursue my own dreams.

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This dissertation is concerned with a topic I first began investigating in September of 1975. Needless to say, over the past 5 1/2 years my thinking patterns, behavioral patterns and general well-being have been influenced by a number of persons whose contributions I would now like to recognize.

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CHAPTER I

A THEORY OF INFORMATION PROCESSING

Introduction

The purpose of this dissertation is to present a theory of information processing which details the relationship between symbolic environments and an individual's responses to symbolic environments. The fundamental premise of this theory is that information processing is a measurement process individuals engage in to reduce environmental uncertainty. The theory will argue that there are only two basic processing styles which an individual can adopt to reduce uncertainty--nominal-dominant and ratio-dominant. Further, the theory will explain how the information processing style an individual adopts is largely a function of the environmental factors to which the individual has been exposed. Moreover, the theory will show how one can infer which style dominates an individual's repertoire from the individual's responses to a specific information processing task. Finally, the theory will illustrate the relationship between dominant processing style and cognitive structure, and argue that individuals who employ a ratio-dominant processing style have relatively more complex cognitive structures than individuals who employ a nominal-dominant style.

To accomplish the objectives specified above, the remainder of this chapter will be devoted to the presentation of four topics. First, a review of the work concerned with the topic of cognitive structure will be presented. A chronological approach will be taken to explicate the development of this variable, from its theoretic underpinnings to the state-of-the-art models which now influence social-psychological thought. Second, a review of the work concerned with the distributional patterns of individuals' responses to information processing tasks will be presented. In particular, this section will closely examine the manner in which individuals respond to questionnaire items. These first two sections are structured so as to acquaint the reader with the fundamental ideas concerned with information processing style and cognitive structure. Next, the third section will detail the problems of prior research in the area of information processing and cognitive structure. These ideas will then provide the framework for a theoretic reformulation of human information processing to be presented in the fourth section of this chapter. This reformulation will focus on how information processing is accomplished, and the effect of each dominant style of information processing on the individual's cognitive structure. Key theoretic constructs will be cast into relationships that will be used to generate a causal model.

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From this model, specific hypotheses concerning information processing style and cognitive structure will be presented. Finally, a summary of this chapter will be provided.

A Review of the Work on Cognitive Structure

Theoretic roots. Much of the contemporary research on the topic of cognitive structure is based upon the social-psychological work of Lewin (1935, 1936, 1948, 1951), Heider (1946, 1958) and Kelly (1955). Lewin's Principles of Topological Psychology introduced the concept of cognitive complexity as the differentiation and integration of the individual's life space. For Lewin, the individual's "life space" referred to the internal organization of the environmental stimuli to which the individual had been exposed. This "life space" was conceived by Lewin to be comprised of regions which become articulated (i.e., differentiated) into sub-regions as a result of diverse experiences. As Lewin (1936) writes:

> It is typical of the process of orientation into a new environment that the regions which are at first unclear gradually become clearer. The degree of clearness is an essential determinant of the cognitive structure of the life space. It is closely related to the degree to which one can differentiate the life space into different regions. (p. 39)

In addition to the process of differentiation, Lewin notes that the individual is also capable of integrating regions s

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of the life space in order to gain understanding of the environment. Lewin (1951) comments:

> The increasing differentiation of the life space into relatively separated subparts is somehow counteracted by the increasing organization of the life space. . . . It refers to the increasing scope of coexisting parts of the life space which can be organized as a unit and the increasingly larger sequence of actions which are unitedly governed. (p. 108)

Lewin's major contributions to the development of a theory of cognitive structure are these concepts of differentiation and integration (Yum, 1979), and his conceptualization of psychological processes using topological principles. This latter point is important because: (a) it represents an attempt to apply a spatial metaphor to the study of a social science problem, and (b) as we shall see, most of the contemporary theories of cognitive structure are based on spatial (i.e., topological) principles. As it turns out, this same approach will be adopted in the theoretic and operational reformulations to be presented. As Lewin (1936) comments:

> The nature of things whose system constitutes a mathematical space is entirely irrelevant for modern mathematics. It does not matter whether one thinks of them as physical objects, temperatures, numbers, colors, events, or anything else. Only certain relationships and the possibility of certain operations are relevant. It is these which finally define space. As far as mathematics is concerned there is

> therefore no fundamental objection to applying the mathematical concept of space to psychological facts. The crucial point is whether the relationships that characterize space in mathematics can be applied adequately to psychological facts, and whether one can coordinate psychological processes univocally to mathematical operations. (pp. 52-53)

An important extension of Lewin's Gestalt perspective of psychological processes is the theoretic work of Fritz Heider (1946, 1958) and George A. Kelly (1955). Among Heider's many contributions, probably the most relevant to our concerns here is his work on attribution theory. In an attempt to understand how attitudes developed, Heider posited that individuals processed information by defining their experiences according to the properties (or attributes) that they perceived the phenomena of their experience to possess. Further, Heider contended that an individual's understanding of the environment, and the people in it, could be determined by examining the attributions the individual made with respect to these stimuli. Utilizing this key notion, Kelly developed a theory of personal constructs in which he contended that individuals engaged in a process of construing (or interpreting) events, by observing the similarities and/or differences among them, and developing a set of "constructs" (bi-polar adjective continua) for defining these events. As Kelly (1955) writes:

> In construing, the person notes the features in a series of elements which characterize some of the elements and are particularly characteristic of others. Thus, he erects constructs of similarity or contrast. Both the similarity and contrast are inherent in the same construct. (p. 50)

Kelly went on to assert that individuals eventually develop a construction system which organized a finite number of dichotomous constructs into a meaningful hierarchy, consisting of many levels of ordinal relationships between constructs, which can vary as the individual further construes events.

From these initial studies have come a multitude of theoretic models concerning how individuals organize information (for a good review of these models see: Goldstein and Blackman, 1978; Streufert and Streufert, 1978; Scott, Osgood and Peterson, 1979). A convenient framework for examining these models is to distinguish the static-structural models from the dynamic-processing models.

The static-structural models. The term "static-structural models" refers to that class of models which simply attempt to specify the components of the individual's cognitive structure, and which do not include "time" as a variable or index. The work of Bieri (1955, 1961, 1966, 1971), Crockett (1965) and Zajonc (1960, 1968) is representative of this class of models. The common thread among the work of these theorists is that each have based their work around Kelly's notion of the "construct." Commenting upon Bieri's work, Streufert and Streufert (1978) write:

> Similar to Kelly, Bieri is concerned with the effects of an individual's cognitive dimensional structure on the judgments he makes about input from the environment. . . . 'Cognitive complexity is a measure of the degree of differentiation in the cognitive system for perceiving others' (Bieri, 1961). 'As such, it is considered to be a structural characteristic which serves as an information processing variable affecting the way in which specific (social) stimuli are transformed into judgments' (Bieri, 1966). The degree of cognitive complexity is related to the number of dimensions of judgment a person has available to him. The more available dimensions, the higher the degree of complexity. (p. 20)

More specifically, Bieri considers the individual's cognitive structure relatively complex when he/she uses a relatively large number of well-articulated independent dimensions when construing others (Bieri, 1966; Bieri, et al., 1966). For Bieri, the term "articulation" refers to the extent to which the individual makes discriminations among stimuli using any one dimension. That is, it refers to the number of categories or intervals that have been delineated along any one dimension. Bieri (1971) expanded upon this framework by emphasizing that an individual had certain cognitive abilities to extract information from a complex stimulus, and integrate this information into some meaningful pattern. Further, it should be noted that

Bieri's later work did begin to consider time as a variable by pointing out that the individual's cognitive structure: (a) affected his/her behavior when encountering new phenomena, (b) determined the parameters which bounded the individual's responses to new phenomena, and (c) was largely a function of complexity of the stimuli to which the individual was exposed.

Like Bieri, Crockett (1965) addressed himself to what he termed the individual's "cognitive system," which was comprised of constructs which were related to each other in various ways. More specifically, he posited that constructs were related to one another based upon such factors as similarity, spatial or temporal contiguity, and logical or psychological implication (p. 48). For Crockett, the relative complexity of the individual's cognitive structure is dependent upon the number of constructs the individual utilizes to define stimuli, and the hierarchical integration of constructs. The only consideration of time in Crockett's work is in his conceptualization of the changes that take place in the individual's cognitive system when hierarchical integration takes place. Here Crockett proposes that individuals form impressions of phenomena by first defining the properties of the phenomena in terms of the extant constructs in the cognitive system, and then by defining the properties of the phenomena using a new set of constructs, which are a result of the individual's integration of extant constructs. Further, Crockett strongly contends that the frequency of contact with non-redundant stimuli is the major predictor of cognitive complexity.

Work by Zajonc (1960, 1968) represents the first attempt to: (a) develop a distinction between a "cognitive universe" and "cognitive structure" (i.e., a distinction between the individual's overall structure and the sub-structures that pertain to various domains of experience), and (b) suggest the use of a dimensional model consisting of independent constructs (attributes) treated as vectors in a multidimensional space. Zajonc (1968) states:

> A psychological dimension is one's capacity to map consistently a set of responses onto a collection of stimuli that is itself ordered. A specific act of "perceiving" or "cognizing" a given stimulus object or event is regarded as involving the projection of the stimulus onto a set of psychological dimensions, and thereby attributing to it one value from each of these dimensions. These projected values, attributes, are the elements of the cognitive structure under analysis. They are what is commonly understood by the traits, characteristics, qualities, etc., of the object, event, or concept as the person perceives them. (p. 328)

The use of a dimensional model, and the distinction between the individual's overall structure and particular domains are important because they allow: (1) the possibility of an individual having a relatively complex structure with respect to one domain, and a relatively simple structure with respect to another, and (2) the use of factor analytic techniques to develop dimensional models that can represent certain organizational features of the individual's cognitive structure. This latter point was an important influence on the work of Schroder, Driver and Streufert (1967), Wexler and Romney (1972), and Scott, Osgood and Peterson (1979), all of whom developed models of cognitive structure based upon factor analytic principles.

Summary of the static-structural models. While there has been a great deal of variety in the approaches discussed thus far, there have been three commonalities in the conceptual explications which we can review. First, the basic premise of each of these models is that as individuals encounter phenomena, they define these stimuli according to the properties (attributes) they perceive the stimuli to possess. In general, cognitive theorists use the number of independent attributes an individual utilizes to define stimuli as a primary indicator of the complexity of the individual's cognitive structure. That is, the more independent attributes the individual employs, the more relatively complex the cognitive structure. In passing, it should be noted that two variables have been discussed thus far: (1) the total number of attributes that the individual utilizes to define a set of stimuli, and (2) the total number of <u>independent</u> attributes that are used to define the set of stimuli (i.e., the dimensionality of an attribute space). The process of defining stimuli according to the properties (attributes) they are perceived to possess will be referred to as <u>differentiation</u>. Second, static-structural models emphasize the importance of examining the degree to which an individual makes distinctions among stimuli defined along the same attribute as an indicant of complexity. The capability to make distinctions along any attribute, sometimes called articulation, will be referred to as <u>discrimination</u>. In general, the more distinctions an individual makes, the greater the discrimination. Third, the static-structural models examine the kind of relationships an individual establishes among stimuli. The capability to combine information and establish relationships among stimuli, such that the individual can generate several perspectives as to how the stimuli and attributes interrelate, will be referred to as <u>integration</u>. In general, the more different ways an individual perceives certain stimuli in relationship with other stimuli, the greater the level of integration.

From the static-structuralists' perspective an individual's cognitive structure can be considered relatively complex when: (a) the individual uses a large number of attributes to define a particular set of stimuli (<u>differentiation</u>), (b) the individual makes fine <u>discriminations</u>

among the stimuli, and (c) the individual exhibits a high level of integration. Further, these variables are expected to be correlated with each other, such that an individual who utilizes a large number of attributes to define a set of stimuli is also likely to exhibit a high level of discrimination and integration. As it turns out, the theoretical reformulation that will be presented will contend that these three variables (differentiation, discrimination, and integration) are the fundamental aspects (indicators) of an individual's cognitive structure.

The dynamic-processing models. The term "dynamic-processing models" refers to that class of models which attempt to examine the manner in which the components of the cognitive structure change over time. Based upon the work of Murphy (1947), Piaget (1926, 1932, 1952, 1954) and Werner (1957), these developmental models focus on the interaction between environmental complexity and the complexity of the individual's cognitive structure. These models are considered here to be dynamic because of their emphasis on interaction processes and responses to forces. Representative of this class of models is the work of Harvey, Hunt and Schroder (1961), Schroder, Driver and Streufert (1967), and Streufert and Streufert (1978).

Harvey, Hunt and Schroder (1961) consider cognitive complexity the result of a process which entails the acquisition of increasingly abstract constructs, producing a cognitive system which is highly differentiated and which is characterized by a high level of discrimination and integration. Commenting upon this process of abstraction, Harvey, et al. write:

> We assume that the most important structural characteristic is the degree of concreteness or abstractness. The more concrete, the structure is assumed to be restricted to, or dependent upon, physical attributes of the activating stimulus. (p. 3)

They specifically define abstraction as:

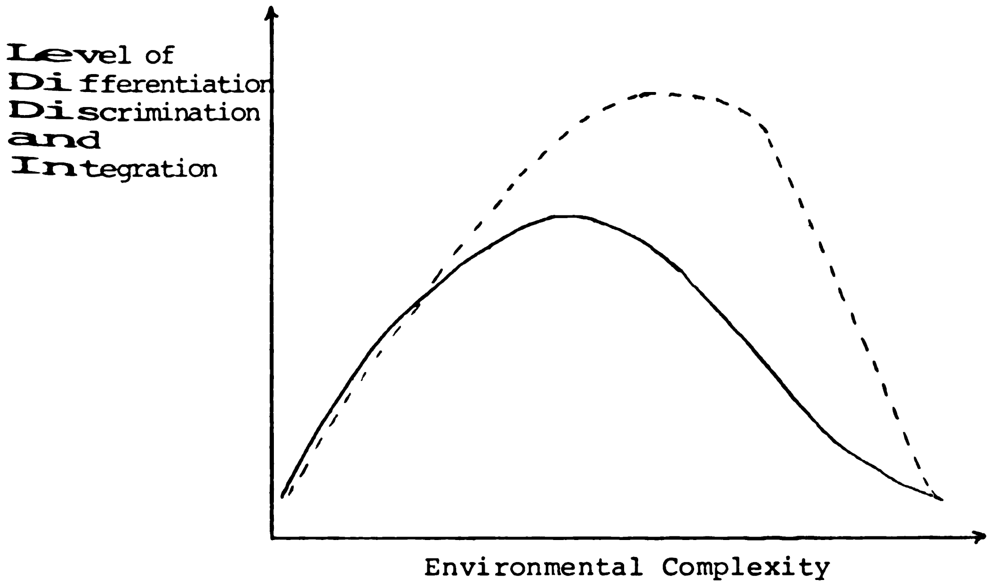
> . . . how the ambiguous or undifferentiated is broken down or differentiated into parts and then integrated or interrelated into a conceptual pattern. (p. 22)
>
> We assume that learning occurs through a process of differentiation and integration, during which time the person breaks down the environment into parts relevant to his current conceptual structure and then integrates these parts in ways compatible with his current organization. (p. 4)

Ultimately, Harvey, et al. posit that each individual passes through stages of development that are characterized by certain (hierarchical) levels of complexity. However, they note that development may be arrested at any level due to such factors as changes in training, or environmental complexity. As these authors comment:

> A given level or stage of concreteness-abstractness is attained through differentiation-integration, but this same

> level or stage of abstractness affects both what kind of differentiations or discriminations are made and how these are subsequently organized or integrated by their being related to existing internal standards. (p. 23)

Schroder, Driver and Streufert (1967) consider cognitive complexity to be "the complexity of the schemata that determines the organization of several dimensions in a complex cognitive structure" (p. 65). Schroder, et al. focus their theory around the three variables of differentiation, discrimination, and integration, and how these variables vary with respect to different levels of environmental complexity. Interestingly, these authors posit that differences between relatively simple and complex individuals can only be uncovered when they are presented with an information processing task which presents an "optimally" complex set of stimuli (i.e., when the task presents stimuli which is neither "underloading" nor "overloading"). Their rationale is that a too extreme level of complexity produces stressful situations in which no meaningful differentiation, discrimination, or integration should be expected to occur. However, when an "optimal" environment is present, individuals should exhibit differences in processing style, particularly with respect to their level of differentiation and integration. More specifically, Schroder, et al. expect relatively complex individuals to obtain a higher peak point on an inverted U-shaped curve which relates environmental complexity (on the ordinate) to differentiation, discrimination, and integration (on the abscissa). Further, they expect relatively complex individuals to attain this peak at a higher level of environmental complexity than relatively simple individuals (see Figure 1).



---- relatively complex individuals

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Figure 1. The Relationship Between Environmental Complexity and Level of Differentiation, Discrimination and Integration

Recent work by Streufert and Streufert (1978) has expanded upon the work of Schroder, et al. to include a consideration of how individuals adapt their information processing behaviors to meet varying levels of environmental complexity. However, rather than use the term "environmental complexity," Streufert and Streufert discuss environmental conditions in terms of the relative amount of incongruity that is present at any one time. In discussing this notion of incongruity these authors write:

> One could hypothesize that organisms form expectations concerning the probable amount of incongruity they will encounter. . . . By "general incongruity" is meant the total amount of novelty, imbalance, dissonance, disagreement, failure, conflict, etc. which an individual typically encounters. . . . Organisms could average their prior general incongruity experience over time and thus develop general expectations concerning the "normal" (consistent!) amount of general incongruity to expect in their environment. The expectation concerning general incongruity can be termed the General Incongruity Adaptation Level (GIAL). Organisms with past experiences rich in general incongruity would develop high GIALs, and those with relatively constant pasts would evolve with low GIALs. Both would define points or ranges where the incongruity to which they may be exposed would be experienced as consistent. (pp. 172-173)

Streufert and Streufert go on to posit that: (a) during early cognitive stages, the GIAL will be subject to radical shifts as general incongruity varies, due to the fact that the individual's GIAL is based upon relatively few experiences; (b) over time, the individual developes a more stable GIAL, due to the fact that he/she continues to "average" the incongruity from diverse experiences; and (c) over long periods of time, changes in the GIAL require frequent and/or extended exposures to extreme levels of incongruity to offset the level established on the basis of previous experience. Finally, Streufert and Streufert argue that, in general, individuals with a moderate GIAL will tend to be relatively more cognitively complex. This is because an individual with a moderate GIAL will typically encounter environmental conditions that allow the ultilization of complex search activities. As these authors comment:

> A very low GIAL would not allow much incongruity to occur before cloze actions predominate.[1] . . . Similarly, a person with a very high GIAL may be so continuously overloaded that his ability to develop or utilize multidimensional thought processes could be seriously reduced. . . . A moderate GIAL . . . with its better balance between load and complex search-producing incongruity levels may aid in the development of multidimensionality. . . . This activity of the moderate GIAL person may, in the long run, result in the development of higher complexities. (pp. 276-277)

Hence, these authors contend that a balance between environmental conditions and the individual's cognitive structure leads to the development to a relatively complex structure.

Summary of the dynamic-processing models. As we have seen, the dynamic-processing models focus on the development of an individual's cognitive structure. Basically, the emphasis of these models is on the interaction between the individual's cognitive structure and the environmental conditions that the individual experiences. In general, the more diverse experiences the individual has, and the greater the complexity of the environment characterizing those experiences, the more likely the individual is to develop a relatively complex cognitive structure, and exhibit behavioral responses which expose him/her to environmental conditions which correspond (or complement) the complexity of his/her cognitive structure.

A summary of the work on cognitive structure. The purpose of the preceding sections was to provide an introduction to the literature on cognitive structure, the major criterion variable in the theory to be presented. This introduction first discussed the theoretic roots found in the work of Lewin, Kelly and Heider. Next, two classes of models were distinguished and detailed--static-structural and dynamic-processing. It was noted that the major distinction between these two classes of models rest in their utilization of time. Further, when representative work for each model class was presented, it was evident that both static-structural models and dynamic-processing models consider differentiation, discrimination and integration as the key indicants of cognitive structure, although they are not always referred to by these labels.

The Distributional Patterns of Individuals' Responses

One of major contentions of the theory of information processing is that the individual's cognitive structure is determined by environmental conditions and the individual's information processing style. Stated somewhat differently, it will be argued that one of the prime predictors of cognitive complexity is the dominant measurement procedure an individual employs to reduce environmental uncertainty. Further, it will be argued that the measurement procedure which is dominant in the individual's overall processing behaviors can be detected by examining the distributional pattern of response the individual exhibits with respect to certain information processing tasks. Consequently, it is important to review what is known about such patterns. This objective will be satisfied by examining the three primary areas in the social sciences where such research has been conducted: (1) the psychophysical literature, (2) the personality literature, and (3) the cognitive structure literature.

Psychophysics and human responses. Baird and Noma (1978) define psychophysics as "the study of perception, examining the relations between observed stimuli and responses and the reasons for those relations" (p. 1). In general, psychophysicists attempt to develop models that are capable of specifying invariant relationships between the known properties of various stimuli and the individual's perception of those properties. So, for example, research has been conducted on each of the sense modalities: sight (Ono, 1967; Curtis, 1970), hearing (Shower and Biddulph, 1931; Harris 1952; Stevens, 1966; Ward, 1972), touch (Gibson and Tomko, 1972), smell (Berglund, Berglund and Lindvall, 1971) and taste (Carroll, 1972). While there have been a plethora of interesting findings generated by the work in this area, undoubtably the most ubiquitous finding is Steven's law. Very simply, Steven's law refers to the observation that geometric increases in the magnitude (or intensity) of some stimulus correspond to geometric increases in the responses concerning the perceived magnitude of the stimulus. As Baird and Noma (1978) comment:

> These facts are often summarized by stating "equal stimulus ratios produce equal response ratios." That is, if
>
> $$R_i = \lambda S_i^n$$
>
> and $$R_j = \lambda S_j^n$$
>
> then $$\frac{R_i}{R_j} = \left(\frac{S_i}{S_j}\right)^n$$
>
> regardless of the absolute values of S_i and S_j. (p. 80)

However, the utility of Steven's law for describing an individual's response is dependent upon the availability of precise measurement procedures. That is, the power function is helpful in understanding certain response patterns only when the stimulus and the individual's responses to the stimulus can be measured precisely.

As a result of their concern for precise measurement, psychophysicists have been able to closely examine not only the relationship between stimulus magnitudes and response magnitudes, but also the manner in which individuals use different types of scales (see Stevens, 1971; Rule, Laye and Curtis, 1974; Schneider, Parker, Valenti, Farrell and Kanow, 1978), and the relative frequencies of certain numerical responses in the ratio estimation of phenomena (Baird, Lewis and Romer, 1970). Because of our interest in the distributional pattern of responses, this latter work concerning the use of particular numerical responses seems especially relevant. Using data from several studies, Baird et al. found that: (1) individuals tend to use certain numerical responses more frequently than others; (2) in the range from 0 to 100, individuals tend to use multiples of 5 and 10; (3) in the range from 100 to 1000, they tend to use multiples of 50 and 100; (4) the interval (spacing) between numerical responses increases with increasing magnitude; (5) when provided with a "standard," individuals tend to use more response categories around the region of the standard.

While we are far from a complete understanding of input-output functions, the individual's use of different scales or the tendency to use certain numerical responses, there are important lessons to be learned from this brief review of psychophysical research. First, there are clear individual differences in the manner in which persons process sensory data which are reflected by the varying responses individuals give to carefully controlled stimuli. Second, some individuals tend to use certain numerical responses more frequently than others. And third, given the research on input-output functions, it may be necessary to re-express the responses individuals provide in an information processing task (e.g., using a power, root or logarithmic transformation rule) before invariant relationships can be uncovered between these responses and other theoretic variables. We shall return to these issues later.

Personality theory and human responses. In this section two specific traits will be examined which have been: (a) extensively researched with respect to response patterns, and (b) considered as distinct cognitive styles. These two traits are authoritarianism and dogmatism.

Authoritarianism. One of the earliest and most comprehensive investigations of individual responses to specific measurement scales was the work conducted by Adorno, Frenkel-Brunswick, Levinson and Sanford (1950) on authoritarianism. Prompted by concerns with Fascism, these authors focused on the identification of a method which could be used to explain and predict fascist (i.e., anti-democratic) behavior. More specifically, these authors posed the following research questions:

> If a potentially Fascist individual exists, what, precisely, is he like? What goes to make up anti-democratic thought? What are the organizing forces within the person? If such a person exists, how commonly does he exist in our society? And if such a person exists, what have been the determinants and what the course of his development? (Adorno, et al., 1950, p. 2)

Primarily as a result of Nazism, anti-democratic style was first operationalized as prejudice toward Jews in the Anti-Semitism scale developed by Levinson and Sanford (1944). Other scales studied at about this time by these investigators were the Ethnocentrism Scale (Levinson, 1949), the Politico-Economic Conservatism Scale, and the Fascism Scale (reviewed by Adorno, et al., 1950). In general, these scales were Likert-type scales in which the respondent is asked to indicate the degree to which he/she agrees (or disagrees) with a particular statement (e.g., "Jews are ruthless"). Further, statements were posed such that a high score on these items would reflect extreme prejudice and high authoritarianism. Finally, investigators have typically found high positive correlations among these scales (e.g., Adorno, et al., 1950; Christie, 1954; Rule and Hewitt, 1970), providing some evidence for the validity of these measures.

While many interesting findings have been generated by the research on authoritarianism (for a crisp review see Goldstein and Blackman, 1978), our discussion here will be restricted to those results which are concerned with the response patterns exhibited by authoritarians. Further, three particular response patterns examined by the above research seem pertinent to our concerns: (1) intolerance for ambiguity, (2) rigidity, and (3) response-set acquiescence. Research clearly indicates that highly authoritarian individuals tend to be less tolerant of ambiguity and more rigid than less authoritarian individuals. Commenting upon these two findings, Goldstein and Blackman (1978) write:

> A person who is intolerant of ambiguity is likely to make infrequent use of limiting and qualifying language. The concept of rigidity refers to thought and behavior that is exceptionally resistant to modification. Rigidity was evident when the authoritarian individual refused to relinquish ethnic stereotypes when faced with information contradicting the stereotype. Another characteristic of rigidity is that the individual's cognitions are compartmentalized and walled-off from each other, resulting in an apparent lack of consistency. (p. 19)

We interpret these findings to indicate two important things. First, high authoritarians tend to make extreme judgments. That is, they do not use qualifying language and when provided with a bounded Likert-type scale, they tend to use the end points of these scales. Second, high authoritarians tend to have relatively simple cognitive structures. That is, we interpret the authoritarian tendencies to employ stereotypes as an organizing scheme for others, to adhere to stereotypic patterns even when presented with conflicting information, and to have difficulty inter-relating cognitions, as reflective of a simple cognitive structure.

Finally, with respect to authoritarianism, we come to the issue of response-set acquiescence. As was discussed earlier, the scales that were developed to tap authoritarianism were Likert-type scales wherein agreement with each item contributed to a higher authoritarian score. One problem with this type of scale is the tendency for individuals to respond to the questionnaire item in an agreeing (or acquiescent) manner, regardless of the content of the prompt. Consequently, some researchers argue that these (authoritarianism) scales measure authoritarianism as a result of the authoritarian's tendency to acquiesce (e.g., Cohn, 1953, 1956; Chapman and Bock, 1958; Chapman and Campbell, 1959; Zuckerman, Norton and Sprague, 1958), while others dispute the degree to which authoritarian scores can be attributed to acquiescence (e.g., Brown and Datta, 1959; Couch and Keniston, 1960; Clayton and Jackson, 1961). Nonetheless, it appears that at least some amount of variance in authoritarian scores is due to acquiescence, and that individuals who acquiesce are also likely to be authori

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authoritarian (Messick and Frederiksen, 1958). In sum then, it appears that the research on authoritarianism points out that high authoritarians tend to make: (a) extreme judgments, (b) categorical judgments, and (c) more acquiescent responses than low authoritarians.

Dogmatism. One of the main criticisms of the authorianism scales was that they only measured authoritarianism of the "right." That is, that they focused on "conservative" authoritarian beliefs (Shils, 1954). Consequently, an effort was undertaken, primarily by Rokeach (1951, 1954, 1956, 1960), to develop a measure of cognitive style which would reflect close-minded (i.e., dogmatic) beliefs regardless of their content. Stated somewhat differently, Rokeach attempted to develop a measure of cognitive style which would reflect authoritarianism of the "left" as well as the "right." According to Rokeach, individuals vary along an open-minded-close-minded continuum. He posited that a person who was extremely close-minded (i.e., highly dogmatic): (a) polarized his/her beliefs into a belief-disbelief system, totally accepting all ideas (and people who hold those ideas) in the belief region, and totally rejecting all ideas (and people who hold those ideas) in the disbelief region, (b) maintained an authoritarian perspective, glorifying authorities who supported his/her belief region and supportive of an elite class, and (c) was likely to be dogmatic across all domains of experience.

To assess this form of cognitive style, Rokeach developed the Dogmatism Scale (see Rokeach, 1960). Similar to the authoritarianism scales discussed in the previous section, the Dogmatism Scale was a Likert-type instrument which provided a prompt (statement), and asked the respondent to place a checkmark along a six-point scale to express the degree to which he/she agreed or disagreed with the prompt. Because of the wording of the prompts, agreement was scored as a reflection of close-mindedness, while disagreement was scored as open-mindedness. Unlike the authoritarianism scales with their concern for prejudice beliefs, the Dogmatism Scale focused on measuring the individual's belief-disbelief system; perceived adequacy of self; uncertainty concerning the future; perceived friendliness of the environment; perception of authority; intolerance of conflicting ideas; and time orientation (i.e., a concern for the past, present, or future). A high score across these items reflected a highly dogmatic cognitive style.

To determine whether or not Rokeach was successful in his attempt to measure dogmatism, investigators experimented with different research strategies. For example, one strategy was to examine the relationship between dogmatism and authoritarianism (e.g., Schroder and Streufert, 1962; Zippel and Norman, 1966; Sheikh, 1968). Another strategy was to examine the relationship between dogmatism and political ideology (e.g., Di Renzo, 1968; Parrot and

Brown, 1972; Thompson and Michel, 1972; Steininger and Lesser, 1974; Stimpson and D'Alo, 1974). In a review of the different research strategies that were employed, Goldstein and Blackman (1978) report that these studies show: (a) a "consistent positive relationship" between dogmatism and authoritarianism, and (b) that high dogmatism is associated with the political orientations and attitudes of the extreme "right wing." As a result, Goldstein and Blackman conclude that "Rokeach's attempt to develop an instrument that would be equally sensitive to dogmatism of the right and left was not successful" (p. 70).

Nevertheless, even though the Dogmatism Scale does not completely satisfy its objective to be content free, it does provide us with some useful information about response patterns and cognitive style. First, because the Dogmatism Scale is structured like the authoritarianism instruments, the same observation concerning response set acquiescence has been made for these scales (e.g., Couch and Keniston, 1960; Peabody, 1961; Roberts, 1962). That is to say, highly dogmatic individuals tend to be more acquiescent. Second, while relatively few studies have been conducted with respect to examining the relationship between dogmatism and intolerance for ambiguity, the research evidence indicates that highly dogmatic individuals are less tolerant of ambiguity than less dogmatic individuals (e.g., see Barker, 1963; Feather, 1969; MacDonald, 1970). Third, parallel to the a

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the authoritarianism research findings, highly dogmatic individuals tend to be more cognitively rigid (e.g., Korn and Giddan, 1964; Schroder and Streufert, 1962; Hession and McCarthy, 1975; White and Atler, 1965). In sum then, it appears that dogmatism research findings closely parallel the research findings cited for authoritarianism, and points out that highly dogmatic individuals tend to: (a) make more acquiescent responses, (b) make extremely polarized judgments, (c) be less tolerant of ambiguity, and (d) be more cognitively rigid.

Cognitive structure and human responses. Since the theoretic work with respect to cognitive structure has already been reviewed,[2] this section will simply discuss two key findings that have been generated with respect to response patterns. Probably the most important finding with respect to response pattern is that cognitively simple persons tend to use extreme scores on semantic-differential items more frequently than cognitively complex persons (White and Harvey, 1965; Sawatzsky and Zingle, 1971; cf., Nidorf and Argabrite, 1970). This result is interpreted here as reflective of the individual's discrimination abilities. More specifically, cognitively simple persons make fewer discriminations among stimuli and hence, operate at a more "concrete" level of information processing in which stimuli are defined terms of dichotomies. Moreover, this style of cognitive functioning is interpreted as

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the major factor determining dichotomized (i.e., extreme) judgments on questionnaire items. A more complex individual makes finer discriminations among stimuli. Further, such an individual uses more alternative response foils when presented with a series of questionnaire items. Support for this contention is provided by Miller and Harvey (1973) who report that "concrete" individuals tend toward extreme and polarized judgments, and are less tolerant of ambiguity.

The second finding to be discussed here is the observation that relatively complex individuals tend to use more "constructs" in describing stimuli. This observation, supported by the research of Campbell (1960), Supnick (1964) and the several studies reviewed by Crockett (1965), is interpreted here to indicate strong support for the contention that differentiation is a prime indicant of the complexity of an individual's cognitive structure. Further, this observation supports the contention that an individual's differentiation capability can be empirically assessed by the individual's performance on particular information processing tasks.

Summary: the distribution pattern of individuals' responses. The purpose of this section was to review the relevant research concerned with the patterns of individual's responses to information processing tasks as they relate to cogn

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cognitive style. Three areas of investigation were focused upon: (1) the psychophysical literature, (2) the personality theory literature, and (3) the cognitive structure literature. The review of the research in these three areas yielded several interesting findings. First, there are clear differences in the manner in which individuals process information (e.g., some individuals tend to use certain numerical responses on a questionnaire task more frequently than other responses). Second, there exist individual differences in the use of polarized, stereotypic judgments and extreme scores on questionnaire tasks. These tendencies are consistently associated with authoritarianism, dogmatism, conservatism, intolerance for uncertainty, and rigidity. As White and Harvey (1965) comment:

> . . . the tendency for the individual to dichotomize his psychological scale and pile up his judgments of the issue at the ends of the scale instead of distributing them more evenly over the entire range of the scale . . . would be predicted from at least three different but related personality theories, that of Adorno, Frenkel-Brunswik, Levinson, and Sanford (1950), of Rokeach (1960) and of Harvey, Hunt, and Schroder (1961). Greater authoritarianism (Frenkel-Brunswik, 1949; Adorno, et al., 1950), higher dogmatism (Rokeach, 1951, 1960), or greater concreteness (Harvey, et al., 1961) each of which is presumed to be underlaid by poorly differentiated and integrated cognitive structures, should dispose the individual toward the usage of more absolute, more undifferentiated, and more discontinuous internal standards. (pp. 334-335)

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Third, given the psychophysical research findings on the manner in which individuals perceive the magnitudes of certain stimuli, serious consideration must be given to re-expressing raw data using some transformation if meaningful patterns are to be uncovered. Moreover, it is not unlikely that several different transformations will have to be experimented with before meaningful patterns are extracted from the raw data of questionnaire responses. That is to say, the transformations that have been of high utility to psychophysicists may not necessarily be the same ones which best re-express questionnaire data. These issues will be dealt with in the next few sections.

The Problems with Prior Research

In the next section a formal theory of human information processing will be presented. Essentially, this work will be a theoretical and operational reformulation of the work described in the previous two sections. Consequently, this section will first review the problematic aspects of prior conceptualizations and operationalizations.

While there have been numerous attempts to examine the relationship between information processing and cognitive structure, these previous efforts have suffered from several shortcomings. First, there has been a general weakness in conceptualizing the indicators of cognitive structure. Commenting upon this situation, Streufert and Streufert (1978) write:

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> The term cognitive complexity has appeared with increasing frequency and increasing confusion in the psychological literature. In reviewing the literature, both theory and research, the reason for the confusion becomes apparent. . . . The ways in which the theories differ are many, including the underlying assumptions upon which they are based and the definitions of terms. (p. 12)

For example, with respect to the problem of the conflicting definition of terms, Scott, Osgood and Peterson (1979) note that several different labels have been used to refer to the concept of "attribute" including: personal construct (Kelly, 1955), dimension of judgment (Anderson, 1971), cue variable (Hammond, 1972), and trait (Bruner, Shapiro and Taiguri, 1958). Sometimes however, the problem worsens with definitions simply lacking. For example, Scott, et al. note the work of Asch (1952), and Kretch and Crutchfield (1948) who ". . . used the term cognitive structure quite frequently; nevertheless, it was left undefined, and was used for a variety of purposes. Nowhere did these authors offer a specific designation of just what was structured" (p. 34). So then, without delving further into detail, the first major problem noted with previous research efforts has been the weak theoretical development, as indicated by the weaknesses in the conceptualization of indicators and the specification of relationships.

Second, there has been a general weakness in operationalizing the indicators that have been developed. That is, th

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is, the connection between the theoretic indicator and the scale item(s) is not always clear (e.g., see Harvey, Hunt and Schroder, 1961; Schroder and Streufert, 1962; Harvey, 1966; Tuckman, 1966). Further, there has been a general lack of consistency across investigators with regard to the manner in which constructs have been operationalized. As Goldstein and Blackman (1978) write: "The major stumbling block to widespread research on integrative complexity theory is the problem of measurement" (p. 172). Most notably, these authors are critical of the lack for researchers to develop an instrument that can be used across domains, and individuals. Nevertheless, as Streufert and Streufert (1978) point out in their review of the literature:

> The most striking aspect of complexity as a phenomenon in psychology is the inconsistency among the various measurement techniques, yet the similarity of experimental results. While different researchers have made similar predictions, they have used diverse (and uncorrelated) measures of complexity as a personality characteristic. Nonetheless, they have typically obtained identical results. (pp. 68-69)

Streufert and Streufert conclude that this observation is most likely a result of the different measures being

> . . . geared toward separate and different components of complexity, and that each of these components is likely to produce the expected differences in perceptions or behavior. (p. 69)

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Hence, the second major problem with previous research efforts has been with the clarity, consistency and comprehensiveness with which the indicators of cognitive structure have been operationalized.

Third, there has been a predominant tendency to employ imprecise scaling procedures in the operationalization of indicators. The major problem here is that the nominal and ordinal scales that have been most popular among cognitive theorists have severe limitations with respect to the amount and type of information which they can provide. As Scott, et al. (1979) remark:

> Psychologists have developed rather arbitrary measuring procedures, such as Likert scales and Thurstone scales, relying on particular sets of questions that may be appropriate to one group, not another, applicable today, but not tomorrow. The scores yielded by [such] attitude scales typically depend on the number of items with which the subject agrees, and this in turn depends more than anything else on the number and type of items in the scale. (p. 80)

While all measurement is, to a degree, arbitrary, the selection of a scaling procedure to operationalize indicators is important in that it largely determines the quality and quantity of the information gathered. Consequently, it seems important to try and create the most precise scales possible, and the problem with prior research efforts is that this has not been carefully attempted.

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Finally, and largely a consequence of the above, investigators have been limited in the methods that they have employed to seek out meaningful patterns in the data (e.g., see Cronbach, 1955; Wyer, 1964; Crockett, 1965; Schroder, Driver and Streufert, 1967; Wexler and Romney, 1972). What is important to realize is that a variety of transformations can be used to find the correct functional form of the relationship between two (or more) variables when the scales which are employed yield data rich enough to apply them. However, when imprecise scales are used, only a small number of transformations may be "appropriately" applied. This, then, implies the need to use scales which allow the greatest number of transformations.

A Theory of Information Processing

Information processing: the detection of change.

From birth, individuals are part of an environment in which a multiplicity of processes are taking place. Each human is equipped with a set of sensory organs which are sensitive to certain ranges of fluctuation in the environment. Not all processes which take place in the environment are capable of being directly monitored by the human sensory mechanisms. That is, while some processes generate changes in the environment which stimulate one or more of the individual's sensory organs, others are beyond human perception. Among the set of sensory mechanisms which an individual poss

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possesses, five are generally distinguished: (1) sensitivity to light wave fluctuations (sight), (2) sensitivity to sound wave fluctuations (hearing), (3) sensitivity to pressure fluctuations (touch), (4) sensitivity to fluctuations in the air's composition (smell), and (5) sensitivity to chemical reactions which take place when stimuli interact with the enzymes of the mouth (taste). Using this perspective, human experience may be conceptualized as the processing of changes.

The interpretation of our experience is facilitated by the brain's capacity to store information (signals), and to utilize this stored information in the future to make comparison with other signals. As reported by Guyton (1971), it is believed that patterns of sensation are stored as a result of neural signals providing similar (or redundant) spatial and temporal stimulation to the cortex of the brain. That is, these neural signals stimulate certain areas of the brain in a particular sequence. Over time, an individual is likely to encounter various environmental conditions which stimulate his/her sensory organs to generate similar and/or redundant neural signals. Thought of in this way, memory may be conceptualized as a process in which neural signals stimulate the cortex of the brain, such that cognitions of previous experiences are evoked. Further, the previous experience(s) serve as the basis for identifying similarities and/or differences in the present sig

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signal. The phrase "redundant neural signals" refers to signals which stimulate the cortex to provide <u>equivalent</u> sensations, while the phrase "similar neural signals" refers to signals which stimulate the cortex to provide sensations of greater and/or lesser magnitude (or intensity) as a previous signal.

An individual's ability to survive is, to a large extent, dependent upon his/her ability to monitor variations in the environment, interpret the resultant sensations, and respond with behaviors. It appears that the primary manner in which an individual accomplishes these tasks is by directing his/her attention toward particular stimuli, and forego the processing of other stimuli. Stimuli which exhibit large fluctuations tend to dominate the individual's attention. Beyond these phenomena, it seems that individuals selectively attend to stimuli which provide similar and/or redundant sensations. In a fundamental sense, we may say that information (signals) can reduce environmental uncertainty when the individual is cognizant that redundant and/or similar neural signals are being processed. Stated somewhat differently, environmental uncertainty is reduced when an association can be made between two (or more) experiences. Moreover, as this capability to make associations develop, the individual begins to notice that particular sensations either precede, co-occur, or follow other sensations. This is important, for once a

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time-order can be established between two (or more) experiences, the individual can begin to learn about the processual nature of the environment.

Information processing as a measurement procedure. In the preceding section, it was argued that environmental uncertainty could be reduced when the individual could establish a correspondence (association) between two (or more) experiences. Conceived of in this manner, information processing is essentially a measurement procedure individuals engage in to reduce environmental uncertainty. At the mention of the phrase "measurement procedure," typically one thinks in the abstract, and considers it a process wherein numbers are assigned to represent the attributes or properties of the phenomena of our experience (e.g., see Campbell, 1938; Russell, 1938; Stevens, 1951). However, at a more fundamental level, numbers are simply one set of symbols which can be utilized to represent cognitions. From our perspective, any time a correspondence can be established between the elements of two sets, such that the elements of the first set are used to refer to (i.e., designate) the elements of the second set, a measurement procedure has been accomplished. Further, it is argued that there are only two fundamental measurement procedures which can be employed to reduce environmental uncertainty: nominal procedures and ratio procedures. The next few paragraphs will discuss each of these procedures, and the manner in which they facilitate unc

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With human memory, the elements which are utilized to represent stimuli (or attributes of stimuli) are cognitions. While the processes of human memory are too complex to detail here, in general, it can be described as a process in which the individual establishes a one-to-one correspondence between a referent and a cognition (for a fuller discussion, see Lawson, 1967). That is, the human brain can preserve cognitions of various referents, and can evoke them by similar and/or redundant neural stimulation of the cortex. Further, there are two important aspects of human memory which are relevant to our discussion. First, while there is sometimes a high iconicity between cognitions and their referents, this is not always the case. That is, the human brain does not store exact replications of stimuli, but rather, stores either: (a) neural signals that evoke cognitions of particular features of the stimuli, or (b) neural signals that evoke cognitions that are not iconic with the referent, but which are utilized to designate the referent (e.g., the symbols of a person's name). Second, the individual's capability to evoke cognitions through similar and/or redundant stimulation of the cortex indicates that stimuli which differ somewhat from the referent may be considered as part of the same <u>class</u> of phenomena, to the extent that they evoke the same cognition(s). These two aspects of human memory, when considered together,

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seem to indicate a general principle that individuals have the tendency to group referents which provide similar stimulation, and utilize a minimum number of cognitions to refer to these referents. While referents may be grouped by any criterion, what is important to realize is that it is this grouping (or categorization) which provides meaning for the individual concerning the referents. That is to say, when an individual encounters stimuli which provide similar and/or redundant stimulation to the cortex to evoke a particular cognition (or set of cognitions), he/she is capable of reducing uncertainty in the sense that he/she can identify the presence of the referent (or at least the presence of some feature of the referent). When the individual is capable of cognizing the presence of a referent (or an attribute of a referent), a nominal measurement procedure has been accomplished. In general, when a correspondence can be established between the elements of two sets, such that the elements of the first set are used to designate the presence of elements in the second set, a nominal measurement procedure has been accomplished. <u>Nominal</u> procedures allow the individual to group the stimuli of experience, and establish correspondences between such groups. Typically, symbols are assigned to each group and utilized to designate the elements of the group. Nevertheless, the uncertainty reduction capabilities afforded by nominal procedures are somewhat limited, since these procedures only allo

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allow the individual to detect the presence or absence of an attribute or referent.

As an individual's experiences with similar but non-redundant phenomena increase, the individual becomes increasingly capable of differentiating among stimuli within the same class. That is, the individual learns to consistently detect differences in the magnitude of certain attributes among elements of the same class. When the discrepancy between any two phenomena can be judged along some attribute, a ratio measurement procedure has been accomplished. More specifically, ratio procedures are accomplished when the individual can judge the discrepancy among stimuli (along some attribute) with respect to some standard. Further, there are three types of ratio level procedures which may be employed to reduce environmental uncertainty--direct ordinal estimation, direct magnitude estimation, and direct interval estimation.[3]

With direct ordinal estimation the individual uses a previously experienced stimulus as the standard, and simply classifies novel stimuli on the basis of whether the stimuli possess more or less of a particular attribute than the standard.[4] Hence, the individual establishes an "order relationship" among the elements of a class. So, for example, with direct ordinal procedures an individual can not only distinguish between hot and cold, but also among ranges (or degrees) of hot and cold. The capability to employ direct ordi

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ordinal estimation procedures is important, for they provide the individual with more information than nominal procedures, and the capability to develop expectations of phenomena not yet experienced, but which may potentially exist.

Similar to direct ordinal scaling, direct magnitude measurement procedures are accomplished when the individual judges the discrepancy between two stimuli in terms of the relative magnitude (or intensity) of some attribute the stimuli possess. The subtle difference here is that with direct magnitude estimation, the discrepancy between the stimuli is judged <u>in proportion</u> to the amount of the attribute some arbitrarily defined standard possesses. Hence, the general form of direct magnitude scaling is as follows: if x possesses u units of attribute a, how many units of attribute a does y possess? With direct interval estimation, the discrepancy between any <u>two</u> stimuli are judged in proportion to an arbitrarily selected <u>interval</u> of discrepancy. Hence, the general form of direct interval estimation is as follows: if there are u units of difference between a and b, how different are x and y? Consequently, while both direct magnitude estimation and direct interval estimation both use an interval of discrepancy as a standard,[5] the key distinctions between these two procedures are that a direct interval procedure: (1) does not <u>require</u> the respondent to make judgments of discrepancy along any one attribute

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(dimension), but rather, allows the respondent to judge the total (multidimensional) discrepancy among stimuli, and (2) requires the individual to make judgments among paired stimuli. Nonetheless, both direct magnitude estimation and direct interval estimation procedures are important, for they provide even more information than direct ordinal estimation and nominal procedures, respectively. This is because direct magnitude and direct interval procedures establish proportions of discrepancy among stimuli. So, for example, with these procedures an individual can not only distinquish among ranges (or degrees) of discrepancy, but also among the proportionate relationships of these differences.

Thus far, it has been argued that information processing is a measurement procedure individuals engage in to reduce environmental uncertainty. Further, it has been argued that there are only two fundamental measurement procedures an individual may employ to reduce uncertainty--nominal procedures and ratio procedures. Moreover, it is hypothesized that there is a hierarchical relationship among these two procedures, in the sense that ratio procedures are higher order than nominal procedures because: (a) ratio procedures cannot be accomplished until nominal procedures have already been applied to define the set of stimuli, (b) ratio procedures allow for discriminations to be made among similar but non-identical stimuli, and (c) at

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ratio procedures generate more information, which presumably could be utilized to reduce environmental uncertainty. Finally, it is argued that the measurement procedure which is dominant in an individual can be determined from a response type the individual should exhibit when responding to an information processing task which would allow such differences to emerge. More specifically, the type of measurement procedure which is dominant can be determined from examining the distributional pattern of responses the individual exhibits when responding to a questionnaire that employs direct interval estimation techniques (i.e., that uses direct-interval, paired-comparison scales). Further, we would expect the dominant use of nominal procedures to be reflected by the predominant use of extreme scores, with most scores being either zero or integer multiples of the standard. On the other hand, we would expect the dominant use of ratio procedures to be reflected by a greater differentiation among scores, with scores along the entire continuum being utilized, and with a large percentage of scores _not_ being multiples or proportions of the standard. The terminology "nominal-dominant" and "ratio-dominant" will be utilized to refer to these two hypothesized information processing styles.

The relationship between information processing style and cognitive structure. In the preceding section, two distinct measurement procedures were delineated, and two information processing styles which result from the domin

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dominant use of these procedures were discussed. It is hypothesized that an individual's information processing style is one of the major determinants of the complexity of the individual's cognitive structure. Because of the increased discriminatory capabilities afforded by the ratio measurement procedures, individuals who maintain a ratio-dominant processing style are more likely to develop a relatively complex cognitive structure than individuals who maintain a nominal-dominant style. Moreover, it should be possible to test this hypothesis by examining the relationship between processing style (as indicated by the response type the individual exhibits) and relevant indicators of cognitive structure. The following indices of cognitive structure are proposed because of their: (a) consistency with previous conceptualizations, (b) isomorphism with the tasks which are accomplished when an individual processes information, and (c) ability to be observed using established social science techniques.

First, it would be important to examine how many attributes an individual utilizes to discriminate among stimuli. This process of defining stimuli according to the properties they are perceived to possess was referred to as <u>differentiation</u>. In general, the greater the number of independent attributes an individual utilizes to define a particular set of stimuli, the greater the differentiation, and the greater the relative complexity of the individual's

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cognitive structure. Second, it is important to examine the degree to which an individual makes distinctions among stimuli. In general, the greater the discrimination, the greater the relative complexity of the individual's cognitive structure. Third, it would be important to examine the kind of relationships an individual establishes among stimuli and attributes. In general, the greater the level of integration, the more relatively complex the individual's cognitive structure. In sum then, an individual's cognitive structure is relatively complex when the individual: (a) uses a large number of independent attributes to define a particular set of stimuli, (b) makes fine discriminations among stimuli, and (c) exhibits a high level of integration. Further, an individual characterized by a ratio-dominant style is expected to differentiate, discriminate and integrate in a manner indicative of greater complexity than an individual characterized by a nominal-dominant style.

While there is great variation in the way in which nominal-dominant and ratio-dominant individuals process information, it is hypothesized that over time, they will develop distinct patterns for: (a) the rate at which information is processed, (b) the complexity of the information which is processed, (c) the content of the information which is processed, and (d) the amount of uncertainty they perceive in the environment. This hypothesis assumes that environmental conditions determine the relative complexity of the i

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the individual's cognitive structure, which in turn will determine the kind of behaviors the individual will respond with in particular environmental conditions.[6] If we were to plot the patterns individuals maintained over lifespan, we would note dramatic changes in these curves at particular points in time where information processing behaviors undergo considerable transformation. These fluctuations are: (a) attributable to three types of change--environmental change, personal change and social structural change, and (b) accompanied by changes in the individual's cognitive structure. The next few sections will discuss: (1) each type of change listed above, (2) the expected changes in cognitive structure which accompnay each type of change, and (3) the remaining factors which determining the relative complexity of an individual's cognitive structure.

<u>Environmental change: adaptation to new environments</u>. Clearly, the environmental conditions experienced over lifespan vary considerably across individuals. This is particularly true in complex societies which are characterized by several distinct classes. Nonetheless, even in a relatively simple society, individuals are likely to encounter a wide range of environmental conditions which present varying amounts and types of information. For our purposes, the term "information environment" will be utilized to refer to all those processes which produce changes that may be detected by the human sensory organs. Moreover,

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of all components of an information environment, it is hypothesized that the one which has the greatest impact on the individual's cognitive structure are the interpersonal (face-to-face) interactions which the individual engages in with "significant others." More specifically, the factors which have the greatest impact on cognitive structure are the contextual and structural components of "significant other" interactions. This contention is based upon a large body of literature in sociology which has examined "significant other" influence (for a good review of this literature, see Haller and Woelfel with Fink, 1969).[7] Contextual components refer to the content of the information that is exchanged, that is, the topics which are discussed, the concepts which are utilized, and the relationships which are established among concepts during conversations. Contextual components are important because we would expect that the greater the diversity and complexity of the conversations the individual engages in with "significant others," the more likely the individual is to develop a relatively complex cognitive structure. Further, it is important to realize that it is during conversations with "significant others" that the individual is likely to learn how to apply either nominal or ratio measurement procedures to organize the stimuli of experience. In particular, the individual may learn how to apply nominal and/or ratio measurement procedures by either: (a) being

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explicitly instructed by a "significant other," and/or (b) observing "significant others" utilize these procedures, and then adopting them (i.e., by having the "significant other" serve as a model). Consequently, it is hypothesized that the greater the diversity and complexity of the contextual components, the more likely the individual is to develop a relatively complex cognitive structure.

The structural components of the individual's interactions refer to the linkages that exist between individuals, the inter-connectedness of their networks, and the rate at which information flows through the network. As these factors vary, individuals should exhibit corresponding changes in their information processing behaviors. It is hypothesized that as the structural components increase in complexity (i.e., as the number of links increase, as inter-connectedness increases, and as information flow increases), the more likely the individual is to develop a relatively complex cognitive structure. In sum then, increases in the diversity and complexity of structural and contextual components characterize an "enriched environment," and that individuals exposed to enriched environments are more likely to develop: (a) a ratio-dominant processing style, and (b) a relatively complex cognitive structure than individuals who are exposed to less enriched environemnts.

Personal change: stages of development. The term "personal change" is utilized here to refer to two kinds of chan

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change: (1) changes in the capability of the individual's sense modalities to detect fluctuations in the environment, and (2) changes in the individual's ability to detect patterns in the environment and to store that information for future use. The first type of personal change is treated as "levels of awareness," and the second type of personal change is treated as "learning." However, it is important to realize that the level of awareness changes and learning changes are related to each other, such that learning changes affect the sense modalities' sensitivity to certain fluctuations, and vice versa.

While level of awareness changes and learning changes can take place continually over lifespan, probably the most pronounced periods of change occur during early childhood (0-8 years) and late adulthood (over 70). During early childhood, the individual's sensory mechanisms become more fully developed than they were at birth. That is, as the individual grows, the individual's nervous system continues to undergo development, and the individual becomes increasingly sensitive to fluctuations in the environment. These changes allow the individual to process more information, and are likely to be accompanied by increases in the complexity of the individual's cognitive structure. Here, the individual is assumed to be born with a "blank slate." Consequently, any processing of environmental information will necessarily lead to increases in the complexity of the cognitive structure. In addition, there has been considerable theoretic and empirical work conducted, most notably by Piaget (1926, 1952, 1954), that demonstrates that it is during early childhood that the individual undergoes considerable cognitive structural change as a result of learning.

During later changes of the individual's lifespan, the individual's sense modalities begin to deteriorate and his/her sensitivity to certain ranges of wave fluctuation diminishes (e.g., see Restak, 1979). It is hypothesized that this type of personal change is likely to be accompanied by decreases in learning (relative to learning capabilities experienced earlier during lifespan), and by decreases in the relative complexity of the individual's cognitive structure. That is, as the individual's sense modalities diminish in their capacity to detect changes in the environment, less information is processed, less cognitive activity takes place, less previously stored information is reinforced via direct experiences, and it is less likely that the relative complexity of his/her cognitive structure increases. Further, as the individual's memory capabilities diminish, the more likely the individual is to resort to the use of categorical and/or polarized judgments, and seek out less complex environments (i.e., favor high stability, low uncertainty type environments, and become more cognitively rigid and less

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<u>Social structural change: adaptation to meet role aspirations and/or expectations</u>. The final class of change which restructures information processing behaviors and influences cognitive structure are the transitions individuals make from one stage of the life-cycle to another. That is, there are certain key periods during the life-cycle when individuals restructure their information processing behaviors to adapt to societal expectations of particular age cohorts. The transition from one period of the life-cycle to another is characterized by an environment in which: (a) the individual is changing due to maturation, (b) the individual's role-position is changing, (c) other's expectations for the individual's behavior are changing due to the changes the individual is undergoing, and (d) the individual is expected to perform coordinating activities which will correspond (or fulfill) the societal expectations for his/her behavior. In describing this environment, Woelfel (1974) writes:

> Other persons proxemic to the individual . . . observe the individual and form inferences about his or her future potential for attainment based on these observations. At the same time, of course, the person himself or herself makes similar observations and inferences. Out of this information provided by the individual's own observation and the observations and inferences of those surrounding him or her, the individual forms conclusions about his or her likely and desired outcomes (a "self conception"), and acts accordingly, insofar as circumstances and genetic capabilitity permits. What is crucial in

> understanding the complexities of this process, however, is the recognition that no two persons will . . . form precisely the same expectations for the same person. Thus, any individual will be in receipt over time of many sets of expectations from many others, all of which differ in minor and major ways from all others and from the individual's own judgments. The question of how the individual responds to a set of multiple and disparate expectations thus becomes crucial. . . . (p. 3)

Further, Woelfel goes on to state that it is the belief of most sociologists who have examined attainment processes that there are certain processes which take place in society which account for observed differences in aspiration and attainment. This assertion is based upon a large body of literature which has consistently demonstrated that individuals who come from families in the higher socioeconomic strata tend to develop higher aspirations for educational and occupational attainment than do individuals who come from families in the lower socioeconomic strata (e.g., see Sewell and Shah, 1967; Duncan, Featherman and Duncan, 1972). Following Haller and Portes (1973), it is assumed that the influence of social structural factors on the individual's cognitive structure is mediated by the communication patterns the individual maintains with "significant others." That is to say, that social structural factors determine the complexity of the contextual and structural components of the individual's information environment, which in turn determines the relative complexity of the individual's cogn

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<u>A theoretic model and hypotheses</u>. The key relationships presented in this theory can be expressed by the following diagram:

$$\begin{tikzcd} \xi \arrow[r] & \eta_1 \arrow[r] \arrow[d] & \eta_3 \\ & \eta_2 \arrow[ur] & \end{tikzcd}$$

where: ξ = social structural factors

η_1 = complexity of the individual's information environment

η_2 = dominant processing style employed by the individual

η_3 = complexity of the individual's cognitive structure

First, this diagram posits that social structural factors (primarily socioeconomic status) determine the relative complexity of the individual's information environment. Second, the diagram posits that the complexity of the individual's information environment determines: (1) the dominant processing style the individual is likely to develop, and (2) the relative complexity of the individual's cognitive structure. Third, the final key relationship expressed by the diagram is that the individual's dominant processing style determines the relative complexity of the individual's cognitive structure. Hence, the diagram details how there are two factors which determine the relative complexity of the individual's cognitive structure--

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the relative complexity of the individual's information environment, and the individual's dominant processing style.

Given the relationships just described, the following bivariate hypotheses are offered:

> HYPOTHESIS ONE: The more ratio-dominant the individual's processing style, the greater the relative complexity of the individual's cognitive structure.

> HYPOTHESIS TWO: The greater the relative complexity of the individual's information environment, the greater the relative complexity of the individual's cognitive structure.

> HYPOTHESIS THREE: The greater the relative complexity of the individual's information environment, the more likely the individual is to employ a ratio-dominant style.

While there are other hypotheses that could be formulated, these three will serve as our focus for now. Should these relationships be supported, future work would attempt to duplicate these findings, and extend the model.

Chapter Summary

The purpose of this chapter was to present a theory of human information processing. The major contention of this theory is that information processing is a measurement procedure individuals engage in to reduce environmental uncertainty. Further, the theory argues that there are only two fundamental measurement procedures that an individual can employ to reduce uncertainty--nominal procedures and ratio procedures. The theory discusses the discriminatory and information generation capabilities afforded by each procedure, and contends that the dominant use of one (as opposed to the other) would lead to distinct differences in the development of the individual's cognitive structure. More specifically, it is argued that a ratio-dominant individual will develop a relatively more complex cognitive structure than a nominal-dominant person.

To provide adequate context for this theory, a literature review provided a discussion of cognitive structure, and the response patterns individual's exhibit with respect to certain information processing tasks. Next, a theory of information processing was presented. This theory provided a detailed discussion on the nature of information processing, and then presented a diagram which laid out the major relationships of the theory. Finally, three hypotheses are presented which formally express the relationships between the key theoretic constructs.

FOOTNOTES

[1]"Cloze actions" is a term which refers to the manner in which individuals completed sentences which were in need of nouns, adjectives, verbs, etc. As used by Streufert and Streufert "cloze actions" refer to the individual's responses made on the basis of stereotype or limited information. That is, when faced with the high level of incongruity in the environment, the individual is likely to respond to initial or familiar cues.

[2]For a good review of the various instruments that have been developed to assess cognitive structure, see Streufert and Streufert (1978), and Scott, Osgood and Peterson (1979).

[3]At this point, the discussion on measurement begins to differ from previous conceptualizations in important ways. For a good review of the "traditional" perspective on measurement, see Torgerson (1958).

[4]Of course, the possibility exists that the novel stimuli will be judged to possess the same amount of the attribute as the standard.

[5]This is because the phrase "if x possesses u units of attribute a" is essentially equivalent to "if there are u units of difference between an object with none of this attribute and x." That is to say, the two types of procedures are very similar when one considers that the direct magnitude scale is always anchored by a zero point.

[6]For a complete review of interactive complexity theory, see Schroder, Driver and Streufert (1967), Streufert and Streufert (1978) or Scott, Osgood and Peterson (1979).

[7]While it is clear that "significant other" interactions influence an individual's behavior, it is important to note that the "significant other" literature does not specifically discuss the contextual or structural components of communication interactions. Hence, this discussion is simply trying to infer what it is about "significant other" interactions that make them so influential in determining an individual's attitudes and behaviors.

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CHAPTER II

METHOD

Overview. To adequately test the hypotheses presented in Chapter I, a method has to be employed which: (1) demonstrates a logical connection between the conceptual and operational constructs, (2) overcomes previous inadequacies in measurement, and (3) allows for data transformation techniques to detect complex patterns. To accomplish this task requires the implementation of an information processing task which can be utilized to categorize individuals into groups of nominal-dominant and ratio-dominant information processors. Further, the design must include measures of cognitive structure, such that the relationship between dominant processing style and the relative complexity of the individual's cognitive structure can be empirically assessed. Finally, the design should incorporate multiple measures of the key constructs to increase reliability.

The purpose of this chapter is to provide a description and rationale for the full set of procedures that will be employed. First a set of primary measures that operationalized all of the key theoretic constructs will be discussed. Second, a set of secondary measures for all the key d

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key dependent variables (constructs) will be presented. Third, a preliminary instrument will be presented, and the pre-test of this instrument will be discussed. Fourth, the final instrument which will be utilized to formally test the hypotheses will be presented. Fifth, the data collection procedures will be discussed. Finally, the data handling procedures will be described.

Operationalization

Primary measures. The individual's dominant processing style can be determined by the manner in which the individual responds to certain subject-centered scales. More specifically, the individual's dominant processing style will be reflected in the distribution of responses the individual generates when completing ratio-level paired-comparison scales. This type of instrument will be utilized because: (a) the completion of a questionnaire item is, in itself, an information processing task, (b) paired-comparison scales are free from the problems of "edge effects" and truncation of response, i.e., these scales have an increased ability (over less precise scales) to allow for differences in response patterns to become evident, and (c) the data provided by these scales is appropriate for metric multidimensional scaling analysis (MMDS), which is the technique which will be utilized to obtain the indices of cognitive structure (for a discussion on MMDS, see Woelfel and Fink, 1980). As was discussed earlier, the dominant use of nominal procedures

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should be reflected by the predominant use of extreme scores, with most scores being either zero or integer multiples of the standard. Alternatively, the dominant use of ratio procedures should be reflected by the use of scores along the entire continuum, with a large percentage of scores not being integer multiples or integer reciprocal proportions of the standard.

Once the data from the paired-comparison items have been analyzed for the distributional patterns discussed above, the response set for both nominal and ratio-dominant individuals will be examined using MMDS, and the information provided by this analysis will be utilized to index the three indicators of cognitive structure discussed in Chapter I -- differentiation, discrimination and integration. First, the extent to which an individual uses different (independent) attributes to define a set of stimuli (differentiation) can be assessed from the number of dimensions which result from the orthogonal decomposition of a transformed distance matrix (i.e., a scalar-products matrix). The greater the number of independent dimensions needed to account for a "significant portion" of the variance in the space, the greater the differentiation. Because MMDS procedures recover all n-1 dimensions from a n x n symmetric matrix, a scree test will need to be applied to obtained differences in differentiation.[1] Since we have no theoretic criteria at this point on which to base our scree test, we shall examine the number of dimensions whic

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which account for 70, 80 and 90% of the distance variance in real space, and inspect the discriminatory capabilities provided by each. From this analysis we should be able to select a level to use for future data analysis. Second, the individual's capability to make distinctions among stimuli (discrimination) can be assessed by examining the trace of the eigenvalue matrix. As the individual makes finer and finer discriminations, distance variance increases and the magnitude of the trace (a measure of variability) increases.[2] Finally, the individual's capability to establish relationships among the stimuli of his/her experience (integration) can be assessed by examining the warp factor:

$$\left(\frac{\text{sum of the positive eigenroots}}{\text{sum of all (positive and negative) eigenroots}}\right).$$

The warp factor is a summary measure which reflects the relative number and size of triangular inequalities generated by an individual during the evaluation of the paired comparison items. It essentially indicates the individual's capability to maintain a "Euclidean-consistent" relationship among triads of concepts in the set of paired comparisons. A triangular inequality results when the Euclidean rule for planar triangles is violated (i.e., when the individual reports distances between a triad of concepts which does not allow the construction of a triangle). This measure can be utilized as an index of the degree to which an individual can establish "consistent" relationships among concepts.

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However, it is important to remember that the term "consistent" simply means, in this case, "Euclidean consistent." The warp factor is a summary measure which expresses the degree to which triangular inequalities are present in the paired comparison data. As the number and size of the triangular inequalities increases, the warp factor increases. The smaller the warp factor, and the fewer the number of triangular inequalities, the greater the integration.

To assess the relative complexity of the individual's information environment, a series of items will be presented which ask the respondent to: (1) detail his/her communication activity, (2) report his/her rates of attentiveness to mass media sources, and (3) assess the relative sociological and psychological "richness" of his/her present and past experiences. In addition, several measures will be developed to examine how informed the individual is with respect to certain topics.

Secondary measures. Some secondary measures of cognitive structure will be employed to provide some indication of the validity and reliability of the MMDS measures, insofar as these secondary measures in themselves adequately assess what they purport to assess. These secondary measures will be derived from a modified version of Scott's "Listing and Comparing" instrument (see Scott, Osgood and Peterson, 1979, pp. 86-87, and pp. 104-107 for a complete discussion of this instrument). Briefly, this instrument requires the respondent to examine a list of concepts, and generate a series of sets which group concepts together on the basis of some characteristic. From these data, measures can be derived for each of the indicators of cognitive structure. First, integration may be assessed by examining the number of sets the individual generates, for it reflects the individual's capability to establish relationships among a set of stimuli. Second, discrimination may be assessed by examining the variance in the elements of the grouping patterns generated by the individual. Finally, two measures of differentiation, D and H, can be derived from the "Listing and Comparing" technique. First the equation:

$$D = 2^k$$

where: D = the measure of differentiation
k = the number of sets (or grouping patterns)

reflects the number of decisions that were made to classify the elements into sets and hence provide an indicator of the number of independent attributes the individual utilizes to define these stimuli. Similarly, the equation:

$$H = \log_2 n - \frac{1}{n} \Sigma n_i \log_2 n_i$$

where: H = the degree of differentiation
n = the number of stimuli
n_i = the number of elements in each grouping pattern

which is based on the index of dispersion derived from information theory (see Attenave, 1959) provides an additional indicator of the number of independent attributes that were use

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used to define the set of stimuli. As Scott et al. (1979) comment,this measure:

> . . . represents the number of dimensions implicit in the respondent's grouping system. . . . Each different combination of group membership [i.e., grouping pattern] (including no group memberships) is considered a distinct way of combining the dichotomous attributes. . . . The more different combinations appear, the greater is the independence of the several attributes and the higher the resulting index of dimensionality. (p. 105)

In other words, as the number of distinct grouping patterns increases, the greater the number of independent attributes, and the higher the resulting measure of differentiation.[3]

<u>Background items</u>. In addition to the primary and secondary measures already discussed, a series of items will be presented to obtain background information on each participant. The focus of these items will be on the examination of demographics, lifestyle patterns, and other social-structural factors. This information will be gathered to examine the hypothesized relationships between social structural factors, processing style and cognitive structure outlined in Chapter I.

<u>The Pre-Test</u>

<u>Objectives</u>. The purpose of the pre-test was to: (1) identify the domain the paired-comparison items should be drawn from, (2) generate the actual list of concepts that will be utilized in the final questionnaire,[4] (3) initially

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evaluate the primary and secondary measures, and (4) examine the overall questionnaire as an information processing task. Data analysis of the pre-test instrument would allow for adjustments and refinements to be made before major data collection session was initiated. For pre-test purposes, the instrument which appears in Appendix A was developed. This instrument first asked the participant to identify two major news events which had taken place in the past year, about which most individuals had a firm opinion. Then, for each news event listed, the participant was asked to free-associate and list all major words and phrases that were in some way related to (or described) the news event, and to summarize his/her own opinion of the news event in a paragraph or two. In the second section of the pre-test instrument, the participant was presented with a list of 21 emotions, and asked to engage in a version of Scott's "Listing and Comparing" task. Third, participants were presented with 36 paired-comparison items which required them to evalute the discrepancy between 9 concepts associated with the National Aeronautic and Space Administration space shuttle program. Finally, several items were presented which asked the participant to provide background information with respect to socioeconomic status, media patterns, and self-perceptions. In addition, participants were provided with the opportunity to evaluate the relative clarity of the pre-test instrument.

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Procedure. On June 3-4, 1980, 29 participants were administered the pre-test instrument.[5] All of the participants were students enrolled in an introductory communication course at Michigan State University. The participants were administered the pre-test instrument after they had completed their final examination for the course. For their participation, students were informed that they would receive credit toward their final grades; however, no penalty was suffered by any student who did not wish to participate. While no verbal instructions were provided, the author was present to answer any questions that arose. Participants required between 18 and 30 minutes to complete the pre-test instrument. Since the students were in the midst of examination week at the University, many were anxious to leave without any debriefing. Consequently, the author only provided an informal discussion about the objectives of the instrument to approximately four or five students.

Pre-test results. Table 1 shows the participants' responses to the question which asked them to specify the two most important news events of the past year. As can be observed from Table 1, 28 of 29 respondents listed the taking of hostages in or around the United States Embassy in Tehran, Iran as one of the two most important news events.[6] Of the 28 participants who listed the taking of the hostages, 24 of them listed it first. Further examination of Table 1 shows that no other news event received more than 9 responses.

Table 1

Pre-Test Data

Participants' Listing of the Two Most Important News Events in the Past Year (N=29)

Event	Frequency of Response
Taking of Hostages in Tehran, Iran	28
Presidential Primary Elections	9
Olympic Boycott	4
Economic Recession in the United States	4
Three Mile Island Nuclear Accident	3
Chrysler Corporation Bankruptcy	2
Russian Invasion of Afghanistan	2
Mt. St. Helens Volcano	2
Oil Crisis	1
The Failed Rescue Attempt of the Hostages in Tehran, Iran	1
The Jonestown Massacre	1
The Death of John Wayne	1

Consequently, only the participants' responses to the Iranian issue were selected for further examination. The 29 participants were asked to free-associate and list as many words or phrases that were in some way related to the news event, and then, in a paragraph or two, to state their own opinion regarding the news event. A content analysis of these data (conducted by the author) revealed that 459 terms were generated by the participants with respect to the taking of the hostages in Iran (see Appendix B). These concepts were then sorted into categories on the basis of their similarity in meaning. Table 2 lists the 15 concept categories that were created from the total set of concepts. A category was created if at least 5 concepts were grouped together.

Table 3 reports the descriptive statistics to all (primary and secondary) indicators of cognitive structure. More specifically, Table 3 reports the mean, standard deviation, minimum score, maximum score and range for each indicator of cognitive structure examined in the pre-test. Table 4 reports the inter-correlations among all these indicators of cognitive structure. An analysis of these data should provide indication of how well these scales reflect variation in the theoretic constructs, and how strong the association is between the primary and secondary indicators of each construct, both "within measure" and "across measures" (i.e., how strong the association is among indicators of the same construct, and among indicators of different constructs).

An inspection of the standard deviations in Table 3 indicates that NDN, the number of dimensions needed to account for 90% of the variance of the space, has the highest variance of any of the three MMDS differentiation measures. We interpret this finding to suggest that this measure provides the most discriminatory capabilities, and hence should be used as the criterion level in the scree test which will

Table 2

Pre-Test Data

Concept-Categories Extracted from the 459 Concepts Generated by the 28 Participants who Listed the Taking of the American Hostages in Tehran, Iran as an Important News Event

Concept-Category
Iran
United States
Hostages
Khomeini
Carter
Shah
Militants
Weak
Hostile
Media Coverage
Diplomacy
Military Intervention
Religion
Irrational
Economic Sanctions

be used to determine differentiation.

As can be observed in Table 4, 25 correlations (out of a total of 91) were significant at the .05 level. Further, with one exception, all of the correlations which were significant were "within measure." That is to say, ten of the fifteen correlations among the indicators derived from the Scott measure were significant, while fourteen of the 28 correlations among the indicators derived from the MMDS measures were significant; however, only one of the 48

Table 3

Table 3

Pre-Test Data

Mean ($\overline{X}$), Standard Deviation (S.D.), Coefficient of Variation (C.V.), Minimum Score (Min), Maximum Score (Max) and Range for All Indicators of Cognitive Structure (N=29)

Source	Measure	Label	$\overline{X}$	s.d.	C.V.	Min	Max	Range
Derived from the Scott Measure	Differentiation	D	134936.28	433690.93	321.40	32.00	2097152.00	2097120.00
		H	2.71	0.92	33.89	1.22	4.39	3.17
	Discrimination	SGP	2.83	1.59	56.19	0.00	6.10	6.10
	Integration	NGP	9.83	4.90	49.85	5.00	21.00	16.00
Derived from the MMDS Measure	Differentiation	NDS	1.76	0.58	32.95	1.00	3.00	2.00
		NDE	2.10	0.82	39.05	1.00	4.00	3.00
		NDN	2.69	0.97	36.06	1.00	4.00	3.00
	Discrimination	TRACE	649723.48	1519437.57	233.86	67.00	7853078.00	7853011.00
	Integration	WARP	1.87	0.68	36.36	1.14	4.11	2.97
	Processing Style	PS	-5.90	1.25	21.19	-3.40	-7.75	3.35

where:

$D = 2^k$ (where k=NGP)

$H = \log_2 n - \frac{1}{n}\Sigma n_i \log_2 n_i$

SGP = grouping pattern variance

NGP = the number of grouping patterns of emotions generated by the listings

NDS = the number of dimensions needed to account for $\geq$ 70% of the variance
NDE = the number of dimensions needed to account for $\geq$ 80% of the variance
NDN = the number of dimensions needed to account for $\geq$ 90% of the variance
TRACE = the trance of the eigenvector matrix
WARP = ratio of the positive eigenroots to the trace
PS = $\lambda_{Y_1} Y_1 + \lambda_{Y_2} Y_2 + \lambda_{Y_3} Y_3 + \lambda_{Y_4} Y_4 + \lambda_{Y_5} Y_5$ (see Table 6)

Table 4

Pre-Test Data

Correlations Among the Indicators of Cognitive Structure (N=29)

Source	Measure	Label	D	H	SGP	NGP	NDS	NDE	NDN	TRACE	WARP	PS
Derived from the Scott Measure	Differentiation	D	1.00									
		H	.57**	1.00								
	Discrimination	SGP	-.21	.44*	1.00							
	Integration	NGP	.68**	.95**	-.25	1.00						
Derived from the MMDS Measure	Differentiation	NDS	-.02	.28	-.45**	.12	1.00					
		NDE	-.13	.16	-.17	.06	.81**	1.00				
		NDN	-.25	.07	-.26	-.04	.82**	.86**	1.00			
	Discrimination	TRACE	.02	.12	-.05	.12	-.12	.07	-.12	1.00		
	Integration	WARP	.18	.00	.30	.11	-.66**	-.66**	-.77**	.10	1.00	
	Processing Style	PS	-.05	.04	-.20	.03	.31*	-.02	.08	-.40*	-.05	1.00

where:

$D = 2^k$ (where k=NGP)

$H = \log_2 n - \frac{1}{n} \Sigma n_i \log_2 n_i$

SGP = grouping pattern variance

NGP = the number of grouping patterns of emotions generated by the listings

NDS = the number of dimensions needed to account for $\geq$ 70% of the variance
NDE = the number of dimensions needed to account for $\geq$ 80% of the variance
NDN = the number of dimensions needed to account for $\geq$ 90% of the variance
TRACE = the trance of the eigenvector matrix
WARP = ratio of the positive eigenroots to the trace
PS = $\lambda_{y_1} y_1 + \lambda_{y_2} y_2 + \lambda_{y_3} y_3 + \lambda_{y_4} y_4 + \lambda_{y_5} y_5$ (see Table 6)

*$p \leq .05$
**$p \leq .01$

correlations between the Scott measures and the MMDS measures were significant. This outcome may be interpreted as the result of the attempt to inter-correlate indicators from two different domains (emotions and space technology). This implies that cognitive complexity appears to be domain specific rather than a general trait across all domains of experience; one's ability to deal with, understand, and/or differentiate among ideas related to space technology is not necessarily related to one's ability to deal with, understand, and/or differentiate among ideas related to human emotions. Consequently, attempts to assess the relative complexity of an individual's cognitive structure using more than one technique (measure) should strive to focus each technique around the same domain of experience (unless the investigator has prior evidence that the complexity measures of two or more domains should be correlated).

In Chapter I, it was posited that ratio-dominant and nominal dominant individuals could be distinguished by the distribution of their responses to the paired-comparison items. More specifically, it was expected that nominal dominant individuals could exhibit a bi-polar distribution of scores, with most scores being either zero or integer multiples of the standard, while ratio-dominant individuals would use more scores across the entire continuum. To distinguish nominal dominant individuals from ratio dominant individuals using these criteria, five indicators were ext

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extracted from the MMDS portion of the pre-test instrument and utilized to create a summary measure of processing style. The five indicators are listed below:

(1) The total number of scores the individual used (NOS). The acronym NOS refers to "number of scores." This indicator reflects the extent to which the respondent used a large variety of scores as opposed to a few scores.

(2) The number of scores equal to zero and/or a multiple of 50 (FOF). The acronym FOF refers to "frequency of fifty." This indicator reflects the individual's tendency to use integer multiples of the standard, half of the standard and/or zero (i.e., a somewhat limited set of scores).

(3) The number of scores greater than or equal to 250 (NEXMAX). The acronym NEXMAX refers to the "number of extreme scores greater than or equal to a selected maximum score of 250." This score of 250 was employed as the criterion for determining an extreme score because it was the median of the set of the largest scores provided by each individual.

(4) The number of scores less than or equal to 10 (NEXMIN). The acronym NEXMIN refers to the "number of extreme scores less than or equal to a selected minimum score of 10." This score of 10 was employed as the criterion for determining an extreme score because it was the median of the set of the smallest scores provided by each individual.

(5) The coefficient of variation for the entire set of scores that were used by each individual (C.V.). The acronym "CV" refers to the "coefficient of variation." This coefficient reflects the range of scores that were employed by the respondent relative to the mean. It is derived by dividing the standard deviation by the mean.[7]

Table 5 reports the mean and standard deviation for each of these indicators of information processing style, while Table 6 reports their variances, covariances and correlations. It can be observed from Table 6 that the correlations between NOS, FOF and NEXMIN are moderate and negative (-.27 and -.29, respectively), while the correlation between FOF and NEXMAX is near zero (.09). These findings indicate that an individual who utilizes a large number of categories tends <u>not</u> to use extreme scores, zero, or integer multiples of the standard. Further, in Table 6

Table 5

Pre-Test Data

Means ($\overline{X}$) and Standard Deviations (s.d.) for the Indicators of Information Processing Style Derived From the MMDS Instrument (N=29)

Variable	$\overline{X}$	s.d.
NOS	11.03	4.14
FOF	21.59	12.57
NEXMAX	6.62	8.72
NEXMIN	6.86	10.73
C.V.	128.97	128.53

where: NOS = number of scores used

FOF = number of scores = 0 or an integer multiple of 50

NEXMAX = number of scores $\geq$ 250

NEXMIN = number of scores $\leq$ 10

C.V. = coefficient of variation

Table 6

Pre-Test Data

Variances, Covariances and Correlations for the Five Indicators Used to Determine Nominal-Dominant and Ratio-Dominant Information Processors* (N=29)

	NOS	FOF	NEXMAX	NEXMIN	C.V.
NOS	17.11	-.27	.09	-.29	-.10
FOF	-14.20	157.97	.72	-.56	.39
NEXMAX	3.37	78.66	76.10	-.46	.33
NEXMIN	-12.89	-75.56	-43.05	115.20	-.11
C.V.	-51.63	632.52	374.42	-153.67	16520.24

where: NOS = number of scores used

FOF = number of scores = 0 or an integer multiple of 50

NEXMAX = number of scores $\geq$ 250

NEXMIN = number of scores $\leq$ 10

C.V. = coefficient of variation

*Covariances are in the lower-left of the matrix, variances are in the diagonal of the matrix, and correlations are in the upper-right of the matrix.

it can be observed that the correlation between NEXMAX and FOF is high and positive (.72) while the correlation between NEXMAX and NEXMIN is moderate and negative (-.46). These findings seem to indicate that: (a) there is a tendency for individuals who use extreme scores to use integer multiples of the standard, and (b) that individuals who tend to report extremely large scores have a slight tendency to also report extremely small scores. Similarly, the correlation between NEXMIN and FOF is moderate and negative (-.56), indicating that individuals who report small scores are not likely to use integer multiples of 50. Finally, the correlations between C.V.,NOS and NEXMIN are small and negative (-.10 and -.11, respectively) while the correlations between C.V., FOF and NEXMAX are moderate and positive (.39 and .33, respectively). We interpret these correlations to indicate a general trend that the coefficient of variation increases as the number of extreme scores increase, and decrease as the number of scores near zero increases. The only paradoxical correlation within this last set of correlations in Table 6 is the small negative correlation between C.V. and NOS. This seems to indicate that as the number of categories employed by the individual increases, the coefficient of variation decreases. This finding is most likely attributable to the sensitivity of the coefficient of variation to extreme scores (see footnote 7). However, it is important to remember that many of these correlations are essentially zero. Consequently, further data should be examined before any substantive conclusions about this, or any of the other correlations, are drawn.

A summary measure of information processing style (PS) was created by first, factor analyzing the set of five indicators discussed above, and then using the unstandardized factor score coefficients as the weights in the regression equation:

$$PS = \lambda_{y_1} y_{1i} + \lambda_{y_2} y_{2i} + \lambda_{y_3} y_{3i} + \lambda_{y_4} y_{4i} + \lambda_{y_5} y_{5i}$$

where: PS = processing style score
λ_{y_1} = the factor score coefficient for NOS
λ_{y_2} = the factor score coefficient for FOF
λ_{y_3} = the factor score coefficient for NEXMAX
λ_{y_4} = the factor score coefficient for NEXMIN
λ_{y_5} = the factor score coefficient for CV
y_{1i} = NOS score for the i^{th} individual
y_{2i} = FOF score for the i^{th} individual
y_{3i} = NEXMAX score for the i^{th} individual
y_{4i} = NEXMIN score for the i^{th} individual
y_{5i} = C.V. score for the i^{th} individual

This structural equation describes a "factor model" of one theoretic construct with five indicators. The equation was solved using the LISREL IV (Jöreskog and Sörbom, 1978) software package. This computer program provides unstandardized maximum likelihood estimates for all coefficients in the equation.[8] In addition, the SPSS (Nie, et al. 1970) procedure FACTOR was employed to obtain standardized coefficients for the parameters of the equation described above.

This program uses a principal components technique for obtaining the parameters of the model. Table 7 reports the standardized and unstandardized factor score coefficients for each of the parameters which were derived from each estimation procedure.

Table 7

Pre-Test Data

Unstandardized and Standardized Factor Score Coefficients for the Five Indicators Used to Determine Nominal-Dominant and Ratio-Dominant Information Processors (N=29)

Variable	Unstd.	Std.
NOS	-.320	-.004
FOF	-.124	.386
NEXMAX	.013	.364
NEXMIN	-.043	-.302
C.V.	.005	.228

χ^2 = 12.209
df = 5
probability level = .032

$$PS = \lambda_{y_1} y_1 + \lambda_{y_2} y_2 + \lambda_{y_3} y_3 + \lambda_{y_4} y_4 + \lambda_{y_5} y_5$$

where: PS = processing style score
y_1 = NOS = number of scores used
y_2 = FOF = number of scores = 0 or an integer multiple of 50
y_3 = NEXMAX = number of scores $\geq$ 250
y_4 = NEXMIN = number of scores $\leq$ 10
y_5 = C.V. = coefficient of variation
λ_{y_i} = the unstandardized factor score coefficient for each y_i

Table 8

Pre-Test Data

Mean Scores for the Indicators of Cognitive Structure: Upper vs. Lower Half Means and Upper vs. Lower Quartile Means (N=29)

Variable	Upper Half N=(14)	Lower Half (N=15)	Upper Quartile (N=7)	Lower Quartile (N=7)
D	224123.73	39378.28	171053.71	78061.71
H	2.82	2.59	2.89	2.86
SGP	2.94	2.72	3.70	2.58
NGP	10.53	9.07	11.29	10.86
NDS	1.60	1.92	1.42	2.00
NDE	2.07	2.14	2.00	2.14
NDN	2.60	2.79	2.43	2.86
TRACE	1067950.73	201622.86	1878344.00	38752.43
WARP	1.90	1.83	2.14	1.91

where:

D = 2^k (where k=NGP)

H = $\log_2 n - \frac{1}{n}\Sigma n_i - \log_2 n_i$

SGP = grouping pattern variance

NGP = the number of grouping patterns of emotions generated by the listings

NDS = the number of dimensions needed to account for $\geq$ 70% of the variance

NDE = the number of dimensions needed to account for $\geq$ 80% of the variance

NDN = the number of dimensions needed to account for $\geq$ 90% of the variance

TRACE = the trace of the eigenvector matrix

WARP = ratio of the positive eigenroots to the trace

Following Woelfel et al. (1977), the unstandardized coefficients were selected for use in the development of the processing style (PS) score. Once a PS score was generated for each individual, the total set of scores was subjected to a median split and a upper vs. lower quartile split. Then, using these groups, a one-way analysis of variance was conducted using every indicator of cognitive structure as a dependent measure.[9] Table 8 reports the mean score for each indicator of cognitive structure yielded by the median and quartile splits of processing style score. Table 9 reports the analysis of variance.[10] An inspection of Table 9 reveals that none of the *F* statistics was significant at the .05 level. Further, an examination of Table 9 indicates that in many instances the direction of the mean scores was opposite to that which was expected. What this seems to indicate is that the sample of respondents may have been too homogeneous with respect to processing style for significant differences in cognitive structure to be uncovered. More will be said about this, as well as other problems, in the next section.

Discussion of the pre-test results. The results of this pre-test suggest that several changes should be made in the final instrument to test the relationships proposed in Chapter I. First, the Scott measure and the MMDS measures of cognitive structure should be drawn from the same domain so as to avoid problems with individuals whose complexity varies significantly across domains of experience.

Table 9

Pre-Test Data

F-Ratios for the Indicators of Cognitive Structure by Information Processing Style: Comparison of the Upper vs. Lower Half and Upper vs. Lower Quartiles (N=29)

Dependent Variables	Upper vs. Lower Half F	Upper vs. Lower Quartile F
D	1.330	.317
H	.428	.004
SGP	.139	1.364
NGP	.636	.023
NDS	2.475	3.692
NDE	.061	.097
NDN	.260	.614
TRACE	2.478	3.262
WARP	.072	.246

where: D = 2^k (where k=NGP)

H = $\log_2 n - \frac{1}{n}\Sigma n_i \log_2 n_i$

NGP = the number of grouping patterns of emotions generated by the listings

SGP = grouping pattern variance

NDS = the number of dimensions needed to account for $\geq$ 70% of the variance

NDE = the number of dimensions needed to account for $\geq$ 80% of the variance

NDN = the number of dimensions needed to account for $\geq$ 90% of the variance

TRACE = the trace of the eigenvector matrix

WARP = ratio of the positive eigenroots to the trace

Second, the MMDS portion of the instrument should: (a) provide an example to demonstrate how the task should be approached, (b) employ more items so that distributional differences can be more readily detected, (c) remind individuals of the standard more frequently so as to increase the likelihood that judgments are made on the basis of the standard, and (d) better inform individuals about the meaning of the distance estimates so that judgments can be made as reliably as possible (see footnote 9). Third, with respect to the Scott measure: (a) an example should be provided to demonstrate how the task should be approached, (b) the items that are being evaluated should appear on every page with boxes to aid in the task at hand, (c) the items should appear at the end of the questionnaire, and (d) individuals should be provided with clear instructions that they should exhaust all possible combinations that come to mind. These recommendations are made because the Scott measure is the most open-ended of all the items, and hence, likely to require the most time to complete. Consequently, if it is placed at the end of the instrument it is less likely to disrupt the individual's processing of the others items and/or cause frustration. Fourth, a greater heterogeneity in the sample should be sought so that differences in processing style and cognitive structure may be more readily detected. Fifth, a set of oral instructions should accompany at the administration of the instrument. These oral instructions should outline each section of the instrument, and detail helpful examples. Finally, the instrument should be timed so that it is known how long it takes each individual to complete the questionnaire. This recommendation is made simply to check an assumption held by the author that a relatively complex person will take more time to complete the instrument than a relatively simple person. The rationale for this assumption is that a relatively complex person is likely to require more time to make fine discriminations among the set of stimuli being evaluated.

The Final Instrument

The instrument which was designed for the final data collection appears in Appendix C. There are three major types of items contained in the instrument. First, a set of items appear which measure social-structural factors, i.e., demographic information, communication activity, and life-style patterns. Second, a set of paired comparison items appear which require respondents to make judgments among a set of 15 concepts related to the United States - Iranian Hostage Situation. Third, respondents are asked to engage in the Scott "listing and comparing" task using the same concepts that appeared in the paired comparison portion of the instrument. The next few paragraphs will provide further detail of each of these item-types contained in the final instrument.

The social-structural items. The social-structural items are designed to measure various aspects of the individual's sociological and psychological background. In particular, these items focus on: demographics, family structure, communication activity, and general lifestyle patterns. The demographic and family structure items were designed to gather information about the individual's religion, family composition, and family socioeconomic status. The items dealing with communication activity were designed to provide summary measures of the individual's interpersonal (face-to-face) interactions and exposure patterns to a variety of mass media. The items concerned with lifestyle patterns were designed to gather information related to the kind of social-psychological environment the individual has experienced. More specifically, these items measure the degree to which the individual's experiences were, e.g., nuturing, stimulating, organized, and socially responded to. The total set of social-structural items were presented to obtain a multiple indicator perspective of the individual's background and information processing experiences. The specific items which appear were developed by the author after a comprehensive review of literatures concerned with the specification of sociological and psychological variables related to cognitive development (e.g., see Bayley, 1940; Werner, 1957; Warner, 1960; Wolf, 1964; Elder, 1968; Levin and Fleischman, 1968; Wachs, Uzgiris and

Hunt, 1971; Elrado, Bradley and Caldwell, 1975; Walberg and Majoribanks, 1976) and academic/occupational achievement (e.g., see Duncan, Featherman and Duncan, 1972; Nuttal et al., 1976; Essen, Foggelmark and Head, 1978).

The paired comparison items. The second main section of the final instrument consists of a series of 105 paired comparison items, which require the respondents to evaluate the semantic discrepancy among 15 concepts concerned with the United States - Iranian Hostage Situation. These concepts were obtained from the pre-test data which were reported earlier. Further, since the pre-test was conducted in June, 1980 and the final instrument was not to be administered until October, 1980, the author collected new data to see if any concepts should be deleted or added to the list of concepts obtained from the pre-test.

New data were collected from 38 undergraduates enrolled in an advertising course at Michigan State University during the second week of October, 1980. These 38 students were asked to free associate and list all major words and phrases that were related to the United States - Iranian Hostage Situation. Appendix D shows the list of 555 concepts that were generated by the respondents, content analyzed by the author, and sorted into categories. A concept category was created if 15 or more terms were grouped together. On the basis of these data, it was decided not to add or delete any concepts from the original list synthesized from the pre-test data. Consequently, the following fifteen concepts appear in the list of paired comparison items: The United States, Iran, Khomeini, Carter, Diplomacy, Military Intervention, Economic Sanction, The Shah, The Hostages, The Militants, Irrationality, Weakness, Hostility, Freedom and Me.

The Scott "Listing and Comparing" task. The final section of the instrument consists of the Scott "Listing and Comparing" task. This task requires the respondents to examine a list of concepts and group those concepts which are alike in an important way. Each respondent is to create as many groups as he/she feels are necessary to exhaust all important groupings. Since the paired comparison data and the data from the "Listing and Comparing" task are to be used to develop the primary and secondary measures of cognitive structure, the same 15 concepts which appeared in the paired comparison portion of the final instrument were used in the "Listing and Comparing" Task. This procedure was employed to make the two measurement techniques as comparable as possible.

The Administration of the Final Instrument

Selection of subjects.[11] During the analysis of the pre-test data, one conclusion that was reached was that the sample may have been too homogeneous for significant individual differences to emerge. Consequently, an attempt was made to get a more heterogeneous set of respondents. To accomplish this, the author targeted every junior and senior in the Department of Communication to participate in the study. This particular selection procedure was adopted for two reasons:

(1) it was thought that grade point average, since it is a summary measure of the individual's ability to complete information processing tasks (i.e., exams and term papers), would be a good indicator to use to differentiate among the two information processing types, and

(2) it was thought that 80 credits (junior class standing at Michigan State University) would be a good criterion for deciding when an individual's grade point average had been reliably established.

The auther assessed the student records of every student in the Department of Communication, and selected those students who had:

(1) completed at least 80 credits at the University,

(2) taken at least some of the Michigan State University Entrance Exams, and

(3) taken either the American College Test (ACT) or Scholastic Aptitude Test (SAT).

Since student records were being assessed, it was thought that the entrance exam information and ACT - SAT information would be useful indicators for discriminating among individuals' information processing ability. Appendix E contains a brief description of the University Entrance Exams, the Scholastic Aptitude Test, and American College

Test, prepared by the University College at Michigan State University.

This subject selection process yielded 236 potential participants. Attempts were made to reach all individuals. Of these 236 people, 99 either had graduated during the summer or could not be utilized.[12] The 137 people who were contacted were informed that a study was currently being conducted in the Department of Communication for the Director of Undergraduate Studies. Each person was also informed that they had been selected to participate in the study, and asked if they could volunteer 1/2 hour of their time to help out in the data collection process. Each student was told that the study was concerned with information processing, and that some of the results might be utilized by the Director of Undergraduate Studies to aid in curriculuum development. After each student was provided with this brief description of the study, he/she was asked to indicate a time that would be convenient for him/her to come in and participate. Appendix F contains the instuction sheet that was used to guide the request for participation. Of the 137 people who were contacted, 16 refused to participate, and 22 said they would participate but never showed up at the data collection site. Consequently, 99 students in all participated in the study.

Administration of the questionnaire. Data collection procedures commenced on Wednesday, October 22, 1980 and were completed on Tuesday, November 4, 1980. Each participant was greeted at the data collection site by the author or an undergraduate research assistant.[13] Each participant was briefly informed about the study and asked if he/she were willing to participate. Appendix G provides a brief summary of the procedures that were used to greet participants and introduce them to the study. After each participant orally agreed to participate in the study, he/she was asked to sign a consent form (Consent Form A, see Appendix H) which informed him/her of his/her "rights" as a participant, and which outlined the relative costs and benefits of his/her participation. Once the participant had signed the consent form, he/she was placed in an ordinary meeting room which contained six chairs situated around a large table. Each participant was provided with an oral set of instructions about how to complete the questionnaire, and told to: (a) read the printed instructions carefully, (b) consider each item carefully, and (c) ask the author (or research assistant) to clarify or interpret any item which was not clear. The author (or research assistant) then noted the time of day, wrote it on the questionnaire, instructed the participant to begin filling out the instrument, and leave when finished. The author (or research assistant) then waited outside the meeting room until the participant left. After noting the time of day that the participant wrote on the questionnaire, the participant was given a comprehensive debriefing on the nature of the study which included:

(1) a brief description of the theory and hypotheses generating the inquiry,

(2) a discussion on the relationship of the data collection procedures to the theory and hypotheses,

(3) a discussion of the null and alternate hypotheses, and

(4) a description of how the data were to be processed, and where written reports of this research could be obtained.

After all questions from the participants had been answered, the participant was asked for permission to utilize the data contained in his/her student record in the analyses to be conducted. A consent form (Consent Form B, see Appendix H) was provided to those participants who orally agreed to allow the data to be used as part of the investigation. After the response to Consent Form B was obtained, the participant was excused.

It should be noted that data were collected between October 22 through November 4, exclusive of and November 1-2, because these were weekends, and November 3, due to scheduling difficulties. Finally, data collection ceased on November 4, due to the election of Ronald Reagan as president of the United States. It was thought that the change of leadership in the United States might serve as an effect that would greatly influence a participant's response to certain items in the final instrument. One additional note is that not all participants filled out the questionnaire in isolation. While some participants filled out the questionnaire while being seated in the meeting room alone, others completed the questionnaire while seated in the room with other participants who were also filling out the questionnaire. When this latter situation arose, participants were informed to work independently, and to direct all inquiries to the author (or research assistant) outside.

Data Handling Procedures

The questionnaires were first coupled with a sheet which contained the academic data from the participant's student record, and assigned an arbitrary "participant number." These data were then translated to computer coding sheets. These coding sheets were then verified (and corrected) twice against the questionnaires. After the second verification and correction, the author randomly examined another 20% of the coding sheets and found no errors. The coding sheets were then professionally keypunched by Resource Control Incorporated, a Lansing, Michigan keypunch service.

The punched cards were listed and verified (and corrected) against the questionnaires twice. After the second verification and correction, the author randomly examined another 20% of the questionnaires, checked them against the listing of the punched cards, and found no errors. The data were then submitted to the analyses described in Chapter III.

FOOTNOTES

[1]For a good review on procedures for determining the dimensionality of psychological processes, see Barnett and Woelfel (1979) or Woods (1977).

[2]One problem with this measure is that a high discrimination score may result from two different situations: (1) the individual's tendency to make fine discriminations among a relatively homogeneous set of stimuli, or (2) the individual's tendency to dichotomize the differences among stimuli and use a large number of extreme scores to represent his/her judgments. To overcome this problem one may: (a) transform the distance estimates using some monotonic function, (b) normalize the distance estimates using some arbitrary criterion, or (3) separate the Type 1 individual (described above) from the Type 2 individual, and then examine the differentiation scores. If this problem is observed in the data, the latter two procedures will be employed in the data analysis.

[3]For a more complete discussion of these derived measures see Stoyanoff (1980), and Scott et al. (1979).

[4]We would want to select a domain by controlling for past information while maximizing the variance in the concepts that are reported by the participants. That is, we would want to select a domain in which: (1) all participants had about the same prior information, and (2) exhibited a large variance in the number of concepts (across individuals) that were used to define the domain.

[5]Twenty-eight of the participants were administered the pre-test instrument on the evening of June 3, 1980 at a final exam session. The 29th participant was administered the instrument at a "make-up" exam session on the morning of June 4, 1980.

[6]It should be noted that the one person who did not list this response in the space provided made a note in the margin of the questionnaire that the taking of the hostages had temporarily slipped his/her mind, and probably

should have been listed as one of the two most important news events.

[7]One problem with interpreting the coefficient of variation is that some respondents tend to use extreme scores quite liberally. Consequently, an extreme score of 10,000 or 20,000 tends to inflate the coefficient of variation, while a series of extreme scores $\leq$ tends to deflate the coefficient of variation.

[8]For a concise discussion which compares maximum likelihood estimation with other estimation techniques, see Stoyanoff (1979), and Hanushek and Jackson (1977).

[9]It was suspected that many of the extreme scores encountered in the pre-test were given rather hastily, i.e., without much consideration. Consequently, scores larger than 2500 in the MMDS data set were replaced by the extreme score 2500. This "trimming" reduced the influence of these scores to inflate the measures of TRACE and WARP, and deflate the measures of NDS, NDE and NDN.

[10]The assumption that the errors of prediction are normally distributed and homoskedastic were not checked.

[11]The procedures which were employed throughout the entire study were submitted to and approved by the Michigan State University Committee on Research Involving Human Subjects, and the University Committee on the Privacy and Release of Student Record Information.

[12]Three of the 99 were research assistants involved in the project. Consequently, they were not included in the sample.

[13]The research assistants were three people who were working on an independent study project concerned with learning the research process. Two were female and one was male. All assistants had taken at least one course in research methods prior to being selected to work on the present project. They were trained for a period of four weeks (approximately 16 hours) in the research procedures described here.

CHAPTER III

RESULTS AND DISCUSSION

In Chapter I the following theoretic model was presented to account for individual differences in cognitive structure:

$$\begin{tikzcd}
\xi \arrow[r] & \eta_1 \arrow[r] \arrow[d] & \eta_3 \\
& \eta_2 \arrow[ur] &
\end{tikzcd}$$

where: ξ = social structural factors

η_1 = the relative complexity of the individual's information environment

η_2 = the individual's information processing style

η_3 = the relative complexity of the individual's cognitive structure

From this model three formal hypotheses were generated:

> Hypothesis One: the more ratio dominant the individual's processing style, the greater the relative complexity of the individual's cognitive structure.
>
> Hypothesis Two: the greater the relative complexity of the individual's information environment, the greater the relative complexity of the individual's cognitive structure.

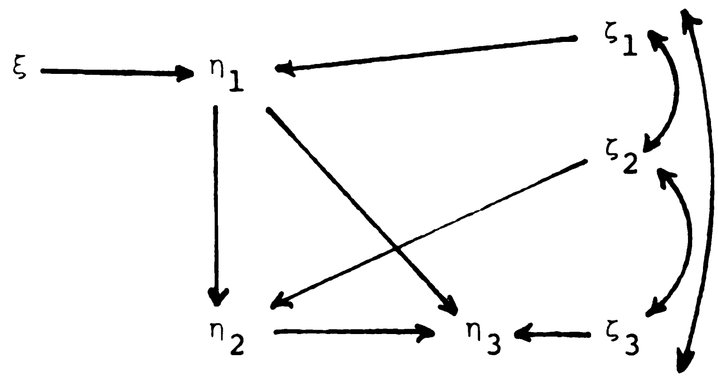
> Hypothesis Three: the greater the relative complexity of the individual's information environment, the more likely the individual is to employ a ratio-dominant (processing) style.

The fundamental purpose of the data collection procedures was to gather data which would allow us to test these hypotheses and determine the extent to which the model represents the factors and process which determine individual differences in cognitive structure. The primary means by which this objective will be accomplished is through the utilization of linear estimation techniques. More specifically, the plausibility of the hypotheses and overall model will be examined through correlation analysis and other linear model analyses. This chapter describes how these analytic procedures were used to evaluate the model, and the results that were discovered.

The chapter begins with the presentation of a structural equation model and brief discussion of linear regression analysis. This discussion focuses on the theoretic and statistical assumptions of full information maximum likelihood estimation, and examines the extent to which the model and sample data satisfy these assumptions. Second, the correlations among the indicators of each theoretic construct are examined. This analysis describes the magnitude, direction and significance levels of these correlations. Third, the extent to which the indicators of each theoretic construct fit a single factor structure is examined using confirmatory factor analysis. Essentially, this procedure will test each component of the model independently of the other components, and provide information on how well the indicators reflect variation in each theoretic construct. Further the extent to which each predictor construct is correlated with the each predicted construct is examined using canonical correlation analysis. The results of this analytic procedure indicate how many significant canonical correlations there are among the canonical variates of each theoretic construct. Fourth, all model parameters will be estimated using full information maxiumum likelihood, and the overall model will be tested to examine the extent to which the sample data fit the model. Finally, the chapter concludes with a discussion of the major findings.

A Basic Discussion of Linear Regression Analysis

Since the initial formulation of "path analysis" by the biologist Sewall Wright (1934), regression analysis has been one of the most widely used techniques for examining the direct and indirect effects of variables specified as causes on variables specified as effects (Kerlinger and Pedhazur, 1973, p. 305). To employ regression analysis, a verbal theory must first be cast into a model representing the relationships between the variables expressed by the theory. Figure 2 is such a model. This analytic representation is essentially a simplified presentation of the theory in Chapter I.



where: ξ = the theoretic construct "social structural factors"

η_1 = the theoretic construct "information environment"

η_2 = the theoretic construct "processing style"

η_3 = the theoretic construct "cognitive structure"

ζ_i = the error of prediction in each η_i

Figure 2. Theoretic Model

Following Kmenta (1971), whenever a structural equation model like the one in Figure 2 is generated, it is assumed that in the model for the population:[1]

(a) there are no specification errors, i.e., that the correct functional form is specified (with all equations being linear), that no variables pertinent to explaining variance in the endogenous variables are excluded, nor are any extraneous variables included;

(b) the model is identified;[2]

(c) the errors of prediction (ζ_i) are normally distributed about zero and homoskedastic, with the structure of the variance-covariance matrix among the errors of prediction fully specified;

(d) the exogenous variables are nonstochastic, with values fixed in repeated samples such that, for any size sample

$$\frac{1}{n}\sum_{i}^{n}(x_i-\bar{x})^2$$

is a finite number greater than zero (Kmenta, 1971, p. 202);

(e) the exogenous variables are not characterized by perfect multicollinearity, and exhibit some independent variations; and

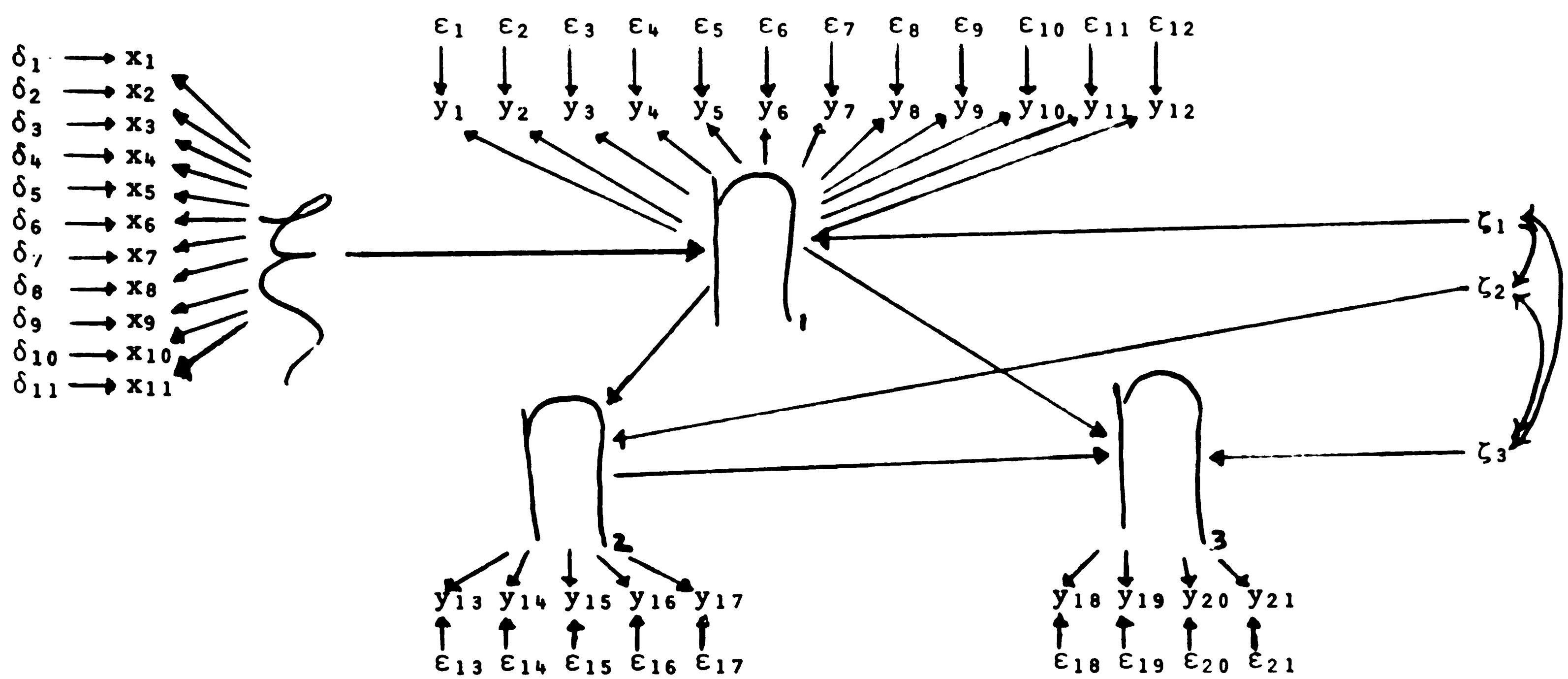
(f) additionally, the number of observations (i.e., measured variables) is greater than the number of parameters to be estimated.

Hence, full specification of the model requires specification of: (1) the functional form of the model, (2) the probability distribution of the errors of prediction, and (3) how the exogenous variables are determined (Kmenta, 1971, pp. 347-348).

Figure 3 illustrates the fully specified structural equation model which was developed to test the theory in Chapter I. The scale items which correspond to each indicator in the model, and the labels which will be used to refer to these indicators appear in Appendix I. An inspection of Figure 3 indicates that the "counting rule" for identification has been met: the number of measured inputs is larger than the number of parameters to be estimated (df=457). Beyond this, however, not much can be said about the extent to which the assumptions of full information maximum likelihood estimation have been met without analyzing the sample data.

Table 10 (columns 1 through 6) reports the summary statistics for each indicator in the model depicted in Figure 3. As can be seen from Table 10, many of the endogenous indicators (y_i's) have large positive skews. This finding indicates that these measures are <u>not</u> normally distributed about their mean, which in turn implies that the additive errors of prediction associated with these dependent measures will <u>not</u> be normally distributed about zero. This means that a key statistical assumption required for linear regression is unlikely to have been met in the population.

One procedure that can be employed to alleviate the problem of highly skewed variables calls for the transformation of the raw data using a statistical criterion for:



where:

ξ = the theoretic construct "social structural factors"
x_i = the indicators which reflect ξ
δ_i = the error of measurement in each x_i
η_1 = the theoretic construct "information environment"
y_1-y_{12} = the indicators which reflect η_1
η_2 = the theoretic construct "processing style"
y_{13}-y_{17} = the indicators which reflect in η_2
η_3 = the theoretic construct "cognitive structure"
y_{18}-y_{21} = the indicators which reflect η_3
ε_i = the error of measurement in each y_i
ζ_i = the error of prediction in each η_i

Figure 3. Full Model.

For a glossary of the indicators see, Appendix I.

Table 10

Descriptive Statistics for All Indicators in the Full Model (N=99)[a]

Indicator	N	Mean	Standard Deviation	Skew	Minimum Score	Maximum Score	Constant
x_1	89	35191.01	20944.39	1.37	2500.00	100,000.00	-
x_2	94	52.30	12.23	0.30	20.30	81.20	-
x_3	94	34.80	12.23	0.88	18.00	71.40	-
x_4	97	17.11	3.88	-0.31	7.00	27.00	-
x_5	99	15.15	3.35	0.32	5.00	26.00	-
x_6	99	160.50	70.62	2.27	50.00	500.00	25
x_7	99	188.87	218.88	6.45	0.00	2000.00	25
x_8	98	188.90	132.79	3.42	75.00	1000.00	25
x_9	98	145.05	81.59	2.00	10.00	500.00	25
x_{10}	98	185.16	195.58	8.41	40.00	2000.00	25
x_{11}	97	185.16	127.00	4.26	90.00	1000.00	25

[a]Unequal N sizes are the result of case elimination due to missing data. Indicators y_{11} to y_{12} are computed variables; see Appendix I. For a glossary of the indicators, see Appendix I. For variables with a skew > $|2.0|$, the transformation ln (variable + constant) was done, and is reported here.

Table 10 (cont'd)

Indicator	Mean of Log Transformed Scores	Standard Deviation of Log Transformed Scores	Skew of Log Transformed Scores
x_1	-	-	-
x_2	-	-	-
x_3	-	-	-
x_4	-	-	-
x_5	-	-	-
x_6	5.16	.34	0.39
x_7	5.18	.55	0.73
x_8	5.25	.44	1.18
x_9	5.04	.45	-0.26
x_{10}	5.23	.47	1.90
x_{11}	5.25	.39	1.62

Table 10 (cont'd)

Indicator	N	Mean	Standard Deviation	Skew	Minimum Score	Maximum Score	Constant
y_1	99	194.28	113.32	4.23	80.00	1000.00	25
y_2	99	144.68	113.02	4.70	0.00	1000.00	25
y_3	99	176.11	81.65	1.96	75.00	500.00	25
y_4	99	150.57	110.45	4.99	0.00	1000.00	25
y_5	99	159.46	65.51	1.77	40.00	500.00	25
y_6	99	222.12	490.79	9.61	60.00	5000.00	-50
y_7	99	193.26	493.15	9.64	0.00	5000.00	5
y_8	99	156.47	68.54	1.99	50.00	500.00	25
y_9	98	166.33	73.46	1.24	18.00	400.00	25
y_{10}	97	31.27	37.77	4.20	2.00	300.00	5
y_{11}	94	.01	.18	-.05	-0.48	0.47	-
y_{12}	98	1.02	1.14	.21	-1.81	4.53	-
y_{13}	88	15.11	7.84	1.46	2.00	42.00	-
y_{14}	88	67.65	25.18	-.51	7.00	103.00	-
y_{15}	88	100.17	77.97	2.89	26.95	454.76	100
y_{16}	88	15.22	12.65	1.08	0.00	70.00	-
y_{17}	88	8.57	15.42	2.38	0.00	74.00	25
y_{18}	88	4.81	1.08	-1.00	1.00	7.00	-
y_{19}	88	427045.11	740317.08	2.62	10452.00	3361490.00	25
y_{20}	88	2.25	.84	2.29	1.31	5.91	0.01
y_{21}	90	2.65	.86	-.49	.57	3.91	-

Table 10 (cont'd)

Indicator	Mean of Log Transformed Scores	Standard Deviation of Log Transformed Scores	Skew of Log Transformed Scores
y_1	5.31	.37	1.22
y_2	5.00	.52	-0.19
y_3	5.24	.34	0.80
y_4	5.06	.45	0.17
y_5	5.16	.33	0.17
y_6	4.68	.73	0.92
y_7	4.93	.65	0.42
y_8	5.14	.33	0.53
y_9	5.18	.38	-0.45
y_{10}	3.28	.76	0.48
y_{11}	-	-	-
y_{12}	-	-	-
y_{13}	-	-	-
y_{14}	-	-	-
y_{15}	5.25	.29	1.95
y_{16}	-	-	-
y_{17}	3.44	.35	1.66
y_{18}	-	-	-
y_{19}	11.87	1.45	.51
y_{20}	.76	.30	1.11
y_{21}	-	-	-

(a) a single batch of data,

(b) the relationship between two (or more) variables, or

(c) a time series of observations.

For our purposes here, the method of selecting a transformation which focuses on a single batch of data was deemed as most appropriate given the exploratory nature of the present research. More specifically, the criterion which governed the search for a transformation was to find a single bend transformation to satisfy the equation:

$$x^* = \ln(x+k)$$

where: x^* = the transformed value of the variable
x = the raw data value of the variable
k = a constant,

such that the skew of the distribution of x^* was between $\pm$ 2.00.[3] Columns 7-10 of the Table 10 present the constant (k) that satisfied the above equation,[4] and the standard deviation, and skew of the transformed scores. As can be seen from the data in columns 2-10, the problems with respect to the distribution of the measures have been resolved. Consequently, we are now in a position to estimate (i.e., derive values for) the parameters of the model under investigation. However, prior to solving for the parameters of the model, it would be extremely useful to examine the correlations among the indicators of the model. Since a correlation reflects the bivariate linear association between two variables (i.e., the extent to which variation in one variable is linearly associated with variation in another variable), a close inspection of the correlations among the indicators of the model should provide us with information on the extent to which: (a) the indicators of each theoretic construct are linearly related to one another, and (b) the linear relation of the indicators of predictor constructs to the indicators of predicted constructs. This information will allow us to determine the extent to which the correct functional form of the model has been specified.

Analysis of the Correlations Among Indicators

Tables 11-13 report the correlations among all indicators in the model depicted in Figure 2. More specifically, Table 11 reports the correlations among the indicators of the exogenous variable (ξ), Table 12 reports the correlations among the indicators for the three endogenous variables (η_1, η_2, and η_3), and Table 13 reports the inter-correlations among the indicators for the exogenous and endogenous variables (i.e., the inter-correlations of the indicators of ξ with the indicators for η_1, η_2, and η_3). Some of the correlations contained in Tables 11-13 will be examined in the next few sections.

Analysis of the correlations among the exogenous indicators.[5] An examination of Table 11 reveals three distinct groups of inter-correlations. First, the correlations among variables x_1-x_5 are all positive and low to moderate in magnitude (.114 to .457), with eight of the ten

Table 11

Correlations Among the Exogenous Indicators (N=99)[a]

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
x_1	1.000										
x_2	.351**	1.000									
x_3	.129	.114	1.000								
x_4	.435**	.422**	.219**	1.000							
x_5	.333**	.198**	.430**	.457**	1.000						
x_6	.025	.039	.085	.033	-.062	1.000					
x_7	-.069	-.074	.100	-.091	-.074	.379**	1.000				
x_8	-.193*	-.043	-.015	-.138	-.060	.488**	.415**	1.000			
x_9	.035	-.104	-.049	.030	-.160	.356**	.162	.151	1.000		
x_{10}	.059	-.040	.182*	-.008	-.021	.288**	.395**	.018	.254**	1.000	
x_{11}	-.034	.130	.109	.064	-.004	.454**	.436**	.398**	.234**	.411**	1.000

*$p \leq .05$

**$p \leq .01$

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators x_6 to x_{11}; see Table 10. For a glossary of the indicators, see Appendix I.

correlations significant at the .05 level or lower. This suggests a moderate but direct relationship between family income (x_1), parents' occupational status (x_2 and x_3), and parents' educational attainment level (x_4 and x_5).[6] Second, the correlations among variables x_6-x_{11} are all positive and low to moderate in magnitude (.018 to .488), with twelve of the fifteen correlations significant at the .01 level or lower. These findings suggest a moderate but direct relationship between these six indicators of life-style. Third, the correlations among the variables contained in the x_1-x_5 set, and the variables in the x_6-x_{11} variable set are all near zero or very low in absolute magnitude (-.004 to -.193).[7] Further, seventeen of the thirty correlations are negative, with only two of the thirty correlations significant at the .05 level or lower. These findings suggest that there is little relationship between the socioeconomic status variables (x_1-x_5) and the lifestyle variables (x_6-x_{11}) that were used as indicators of the individual's social structural background (ξ).

In sum, there is a moderate linear relationship among the five socioeconomic status indicators x_1-x_5, a moderate linear relationship among the six lifestyle indicators x_6-x_{11}, but very little relationship between these two sets of indicators. From these findings we conclude that while the socioeconomic variables and lifestyle variables correlate moderately and positively within each set (i.e., amongst themselves), there is little relationship between socio-economic status and one's lifestyle pattern (at least with respect to which the lifestyle pattern is socially responsive, diverse, independent, nurturing, cohesive or intellectual).

Analysis of the correlations among the endogenous indicators. Table 12 reports the correlations among all three sets of endogenous indicators. For our purposes here, variables y_1-y_{12} will be referred to as the first set of endogenous variables (since they are indicators of η_1), y_{13}-y_{17} will be referred to as the second set of endogenous variables (since they are indicators of η_2), and variables y_{18}-y_{21} will be referred to as the third set of endogenous variables (since they are indicators of η_3).

For the first set of endogenous variables, an examination of Table 12 reveals three distinct groupings of correlations among the twelve indicators of information environment (η_1). First, there is a moderate to high positive correlation among variables y_1-y_9 (.197 to .702), with all thirty-six correlations significant at the .05 level or lower. Second, there is little relationship between the set of variables y_1-y_9 and the set of variables y_{10}-y_{12} (-.001 to -.304). Twenty of these thirty correlations are less than .10 in absolute magnitude. Further, sixteen of these thirty correlations are negative in direction. Finally, only nine of the thirty correlations in this sub-group were

Table 12

Correlations Among the Endogenous Indicators (N=99)[a]

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}	y_{11}	y_{12}	y_{13}
y_1	1.000												
y_2	.430**	1.000											
y_3	.702**	.309**	1.000										
y_4	.553**	.648**	.580**	1.000									
y_5	.669**	.358**	.613**	.499**	1.000								
y_6	.697**	.371**	.679**	.511**	.584**	1.000							
y_7	.477**	.699**	.500**	.803**	.431**	.644**	1.000						
y_8	.605**	.197*	.561**	.386**	.686**	.519**	.308**	1.000					
y_9	.569**	.372**	.429**	.285**	.471**	.501**	.298**	.461**	1.000				
y_{10}	-.008	.019	.001	.018	-.001	.050	-.005	.064	.209*	1.000			
y_{11}	-.182*	-.226*	-.145	-.304**	-.083	-.062	-.294**	.095	-.040	-.059	1.000		
y_{12}	-.016	.200*	.014	.172*	.018	.020	.177*	-.070	.009	-.062	-.293**	1.000	
y_{13}	-.180*	-.058	.038	-.032	-.105	-.192*	-.059	.098	-.077	.151	.067	.043	1.000
y_{14}	.211*	.040	.123	.145	.219*	.269**	.120	.139	-.039	.140	.011	-.096	-.496**
y_{15}	.338**	.100	.318**	.061	.272**	.265**	.000	.385**	.342**	.158	-.016	-.028	.198*
y_{16}	-.063	-.015	-.051	-.253**	-.094	-.071	-.244**	-.065	.156	.049	-.036	-.150	-.058
y_{17}	.263**	-.023	.314**	.189*	.295**	.205*	.086	.388**	-.064	.079	.031	-.019	.149
y_{18}	-.059	.035	-.104	.028	-.043	.002	.127	-.108	-.239**	-.137	-.038	-.003	-.315**
y_{19}	.272**	.025	.327**	.169	.380**	.239*	.066	.400**	.018	.134	.078	-.053	.182*
y_{20}	.107	.031	.097	-.022	.074	-.001	-.086	.171	.197*	.127	.102	.058	.311**
y_{21}	-.055	-.161	-.050	-.087	.026	.016	-.015	-.049	-.110	-.157	-.056	-.198*	-.056

*$p \leq .05$

**$p \leq .01$

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_1 to y_{10}, y_{17} and y_{19} to y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

Table 12 (cont'd)

	y_{14}	y_{15}	y_{16}	y_{17}	y_{18}	y_{19}	y_{20}	y_{21}
y_{14}	1.000							
y_{15}	.189*	1.000						
y_{16}	-.103	.377**	1.000					
y_{17}	.432**	.508**	-.141	1.000				
y_{18}	.035	-.506**	-.246**	-.402	1.000			
y_{19}	.538**	.587**	-.184*	.888**	-.220*	1.000		
y_{20}	.101	.699**	.217*	-.255**	.754**	.402**	1.000	
y_{21}	.402	-.155	.007	.008	.113	-.034	-.191*	1.000

significant at the .05 level or lower. Third, there is an <u>extremely small inverse</u> relationship among the set of variables y_{10}-y_{12} (-.059 to -.293), with only one of the three correlations in this set significant ($\underline{r}_{y_{11}y_{12}} = -.293$, $\underline{p} \leq .01$). In sum, these findings suggest that there is: (a) a <u>moderate to high</u> linear relationship among the variables which tapped the relative complexity of the individual's interpersonal and media experiences (y_1-y_9), (b) <u>little relationship</u> between variables y_1-y_9 and variables y_{10}-y_{12} (which measure number of hours talking with friends, reading print media, and watching TV news, respectively), and (c) a <u>low inverse</u> relationship among the set of variables y_{10}-y_{12}. Hence, while variables which measure the relative complexity of the individual's interpersonal and media environment correlate in a moderate and positive fashion, the remainder of the findings lead us to conclude that the extent to which an individual interacts with friends is inversely related to the amount of time spent with print and electronic media, and that the relative amount of time spent interacting interpersonally and/or with the mass media is <u>unrelated</u> to the relative complexity of these experiences.

The second set of endogenous variables (y_{13}-y_{17}) are the indicators of processing style (η_2). An examination of Table 12 indicates that: (a) the correlations of y_{15} with all other variables in the set are <u>moderate</u> and <u>positive</u> (.189 to .508), with all correlations significant at the .05

level or lower, (b) the correlations between y_{16} and y_{13}, y_{14}, and y_{17} are small, negative and non-significant (-.058, -.103, and -.141, respectively), (c) the correlation between y_{13} and y_{14} is moderate, negative and significant (-.496, $p \leq .05$), while the correlation between y_{13} and y_{17} is small, positive but not significant (.149), and (d) the correlation between y_{14} and y_{17} is moderate, positive and significant (.432, $p \leq .05$). These findings suggest that:

(1) as the coefficient of variation of the set of MMDS responses increases, the total number of scores which are used, the number of integer multiples of the standard which are used, and the number of extremely small and large scores which are used also increase,

(2) as the number of extremely small scores which are used increases, the total number of scores which are used, the number of integer multiples of the standard which are used, and the number of extremely large scores which are used decrease,

(3) as the total number of (unique) scores which are used increases, the number of integer multiples of the standard which are used decreases, and the number of extremely large scores which are used increases, and

(4) as the number of integer multiples of the standard which are used increases, the number of extremely large scores which are used increases.

However, it is important to remember that these conclusions are based on a set of correlations which included a few small and nonsignificant coefficients.

The third set of endogenous variables (y_{18}-y_{21}) are the indicators of cognitive structure (η_3). An examination of Table 12 indicates that: (a) the correlations between y_{18} with y_{19} and y_{20} are both negative and significant (-.220 and -.754, respectively), while the correlation between y_{18} and y_{21} is small, positive, but not significant (.113), (b) the correlation between y_{19} and y_{20} is positive and significant (.402, $p \leq .05$), while the correlation between y_{19} and y_{21} is near zero and nonsignificant, and (c) the correlation between y_{20} and y_{21} is small, negative and significant (-.191, $p \leq .01$). These findings suggest:

(1) the correlation between the dimensionality measure (H) derived from the Scott "Listing and Grouping" task and the MMDS measure of dimensionality is positive but not significant,

(2) the dimensionality measure H seems unrelated to the MMDS measure of discrimination, and inversely related to the MMDS measure of integration,

(3) the MMDS measure of dimensionality is inversely related to the MMDS measure of discrimination and directly related to the MMDS measure of integration, and

(4) the MMDS measure of discrimination is inversely related to the MMDS measure of integration.

While no specific predictions were made as to how the indicators of cognitive structure would correlate with each other, low to moderate positive (and significant) correlations were anticipated. Consequently, the lack of a strong relationship between the Scott measure and the MMDS measures was expected. Further, the inverse relationship between the MMDS measures of dimensionality and integration, while unexpected, indicates that the distance variance in the MMDS space is being accounted for more by imaginary dimensions as the individual generates large triangular inequalities in the set of paired comparisons.

Analysis of the Correlations Among the Indicators of Predictor Variables with the Indicators of Predicted Variables

In the preceding section the correlations among the indicators for each theoretic variable were examined to see how well these measures correlated with each other. However, this discussion was limited to examining these measures within each set (i.e., theoretic variable by theoretic variable). It would now be useful to examine how the indicators of *predictor* theoretic variables correlate with the indicators of *predicted* theoretic variables. Such an examination would help us determine the extent to which the *causal* relationships among the theoretic variables in the model are plausible given this set of indicators. In the following sections four sets of correlations will be examined: (1) the correlations among the indicators of ξ and η_1, (2) the correlations among the indicators of η_1 and η_2, (3) the correlations among the indicators of η_1 and η_3, and (4) the correlations among the indicators of η_2 and η_3. Then, a summary of the implications of these relationships will be presented.

<u>Analysis of the correlations among the indicators of ξ and η_1</u>. Table 13 reports the correlations among the indicators of $\xi(x_1-x_{11})$ and $\eta_1(y_1-y_{12})$. An inspection of Table 13 reveals that the most distinct grouping of correlations rests in the relationship of y_1-y_8 with x_6-x_{11}. Of the forty-eight correlations in the subset, forty-five are <u>low to moderate positive correlations</u> (.035 to .559), with forty-one of these forty-five correlations <u>significant</u> at the .05 level or lower. The three correlations which are negative in direction are all <u>near zero</u> (-.086, -.010 and -.068) and <u>nonsignificant</u>. A second finding among the correlations of indicators with η_1 indicators is the relationship between x_1, x_2 and x_4 with y_1 to y_7. Of the twenty-one correlations in this subset, all are either <u>very low</u> or <u>near zero</u> in absolute magnitude (-.009 to -.175), with only one significant correlation ($r_{x_1y_2}$=-.175, $p \leq .01$). Third, of the sixty-three remaining correlations in the overall set of ξ and η_1 indicators, all are either <u>very low</u> or <u>near zero</u> in absolute magnitude (.000 to .208), with the exception of one correlation ($r_{y_9x_{10}}$=.334, $p \leq .05$). Further, there seems to be no distinct trend in the direction of any of these correlations, with the exception of the correlations of x_3 with y_1 to y_{11}, which are all <u>positive</u>. Finally, only seven of the remaining sixty-three correlations are significant at the .05 level or lower ($r_{x_2y_{12}}$, $r_{x_4y_{11}}$, $r_{x_5y_{11}}$, $r_{x_5y_5}$, $r_{x_5y_8}$, $r_{x_8y_{11}}$, and $r_{x_{10}y_9}$).

Table 13

Correlations Among the Exogenous and Endogenous Indicators (N=99)[a]

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
y_1	-.095	-.044	.050	-.164	-.191*	.323**	.371**	.236**	.291**	.551**	.428**
y_2	.014	-.127	.088	-.009	.063	.125*	.153	-.086	-.010	.407**	.158
y_3	-.120	-.012	.097	-.039	-.042	.410**	.446**	.403**	.193*	.462**	.512**
y_4	-.162	-.166	.131	-.085	.082	.275**	.263**	.183*	.115	.438**	.403**
y_5	-.084	-.138	.032	-.154	-.168*	.527**	.353**	.258**	.253**	.434**	.488**
y_6	-.058	-.085	.114	-.129	.038	.338**	.443**	.240**	.170*	.559**	.421**
y_7	-.175*	-.131	.102	-.129	.070	.156*	.268**	.035	-.068	.436**	.350**
y_8	.002	.101	.000	-.043	-.174*	.463**	.392**	.264**	.285**	.369**	.426**
y_9	.067	.035	.009	-.149	-.092	.107	.145	.007	.110	.334**	.107
y_{10}	.096	-.072	.009	.085	.013	.033	.117	-.103	.009	.148	-.085
y_{11}	.091	.093	.088	.173*	.079	-.069	-.157	-.208*	-.064	-.058	-.200*
y_{12}	-.100	-.184*	-.054	-.027	.023	.088	.043	-.013	-.027	.062	.040
y_{13}	-.169	-.038	-.083	.148	.004	-.027	.106	.026	-.236**	-.081	.034
y_{14}	-.080	-.056	.002	-.227*	-.174*	.209*	.119	.171	.182*	.200*	.097
y_{15}	.010	.032	-.011	.001	-.201*	.318**	.294**	.210*	.094	.252**	.160
y_{16}	.292**	.247**	.185*	.277**	.148	-.006	-.097	-.015	-.058	.088	.089
y_{17}	-.177	.096	-.009	-.064	-.134	.313**	.480**	.407**	.125	.198*	.315**
y_{18}	.109	.038	.019	-.016	.130	-.112	-.004	-.254*	-.017	.106	.083
y_{19}	-.191*	.003	-.081	-.084	-.227*	.345	.398**	.385**	.120	.161**	.257*
y_{20}	-.121	.040	.015	.070	-.176*	.153	.115	.100	.008	-.052	.044
y_{21}	.147	-.001	.113	.070	.095	.019	-.157	.037	.167	-.050	.081

*$p \leq .05$
**$p \leq .01$

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_1 to y_{10} and x_6-x_{11}; see Table 10. For a glossary of the indicators, see Appendix I.

<u>Analysis of the correlations among the indicators of η_1 and η_2</u>. Table 14 reports the correlations among the indicators of $\eta_1(y_1\text{-}y_{12})$ with the indicators of $\eta_2(y_{13}\text{-}y_{17})$. A close inspection of Table 14 indicates that the correlations among the indicators of $\eta_1$and η_2 are all <u>moderate to near zero</u> in absolute magnitude (-.015 to .385), with only eighteen of the sixty correlations in this subset significant at the .05 level or lower. Of these eighteen significant correlations, six involve y_{15} and these are all <u>positive</u>, five involve y_{17} and these are all positive, and three involve y_{14} and these are all <u>positive</u>. The four other significant correlations ($\underline{r}_{y_1y_{13}}$, $\underline{r}_{y_4y_{16}}$, $\underline{r}_{y_{16}y_{13}}$, $r_{y_7y_{16}}$) however, are all <u>negative</u>. Consequently, the most noteworthy relationships evident in the set of correlations among the indicators of η_1 and η_2 in general are:

(1) the positive linear relationship between η_2 indicators y_{14}, y_{15}, and y_{17} with the indicators of η_1,

(2) the negative linear relationship between η_2 indicators y_{13} and y_{16} with the indicators of η_1, and

(3) the trend of fourteen of the eighteen significant correlations to be positive and associated with η_2 indicators y_{14}, y_{15} and y_{17}.

<u>Analysis of the correlations among the indicators of η_1 and η_3</u>. Table 15 reports the correlations among the indicators of $\eta_1(y_1\text{-}y_{12})$ and $\eta_3(y_{18}\text{-}y_{21})$. As can be seen

Table 14

Correlations Among the Indicators of η_1 and η_2 (N=99)[a]

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}	y_{11}	y_{12}
y_{13}	-.180*	-.058	.038	-.032	-.105	-.192*	-.059	.098	-.077	.151	.067	.043
y_{14}	.211*	.040	.123	.145	.219*	.269**	.120	.139	-.039	.140	.011	-.096
y_{15}	.338**	.100	.318**	.061	.272**	.265**	.000	.385**	.342**	.158	-.016	-.028
y_{16}	-.063	-.015	-.051	-.253**	-.094	-.071	-.244**	-.065	.156	.049	-.036	-.150
y_{17}	.263**	-.023	.314**	.189*	.295**	.205	.086	.388**	-.064	.079	.031	-.019

*$p \leq .05$

**$p \leq .01$

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_1 to y_{10}, y_{15}, and y_{17}; see Table 10. For a glossary of the indicators, see Appendix I.

from Table 15, only eight of the forty-eight correlations in this subset are significant at the .05 level or lower, and five of these eight significant correlations involve y_{19}. Further, while there is a generally positive relationship between η_3 indicators y_{19} and y_{20} and the indicators of η_1, and a generally negative relationship between η_3 indicators y_{18} and y_{21} and the indicators of η_1, only three of the thirty-six correlations including these indicators are significant. Consequently, the most noteworthy finding yielded by this analysis is that of no linear relationship between the indicators of η_1 and η_3, with the exception of y_{19}, which seems to be moderately (and positively) related to five of the indicators of η_1.

Analysis of the correlations among the indicators of η_2 and η_3. Table 16 reports the correlations between the indicators of $\eta_2(y_{13}-y_{17})$ and $\eta_3(y_{18}-y_{21})$. An examination of Table 16 reveals that twelve of the sixteen correlations between $y_{18}-y_{20}$ are significant at the .05 level or lower. Further, in general, there is a negative relationship between y_{18} and the indicators of η_2 (for the exception of $r_{y_{14}y_{18}}$ which is near zero and nonsignificant), and a positive relationship between $y_{19}-y_{20}$ and the indicators of η_2 (with the exception of $r_{y_{16}y_{19}}$ which is negative and significant at the .05 level). Finally, it is quite evident that y_{21} has the weakest relationship of any η_3 indicator with $y_{13}-y_{17}$, with all correlation coefficients near zero

Table 15

Correlations Among the Indicators of η_1 and η_3 (N=99)[a]

	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}	y_{11}	y_{12}
y_{18}	-.059	.035	-.104	.028	-.043	.002	.127	-.108	-.239**	-.137	-.038	-.003
y_{19}	.272**	.025	.327**	.169	.380**	.239*	.066	.400**	.018	.134	.078	-.053
y_{20}	.107	.031	.097	-.022	.074	-.001	-.086	.171	.197*	.127	.102	.058
y_{21}	-.055	-.161	-.050	-.087	.026	.016	-.015	-.049	-.110	-.157	-.056	-.198*

* $p \leq .05$

** $p \leq .01$

[a] See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_1 to y_{10}, and y_{19} to y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

Table 16

Correlations Among the Indicators of η_2 and η_3 (N=99)[a]

	y_{13}	y_{14}	y_{15}	y_{16}	y_{17}
y_{18}	-.315**	.035	-.506**	-.246**	-.042
y_{19}	.182*	.538**	.587**	-.184*	.888**
y_{20}	.311**	.101	.669**	.217*	.255**
y_{21}	-.056	.042	-.155	.007	.008

*$p \leq .05$
**$p \leq .01$

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_{15}, y_{17}, y_{19}, and y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

(-.007 to -.155) and nonsignificant. In review, the most noteworthy findings discovered during the examination of η_2 and η_3 correlations were:

(1) the generally negative relationship between y_{18} and the indicators of η_2,

(2) the generally positive relationship between y_{19} and y_{20} and the indicators of η_2, and

(3) the lack of a linear relationship between y_{21} and the indicators of η_2.

A Summary and Discussion of the Correlation Analyses Performed on the Indicators of the Model

In the previous two sections we have examined the correlations among the indicators of the model to see: (a) how indicators of the same theoretic construct correlated with one another, and (b) how the indicators of predictor variables correlated with the indicators of predicted variables. While no specific predictions were presented as to how these indicators would correlate with each other, in an "ideal" situation all correlation coefficients would be moderate to high in absolute magnitude and significant. However, as we have observed in the preceding sections many of the correlation coefficients both within and across theoretic constructs were either near zero and/or nonsignificant. More specifically, only 114 of the 265 inter-correlations examined were significant at the .05 level or lower. These findings call into question the validity of some of the indicators. Consequently, further data analysis must be conducted to examine the extent to which the indicators are valid measures of the theoretic constructs. Since the model is essentially comprised of four theoretic factors with multiple indicators, this can be accomplished by conducting a confirmatory factor analysis on the indicators of each theoretic construct to see how well these indicators fit a single factor structure. These analyses are reported below.

An Examination of the Fit of the Indicators

To determine the extent to which the indicators of the measurement model fit the factor structures which are implicit in the model, a confirmatory factor analysis was performed for each theoretic construct. This technique provides information on the extent to which the indicators of the model reflect the underlying theoretic construct. More specifically, the LISREL® (Jöreskog and Sörbom, 1978) program provides maximum likelihood estimates of the factor score coefficients, and a statistic (which is distributed χ^2 in large samples) which provides information on the "goodness of fit" of the model.[8]

Tables 17-20 report the results of the confirmatory factor analyses that were performed on the indicators of ξ, η_1, η_2 and η_3, respectively. In these tables the following data are reported: (a) the maximum likelihood estimates of the factor loadings, (b) the standard errors

Table 17

A Confirmatory Factor Analysis On the Indicators of ξ (N=99)[a]

Indicator	Estimated Loading: unstandardized	Estimated Loading: (standard error)	Estimated Loading: standardized	Unstandardized Error of Measurement: error	Unstandardized Error of Measurement: (std. error of error)
x_1	1.00[b]	(0.00)	.0006	.04	(.006)
x_2	2.78	(111.85)	.0017	.01	(.002)
x_3	23.69	(933.18)	.0145	.01	(.002)
x_4	-13.05	(518.92)	-.0080	.15	(.022)
x_5	-38.35	(1511.34)	-.0235	.12	(.016)
x_6	374.89	(c)	.2296	.06	(.012)
x_7	561.59	(c)	.3440	.17	(.031)
x_8	393.65	(c)	.2411	.14	(.022)
x_9	275.38	(c)	.1687	.17	(.026)
x_{10}	321.41	(c)	.1969	.13	(.020)
x_{11}	448.32	(c)	.2746	.08	(.016)

df = 44
χ^2 = 139.00
probability level = .0000

[a] See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators x_6 to x_{11}; see Table 10. For a glossary of the indicators, see Appendix I.

[b] This value is fixed to serve as a reference indicator.

[c] This standard error exceeded the print limitation (99,999) on the LISREL® computer program and cannot be reported.

Table 18

A Confirmatory Factor Analysis On the Indicators of η_1 (N=99)[a]

Indicator	Estimated Loading unstand-ardized	(standard error)	stand-ardized	Unstandardized Error of Measurement error	(std. error of error)
y_1	.70	(.09)	.31	.04	(.01)
y_2	.64	(.12)	.29	.19	(.03)
y_3	.61	(.08)	.27	.04	(.01)
y_4	.73	(.11)	.32	.10	(.01)
y_5	.56	(.08)	.25	.05	(.01)
y_6	1.32	(.18)	.59	.19	(.03)
y_7	1.00[b]	(0.00)	.45	.21	(.03)
y_8	.49	(.08)	.22	.06	(.01)
y_9	.50	(.09)	.22	.09	(.01)
y_{10}	.06	(.18)	.03	.58	(.08)
y_{11}	-.07	(.04)	-.03	.03	(.00)
y_{12}	.15	(.27)	.07	1.29	(.19)

df = 54
χ^2 = 2.13.34
probability level = .0000

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_1 to y_{10}; see Table 10. For a glossary of the indicators, see Appendix I.

[b]This value is fixed to serve as a reference indicator.

Table 19

A Confirmatory Factor Analysis On the Indicators of η_2 (N=99)[a]

	Estimated Loading			Unstandardized Error of Measurement	
Indicator	unstand-ardized	(standard error)	stand-ardized	error	(std. error of error)
y_{13}	1.00[b]	(0.00)	.63	61.89	(8.91)
y_{14}	5.20	(1.88)	3.25	622.77	96.16)
y_{15}	.06	(.02)	.04	.08	(.01)
y_{16}	-1.47	(.63)	-.92	158.68	(22.79)
y_{17}	2.01	(7.43)	1.25	-1.44	(5.60)

df = 5
χ^2 = 73.95
probability level = .0000

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_{15} and y_{17}; see Table 10. For a glossary of the indicators, see Appendix I.

[b]This value is fixed to serve as a reference indicator.

Table 20

A Confirmatory Factor Analysis On the Indicators of η_3 (N=99)[a]

Indicator	Estimated Loading: unstandardized	(standard error)	standardized	Unstandardized Error of Measurement: error	(std. error of error)
y_{18}	1.00[b]	(0.00)	.18	1.21	(.37)
y_{19}	-.45	(.19)	-.08	2.11	(.31)
y_{20}	6.81	(67.54)	1.23	1.62	(15.26)
y_{21}	.12	(.08)	.02	.74	(.11)

df = 2
χ^2 = 6.59
probability level = .0370

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_{19} to y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

[b]This value is fixed to serve as a reference indicator.

of these coefficients, (c) the measurement error associated with each indicator, and (d) the chi-square statistic, degrees of freedom, and probability level yielded by the "likelihood ratio" technique used to test the overall "goodness of fit" of the model.[9] As can be seen in Tables 17-20, one of the indicators in each factor stucture (x_1, y_7, y_{13} and y_{18} for ξ, η_1, η_2 and η_3, respectively) was fixed at 1.00 to serve as a reference indicator (i.e., to fix the scales of measurement so that the magnitudes of these are interpreted relative to one another; this is necessary for model identification). However, a detailed discussion of the values obtained for these parameters is unwarranted in the present research given the chi-square values and probability levels obtained for each theoretic construct. More specifically, a close inspection of Tables 17-20 reveals the following chi-square values, degrees of freedom, and probability levels for each theoretic construct:

Theoretic variable	chi-square	df	probability level
ξ	139.00	44	.0000
η_1	213.34	54	.0000
η_2	73.95	5	.0000
η_3	6.59	2	.0370

These results indicate that the specified models are too restrictive. In other words, the indicators for each theoretic construct do not fit single factor structures. Consequently, any further discussion of the specific results obtained from the confirmatory factor analyses would have marginal utility.

Nonetheless, to further examine the extent to which the theoretic constructs were erroneously specified, canonical correlation analyses were performed. Using the indicators within each factor, this procedure derives a series of linear combinations from each set of indicators so as to maximize the correlation between these linear combinations. Each linear combination extracted from a set of indicators is referred to as a canonical variate, and the correlation between each (corresponding) pair of canonical variates is called the canonical correlation. Further, the square of the canonical correlation represents the amount of variance in one canonical variate accounted for by the other.

Tables 21-24 report the canonical correlations among the indicators of the predictor and predicted constructs. As can be observed in these tables, there are two significant canonical correlations between the indicators of ξ and η_1; there are two significant canonical correlations between the indicators of η_1 and η_2; there are no significant canonical correlations between the indicators of η_1 and η_3, and

Table 21

Canonical Correlations Among the Indicators of ξ with the Indicators of η_1 (N=64)[a]

Number	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi Square	df	significance
1	.599	.773	.035	172.263	132	.010
2	.513	.716	.088	125.356	110	.150
3	.406	.637	.180	88.268	90	.537
4	.319	.564	.303	61.469	72	.808
5	.234	.484	.445	41.710	56	.922
6	.184	.429	.581	27.984	42	.952
7	.136	.369	.712	17.492	30	.966
8	.092	.303	.825	9.938	20	.969
9	.054	.232	.908	4.994	12	.958
10	.040	.201	.959	2.154	6	.905
11	.001	.027	.999	.036	2	.982

[a]Sample size the result of case elimination due to missing data across all indicators; see Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators x_6 to x_{11} and y_1 to y_{10}; see Table 10. For a glossary of the indicators, see Appendix I.

Table 22

Canonical Correlations Among the Indicators of η_1 with the Indicators of η_2 (N=64)[a]

Number	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi Square	df	Significance
1	.562	.750	.120	115.297	60	.000
2	.462	.680	.276	70.246	44	.007
3	.302	.549	.513	36.430	30	.194
4	.177	.421	.734	16.863	18	.533
5	.108	.328	.892	6.220	8	.623

[a]Sample size the result of case elimination due to missing data across all indicators; see Table 10 for the sample size of each indicator. This analysis is based on the transformed scores for indicators y_1 to y_{10}, y_{15}, and y_{12}; see Table 10. For a glossary of the indicators, see Appendix I.

Table 23

Canonical Correlations Among the Indicators of η_1 with the Indicators of η_3 (N=64)[a]

Number	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi Square	df	Signif- icance
1	.285	.534	.469	41.689	48	.728
2	.224	.473	.656	23.227	33	.897
3	.109	.330	.844	9.303	20	.979
4	.053	.230	.947	2.978	9	.965

[a]Sample size the result of case elimination due to missing data across all indicators; see Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_1 to y_{10} and y_{19} to y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

Table 24

Canonical Correlations Among the Indicators of η_2 with the Indicators of η_3 (N=64)[a]

Number	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi Square	df	Significance
1	.912	.955	.046	179.913	20	.000
2	.466	.683	.525	37.654	12	.000
3	.010	.102	.984	.958	6	.987
4	.006	.097	.994	.348	2	.840

[a]Sample size the result of case elimination due to missing data across all indicators; see Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators y_{15}, y_{17} and y_{19} to y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

there are two significant canonical correlations between the indicators of η_2 and η_3. These results provide additional evidence that the model has been erroneously specified. This is because if the model were correctly specified, we should have obtained only one significant canonical correlation between the indicators of each set of predictor and predicted constructs. Further, these results, when examined in light of the previous discussion concerning the correlations among indicators both within and across theoretic constructs, strongly suggest that: (1) the proposed indicators for ξ are probably two sets of indicators for two different underlying (theoretic) constructs; (2) the proposed indicators for η_1 are probably the indicators of at least two, and possibly three or four underlying (theoretic) constructs; (3) the proposed indicators for η_1 have little relationship with the indicators of n_3; and (4) the proposed indicators for η_3 are probably two sets of indicators for two different underlying (theoretic) constructs.

When the kind of model specification problems we are experiencing are encountered, Jöreskog and Sörbom recommend an analysis of the covariance residuals and/or an analysis of the first order derivatives of the parameters with respect to the fitting function (F) that was used to derive the maximum likelihood estimates for the parameters (1978: p. 15). According to these authors, such analysis often will suggest ways to alter the model so that the relative fit may be improved, typically through the introduction of new (i.e., additional) parameters to be estimated. However, while such analyses would be useful to improve the fit of the indicators to each theoretic construct, we have yet to examine the overall model as originally proposed. While it is unlikely that the relative fit of the sample data to the overall model will be very good, such an investigation (since it is a full information approach) might provide additional insights to the problems of the model that might otherwise go unnoticed.

Test of the Full Model

Table 25 reports the maximum likelihood estimates for all parameters in the full model, and the results of the chi-square goodness of fit test. As expected, the results of the goodness of fit test indicates that the overall fit of the data to the model is not very good ($\chi^2 = 1222.35$, df = 457, probability level = .0000). However, the ratio of the chi-square value to degrees of freedom (2.67) indicates that the model, while implausible in its present form, may likely be improved via sensitivity analysis which focuses on the addition or deletion of specific indicators and/or parameters.

In addition to the poor fit of the data to the model, the major problems with the full model rest in: (a) the high levels of measurement error in the indicators, particularly the errors associated with x_4, x_5, x_7, x_8, x_9, x_{10},

Table 25

Estimates of Full Model Solution and Test (N=99)[a]

Indicator	unstand-ardized	(standard error)	stand-ardized	Unstandardized Error of Measurement: error	(std. error of error)
x_1	1.000[b]	(c)	.193	4.44	(c)
x_2	.144	(c)	-.028	1.44	(c)
x_3	.716	(c)	.138	1.41	(c)
x_4	-1.839	(c)	-.355	15.32	(c)
x_5	-1.795	(c)	-.347	11.42	(c)
x_6	10.618	(c)	2.050	7.22	(c)
x_7	18.271	(c)	3.527	17.35	(c)
x_8	10.570	(c)	2.041	14.47	(c)
x_9	7.842	(c)	1.514	17.85	(c)
x_{10}	13.236	(c)	2.555	10.03	(c)
x_{11}	13.727	(c)	2.650	8.31	(c)

[a]See Table 10 for the sample size of each indicator. This analysis is based on transformed scores for indicators x_6 to x_{11}, y_1 to y_{10}, y_{15}, y_{17} and y_{19} to y_{20}; see Table 10. For a glossary of the indicators, see Appendix I.

[b]This value is fixed to serve as a reference indicator.

[c]Due to the model's identification problem, standard errors could not be computed; see Chapter III.

Table 25 (cont'd)

Indicator	unstand-ardized	(standard error)	stand-ardized	Unstandardized Error of Measurement: error	(std. error of error)
y_1	.763	(c)	3.109	3.86	(c)
y_2	.658	(c)	2.683	19.63	(c)
y_3	.674	(c)	2.747	3.97	(c)
y_4	.772	(c)	3.149	10.34	(c)
y_5	.626	(c)	2.552	4.32	(c)
y_6	1.438	(c)	5.865	18.44	(c)
y_7	1.000[b]	(c)	4.078	22.27	(c)
y_8	.554	(c)	2.258	5.72	(c)
y_9	.523	(c)	2.132	9.92	(c)
y_{10}	.067	(c)	.275	57.86	(c)
y_{11}	-.082	(c)	-.333	3.12	(c)
y_{12}	.015	(c)	.061	1.20	(c)
y_{13}	1.000[b]	(c)	.473	62.33	(c)
y_{14}	-2.601	(c)	-1.230	4.74	(c)
y_{15}	-3.230	(c)	-1.527	6.02	(c)
y_{16}	.673	(c)	.318	1.58	(c)
y_{17}	-6.080	(c)	-2.874	3.90	(c)
y_{18}	1.000[b]	(c)	.207	1.15	(c)
y_{19}	-7.568	(c)	-1.564	-.17	(c)
y_{20}	-5.553	(c)	-1.147	7.80	(c)
y_{21}	1.314	(c)	.271	72.18	(c)

Table 25 (cont'd)

Path Coefficient[d]	Regression Coefficient unstandardized	(std. error)	standardized
$-\beta_{21}$	.088	(c)	.757
$-\beta_{31}$	.004	(c)	.080
$-\beta_{32}$	-.267	(c)	-.611
γ	17.142	(c)	.812

df = 457
χ^2 = 1222.35
probability level = .0000

[d] β_{ij} is the coefficient from η_j to η_i; γ is the coefficient from ξ to η_1.

Table 25 (cont'd)

Parameter	Estimate unstandardized	Estimate (std. error)	Estimate standardized
$\hat{\sigma}^2_{\zeta_1}$	5.677	(c)	.341
$\hat{\sigma}_{\zeta_1\zeta_2}$	.665	(c)	.345
$\hat{\sigma}^2_{\zeta_2}$	.212	(c)	.949
$\hat{\sigma}_{\zeta_1\zeta_3}$	.014	(c)	.017
$\hat{\sigma}_{\zeta_2\zeta_3}$	.040	(c)	.405
$\hat{\sigma}^2_{\zeta_3}$	.004	(c)	.104
ϕ^e	.037	(c)	1.000

$e_\phi = \hat{\sigma}^2_\xi$

y_2, y_4, y_6, y_7, y_{10}, y_{13}, and y_{21}; (b) the apparently inadmissible value for the variance of the measurement error of y_{19} (-.171); (c) the apparently inadmissible values for the standardized regression coefficients of λ_{x_6} to $\lambda_{x_{11}}$, λ_{y_1} to λ_{y_9}, $\lambda_{y_{14}}$, $\lambda_{y_{15}}$, $\lambda_{y_{17}}$, $\lambda_{y_{19}}$ and $\lambda_{y_{20}}$, which are all greater than $\pm$ 1.00; [10] and (d) the fact that the model may not be identified. More specifically, while the model meets the counting rule for identification, it may not meet all necessary and sufficient conditions for identification (see footnote 2). Substantively, this implies that we are unsure as to whether the data reported in Table 25 provide a <u>unique</u> solution, or simply one solution from a (possibly infinite) set of solutions which could be obtained, given the present model specification and variance-covariance matrix.[11]

Finally, while there are several problems with the overall model, the coefficients among the theoretic variables ξ, η_1, η_2 and η_3 (γ, β_{21}, β_{31} and β_{32}) were all in the expected (positive) direction, which <u>supports</u> the three hypotheses presented earlier.[12] However, these coefficients must be interpreted with extreme caution for three reasons. First, in light of the problems previously mentioned with the overall model, the extremely small unstandarized coefficients for β_{21} and β_{31} may be unstable. Second, the unstandardized and standardized coefficients provided by the LISREL® program for $-\beta_{21}$ and $-\beta_{31}$ were originally .088 and .004, respectively. The direction of these coefficients are interpreted by the author after analyzing the regression coefficients of the indicators of η_1, η_2 and η_3. As can be seen from Table 22, eleven of the twelve coefficients for the indicators of η_1 are positive, three of the five indicators of η_2 are negative, and two of the four coefficients of η_3 are negative. This mix of coefficients suggest that the coefficients which describe the effect of η_1 or η_2 and η_3 should be opposite in direction to that which is obtained from the computer print out. However, if the direction of the coefficients of η_1, η_2 and η_3 is an artifact of the identification or specification problems mentioned earlier, this "direction interpretation" procedure may be erroneous. Third, because of the identification problem, there was no way to "test" the theoretic model and verify the magnitude and/or direction of the beta and coefficients independent of the model (and all its associated problems).

<u>A Discussion of the Overall Results</u>

The primary purpose of the data analysis procedures was to test the theory presented in Chapter I. To accomplish this objective, the <u>theoretic model</u> generated on the basis of the text of the theory (Figure 1) was translated into a <u>operational</u> model via the creation of a set of indicators which served to operationalize each theoretic construct contained in the theoretic model. Table 10 simply described the summary statistics which characterized each indicator contained in the full model. The primary means by which these data were to be used was to test the model using a full information maximum likelihood (linear regression) estimation technique. This technique was selected primarily because it provided: (a) maximum likelihood estimates for the model parameters, and (b) a goodness of fit test which would evaluate the plausibility of the model. However, before this technique was employed, some of the sample data were transformed so as to meet certain statistical assumptions concerning the distribution of variables. The transformation and summary statistics for each indicator in the model are also reported in Table 10.

Prior to testing the model, the correlations both within and across theoretic constructs were examined. Tables 11-16 reported the correlations among the indicators of the model. An analysis of these correlations indicated that the initial expectation for these correlations to all be characterized by moderate to high significant coefficients was not upheld. More specifically, the analysis of the correlations revealed many correlations to be near zero and/or nonsignificant. Realizing that a multiple-indicator approach was being employed in the present research, it was suspected that these findings were a result of "zero-sum" relationship existing among some indicators of each theoretic construct, wherein increases in one indicator necessitates (or requires) decreases in another (much like increases in hours awake is associated with decreases in hours asleep). To assess this assumption, a series of confirmatory factor analyses were performed on the indicators of each theoretic construct.

Table 17-20 reports the results of the confirmatory factor analyses which were performed on the indicators of each theoretic construct. We interpret these results to indicate that there are specification errors in the model for each indicator. More specifically, the indicators of the theoretic variables have been erroneously combined into single factor structures. This finding is consistent across all four factor structures contained in the model. In hindsight, it appears that the attempt to use macro-level[13] theoretic constructs resulted in the selection of indicators which were unrelated to each other but which still may be considered an indicator of the underlying macro-level theoretic construct. To help clarify this problem, consider the following example concerning the variable of "health."

In one sense, a person's health may be assessed by examining his/her respiration rate, heart rate and skin coloring. However, when one is ill, the symptoms (indicators) of the illness may be uncorrelated with the above mentioned indicators of health. Consequently, to measure one's relative health, one cannot use a macro-level approach and simply combine indicators which only in <u>some</u> circumstances reflect variation in the underlying theoretic variable. Substantively, this implies that the theoretic constructs must be refined by: (a) creating multiple constructs to refer to the broad categories of stimuli which are now only represented by a single construct and (b) creating more precise measures of each construct.

To examine the relationship between the factor structures of each theoretic construct, a canonical correlation analysis was performed on the indicators of the model. Tables 21-24 report the results of the canonical correlation analysis. The major findings were: (1) two significant canonical correlations between the canonical variates of ξ and η_1, (2) two significant canonical correlations between the canonical variates of η_1 and η_2, (3) no significant canonical correlations between the canonical variates of η_1 and η_3, and (4) two significant canonical correlations between the canonical variates of η_2 and η_3. On the basis of the correlation analyses, it was concluded that: (1) the indicators of ξ were probably the indicators of two separate factor structures (one with x_1 to x_5; the second with x_6 to x_{11}); (2) the indicators of η_1 were probably the indicators of (at least) two separate factor structures (the "clearest" factor structure being the one which accounts for y_1 to y_9); (3) the indicators of η_2 were probably the indicators of (at least) two separate factor structures (but there were no clear means for determining which indicators should be combined); and (4) the indicators of η_3 were probably the indicators of two separate factor structures (with y_{18} to y_{20} loading on one, and y_{21} loading on the other). However, these conclusions were not empirically tested.

Even though there were serious specification errors in the model, it was decided to examine the maximum likelihood estimates of the overall model, and the overall fit of the data to the model. Table 25 reports the unstandardized and standardized coefficients, and the chi-square goodness of fit test statistics obtained from the LISREL® program. These results suggest three important conclusions. First, the model may not be identified. Consequently, the parameter estimates which were obtained may not be a unique solution. Second, in light of the identification problem, the overall fit of the data to the full model is fairly good. While the probability is .0000, the χ^2 value of 1222.35 with 457 degrees of freedom suggests that this model can very likely be respecified (via sensitivity analysis) so as to fit this set of data, and then retested using a new set of data. Finally, there were three hypotheses specified in Chapter I.

> Hypothesis One: the more ratio dominant the individual's processing style, the greater the relative complexity of the individual's cognitive structure.

> Hypotheses Two: the greater the relative complexity of the individual's information environment, the greater the relative complexity of the individual's cognitive structure.
>
> Hypotheses Three: the greater the relative complexity of the individual's information environment, the more likely the individual is to emply a ratio-dominant (processing) style.

An examination of the (interpreted) beta coefficients in the model show positive relationships between η_2, and η_3, η_1 and η_3, and η_1 and η_3, which supports Hypotheses 1, 2, and 3, respectively. Further, the coefficient between ξ and η_1 (γ) is also in the expected direction (see footnote 12).

In sum, while there were some problems with respect to model specification and identification, the three hypotheses postulated in Chapter I were supported by the results of the analytic procedures described in this chapter.

FOOTNOTES

[1]The following set of assumptions are the assumptions which must be met by a structural equation model to be estimated using a maximum likelihood estimation procedure. The reader is encouraged to compare this set of assumptions with the assumptions required by a least-squares procedure (e.g., see Nie et al., 1970).

[2]The present research employs a <u>multiple equation</u> model with unobserved variables. Models of this type require the additional assumption that the model meets the conditions of identification. For a discussion of these conditions for identification, see Goldberger, 1964, pp. 316-317.

[3]The formula for calculating the skew of a distribution of scores is given below:

$$\text{skewness} = \frac{\sum_{i}^{n} [(x_i - \bar{x})/s]^3}{n}$$

As the distribution of scores more closely approximates a gaussian distribution, the numerical value of the skew approaches zero. A negative numerical value indicates that most scores are greater than the mean, with some scores which are extremely smaller than the mean also in the distribution of scores. Conversely, a positive numerical value for the skew indicates that most scores are less than the mean, with some scores which are extremely larger than the mean also in the distribution of scores. Since the skew of a distribution reflects deviations from symmetry, it is a good indicator of the extent to which a measure is normally distributed about is mean. The values of $\pm$ 2.0 were arbitrarily selected by the author as an acceptable "confidence interval" to reflect normally distributed sample measures.

[4]It should be noted that the transformed skew values are not "optimum" values. That is, data analysis concerned with transforming the raw data stopped when an acceptable

skew value was obtained. A costlier method would have been to iterate to the value closest to zero for every measure.

[5]Due to the exploratory nature of the present research, many correlations which are near zero (e.g. $r_{x_9 x_{10}}=.018$) and/or nonsignificant are nonetheless discussed as being simply "low" correlations. While caution will be used when interpreting these correlations, the reader is alerted that this strategy will be employed throughout the correlation analysis.

[6]In this discussion, the term "direct relationship" will refer to a positive correlation among variables, while the term "inverse relationship" will refer to a negative correlation among variables.

[7]The term "absolute magnitude" refers to the absolute value ($|x|$) of the correlation coefficient (i.e., magnitude irrespective of direction).

[8]Briefly, the confirmatory factor analyses reported here require the following three key assumptions: (1) that the number of factors is correctly specified; (2) that the relations are linear and correctly specified, and (3) that the errors in measurement associated with the indicators of each factor are uncorrelated.

[9]For a good discussion of the results provided by LISREL® and how they are derived, see Jöreskog and Sörbom, 1978, pp. 13-15.

[10]For a brief discussion on the interpretation of standardized regression coefficients larger than $\pm$ 1.0, see Fink and Mabee (1978).

[11]For a discussion of identification problems of the present type, see Jöreskog and Sörbom, 1978, pp. 10-11.

[12]While no formal hypothesis was offered in Chapter I regarding the relationship between ξ and η_1, it was expected that increases in the value of the social structural indicators would be associated with increases in the relative complexity of the individual's information environment.

[13]The term "macro-level" (theoretic construct) is used here to refer to a very general theoretic construct. That is, a theoretic construct which defines a broad category of stimuli.

CHAPTER IV

CONCLUSION

The purpose of this chapter is to: (1) summarize the objectives, methodology and results of the present research, (2) review the problems which were encountered and discuss the limitations on interpreting the findings, and (3) suggest directions for future research.

Theoretic summary. Chapter I presented a theory of information processing which explained the process by which individual differences in cognitive structure occur. The theory focused on the relationships between four macro-level theoretic constructs: social structural factors, information environment, processing style, and cognitive structure. The theory contended that there were four key relationships among these variables that accounted for individual differences in cognitive structure. First, the theory explained how an individual's social structural background is related to the relative complexity of the individual's information environment. More specifically, it was argued that social structural factors (most notably parental socioeconomic status and the extent to which the individual's life style was conducive for development) served as the generating mechanism for exposure to an information environment which was characterized by varied interpersonal and media experiences. That is, as social structural factors increased, the greater the likelihood that the individual would interact with a wide array of media and other individuals who would convey information about a wide range of topics, from a variety of perspectives. Second, the theory explained how the relative complexity of the individual's information environment was related to the kind of information processing style the individual develops. Two distinct types of processing style were identified, nominal dominant and ratio dominant. A nominal dominant style was defined as a style in which an individual made categorical and/or polarized judgments of phenomena. That is, an individual who employes a nominal dominant style to define the phenomena of his/her experience tends to use a limited set of descriptors and/or tends to judge similar but non-identical stimuli as the same (i.e., stereotypes). Alternatively, a ratio-dominant processing style was defined as a style in which the individual makes extremely fine discriminations among phenomena. That is, an individual who employs a ratio dominant style tends to use a large array of descriptors to define the stimuli of his/her experience, and tends to articulate the differences between similar but non-identical stimuli. Given these two processing styles, the theory argued that as the relative complexity of the individual's information environment increased, the individual's tendency to employ a ratio-dominant processing style increased. The third and fourth key relationships expressed by the theory explained how the relative complexity of the individual's information environment, and the processing style the individual employs, are related to the relative complexity of the individual's cognitive structure. Very simply, the theory contended that there were direct (i.e., positive) relationships between: environmental complexity and cognitive complexity, and processing style and cognitive complexity. By "relative complexity of the individual's cognitive structure," we mean: (a) the number of independent dimensions the individual employs to define the stimuli of his/her experience, (b) the extent to which the individual arrays phenomena along these dimensions, and (c) the extent to which the individual establishes relationships among the phenomena defined along the dimensions. These three aspects of cognitive structure were defined as cognitive _differentiation_, _discrimination_, and _integration_, respectively.

The four key relationships outlined above were cast into the following model:

$$\begin{tikzcd} \xi \arrow[r] & \eta_1 \arrow[r] \arrow[d] & \eta_3 \\ & \eta_2 \arrow[ur] & \end{tikzcd}$$

where: ξ = social structural factors

η_1 = the relative complexity of the individual's information environment

η_2 = the individual's processing style

η_3 = the relative complexity of the individual's cognitive structure

From this model, three hypotheses which focused on the relationships among the endogenous variables were presented. These hypotheses are presented below:

> Hypothesis One: The more ratio dominant the individual's processing style, the greater the relative complexity of the individual's cognitive structure.
>
> Hypothesis Two: The greater the relative complexity of the individual's information environment, the greater the relative complexity of the individual's cognitive structure.
>
> Hypothesis Three: The greater the relative complexity of the individual's information environment, the more likely the individual is to employ a ratio-dominant (processing) style.

Methodological summary. To test the proposed theory of information processing and cognitive structure, a quasi-experimental research design was employed. First, each theoretic construct contained in the model was operationalized using ratio scaled items. Second, these items were pretested in June of 1980 using a sample of twenty-nine undergraduates enrolled in a communication course at Michigan State University. Third, using information obtained from the pretest, a final set of questionnaire items were developed. Fourth, because some of the items which were included in the final questionnaire concerned an event which was undergoing change, a second pretest was conducted in October of 1980 to insure that the items were properly selected. Fifth, the final questionnaire was administered to a sample of ninety-nine juniors and seniors enrolled in the Department of Communication at Michigan State University.

Appendix C contains the full questionnaire which was administered, while Appendix I contains the specific items which were used to operationalize each theoretic construct. As can be observed in Appendix I, for the exception of the one measure of cognitive structure derived from the Scott "Listing and Comparing" task, each theoretic construct was operationalized using ratio scaled items. The validity of these measures will be discussed later in terms of the validity of the overall model.

<u>Summary of findings</u>. A variety of analytic techniques were utilized to examine the data. The results of the data analysis allowed for the following conclusions to be drawn. First, the data yielded by many of the

ratio scaled items was positively skewed and required transformation to meet certain theoretical and statistical assumptions. Second, contrary to the expectation that all correlations among the indicators within each theoretic construct would be significant and reflect a single theoretic construct, many of these correlations were nonsignificant, and did not seem to reflect a single construct. This finding was particularly surprising for the relationship between the measures of cognitive structure derived from the MMDS instrument and the cognitive structure measure derived from the Scott "Listing and Comparing" task. Third, contrary to the expectation that all correlations among the indicators across each theoretic construct would be significant and moderate to high in absolute magnitude, many of these correlations were nonsignificant and/or near zero. Fourth, a canonical correlation analysis indicated that the indicators from the theoretic constructs were erroneously specified as single factor structures. That is to say, the indicators which were used for each theoretic construct were, in actuality, the indicators of several orthogonal constructs misspecified as the indicators of a single factor. Fifth, even though there were specification errors in the measurement model, a structural equation analysis yielded coefficients which tended to support each of the three hypotheses that were presented earlier. More specifically, a full information maximum likelihood estimation technique yielded positive coefficients for the paths between all theoretic constructs in the model. This finding supports the relationships proposed by the theory presented in Chapter I. Finally, a chi-square goodness of fit test indicated that while the overall fit of the data to the model was poor, an "improved" fit might be obtained via a sensitivity analysis of the factor structures.

Problems and Limitations

While it is always a humbling task, no research effort would be complete without a discussion of those aspects of the research which limit its interpretation and generalizability. Basically, our discussion here will focus on theoretic and methodological considerations. Further, while some of these considerations are offered in light of the results, others are concerned with issues which are not directly tied to the particular findings of the present research. Consequently, it will be left to the reader to interpret the following considerations vis-á-vis the findings.

Theoretic considerations. First, the theoretic constructs were not specified clearly enough to avoid the specification problems cited earlier with respect to the factor structures. Second, while four direct relationships were proposed among the theoretic constructs, no "threshold levels" were discussed. That is to say, the theory did not discuss the different "levels" of each theoretic construct such that one might determine when: (a) social structural factors would be conducive or non-conducive for development, (b) an information environment was simple or complex, (c) an individual's processing style was nominal dominant or ratio dominant, or (d) an individual's cognitive structure was simple or complex. While the specification of such "threshold levels" may not be theoretically necessary to account for differences in cognitive structure, future research should investigate this matter more thoroughly.

Methodological considerations. First, while two of the three endogenous variables were concerned with how individuals responded to ratio scaled items, due to the complexity of the questionnaire, no attempts were made to vary the presentation of items across respondents. Ideally, item presentation would have been manipulated to minimize the extent to which: (a) "training" on ratio scaled items presented early on in the questionnaire biased responses to ratio scaled items presented later on in the questionnaire, and (b) fatigue factors biased responses to particular items toward the end of the questionnaire.

Second, while the concepts concerning the Iranian hostage situation used in the MMDS and Scott portions of the instrument were pretested twice for stability, several dramatic events took place in Iran during the data collection period. Consequently, some of the variability in these measures may (in part) be a function of history rather than individual differences. Ideally, it would have been desirable to present "stable" concepts to the respondents, i.e., concepts whose meaning was "stable" across time. Third, because of scheduling problems, not all participants filled out the questionnaire under identical circumstances. Hence, while some participants completed the questionnaire independently (alone), others filled out the questionnaire in the presence of other participants. Further, there were differences in such "situational factors" as the date of administration, time of day, weather conditions, etc., which were beyond the control of the author. Ideally, these "situational factors" would be controlled so as to minimize their impact on participants' responses. Fourth, certainly a larger and more heterogeneous sample would serve to strengthen the internal and external validity of the present research. Fifth, this project basically employed a static design. Future research should consider the use of a time series design. Such a design would allow for: (a) an opportunity to examine the relative stability of the model's parameters, and (b) the capability of tracing the relationships among the theoretic constructs over time (i.e., the lifespan). Sixth, in the study a sensitivity analysis of the model, which would have informed us of the effect subtle changes in the specification of the model would have on the fit of the data to the model, was not performed.

In light of the findings and these theoretic and methodological considerations, several recommendations can be made for future research in this area of scientific inquiry. These recommendations, which range from additional analyses using the present data set to radical theoretic and methodological modifications, are detailed in the next section.

Directions for Future Research

As was mentioned earlier, a sensitivity analysis of the full model was not conducted. Given the findings yielded by the data analysis reported in Chapter III, it is apparent that such an analysis would be useful, particularly if it focused on the refinement of each factor structure proposed by the model. More specifically, the sensitivity analysis of the model should be focused on refining these factor structures in two ways. First, by the simple addition or deletion of indicators, and/or second, the respecification of each single factor structure as a multiple factor structure. An example of each of these modification suggestions for the full model would be to: (a) delete indicators y_{10}-y_{12} from η_1 and re-examine that factor structure using only y_1-y_9, and (b) respecify ξ as two factor structures, one which was reflected by indicators x_1-x_5, and a second which was reflected by indicators x_6-x_{11}. Using confirmatory factor analysis, these new factors may be inspected, and the relative improvement these modifications provide may be examined.[1]

Once each factor structure had been improved, additional sensitivity analyses could be conducted to examine how well a set of sample data fit various portions of the model (as well as the entire model). In this form of sensitivity analysis, key theoretic assumptions concerning: (a) the causal paths specified in the model, and (b) the correlation among errors of prediction can be re-examined. For example, in the present model, the analyses indicate a very low path coefficient between η_1 and η_3, and no significant path from η_1 to η_3. Certainly, a sensitivity analysis should be conducted to see if the effect of η_1 on η_3 is indirect (i.e., channeled through η_2) rather than direct. An additional analysis which would be interesting to perform would be to examine the effect of simply deleting η_3 from the model. That is to say, instead of attempting to derive measures of cognitive structure from information processing tasks, it may be worthwhile to simply more carefully scrutinize the processing style data, and to consider processing style as the "ultimate" dependent measure. While such a strategy diverts attention from the development of a model which represents internal (cognitive) organization, it does place emphasis on the development of a model which can predict individual performance, which is a central concern of many cognitive theorists.

Beyond the sensitivity analysis prescribed above, attempts should be made to employ a time series design which uses larger sample sizes and a more heterogeneous sample of respondents. Three important advantages would result from the adoption of this procedure. First, the generalizability of any findings which were obtained would be greater. Second, the stability of model parameters could be better assessed. Third, changes in the key theoretic constructs may be examined over the lifespan, and more sophisticated "lagged" models may be developed. While the first two advantages are extremely desirable when describing <u>any</u> process, the third advantage may be the most important. This is because theoretical advancement in the area of cognitive development will most likely require a greater understanding of how: (1) social structural factors during one stage of the lifespan influence exposure patterns to information environments during the later stages of the lifespan; (2) exposure patterns to information environments during early stages of lifespan influence exposure patterns to information environments during later stages of the lifespan; and (3) how processing style during early cognitive development influences processing style during later stages of the lifespan. These "over-time" considerations can only be examined through the utilization of time series designs.[2]

Finally, future research efforts will have to concentrate on the development of more precise measures for each theoretic construct. For example, future measures of information environment should be developed so as to better assess: (1) aspects of the individual's interpersonal and media experiences, and (2) the individual's perception of these interpersonal and media experiences. Further, with respect to the theoretic construct of processing style, future work should focus on operationalizing this construct so as to better assess the individual's capability to make judgments among phenomena, both within and across domains of experience. Finally, it appears that a major problem with research concerning cognitive structure is the lack of an adequate processing task which can be used to assess general processing capabilities. While it is unclear whether or not such a task can even be developed, new efforts might attempt to create tasks which assess a wider array of processing skills. For example, future research might focus on the development of a processing task which assessed "matrix thinking" capabilities, i.e., which assessed the individual's capability to consider _n_ factors simultaneously when making a decision (or judgment). If successful, such a "matrix" task might later be expanded to include the presentation of _n_ factors which have varying probabilities of occurrence (or success). Nonetheless, because measures of cognitive structure are derived from processing tasks, any improvement in the operationalization of processing style would most likely be associated with improvements in the operationalization of cognitive structure.[3] That is to say, with more varied processing tasks, new capabilities to develop better measures of differentiation, discrimination, and integration are likely to follow.[4]

Dissertation Summary

The present research developed a theory of information processing and cognitive structure which explained how social-structural factors influence exposure patterns to an information environment, exposure patterns to information environment influence processing style development, and how environmental exposure and processing style influence an individual's cognitive structure. A structural equation model and three formal hypotheses were generated from the theory, and submitted to a variety of analyses. The results of the data analysis indicated that, while there were specification errors in the proposed model, the three hypotheses were supported. The dissertation then concluded with a discussion of the problems and limitations of the present research effort, and suggestions for the direction of future research.

FOOTNOTES

[1] See Jöreskog (1974) and Jöreskog and Sörbom (1978) for a discussion of how the chi-square goodness of fit test can be interpreted to judge the extent to which modified models "fit" better than previous models.

[2] Further, the use of interactive software can greatly enhance the utility of a time series design, by providing the opportunity to: (1) be more flexible with respect to administration (of questionnaire) procedures, and (2) better control the effects of history and item presentation bias.

[3] See Woelfel and Fink (1980) for a discussion on the close relationship between fundamental and derived measures.

[4] Additional research which will examine the relationship between ACT test scores, SAT test scores and cognitive structure was proposed here but not performed. Future research would examine these relationships.

APPENDIX A

The Pre-Test Instrument

APPENDIX A

The Pre-Test Instrument

Dear Participant, please consider each of the following questions carefully and respond thoughtfully.

(1) List the two most important news events of the past year. Try to select events about which most persons have a large amount of information and a firm opinion.

(1) ______________________________

(2) ______________________________

(2) For the first news event listed above, free-associate and list as many words or phrases as possible which you feel are related to (or describe) this news event. Then, in a paragraph or two, state your opinion of the news event.

(3) For the second news event listed on page one, free-associate and list as many words or phrases as possible which you feel are related to (or describe) this news event. Then, in a paragraph or two, state your opinion of the news event.

(4) On the next page you will find a list of 21 emotions. Consider the entire list of emotions and pick out some which are alike in an important way. Write their line numbers in the left-hand box and, at the bottom of the box, write whatever it is that the emotions in that group have in common--that is, why you put them together. Then, in the right-hand box, write the line numbers of any emotions on the list that are clearly different from the first group in this respect. That is, include in the right-hand box emotions which do not possess the characteristic written at the bottom of the left-hand box. It is not necessary to include all emotions on the list in either box. If a particular emotion cannot be evaluated on this characteristic, omit it from both boxes.

LINE NUMBERS OF ALL SIMILAR EMOTIONS (ON THIS CHARACTERISTIC) CHARACTERISTIC:	LINE NUMBERS OF EMOTIONS WHICH DIFFER IN THIS RESPECT FROM THE GROUP ON THE LEFT

Here are the emotions you are to consider:

(1) ACTIVE
(2) ANGER
(3) ANXIETY
(4) BAD
(5) DEPRESSION
(6) ENVY
(7) EXCITEMENT
(8) FEAR
(9) GOOD
(10) GUILT
(11) HAPPINESS
(12) HATE
(13) INDIFFERENCE
(14) JEALOUSY
(15) JOY
(16) LOVE
(17) PASSIVE
(18) SADNESS
(19) SELFISH
(20) STRONG
(21) WEAK

CHARACTERISTIC:	

On the following pages are more pairs of boxes. Consider the entire list of emotions again and pick out another group which are alike in an important way. Write their line numbers in the left-hand box, and at the bottom, write in the characteristic they have in common. Then, in the right-hand box, write the line numbers of the emotions which clearly differ in this respect from the left hand group. Continue this process, using as many boxes as you need to make groups of emotions which are similar in an important way. Any particular emotion may be included in more than one group if you wish.

Note: Nine of these pages appeared in the questionnaire

CHARACTERISTIC:	

CHARACTERISTIC:	

CHARACTERISTIC:	

CHARACTERISTIC:	

(5) Below you will find a list of words that are paired together. What we would like you to do is tell us how different each word is from the other word using a number. For example, if you think two words are very similar in meaning to each other, or are closely associated with each other, then you would report a small number. On the other hand, if you think the two words are very different in meaning from each other, or are hardly related at all, then you would report a very large number.

REMEMBER, SMALL NUMBERS INDICATE SIMILARITY AND LARGE NUMBERS REFLECT DIFFERENCES. ZERO WOULD MEAN THAT THERE IS NO DIFFERENCE IN MEANING BETWEEN THE TWO WORDS. YOU MAY USE ANY NUMBER YOU WISH.

To help you make these judgments of similarity and difference, consider the following example. Think about the words

NEW TECHNOLOGY and SCIENTIFIC RESEARCH

OBVIOUSLY, these words are somewhat related, but they clearly do not mean the same thing, so lets assume the number 100 is a number which reflects the difference between these two words. That is to say, the difference between NEW TECHNOLOGY and SCIENTIFIC RESEARCH is 100 units. Try to keep this simple example in mind when making your judgments about the other pairs of words. In review, the important things to remember are:

(a) small numbers indicate similarity, large numbers reflect differences,

(b) you may use any number you wish, and

(c) the difference between NEW TECHNOLOGY and SCIENTIFIC RESEARCH is 100 units.

WHAT IS THE DIFFERENCE BETWEEN

NEW TECHNOLOGY and MONEY WELL SPENT	______
NEW TECHNOLOGY and INDUSTRY IN SPACE	______
NEW TECHNOLOGY and COLONIES IN SPACE	______
NEW TECHNOLOGY and SCIENTIFIC RESEARCH	______
NEW TECHNOLOGY and EXPLORING SPACE	______
NEW TECHNOLOGY and NATIONAL DEFENSE	______
NEW TECHNOLOGY and NATIONAL PRESTIGE	______
NEW TECHNOLOGY and YOU	______

WHAT IS THE DIFFERENCE BETWEEN

MONEY WELL SPENT and INDUSTRY IN SPACE ________
MONEY WELL SPENT and COLONIES IN SPACE ________
MONEY WELL SPENT and SCIENTIFIC RESEARCH ________
MONEY WELL SPENT and EXPLORING SPACE ________
MONEY WELL SPENT and NATIONAL DEFENSE ________
MONEY WELL SPENT and NATIONAL PRESTIGE ________
MONEY WELL SPENT and YOU

WHAT IS THE DIFFERENCE BETWEEN

INDUSTRY IN SPACE and COLONIES IN SPACE ________
INDUSTRY IN SPACE and SCIENTIFIC RESEARCH ________
INDUSTRY IN SPACE and EXPLORING SPACE ________
INDUSTRY IN SPACE and NATIONAL DEFENSE ________
INDUSTRY IN SPACE and NATIONAL PRESTIGE ________
INDUSTRY IN SPACE and YOU ________

WHAT IS THE DIFFERENCE BETWEEN

COLONIES IN SPACE and SCIENTIFIC RESEARCH ________
COLONIES IN SPACE and EXPLORING SPACE ________
COLONIES IN SPACE and NATIONAL DEFENSE ________
COLONIES IN SPACE and NATIONAL PRESTIGE ________
COLONIES IN SPACE and YOU ________

WHAT IS THE DIFFERENCE BETWEEN

SCIENTIFIC RESEARCH and EXPLORING SPACE ________
SCIENTIFIC RESEARCH and NATIONAL DEFENSE ________
SCIENTIFIC RESEARCH and NATIONAL PRESTIGE ________
SCIENTIFIC RESEARCH and YOU ________

WHAT IS THE DIFFERENCE BETWEEN

EXPLORING SPACE and NATIONAL DEFENSE ________
EXPLORING SPACE and NATIONAL PRESTIGE ________
EXPLORING SPACE and YOU ________

WHAT IS THE DIFFERENCE BETWEEN

NATIONAL DEFENSE and NATIONAL PRESTIGE	______
NATIONAL DEFENSE and YOU	______
NATIONAL PRESTIGE and YOU	______

(6) This part of the survey asks for some information about you.

(a) SEX: MALE_____ FEMALE_____
(b) BIRTHDATE:____________________

(c) MAJOR:____________________
(d) GPA:____________________
(e) CLASS:____________________

(f) NUMBER OF PERSONS IN YOUR FAMILY:____________
(g) APPROXIMATE FAMILY INCOME:____________per year
(h) FATHER'S OCCUPATION:____________________
(i) MOTHER'S OCCUPATION:____________________
(j) YOUR OCCUPATION: NOW____________PLANNED__________
(k) YOUR RACE:____________________

(l) HOW MANY HOURS OF TV DO YOU WATCH PER WEEK:_______
(m) HOW MANY HOURS PER WEEK DO YOU SPEND LISTENING TO THE RADIO AND TO RECORDS:__________
(n) HOW MANY HOURS PER WEEK DO YOU SPEND READING A NEWSPAPER OR NEWS MAGAZINE:____________________

(o) DO YOU WATCH THE NATIONAL NEWS ON TV: YES___NO___
(p) HOW MANY CLOSE FRIENDS DO YOU SPEND TIME WITH ON A REGULAR BASIS____________________
(q) ABOUT HOW MANY HOURS A WEEK DO YOU SPEND CONVERSING WITH YOUR CLOSE FRIENDS:__________
(r) ABOUT HOW MANY HOURS A WEEK DO YOU SPEND STUDYING:____________________

(s) If 10 represents the amount of understanding the average person has about emotions, what number best reflects your understanding of emotions (Remember 10 is average).

______

(t) If 10 represents the amount of information the average person has about scientific development in space, what number best reflects your understanding of this topic (Remember 10 is average).

______

(u) If 10 represents the amount of diversity in the average person's life, how diverse have your experiences been thus far (Remember 10 is average).

____

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS SURVEY. IF YOU HAVE ANY COMMENTS ABOUT THE TASKS YOU HAVE JUST COMPLETED, PLEASE FEEL FREE TO WRITE THEM DOWN BELOW. WE ARE PARTICULARLY INTERESTED IN THOSE COMMENTS WHICH DETAIL DIFFICULT OR TROUBLESOME SECTIONS, AND WHICH SUGGEST WAYS TO IMPROVE SURVEY TECHNIQUES. THANKS AGAIN FOR YOUR HELP.

APPENDIX B

Concept Categories and Terms Extracted From the Pre-Test Instrument which were Concerned with the United States - Iranian Hostage Situation (N=29)

APPENDIX B

Concept Categories and Terms Extracted From the Pre-Test Instrument which were Concerned with the United States - Iranian Hostage Situation (N=29)

Concept Category	Terms	Frequency of Occurrence
Iran	*	(44)
	Iran	14
	Iranians	5
	Iranian Crisis	3
	Iran Crisis	3
	Iranian Situation	2
	Tehran	2
	This Issue	1
	This Situation	2
	Crisis in Iran	1
	Iran Situation	1
	Crisis	1
	Tehranian Situation	1
	Their Government	1
	This Event	1
	This Subject	1
	Problems in Iran	1
	The Situation in Iran	1
	The Issue	1
	The Problem	1
	Iranian Government	1
United States	*	(25)
	US	11
	Americans	5
	American Government	1
	The Country	1
	America	1
	Lack of Patriotism	1
	Administrations	1
	USA	1
	US Image	1
	Renewed American Patriotism	1
	Cultural Identification	1
Hostages	*	(58)
	Hostages	21
	Embassy	4
	Hostages in Iran	4
	American Hostages	2
	Captured the Embassy	2
	Hostage Situation in Iran	2
	The Hostage Situation	2

Concept Category	Terms	Frequency of Occurrence
Hostages (cont'd.)	Our People	1
	Day of Hostage Captivity	1
	American Personnel	1
	Captured the Embassy in Tehran	1
	Seized the US Embassy	1
	Seized	1
	Seizure of Our Embassy in Iran	1
	Overthrow of the Embassy	1
	50 American Hostages	1
	60 American Hostages	1
	Take the Hostages	1
	Captives	1
	All of Its [Embassy] Officials	1
	Hostage Crisis	1
	Iranian Hostage Crisis	1
	Hold 53 People Hostage	1
	Capture of Americans in Iran	1
	Iran Hostages	1
	Prisoners of Iran	1
	Held Captive	1
	Holding the Hostages in Tehran	1
Khomeini	*	(14)
	Khomeini	6
	Ayatollah Khomeini	4
	Ayatollah	4
Carter	*	(19)
	Carter	17
	President Carter	2
Shah	*	(15)
	Shah	12
	Shah of Iran	3
Militants	*	(23)
	Militants	8
	Students	7
	Small Band of Terrorists	1
	Terrorism	1
	Terrorists	1
	Captors	1
	Fanatics	1
	Mobs	1

Concept Category	Terms	Frequency of Occurrence
Militants (cont'd.)	Rebels	1
	Revolutionary Council	1
Economic Sanctions	*	(15)
	Blackmail	3
	Oil	3
	Economic Sanctions	1
	Embargo	1
	Punish Them	1
	Boycott	1
	Economic	1
	Business Related	1
	Sanctions	1
	Iranian Oil	1
	American Concern for Oil	1
Military Intervention	*	(43)
	Rescue Attempt	4
	Rescue	3
	Rescue Mission	2
	Shouldn't Have Failed	2
	War	2
	Military	2
	Draft	2
	Helicopters	2
	Invasion	1
	Drop an Atom Bomb on Iran	1
	Endangering Lives	1
	Ill Fated Rescue Attempt	1
	Should Have Tried to Move in Right Away	1
	Plan to Rescue Prisoners	1
	Rescue Mission Failed	1
	Misson Failed	1
	Surprise Rescue Mission	1
	Rescue Failed	1
	Failure	1
	8 Men Lost Their Lives	1
	Daring	1
	Technical Mishap in Machinery	1
	It was Necessary	1
	Not Carefully Planned	1
	Kill Them	1
	Killing	1
	Go to War	1

Concept Category	Terms	Frequency of Occurrence
Military Intervention (cont'd.)	The Navy	1
	Major Power	1
	Revolution	1
	[Men] Can be Taken Anytime	1
	Nice Safe Little World	1
Media Coverage	*	(31)
	Media	7
	News	3
	News Coverage	2
	Coverage	2
	Media Event	1
	Mediazed	1
	Media Coverage	1
	News Event	1
	Read or Hear	1
	Inform	1
	Covered Well	1
	Newspaper	1
	Publicity	1
	Facts	1
	Display	1
	Walter Cronkite	1
	Hush it Up	1
	Not so Much B.S.	1
	Should Have Been Played Down	1
	Over Carried Away	1
	Losing Importance	1
Diplomacy	*	(66)
	Should Have Taken a Firm Stand	1
	Situation Calls for Immediacy	1
	Release	1
	Let Our People Go	1
	Issues	1
	Should Have Been Taken Care of Some Time Ago	1
	Help the Prisoners	1
	Something has to be Done	1
	We May Have Been at Fault	1
	Internal Affairs	1
	Lack Communication	1
	Don't Know What I'd Do	1
	Games Countries Play	1

Concept Category	Terms	Frequency of Occurrence
Diplomacy (cont'd.)	Too Many Things to Consider	1
	Hard to State the Actual Events	1
	In a Position it [Us] Has Never Had	1
	To Face Before	1
	They [Iranians] Should do Their Share	1
	Two Children Fighting over Dolls	1
	Something Must be Done	1
	A Test	1
	Precautious Measures	1
	No Answers or Solutions to the Problem	1
	Not Sure of Best Solution	1
	We Seem in no Hurry to Get Our Citizens Back	1
	No Control Over Situation by Either Country	1
	142 (etc.) Days	1
	So Many Months	1
	Fed Up with the Whole Crisis Deal	1
	Carried on too Long	1
	Gone too Far	1
	Sick and Tired of Hearing How Many Days Have Passed	1
	They Have to be Held Accountable for What They've Done	1
	Passive Point of View	1
	Protest	1
	Don't Know a Lot About it	1
	Don't Really Have a Firm Opinion	1
	Many Wrongs in Foreign Policy	1
	Should Come to an End	1
	We Need to Take Action	1
	Try to Stop it	
	Should be Remedied as Soon as Possible	1
	Have to Pull Together Behind Leaders	1
	Supports Actions	1
	Wish They were Free	1
	Gone on too Long	1
	Long Term	1

Concept Category	Terms	Frequency of Occurrence
Diplomacy (cont'd.)	Drawn Out	1
	Long	1
	No Progress	1
	Government Moving Slow	1
	Power Hungry	1
	Political Unrest	1
	No Reason Being in Power	1
	Hamper US Relations with Russia	1
	An Issue That Affects More Than Iran and the Hostages	1
	Set Off a Fuse That the World Better Put Out Before its the Cause of a Big Blow Up	1
	The Front of US Foreign Policy	1
	Not Doing the Job	1
	Don't Like Actions	1
	UN Judicial Body	1
	Criticized by Many	1
	Mishandled	1
	Mishandling	1
	Careless	1
	Inept	1
Irrational	*	(26)
	Stupid	3
	Wrong	2
	Irrational	1
	No Valid Reason	1
	Unreasonable	1
	Mistake	1
	Sad When You Think About it	1
	Foolish	1
	Uncouth	1
	Foolish Reaction	1
	Don't Feel it Was Right	1
	Not Justified	1
	Justified	1
	Unjust	1
	Unfair	1
	Violation of International Law	1
	Unlawful	1
	Outside of Law	1
	At Fault	1
	The Way They Went About it	1
	Wrong Approach	1

Concept Category	Terms	Frequency of Occurrence
Irrational (cont'd.)	Thought These Kind of Things Don't Happen	1
	Two Wrongs Don't Justify a Right	1
Weakness	*	(9)
	Weakness	1
	Feel Helpless	1
	Helplessness	1
	Feeling of Helplessness	1
	Vulnerability	1
	Seems to Show Weakness in Government	1
	Felt Terrible Weakness	1
	US Looks Weak	1
	Humbled	1
Hostile	*	(10)
	Anger	1
	Hostility	1
	Intense Feelings on Both Sides	1
	Upset	1
	Outraged	1
	Outrage	2
	Humiliated	1
	Hatred	1
	Disgusted by the Situation	1
Religion	*	(5)
	Religion	3
	Religious Freak	1
	Tradition	1
Other	*	(56)
	Empathetic Toward Captives	1
	Sad	2
	Too Bad	2
	Interdependence	1
	Brainwashing	1
	Bigotry	2
	Spies	1
	Tried as Spies	1
	Olympics	2

Concept Category	Terms	Frequency of Occurrence
Other (cont'd.)	Vacillating	2
	Fear	1
	Disgrace	1
	Rage and Terror	1
	Support	1
	My Fiance	2
	Loud	1
	Liberal	1
	Refugees	1
	Foreigners	2
	Out of Their Hair	1
	Other Countries	1
	Canada	1
	USSR	1
	Bani-Sadar	1
	Ghotzbadeh	1
	Families	4
	Empathetic	1
	Physical and Mental Stress	1
	Russia	1
	Afghanistan	1
	Despair	1
	Horrifying	1
	Shameful	1
	Shocking	1
	Shocked by the Event	1
	Confusion	1
	Torment	1
	Suffering	1
	Devastating	2
	Tragedy	1
	Hits the Heart	1
	Pity	1
	Empathy	1
	Dismay	1
	Deport	1

APPENDIX C

The Final Instrument

APPENDIX C

The Final Instrument

THE

IPACS

PROJECT

A STUDY OF INFORMATION PROCESSING AND COGNITIVE STRUCTURE

STUDENT NUMBER:______________________

DATE:________________________________

TIME STARTED:________________________

TIME ENDED:__________________________

MESSAGE TO THE PARTICIPANT:

THANK YOU FOR VOLUNTEERING TO PARTICIPATE IN THIS STUDY. ON THE FOLLOWING PAGES YOU WILL FIND A SERIES OF QUESTIONS WHICH ASK YOU TO TELL US ABOUT YOUR BACKGROUND, AND HOW YOU PERCEIVE CERTAIN THINGS. PLEASE READ ALL INSTRUCTIONS BEFORE YOU BEGIN A NEW SECTION, AND PLEASE CONSIDER EACH QUESTION CAREFULLY. WHILE IT IS TRUE THAT THERE IS NO SUCH THING AS A "RIGHT" OR "WRONG" ANSWER WHEN IT COMES TO PUBLIC OPINION, THE MORE ACCURATELY YOU TRY TO ANSWER, THE MORE LIKELY THE RESULT OF YOUR EFFORTS WILL BE USEFUL. IF YOU HAVE ANY QUESTIONS ABOUT HOW TO FILL OUT ANY OF THE ITEMS ON THE QUESTIONNAIRE, CONSULT THE RESEARCH ASSISTANTS; THEY WILL BE GLAD TO HELP. PLEASE ANSWER ALL QUESTIONS; DO NOT LEAVE ANY ITEMS BLANK.

THANK YOU

SECTION I

INSTRUCTIONS: THE ITEMS IN THIS SECTION ARE DESIGNED TO GATHER INFORMATION ABOUT YOUR BACKGROUND. PLEASE TRY TO ANSWER ALL ITEMS AS ACCURATELY AS POSSIBLE.

(1) SEX: MALE_____ FEMALE_____

(2) BIRTHDATE: ________/________/________
month day year

(3) BIRTHPLACE: ____________________/____________/____________
city state country

(4) CITY WHERE YOU SPENT <u>MOST</u> OF <u>YOUR</u> LIFE: ____________________/____________/____________
city state country

(5) CITY WHERE YOU WENT TO <u>HIGH</u> <u>SCHOOL</u>: ____________________/____________/____________
city state country

(6) WHEN YOU WERE GROWING UP, WHAT WAS THE AVERAGE YEARLY INCOME YOUR FAMILY LIVED ON?

$_______________ / YR (estimate in 1980 dollars)

(7) FATHER'S OCCUPATION? (WHAT HE DOES/DID, NOT WHERE HE WORKS)

____

(8) MOTHER'S OCCUPATION? (WHAT SHE DOES/DID, NOT WHERE SHE WORKS)

____

(9) WHAT IS THE HIGHEST GRADE OR YEAR IN SCHOOL THAT YOUR <u>FATHER</u> COMPLETED?

____

(10) WHAT IS THE HIGHEST GRADE OR YEAR IN SCHOOL THAT YOUR <u>MOTHER</u> COMPLETED?

____

(11) WHAT IS YOUR RELIGION?

____

(12) DURING THE LAST YEAR, HOW MANY TIMES HAVE YOU GONE TO A PLACE OF WORSHIP?

____

(13) DURING THE LAST YEAR, HOW MANY RELIGIOUS HOLIDAYS HAVE YOU OBSERVED?

____

(14) WHAT IS YOUR RACE?

____

(15) DURING THE LAST YEAR, HOW MANY TIMES DID YOU OBSERVE OR PARTICIPATE IN EVENTS RELATED TO YOUR ETHNIC BACKGROUND?

____

(16) INCLUDING YOUR PARENTS, HOW MANY <u>PEOPLE</u> ARE IN YOUR FAMILY?

____

(17) INCLUDING YOURSELF, HOW MANY <u>CHILDREN</u> ARE IN YOUR FAMILY?

____

(18) CONSIDERING THE OLDEST CHILD IN YOUR FAMILY AS NUMBER ONE, AND THE SECOND OLDEST CHILD IN YOUR FAMILY AS NUMBER TWO, ETC., WHAT NUMBER CHILD ARE YOU?

____

(19) ARE YOU A TWIN OR A TRIPLET?

____________TWIN

____________TRIPLET

____________NEITHER A TWIN NOR A TRIPLET

(20) HOW MANY BROTHERS DO YOU HAVE?

____

(21) HOW MANY OF YOUR BROTHERS ARE STEP-BROTHERS?

____

(22) HOW MANY SISTERS DO YOU HAVE?

____

(23) HOW MANY OF YOUR SISTERS ARE STEP-SISTERS?

____

(24) HOW MANY OF YOUR BROTHERS AND/OR STEP-BROTHERS ARE OLDER THAN YOU?

____

(25) HOW MANY OF YOUR SISTERS AND/OR STEP-SISTERS ARE OLDER THAN YOU?

____

(26) HOW MANY OF YOUR BROTHERS AND/OR STEP-BROTHERS ARE YOUNGER THAN YOU?

____

(27) HOW MANY OF YOUR SISTERS AND/OR STEP-SISTERS ARE YOUNGER THAN YOU?

____

(28) IN ADDITION TO YOUR PARENTS, YOURSELF, AND YOUR BROTHERS AND SISTERS, HOW MANY OTHER RELATIVES LIVED WITH YOU WHEN YOU WERE GROWING UP?

____

(29) WITHIN YOUR IMMEDIATE FAMILY, HOW MANY PERSONS HAVE ANY KIND OF A HANDICAP THAT REQUIRES SPECIAL ATTENTION OR CARE?

____

(30) WHEN YOU WERE GRADUATED FROM HIGH SCHOOL, APPROXIMATELY WHAT WAS YOUR GRADE POINT AVERAGE? (PLEASE EXPRESS YOUR GRADE POINT AVERAGE USING THE MSU GRADING SYSTEM.)

____

(31) IF THE PERSON WITH THE HIGHEST GRADE POINT AVERAGE RANKED IN THE 99th PERCENTILE, AND THE PERSON WITH THE LOWEST GRADE POINT RANKED IN THE 0 th PERCENTILE, WHAT WAS YOUR PERCENTILE RANK IN HIGH SCHOOL?

______________%tile

(32) WHAT IS YOUR CURRENT MSU GRADE POINT AVERAGE?

____

(33) WHAT IS YOUR CURRENT CLASS STANDING?

__________FRESHMAN

__________SOPHOMORE

__________JUNIOR

__________SENIOR

(35) INDICATE HOW MANY COLLEGE COURSES YOU HAVE TAKEN IN THE AREAS LISTED BELOW:*

AREA	NUMBER OF COURSES TAKEN
COURSES WHERE YOU LEARN ABOUT AND ACQUIRE LANGUAGE SKILLS	__________
COURSES WHERE YOU LEARN ABOUT AND ACQUIRE MATHEMATICAL SKILLS	__________
COURSES WHERE YOU LEARN ABOUT AND ACQUIRE READING SKILLS	__________
COURSES WHERE YOU LEARN ABOUT AND ACQUIRE SOCIAL SCIENCE SKILLS	__________
COURSES WHERE YOU LEARN ABOUT AND ACQUIRE PHYSICAL SCIENCE SKILLS	__________

*A COURSE MAY BE USED IN MORE THAN ONE CATEGORY

SECTION II

INSTRUCTIONS: THE ITEMS IN THIS SECTION ARE DESIGNED TO GATHER INFORMATION ABOUT YOUR FAMILY'S LIFESTYLE, YOUR LIFESTYLE WHEN YOU WERE GROWING UP, AND YOUR CURRENT LIFESTYLE.

EACH QUESTION WILL FIRST DESCRIBE A PARTICULAR LIFESTYLE, AND THEN ASK YOU TO ESTIMATE YOUR EXPERIENCES AS COMPARED TO THE AVERAGE PERSON'S EXPERIENCE.

FOR OUR PURPOSES HERE, THE NUMBER 100 WILL DESCRIBE THE AVERAGE PERSON'S EXPERIENCE WITH THE PARTICULAR LIFESTYLE, AND THE NUMBER 0 WILL MEAN THAT THE PARTICULAR LIFESTYLE WAS NOT EXPERIENCED AT ALL. YOU MAY USE ANY NON-NEGATIVE NUMBER YOU WISH TO DESCRIBE YOUR OWN EXPERIENCES. ALL WE ASK IS THAT YOU MAKE YOUR ESTIMATES CAREFULLY.

REMEMBER, 0 MEANS NOT AT ALL, AND 100 IS THE AVERAGE PERSON'S EXPERIENCE.

IF YOUR EXPERIENCES ARE TWICE THAT OF THE AVERAGE PERSON'S, YOU WOULD WRITE 200 (because 2 X 100 = 200). ON THE OTHER HAND, IF YOUR EXPERIENCES ARE ONLY HALF THAT OF THE AVERAGE PERSON'S, THEN YOU WOULD WRITE 50 (because 1/2 of 100 = 50).

AGAIN, YOU MAY USE ANY NUMBER YOU WISH. PLEASE CONSIDER EACH QUESTION CAREFULLY, AND ANSWER EACH ITEM AS ACCURATELY AS POSSIBLE.

(36) AN ACTIVE LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL DOES ENERGETIC, ANIMATED, AND LIVELY THINGS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW ACTIVE WERE YOU WHEN YOU WERE GROWING UP? ____________

HOW ACTIVE WAS YOUR FAMILY WHEN YOU WERE GROWING UP? ____________

HOW ACTIVE ARE YOU NOW? ____________

(37) A SPATIALLY ORGANIZED LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL'S LIVING SPACE IS COORDINATED, TIDY, AND WELL ARRANGED. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW SPATIALLY ORGANIZED WERE YOU WHEN YOU WERE GROWING UP? __________

HOW SPATIALLY ORGANIZED WAS YOUR FAMILY? __________

HOW SPATIALLY ORGANIZED ARE YOU NOW? __________

(38) A TEMPORALLY ORGANIZED LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL IS PUNCTUAL, METHODICAL, AND RHYTHMIC IN HIS/HER BEHAVIORS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW TEMPORALLY ORGANIZED WERE YOU WHEN YOU WERE GROWING UP? __________

HOW TEMPORALLY ORGANIZED WAS YOUR FAMILY WHEN YOU WERE GROWING UP? __________

HOW TEMPORALLY ORGANIZED ARE YOU NOW? __________

(39) A STIMULATING LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL CAN LEARN AND SATISFY HIS/HER CURIOSITY. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW STIMULATED WERE YOU WHEN YOU WERE GROWING UP? __________

HOW STIMULATED WAS YOUR FAMILY WHEN YOU WERE GROWING UP? __________

HOW STIMULATED ARE YOU NOW __________

(40) A SOCIALLY RESPONSIVE LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL'S BEHAVIORS ARE ACKNOWLEDGED AND RESPONDED TO BY OTHERS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW SOCIALLY RESPONSIVE WAS YOUR LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW SOCIALLY RESPONSIVE WAS YOUR FAMILY"S LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW SOCIALLY RESPONSIVE IS YOUR LIFESTYLE NOW? ____________

(41) A DIVERSE LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL DOES THINGS WHICH ARE VARIED, AND UNUSUAL. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW DIVERSE WAS YOUR LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW DIVERSE WAS YOUR FAMILY'S LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW DIVERSE IS YOUR LIFESTYLE NOW? ____________

(42) AN INDEPENDENT LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL IS SELF-DIRECTED, AUTONOMOUS, AND FREE TO DO WHATEVER HE/SHE LIKES. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW INDEPENDENT WERE YOU WHEN YOU WERE GROWING UP? ____________

HOW INDEPENDENT WAS YOUR FAMILY WHEN YOU WERE GROWING UP? ____________

HOW INDEPENDENT ARE YOU NOW? ____________

(43) A CONSTRAINED LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL'S BEHAVIORS ARE CONFINED, RESTRICTED, AND LIMITED. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW CONSTRAINED WERE YOU WHEN YOU WERE GROWING UP? ____________

HOW CONSTRAINED WAS YOUR FAMILY WHEN YOU WERE GROWING UP? ____________

HOW CONSTRAINED ARE YOU NOW? ____________

(44) A NURTURED LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL'S EMOTIONS, FEELINGS, AND WELL-BEING ARE CARED FOR BY OTHERS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW NURTURED WERE YOU WHEN YOU WERE GROWING UP? ____________

HOW NURTURED WAS YOUR FAMILY WHEN YOU WERE GROWING UP? ____________

HOW NURTURED ARE YOU NOW? ____________

(45) A COHESIVE LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL ESTABLISHES CLOSE RELATIONSHIPS AMONG FRIENDS AND FAMILY. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW COHESIVE WAS YOUR LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW COHESIVE WAS YOUR FAMILY'S LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW COHESIVE IS YOUR LIFESTYLE NOW? ____________

(46) AN INTELLECTUAL LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL IS SURROUNDED BY INTELLIGENT, KNOWLEDGEABLE, AND COMPETENT PEOPLE. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW INTELLECTUAL WAS YOUR LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW INTELLECTUAL WAS YOUR FAMILY'S LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW INTELLECTUAL IS YOUR LIFESTYLE NOW? ____________

(47) A GOOD LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL ENJOYS LIFE, IS SATISFIED WITH HOW THINGS ARE, AND IS GENERALLY HAPPY. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW GOOD WAS YOUR LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW GOOD WAS YOUR FAMILY'S LIFESTYLE WHEN YOU WERE GROWING UP? ____________

HOW GOOD IS YOUR LIFESTYLE NOW? ____________

(48) A STRONG LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL CAN WITHSTAND ADVERSITY, STRESS, AND BAD LUCK. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW STRONG WERE YOU WHEN YOU WERE GROWING UP? ____________

HOW STRONG WAS YOUR FAMILY WHEN YOU WERE GROWING UP? ____________

HOW STRONG ARE YOU NOW? ____________

(49) IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW SUPPORTIVE WERE YOUR PARENTS OF YOUR AMBITIONS AND ASPIRATIONS WHEN YOU WERE GROWING UP? ________

HOW MUCH ENCOURAGEMENT DID YOUR PARENTS PROVIDE FOR YOUR IDEAS WHEN YOU WERE GROWING UP? ________

(50) IF 100 DESCRIBES THE AVERAGE PERSON'S SKILLS, WHAT NUMBER BEST DESCRIBES YOUR . . .

LANGUAGE SKILLS ________

MATHEMATICAL SKILLS ________

READING SKILLS ________

SOCIAL SCIENCE SKILLS ________

PHYSICAL SCIENCE SKILLS ________

COMMUNICATION SKILLS ________

(51) HOW MANY YEARS HAVE YOU BEEN . . .

PLAYING A MUSICAL INSTRUMENT ________

DANCING ________

PAINTING ________

SCULPTURING ________

WRITING ________

PLAYING SPORTS ________

(52) TEN YEARS AFTER YOU ARE GRADUATED FROM COLLEGE, WHAT DO YOU EXPECT YOUR ANNUAL INCOME TO BE?

$____________/ YR. (estimate in dollars)

(53) WHAT OCCUPATION DO YOU THINK YOU WILL BE WORKING AT TEN YEARS AFTER YOU ARE GRADUATED FROM COLLEGE?

____

SECTION III

INSTRUCTIONS: THE FOLLOWING SET OF ITEMS ARE DESIGNED TO GATHER INFORMATION ABOUT YOUR COMMUNICATION HABITS AND MEDIA EXPERIENCES. IN PARTICULAR, WE ARE INTERESTED IN FINDING OUT ABOUT YOUR INTERPERSONAL COMMUNICATION NETWORKS, AND YOUR MASS MEDIA EXPERIENCES. BY INTERPERSONAL COMMUNICATION NETWORKS, WE MEAN THE FACE-TO-FACE INTERACTIONS THAT YOU HAVE WITH OTHER PERSONS. BY MASS MEDIA EXPERIENCES, WE MEAN THE EXPERIENCES YOU HAVE HAD WITH TELEVISION, RADIO, PERIODICALS, THE CINEMA OR ANY OTHER MEDIA WHICH DISTRIBUTE MESSAGES ON A MASS SCALE.

EACH QUESTION WILL FIRST DESCRIBE A PARTICULAR INFORMATION ENVIRONMENT, AND THEN ASK YOU TO ESTIMATE YOUR EXPERIENCES AS COMPARED TO THE AVERAGE PERSON'S EXPERIENCE.

FOR OUR PURPOSES HERE, THE NUMBER 100 WILL DESCRIBE THE AVERAGE PERSON'S EXPERIENCE WITH THE PARTICULAR INFORMATION ENVIRONMENT, AND THE NUMBER ZERO WILL MEAN THAT THE PARTICULAR INFORMATION ENVIRONMENT WAS NOT EXPERIENCED AT ALL. YOU MAY USE ANY NON-NEGATIVE NUMBER YOU WISH TO DESCRIBE YOUR EXPERIENCES. ALL WE ASK IS THAT YOU MAKE YOUR ESTIMATES CAREFULLY.

REMEMBER, ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE.

IF YOUR EXPERIENCES ARE TWICE THAT OF THE AVERAGE PERSON'S, YOU WOULD WRITE 200 (because 2 X 100 = 200). ON THE OTHER HAND, IF YOUR EXPERIENCES ARE ONLY HALF THAT OF THE AVERAGE PERSON'S, YOU WOULD WRITE 50 (because 1/2 of 100 = 50).

AGAIN, YOU MAY USE ANY NUMBER YOU WISH. PLEASE CONSIDER EACH QUESTION CAREFULLY, AND ANSWER EACH ITEM AS ACCURATELY AS POSSIBLE.

(54) AN ACTIVE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW ACTIVE WERE YOUR INTERPERSONAL COMMUNICATION NETWORKS WHEN YOU WERE GROWING UP? ____________

HOW ACTIVE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________

HOW ACTIVE WERE YOUR MEDIA EXPERIENCES WHEN YOU WERE GROWING UP? ____________

HOW ACTIVE ARE YOUR MEDIA EXPERIENCES NOW? ____________

(55) A STIMULATING INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION WHICH TEACHES HIM/HER NEW THINGS AND STIMULATES HIS/HER CURIOSITY AND IMAGINATION. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW STIMULATING WERE YOUR INTERPERSONAL COMMUNICATION NETWORKS WHEN YOU WERE GROWING UP? ____________

HOW STIMULATING ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________

HOW STIMULATING WERE YOUR MEDIA EXPERIENCES WHEN YOU WERE GROWING UP? ____________

HOW STIMULATING ARE YOUR MEDIA EXPERIENCES NOW? ____________

(56) A <u>SOCIALLY RESPONSIVE</u> INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION WHICH ACKNOWLEDGES OR RESPONDS TO HIS/HER BEHAVIORS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW SOCIALLY RESPONSIVE WERE YOUR INTERPERSONAL COMMUNICATION NETWORKS WHEN YOU WERE GROWING UP? __________

HOW SOCIALLY RESPONSIVE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? __________

(57) A DIVERSE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION ABOUT A VARIETY OF TOPICS, AND WHICH INFORMS HIM/HER ABOUT DIFFERENT THINGS ABOUT THE TOPIC. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW DIVERSE WERE YOUR INTERPERSONAL COMMUNICATION NETWORKS WHEN YOU WERE GROWING UP? __________

HOW DIVERSE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? __________

HOW DIVERSE WERE YOUR MEDIA EXPERIENCES WHEN YOU WERE GROWING UP? __________

HOW DIVERSE ARE YOUR MEDIA EXPERIENCES NOW? __________

(58) A NURTURING INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION WHICH IS DIRECTED AT HIS/HER FEELINGS, EMOTIONS, AND WELL-BEING. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW NURTURING WERE YOUR INTERPERSONAL COMMUNICATION NETWORKS WHEN YOU WERE GROWING UP? ____________

HOW NURTURING ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________

(59) A COHESIVE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL INTERACTS WITH A SET OF PEOPLE WHO ARE HIGHLY INTEGRATED AND WHO EXCHANGE A LOT OF INFORMATION WITH EACH OTHER. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

HOW COHESIVE WERE YOUR INTERPERSONAL COMMUNICATION NETWORKS WHEN YOU WERE GROWING UP? ____________

HOW COHESIVE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________

(60) WHEN YOU WERE GROWING UP, HOW MANY CLOSE FRIENDS WOULD YOU SAY YOU HAD?

____

(61) ON THE AVERAGE, ABOUT HOW MANY HOURS PER WEEK DID YOU SPEND TALKING WITH THESE FRIENDS?

________________HRS/WK

(62) HOW MANY CLOSE FRIENDS WOULD YOU SAY YOU HAD NOW?

____

(63) ON THE AVERAGE, ABOUT HOW MANY HOURS PER WEEK DO YOU SPEND TALKING WITH THESE FRIENDS?

_______________HRS/WK

(64) ON THE AVERAGE, ABOUT HOW MANY HOURS PER MONTH HAVE YOU SPENT TALKING ABOUT . . .

THE HOSTAGES IN IRAN	_______HRS/MONTH
THE IRAN/IRAQ WAR	_______HRS/MONTH

(65) INDICATE HOW MANY HOURS PER WEEK YOU SPEND READING EACH OF THE FOLLOWING NEWSPAPERS . . .

THE STATE NEWS	__________HRS/WK
THE LANSING STATE JOURNAL	__________HRS/WK
THE DETROIT PRESS	__________HRS/WK
THE NEW YORK TIMES	__________HRS/WK
THE WALL STREET JOURNAL	__________HRS/WK
OTHER (PLEASE SPECIFY)	__________HRS/WK
OTHER (PLEASE SPECIFY)	__________HRS/WK

(66) ON THE AVERAGE, ABOUT HOW MANY HOURS PER WEEK DO YOU SPEND . . .

LISTENING TO THE RADIO	__________HRS/WK
PLAYING RECORDS OR TAPES	__________HRS/WK
READING PERIODICALS (MAGAZINES)	__________HRS/WK

(67) INDICATE HOW MANY HOURS PER WEEK YOU SPEND WATCHING . . .

TV NETWORK NEWS	________HRS/WK
TV LOCAL NEWS	________HRS/WK
TV MORNING NEWS PROGRAMS	________HRS/WK
TV LATE NIGHT NEWS	________HRS/WK

(68) IF ZERO MEANS NOT INFORMED AT ALL, AND 100 DESCRIBES HOW INFORMED THE AVERAGE PERSON IS, HOW INFORMED WOULD YOU SAY YOU ARE ABOUT . . .

THE UNITED STATES	________
IRAN	________
AYATOLLAH KHOMEINI	________
PRESIDENT CARTER	________
DIPLOMACY	________
MILITARY INTERVENTION	________
ECONOMIC SANCTION	________
THE SHAH	________
THE AMERICAN HOSTAGES IN IRAN	________
THE STUDENT MILITANTS IN IRAN	________
IRRATIONALITY	________
HOSTILITY	________
FREEDOM	________
WEAKNESS	________
MULTINATIONAL CORPORATIONS	________
CAMP DAVID ACCORDS	________
INTERNATIONAL TRADE	________
OPEC	________
THE IRAN/IRAQ WAR	________
YOURSELF	________

SECTION IV

INSTRUCTIONS: ON THE FOLLOWING PAGES YOU WILL FIND A LIST OF WORDS THAT ARE PAIRED TOGETHER. WHAT WE WOULD LIKE YOU TO DO IS TELL US HOW DIFFERENT EACH WORD IS FROM THE OTHER WORDS USING A NUMBER.

IF YOU THINK TWO WORDS ARE VERY SIMILAR TO EACH OTHER IN MEANING, OR ARE CLOSELY ASSOCIATED WITH EACH OTHER, THEN YOU WOULD REPORT A SMALL NUMBER. ON THE OTHER HAND, IF YOU THINK THAT THE TWO WORDS ARE VERY DIFFERENT FROM EACH OTHER IN MEANING, OR ARE HARDLY RELATED TO EACH OTHER AT ALL, THEN YOU WOULD REPORT A LARGE NUMBER.

REMEMBER, SMALL NUMBERS INDICATE SIMILARITY,
LARGE NUMBERS INDICATE DIFFERENCES,
AND ZERO MEANS THAT THERE IS NO DIFFERENCE BETWEEN THE TWO WORDS AT ALL

TO HELP YOU MAKE THESE JUDGMENTS OF SIMILARITY AND DIFFERENCE, CONSIDER THE FOLLOWING EXAMPLE.

THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100.

OBVIOUSLY, THESE TWO WORDS ARE SOMEWHAT RELATED, BUT THEY CLEARLY DO NOT MEAN THE SAME THING. HENCE, THE NUMBER 100 WAS ASSIGNED TO INDICATE THE DIFFERENCE BETWEEN THESE TWO WORDS.

TRY TO KEEP THIS SIMPLE EXAMPLE IN MIND WHEN YOU CONSIDER EACH OF THE FOLLOWING PAIRS OF WORDS. YOU MAY USE ANY NON-NEGATIVE NUMBER YOU WISH TO DESCRIBE THE DIFFERENCES BETWEEN THE WORDS, THE ONLY THING WE ASK IS THAT YOU TRY TO BE AS ACCURATE AS YOU CAN. USE EXTREMELY LARGE NUMBERS ONLY WHEN THERE IS A VERY LARGE DIFFERENCE BETWEEN THE TWO WORDS, AND USE EXTREMELY SMALL NUMBERS ONLY WHEN THERE IS A VERY GREAT SIMILARITY BETWEEN THE TWO WORDS. AGAIN, ZERO MEANS THAT THERE IS NO DIFFERENCE WHATSOEVER BETWEEN THE TWO WORDS.

REMEMBER, SMALL NUMBERS INDICATE SIMILARITY,
LARGE NUMBERS INDICATE DIFFERENCES,
ZERO MEANS THAT THERE IS NO DIFFERENCE BETWEEN THE TWO WORDS,
AND THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

NOW TURN THE PAGE AND MAKE YOUR JUDGMENTS: IF YOU HAVE ANY DIFFICULTY ASK THE EXPERIMENTAL ASSISTANTS FOR HELP.

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

THE UNITED STATES AND IRAN ___________

THE UNITED STATES AND KHOMEINI ___________

THE UNITED STATES AND CARTER ___________

THE UNITED STATES AND DIPLOMACY ___________

THE UNITED STATES AND MILITARY INTERVENTION ___________

THE UNITED STATES AND ECONOMIC SANCTION ___________

THE UNITED STATES AND THE SHAH ___________

THE UNITED STATES AND THE HOSTAGES ___________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

THE UNITED STATES AND THE MILITANTS ___________

THE UNITED STATES AND IRRATIONALITY ___________

THE UNITED STATES AND WEAKNESS ___________

THE UNITED STATES AND HOSTILITY ___________

THE UNITED STATES AND FREEDOM ___________

THE UNITED STATES AND ME (i.e., yourself) ___________

IRAN AND KHOMEINI ___________

IRAN AND CARTER ___________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

IRAN AND DIPLOMACY ____________

IRAN AND MILITARY INTERVENTION ____________

IRAN AND ECONOMIC SANCTION ____________

IRAN AND THE SHAH ____________

IRAN AND THE HOSTAGES ____________

IRAN AND THE MILITANTS ____________

IRAN AND IRRATIONALITY ____________

IRAN AND WEAKNESS ____________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

IRAN AND HOSTILITY ____________

IRAN AND FREEDOM ____________

IRAN AND ME ____________

KHOMEINI AND CARTER ____________

KHOMEINI AND DIPLOMACY ____________

KHOMEINI AND MILITARY INTERVENTION ____________

KHOMEINI AND ECONOMIC SANCTION ____________

KHOMEINI AND THE SHAH ____________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

KHOMEINI AND THE HOSTAGES	________
KHOMEINI AND THE MILITANTS	________
KHOMEINI AND IRRATIONALITY	________
KHOMEINI AND WEAKNESS	________
KHOMEINI AND HOSTILITY	________
KHOMEINI AND FREEDOM	________
KHOMEINI AND ME	________
CARTER AND DIPLOMACY	________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

CARTER AND MILITARY INTERVENTION	________
CARTER AND ECONOMIC SANCTION	________
CARTER AND THE SHAH	________
CARTER AND THE HOSTAGES	________
CARTER AND THE MILITANTS	________
CARTER AND IRRATIONALITY	________
CARTER AND WEAKNESS	________
CARTER AND HOSTILITY	________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

CARTER AND FREEDOM	________
CARTER AND ME	________
DIPLOMACY AND MILITARY INTERVENTION	________
DIPLOMACY AND ECONOMIC SANCTION	________
DIPLOMACY AND THE SHAH	________
DIPLOMACY AND THE HOSTAGES	________
DIPLOMACY AND THE MILITANTS	________
DIPLOMACY AND IRRATIONALITY	________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

DIPLOMACY AND WEAKNESS	________
DIPLOMACY AND HOSTILITY	________
DIPLOMACY AND FREEDOM	________
DIPLOMACY AND ME	________
MILITARY INTERVENTION AND ECONOMIC SANCTION	________
MILITARY INTERVENTION AND THE SHAH	________
MILITARY INTERVENTION AND THE HOSTAGES	________
MILITARY INTERVENTION AND THE MILITANTS	________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

<u>MILITARY INTERVENTION</u> AND <u>IRRATIONALITY</u> __________

<u>MILITARY INTERVENTION</u> AND <u>WEAKNESS</u> __________

<u>MILITARY INTERVENTION</u> AND <u>HOSTILITY</u> __________

<u>MILITARY INTERVENTION</u> AND <u>FREEDOM</u> __________

<u>MILITARY INTERVENTION</u> AND <u>ME</u> __________

<u>ECONOMIC SANCTION</u> AND <u>THE SHAH</u> __________

<u>ECONOMIC SANCTION</u> AND <u>THE HOSTAGES</u> __________

<u>ECONOMIC SANCTION</u> AND <u>THE MILITANTS</u> __________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

<u>ECONOMIC SANCTION</u> AND <u>IRRATIONALITY</u> __________

<u>ECONOMIC SANCTION</u> AND <u>WEAKNESS</u> __________

<u>ECONOMIC SANCTION</u> AND <u>HOSTILITY</u> __________

<u>ECONOMIC SANCTION</u> AND <u>FREEDOM</u> __________

<u>ECONOMIC SANCTION</u> AND <u>ME</u> __________

<u>THE SHAH</u> AND <u>THE HOSTAGES</u> __________

<u>THE SHAH</u> AND <u>THE MILITANTS</u> __________

<u>THE SHAH</u> AND <u>IRRATIONALITY</u> __________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

THE SHAH AND WEAKNESS ____________

THE SHAH AND HOSTILITY ____________

THE SHAH AND FREEDOM ____________

THE SHAH AND ME ____________

THE HOSTAGES AND THE MILITANTS ____________

THE HOSTAGES AND IRRATIONALITY ____________

THE HOSTAGES AND WEAKNESS ____________

THE HOSTAGES AND HOSTILITY ____________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

THE HOSTAGES AND FREEDOM ____________

THE HOSTAGES AND ME ____________

THE MILITANTS AND IRRATIONALITY ____________

THE MILITANTS AND WEAKNESS ____________

THE MILITANTS AND HOSTILITY ____________

THE MILITANTS AND FREEDOM ____________

THE MILITANTS AND ME ____________

IRRATIONALITY AND WEAKNESS ____________

IF THE DIFFERENCE BETWEEN DIPLOMACY AND ECONOMIC SANCTION IS 100

HOW DIFFERENT ARE . . .

IRRATIONALITY AND HOSTILITY	___________
IRRATIONALITY AND FREEDOM	___________
IRRATIONALITY AND ME	___________
WEAKNESS AND HOSTILITY	___________
WEAKNESS AND FREEDOM	___________
WEAKNESS AND ME	___________
HOSTILITY AND FREEDOM	___________
HOSTILITY AND ME	___________
FREEDOM AND ME	___________

SECTION V

INSTRUCTIONS: ON THE FOLLOWING PAGES YOU WILL FIND A LIST OF WORDS AND A SET OF BOXES. WHAT WE WOULD LIKE YOU TO DO IS TO FIRST, CONSIDER THE LIST AND SEE IF YOU CAN PICK OUT SOME WORDS THAT ARE ALIKE IN AN IMPORTANT WAY. WHEN YOU HAVE SELECTED SOME WORDS FROM THE LIST, WRITE THEIR LINE NUMBERS IN THE LEFT-HAND PORTION OF ONE OF THE BOXES, AND WRITE WHATEVER THEY HAD IN COMMON AT THE BOTTOM OF THE BOX. FINALLY, IN THE RIGHT-HAND PORTION OF THE BOX, WRITE THE LINE NUMBERS OF ANY WORDS ON THE LIST WHICH ARE CLEARLY DIFFERENT FROM THE WORDS IN THE LEFT-HAND PORTION. IT IS NOT NECESSARY TO INCLUDE ALL THE WORDS ON THE LIST IN EITHER PORTION OF THE BOX. IF A PARTICULAR WORD CANNOT BE EVALUATED IN TERMS OF THE OTHERS, SIMPLY OMIT IT.

USE AS MANY BOXES AS YOU WISH. ALL WE ASK IS THAT YOU MAKE YOUR JUDGMENTS <u>CAREFULLY</u>. YOU NEED NOT USE ALL THE BOXES; SIMPLY STOP WHEN YOU HAVE GROUPED ALL THE WORDS WHICH ARE ALIKE IN SOME IMPORTANT WAY.

BEFORE YOU TURN THE PAGE AND BEGIN GROUPING THE WORDS, CONSIDER THE EXAMPLE THAT IS PRESENTED BELOW. HERE IS A LIST OF FIVE WORDS. IN THE FIRST BOX, THE RESPONDENT HAS LISTED LINE NUMBERS 3, 4, AND 5 IN THE LEFT HAND PORTION, AND WRITTEN "MADE WITH STRAIGHT LINES" AT THE BOTTOM. IN THE RIGHT-HAND PORTION OF THE FIRST BOX THE RESPONDENT HAS LISTED LINE NUMBERS 1 AND 2.

IN THE SECOND BOX, THE RESPONDENT HAS LISTED LINE NUMBERS 1 and 5 IN THE LEFT-HAND PORT, AND WRITTEN "ROUND-SHAPED" AT THE BOTTOM OF THE BOX. IN THE RIGHT-HAND PORTION THE RESPONDENT HAS LISTED LINE NUMBERS 2, 3, AND 4.

(1) CIRCLE
(2) CONE
(3) SQUARE
(4) RECTANGLE
(5) PENTAGON

BOX 1

3, 4, 5 made with straight lines	1, 2

BOX 2

1, 5 round-shaped	2, 3, 4

NOW TURN THE PAGE AND MAKE YOUR JUDGMENTS; IF YOU HAVE ANY DIFFICULTY ASK THE EXPERIMENTAL ASSISTANTS FOR HELP.

Note: Five of these pages appeared in the questionnaire

(1) THE UNITED STATES
(2) IRAN
(3) KHOMEINI
(4) CARTER
(5) DIPLOMACY
(6) MILITARY INTERVENTION
(7) ECONOMIC SANCTION
(8) THE SHAH
(9) THE HOSTAGES
(10) THE MILITANTS
(11) IRRATIONALITY
(12) WEAKNESS
(13) HOSTILITY
(14) FREEDOM
(15) ME

APPENDIX D

Concept Categories and Terms Extracted From the Re-Administration of the Request For Information Regarding the United States - Iranian Hostage Situation (N=38)

APPENDIX D

Concept Categories and Terms Extracted From the Re-Administration of the Request For Information Regarding the United States - Iranian Hostage Situation (N=38)

Concept Category	Terms	Frequency of Occurrence
Khomenini	*	(30)
	Ayatollah	8
	Ayatollah Khomeini	2
	Khomeini	19
	Bastard	1
Hostages	*	(99)
	The Event	1
	The Situation	5
	A Situation	1
	The Problem	1
	These People	1
	This Whole Thing	1
	Takeover	1
	Taken Control	1
	Hostages	35
	Hostage Crisis	4
	Fifty	5
	Fifty-Two Hostages	2
	Fifty-Three	1
	Hostage Situation	3
	Hostage Taking	1
	Americans	5
	American Hostages	1
	Iranian Embassy	1
	Iranian Hostages	1
	Iran Crisis	1
	Iran Hostage Crisis	1
	Iranian Crisis	1
	Iranian Situation	1
	Irans Capture	1
	Crisis	2
	Hold Them Hostage	1
	One Hostage	1
	One Guy That is Home with Disease	1
	One Came Home	1
	Our Hostages	1
	Prisoner	1
	Seizure	1
	Richard Queen	3
	US Embassy	2

Concept Category	Terms	Frequency of Occurrence
Hostages (cont'd.)	Embassy	6
	Listening Station	1
	Capture	1
	Capturing	1
Iran	*	(52)
	Tehran	7
	Tehran University	1
	Two Bit Country	1
	Small Country	1
	Third World Country	1
	Iran	37
	Iran Parliament	1
	Iranian	1
	Country of Wimps	1
	Revolutionary Government	1
Carter	*	(34)
	Carter	32
	President Carter	1
	Presidential Candidate	1
Diplomacy	*	(27)
	Apology	1
	Diplomatic Ties	1
	Diplomatically	1
	Make a Swap	1
	Major Concern of Government	1
	Lack of Progress	1
	Negotiated	1
	Negotiations	3
	World Relations	1
	Solved Peacefully	1
	Solved Peaceably	1
	Politics	1
	Political Value	1
	Political Gains	1
	Should be Worked Out	1
	Solve the Problem	1
	Sensible Solution	1
	Dragged Its Feet	1
	Use Words	2
	Pawn	1
	Political Advantage	1
	Political Riff/Raff	1

Concept Category	Terms	Frequency of Occurrence
Diplomacy (cont'd.)	Soviet Move	1
	Slow Moving	1
Freedom	*	(43)
	Free	2
	Freed	1
	Freedom	3
	Free Women	1
	Getting Them Back	1
	Lost no Matter What	1
	Release	4
	Return	2
	Seeing Them Again	1
	Aborted Rescue Mission	1
	Aborted Rescue Attempt	1
	Attempted Rescue Mission	1
	Attempt to Release	1
	Escape	3
	Helicopter Rescue	1
	Rescue Mission	2
	Rescue Efforts	1
	Rescue Attempt	10
	Rescue	6
Weakness	*	(15)
	Weak	1
	Weakness	1
	Victim of Circumstance	1
	Pushover	1
	Pushed Around	1
	Strong	1
	Intimidation	1
	Decline	1
	Power Move	1
	Power Struggle	1
	Oppression	1
	Oppressed	1
	Overpower	1
	Flopping	1
	World Power	1
Economic Sanctions	*	(16)
	Economic Restrictions	1
	Economic Sanctions	1
	Economy	1
	Embargo of Food and Supplies	1

Concept Category	Terms	Frequency of Occurrence
Economic Santions (cont'd).	Resource Embargo	1
	Freeze on Iran's Holdings	1
	Oil	8
	Oil Price	1
	Money	1
Hostility	*	(16)
	Deserve What They Get	1
	Hostility	1
	Hostile	1
	Makes Me Sick	1
	Rebellious	1
	Rebelling Again	1
	Revolution	1
	Sneaky Plan	1
	Torture	2
	Threat	1
	Pain	1
	Kill	1
	Violence	1
	Violent Approach	1
	Aggression	1
Military Interven-tion	*	(15)
	War	6
	Attack	1
	Attack of Iraq	1
	Eight-Day War	1
	Military Action	1
	Military Strength	1
	Make an Attack	1
	Use Force	1
	Raids	2
Students	*	(17)
	Students	7
	Rebels	1
	Militants	2
	Terrorists	1
	Iranians	5
	Iranian Students	1

Concept Category	Terms	Frequency of Occurrence
US	*	(22)
	US	16
	US Government	1
	America	1
	American Power	1
	Our Country	1
	Our Position	1
	The Government	1
Irrational	*	(19)
	Blunder	1
	Foolish	1
	Fool	1
	Ridiculous	1
	Unfair	1
	Unfairly Kept	1
	Unjustified	1
	Stupid	1
	Crazed	1
	Fanatic	1
	Panic	1
	Competent	1
	Correct	1
	Hopeless	1
	Mishandling	1
	Stunt	1
	Tyrant	1
	Right	1
	Wrong	1
Shah	*	(16)
	Shah	16
Other	*	(135)
	ABC Niteline	1
	Action	1
	Afghanistan	1
	Alienated	1
	Bad	1
	Back of People's Minds	1
	Backs on Issue	1
	Biggest Messes	1
	Blamed	1
	Bleak	1
	Blacks	1
	Blindfolds	1

Concept Category	Terms	Frequency of Occurrence
Other (cont'd.)	Brainwash	1
	Be Home	1
	Canada	2
	Coup	1
	Camp	1
	Campaigns	1
	Control	1
	Death	3
	Dead	1
	Draft	1
	Draft Registration	1
	Disgraced	1
	Election Time	1
	Election Day	1
	Embarrasment	1
	Exhausted	1
	Exploit	1
	Fear	1
	Family	1
	Ford	1
	Free Nation	1
	Forgotten About	1
	Funding	1
	Gold	1
	Grief	1
	Getting out of Hand	1
	Help	1
	Helping	1
	Hodding Carter	1
	Hero	1
	Held in Fear	1
	Planes	1
	Marines	1
	Spy Trial	2
	Spies	2
	Suffer	1
	Super Power	1
	Supply of Weapons	1
	Ted Koppel	1
	Triumph	1
	The West	1
	Tired	1
	Tried as Spies	1
	UN	1
	Unprovoked	1
	Wait and Hope	1
	Waiting	1
	Screw Up	1
	Screw Up Escape Plan	1
	Visas	1

Concept Category	Terms	Frequency of Occurrence
Other (cont'd.)	Women	1
	World Opinion	1
	Worst Thing Ever	1
	Worst Things Thats Happened	1
	Year Long	1
	Helicopters	1
	Downed Helicopters	1
	Time	2
	Third World	1
	Thanksgiving	1
	Taking	1
	Hopes for Election	1
	Increase	1
	Indecision	1
	Instable Conditions	1
	Imperialistic	1
	Imperialism	1
	Islam	1
	Juvenile	1
	Kremlin	1
	Leader	1
	Loss	1
	Lost Interest	1
	Love	1
	Media	1
	Mid-East	1
	Murder	1
	Multiple Sclerosis	1
	Moslem	1
	Muslim	1
	Negative	1
	Nixon	1
	November	1
	Niteline	1
	News	1
	Foiled	1
	Failed	1
	Boni Sadr	6
	Failure	3
	Iraq	6
	Nationalism	1
	October	1
	Persian Gulf	1
	Prayers	1
	Protest	1
	Power	1
	Powell	1
	Pressure	1
	Safe	

Concept Category	Terms	Frequency of Occurrence
Other (cont'd.)	Still There	2
	Should Have Never Happened	1
	We must Face an Action	1
	Salience	1
	Sensible Authority	1
	Sacrificing	1

APPENDIX E

A Brief Description of the Data
Assessed From Student Records

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A Brief Description of the Data
Assessed From Student Records

Testing Bulletin No. 3
(Revised, 2-75)

Prepared by
The Office of Evaluation Services
University College
Michigan State University

THE USE OF ORIENTATION TEST DATA

All new undergraduate students at Michigan State University take a set of examinations generally known as "Orientation Tests," the results of which are distributed four times a year to all departments. Although scores on these tests are used regularly by Admissions Officers, Counselors, and others, this bulletin is particularly directed to the instructional faculty, administrative and academic advisers, who may find the scores helpful. As measures of ability important in academic work, the test scores are of value in ascertaining the ability patterns of individual students or groups of students. Knowledge of this kind has proved to be useful in academic advising, class sectioning, and understanding student progress.

Brief Description of the Tests

The MSU Reading Test, Form A-73,[1] (MSU-R) is a 112-item test of reading comprehension and vocabulary. Two sub-test scores and a total score are reported. The reading vocabulary sub-test (RV) is 72-item test asking for definitions of words in context. Words and meanings were first selected from academic and leisure reading material commonly available to freshman students, and then revised by successive try-outs on the 1970, 71, and 72 entering student groups. For a group of 1000 fall, 1973, new freshman students, the K-R #20 reliability of the Reading Vocabulary sub-test was .92.

The Reading Comprehension sub-test (RC) is a 40-item test measuring comprehension of college-level reading passages. The score is based upon the student's ability to answer questions based on reading passages representative of several basic academic areas at MSU. The test is not restricted to the simple mechanics of reading, but rather the score provides some measure of factors involved in critical thought. Reliability of the RC sub-test was .84 in fall, 1972. (The fall, 1972, K-R #20 reliability of the entire 112-item test was .94.)

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[1] Osmond E. Palmer, Ed. MSU Reading Test, Form A-73, OES, MSU, 1973.

The MSU-Reading Test is useful to faculty members in any decision requiring some knowledge about the student's verbal ability. It is routinely used as one basis for assigning students to the American Thought and Language Comprehensive English Program (ATL 101-102-103).

The MSU Arithmetic Placement Test and the MSU Mathematics Test (algebra) are also administered as a part of the Orientation Test battery. All freshman students are required to take both the 40-item basic arithmetic test and the 30-item high school level algebra test. Transfer students, in some cases, are required to take the Mathematics Test.

The Mathematics test was designed by the Department of Mathematics specifically for course placement in MSU math courses. The Arithmetic test is of value in detecting students who are deficient in basic arithmetic, and is used for placement in Quantitative Techniques (IS 194). The K-R #20 reliability was .89 for the MSU Mathematics Test and .83 for the MSU Arithmetic Test. Reliability for the Total Math score (Arithmetic plus Algebra) was .92.

In addition to locally-developed test instruments, scores from two national tests may also be included in a student's test score profile (these are generally taken by students as juniors or seniors in high school).

The American College Test (ACT) assesses developed academic abilities in four areas of high school and college curricula: English, mathematics, social studies, and natural sciences. Four standard scores in each of these areas plus a Composite Score are reported. Scores range from 1 to 36 with a national college-bound high school senior mean of 20. The composite is a weighted total of four subject-matter areas.

The Scholastic Aptitute Test (SAT) also measures developed academic ability. It reports two standardized three-digit part-scores: Verbal (SAT-V) and Mathematics (SAT-M). These standard scores were originally computed to yield a national college bound high school senior mean of 500 with a range from 200 to 800. The total score (SAT-T) therefore has a possible range from 400 to 1600. Beginning in fall, 1974 the verbal and mathematical sections were shortened by 15 minutes and a 30 minute Test of Standard Written English was included. Scores range from 20 to 80. The TSWE was designed to select students "who need some degree of additional instruction in written English usage." These additional scores may be available in fall, 1975.

The Method of Reporting Scores

Scores on the MSU Reading Test, the Arithmetic and Mathematics Tests, and one national test are available on the Orientation Record which each new freshman student must carry when reporting to his academic advisor for planning his first term's program of studies. The scores reported on the Record are raw scores (number of questions answered correctly), and percentile ranks (PR) in graphic form. The PR "score" specifies directly the percentage of freshmen entering MSU who receive scores which are lower on a given test than that reported for a given student. A PR of 85 on the MSU Reading Comprehension sub-test (RC), for example, means that a student was quite superior in reading comprehension since his score on the test was higher than the scores of 85 percent of the freshmen entering MSU that year. It also means that he ranked among the highest 15 percent of students on reading comprehension. In contrast, a PR of 08 is a rather low score since the large majority (92 percent) of freshmen received scores as high or higher. Scores from the Orientation Record are used to specify class placement levels in beginning English and mathematics courses.

Each term Academic Advisors receive the formal report, Test Scores By Entering Students, through their departmental offices. This report contains test scores for all students who participated in the most recent Orientation testing program, reported as percentile ranks (PR).

Other test records available to faculty and advisors, and maintained by the Office of Evaluation Services include Comparative Standings of Various College and Curriculum Groups on the Orientation Week Examinations, Orientation Test and High School Grade Norms and GPA Expectancy Tables for Freshmen. For large research projects, actual raw test scores can be provided on request. The "Comparative Standings" report presents summary test data for both new freshmen and new transfers in different curricula. It reports "typical" performance of students within each curricular group. Since ability levels on different tests vary considerably among curricular groups, a student with a given score may be expected to perform at different levels in different curricula. The expectancy tables report, by sex and total group, the relative first term grade achievement of new students ordered by their orientation test score levels.

The Predictive Value of the Tests

The Orientation Tests serve many purposes. Each test must satisfy different criteria to be considered a valid measure. To be useful for many problems in the diagnosis of individuals or groups, however, a test must measure a relatively stable ability that is indicative of the later quality of college work. A common method of evaluating tests for purposes of this kind is to compare the standings of students on the tests to their later academic attainment as reflected in grade point averages. These comparisons form the basis for the GPA Expectancy Tables for Freshmen.

Results from studies of this kind have demonstrated that all of the tests are of some value in predicting grades. The degree of relationship does vary, however. The total score on either national test (ACT or SAT) has generally proved to be the best single predictor of the grade point average (GPA) for all students in general, followed closely by the MSU Reading Test total score. While this pattern is evident for both sexes, grades for women are usually predicted more accurately.

The meaningfulness of prediction as a factor in determining the degree to which test data can be relied upon in student advising is illustrated in Table I, which shows academic attainment of women the first term at MSU relative to scores earned on the MSU reading Test Total score for 1973-74. The percentage of students earning "satisfactory" (2.0 or higher) or "honors" (3.0 or higher) first term GPA is reported for successive percentile score intervals on the MSU-RT.

TABLE I

PERCENTAGE OF FIRST TERM FRESHMAN WOMEN AT INDICATED PR LEVELS ON THE MSU-RT WITH A SATISFACTORY FIRST-TERM GPA

MSU-RT PR Level	0-19	20-39	40-59	60-79	80-99
% with 2.0 and 3.0 GPA and up	81-04	82-07	87-10	93-22	95-38

Table I shows that four-fifths (81 percent) of women students whose scores ranked them among the lowest 20 percent on MSU-RT made satisfactory progress, but only 4 percent earned a 3.0 or higher. In contrast, 95 percent of women with PR's on the MSU-RT which ranged from 80-99 earned satisfactory grades and almost two-fifths (38 percent) earned honors level grades.

Table II illustrates how two relevant tests considered together increase the precision of prediction. As before, the numbers in the body of the table give the percentage of students at specified test levels garnering a 2.0 or 3.0 GPA or higher, but the probability figure to use is dependent on both the MSU-RT and one of the national tests (ACT or SAT). A student whose tested ability on the MSU-RT falls in the 40-59 PR range would seem at a level where typically 87 percent of women earn a 2.0 or higher their first term. Depending on the level of tested ability for the second test, she may be at an overall level where from 80 to 95 percent of women typically earn a first term GPA of 2.0 or higher.

TABLE II

PERCENTAGE OF FRESHMEN WOMEN AT THE 40-59 PR LEVEL OF THE MSU-RT AND INDICATED LEVELS OF THE NATIONAL TEST SCORE EARNING A 2.0 or 3.0 (or higher) FIRST TERM G.P.A.

MSU-RT	National Test Percentile Rank				
%-ile	0-19	20-39	40-59	60-79	80-99
40-59	80-04	85-07	90-10	95-21	95-30

Knowledge of high school GPA further increases precision of prediction. In 1973 a female student at the 40-59 PR level on both the MSU-RT and the national test total score, who earned a high school GPA in the range 0.0-2.9 was at a level where typically 83 percent of students earn a 2.0 GPA or higher their first term. Had her high school GPA been in the range 3.0-3.4, the expectancy percentage would have been 88, and 98 had her high school GPA been in the range 3.5-4.0.

It is clear from these data that students at all levels of tested ability have a good chance to succeed in college. Knowledge of the nature of the tests, study of test score patterns, and student background often make it possible to isolate reasons for a student's succeeding or failing, especially when a strong academic background is desired for entrance to upper college of graduate education.

Caution. - The illustrative data above are not directly applicable to all students. Male students tend to exhibit lower levels of attainment at specified ability levels than do women students. The magnitude of the GPA tends to vary from curriculum to curriculum. Other patterns of test scores are more predictive in certain curricula than scores used in the illustration. The Office of Evaluation Services has further data which can be provided for persons interested in making more detailed analyses.

Potential Applications of Test Data

Specific applications for test data will be suggested in this section. Applications to the classroom, Applications to Student Advising, and Other Applications will be considered.

A. Applications to the Classroom

Example 1. - You have two students in class who seem to be outstanding students. You feel they should be encouraged to pursue independent work and to plan a long-range program. The Orientation Score profiles (PR's) for Students A and B are:

	MSU Test Percentiles						ACT Percentiles				
	RV	RC	RT	A	M	TM	E	M	SS	NS	Comp
A	84	71	84	99	97	99	89	99	95	96	97
B	24	42	30	46	52	51	08	57	40	40	37

Scores for Student A confirm your initial hypothesis. His performance on the tests is outstanding. He may have even more ability than he has shown in class. Test data for Student B are much less consistent with your beliefs. When data from several sources lead to the same conclusion, as with Student A, one can feel more confident initiating a proposed plan of action. Where inconsistencies are found, as with Student B, additional study is necessary before action is taken.

Example 2. - One of your classes seems lackadaisical. Techniques and procedures which have worked well with previous classes seem to "fall flat." You tabulate the scores from Test Scores by Entering Students and find the following pattern:

National (PR) Tests		Reading (PR) Total	
90-99		90-99	|
80-89	|	80-89	
70-79		70-79	|
60-69	||	60-69	||
50-59	卌 |	50-59	卌
40-49	卌 |||	40-49	卌 ||
30-39	卌 卌	30-39	卌 ||||
20-29	卌 卌 |	20-29	卌 卌 ||
10-19	卌 |||	10-19	卌 卌 |
0-09	卌	0-09	卌
Median Score 32.0		28.3	

Both distributions show the same pattern. The students, as a group, score unusually low on the two tests. The data certainly point to this group being atypical, and suggest that the procedures used might be "over the heads" of the class. Had the analysis showed the group to be "very superior," a related hypothesis could be suggested. Lethargy can also accompany instruction which is keyed below the general level of the class. Class analysis of this kind is most effective when several classes are studied and comparisons made. Reference to <u>Comparative Standings of Various College and Curriculum Groups on the Orientation-Week Examinations</u> could also make an analysis of this type more penetrating by focusing on the general level of tested ability to be expected in certain classes.

<u>Example 3</u>. - Additional actions which might be suggested by reference to the Orientation Tests include:

a. Special aid to students deficient in specific areas.

b. Referral to developmental or supportive services, i.e., Learning Resources Center, Center for Supportive Services, Improvement Services, Comprehensive English, or departmental tutoring programs.

c. A search for special programs for students who seem not to be working up to their abilities.

B. <u>Applications to Student Advising</u>

Advising or counseling is always a complex process where ability, interest, emotions, and other personality factors must be considered. The suggestions which follow must be considered only as clues coming from one source, and must not be followed mechanically.

<u>Case I</u>. A student comes in to plan his next term's program. Grades from previous terms have been on the 1.5 - 0.0 borderline. His Orientation Test scores are:

MSU Test Percentiles

RV	RC	RT	A	M	TM	E	M	SS	MS	Comp
21	12	15	11	11	09	08	07	15	14	09

The scores are uniformly low. This is consistent with his performance in college. The scores do not suggest any special need for specialized remedial programs since no specific disability is suggested. A complete reevaluation of his educational and vocational plans would seem advisable. Referral to the Counseling Center, where facilities for service of this kind are available, should certainly be considered. Until a more intensive analysis is made, temporary provisions such as reducing class or extra-class activities might be suggested.

Case II. A student has exhibited near-average work in University College courses but has failed both the chemistry and mathematics courses in his major area of concentration, which is Engineering. His Orientation Test scores are:

MSU Test Percentiles

RV	RC	RT	A	M	TM	E	M	SS	NS	Comp
43	48	45	66	43	52	37	64	55	55	52

His quantitative ability is about average for students planning to elect a course in mathematics but well below the average score for students majoring in technical curricula. The general test score pattern is one which would describe an average MSU student with somewhat greater than average strength in the quantitative area. Successful students in the technical curricula, however, are generally average or above in most tested abilities and highly superior in the quantitative areas. Students with ACT-M and Total Math scores that do not rank among the highest 20 percent of all freshman norms, and with ACT-NS scores that are not substantially above average, do not have a high likelihood of success. A change in curriculum preference may be considered in this case, or if this is not desirable, emphasis could be placed on having the student work earnestly at strengthening possible weaknesses in his mathematical and basic science background.

Case III. A student transferring 90 credits from a community college wishes to major in Accounting in the College of Business. His general community college GPA was 2.42, but work in courses related to MSU Business Curricula was less than 2.0. He wants to re-take these courses at MSU to meet Business Admissions requirements. His MSU test score percentiles were:

RV	RC	RT	M
42	20	33	25

Again referring to the Report of Comparative Standings, typical transfer students in his major preference have reading scores at a slightly higher level, and freshmen majors have math scores at a considerably higher level. Competition in Accounting might be especially frustrating for this student. Business-oriented majors in other colleges may be more appropriate to his tested abilities.

Case IV. A student is very submissive and seems to lack self-confidence. He looks upon his inferior past achievement as a major calamity and considers himself to be worthless in a number of ways. He seems to have withdrawn within himself and participates in no college activities. His test scores are as follows:

MSU Test Percentiles						ACT Percentiles				
RV	RC	RT	A	M	TM	E	M	SS	NS	Comp
50	48	50	57	63	62	56	67	65	63	60

These symptoms suggest a general problem in adjustment. In cases of this type a simple diagnosis or solution is usually unlikely. While test scores may yield some clues on the problem, they can seldom be used in a simple prescribed manner. In cases of this kind referral to the Counseling Center is usually advisable, but an understanding faculty member working in cooperation with professional counselors can be doubly effective.

C. Other Applications

The data from the Orientation Tests are available for individual or departmental research projects. The scores have been used widely as control data in experiments on learning and for inquiries into the characteristics of students found in a given curriculum. When desired, members of the Office of Evaluation Services are available for consultation on evaluation methodology or research design.

Transfer Students

While percentile rank scores are reported for all new students, freshmen and transfers, the reference group used in computing these PR's is new freshmen only. The result is that transfer students with previous college experience may appear to score higher on the tests than advanced MSU students who took the tests as freshmen. High scores for transfer students should not, as a consequence, be regarded as indexes of superior ability without some adjustment, although low scores are equally as useful in revealing deficiencies for transfer students as they are for freshmen. In the latter sense academic advisors may find it particularly helpful to recommend a remedial service for transfers with low test scores and borderline academic attainment. New freshmen are routinely assigned to improvement services on the basis of test scores but transfer students are not screened for possible disabilities in reading.

A Note of Caution

Test scores must never be considered infallible. While the scores on carefully constructed tests are much more dependable than impressions secured from casual classroom experiences or individual conferences, any one test score must be regarded only as indicative and never final. In this regard, it is usually advisable to view a score as a possible range of scores, i.e., a PR of 55 is considered as any of the PR's in the range from 40 to 70, or a PR of 95 in the range from 90-99. The range suggested above is deliberately larger near the average, since one can generally place more confidence in extremely high or low scores that are reported as percentile ranks than in scores near the PR of 50. Furthermore, when inconsistencies are found among similar tests or between tests and attainment, retesting is often advisable.

A Few Quick Guides

Routine procedures which others who work with students have found to be fruitful include the following:

1. The scores of advisees can be recorded on a convenient record sheet. This sheet can also include other easily summarized background information, such as previous grades. Sometimes information of this kind is secured for small classes where individualized instruction is possible.

2. Test scores can be compared to actual scholastic attainment. Students with marked discrepancies in the two sets of measures are noted for further study when the opportunity arises.

3. Before beginning a conference with a student, a moment spent in scanning the record sheet may provide a useful orientation for the conference.

4. When a new student reports to his advisor the first time, the student should have a copy of his Orientation Record available with his test scores profiled. These scores may be useful in recommending the size of class load to carry, or the types of courses to select.

5. The average test scores for students in a class may be used to help determine the relative number of extreme grades (4.0's, 3.5's and 1.5's or less) to be assigned to a class. However, <u>grades for an individual student should never be influenced by these scores</u>.

APPENDIX F

Instructions for Calling Participants

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Instructions for Calling Participants

Hello, my name is ________________________ and I'm calling from Dr. Ralph's office in the Department of Communication. We are currently working on an important project which is examining how people process information. And we would like to know if you could help us out. All you would have to do is stop by at your convenience, and fill out a questionnaire. Do you think you could help us out? When would it be convenient?

If they say "no." It is really important for us to get as many people to participate, because some of the results from this study will likely be used to improve the undergraduate curriculum. Are you sure you can't find time?

Some Common Questions

How Was I Selected? all juniors and seniors in the Department of Communication will be given the opportunity to participate.

What Will I have To Do? all we would like you to do is come in and fill out a questionnaire; it shouldn't take any more than one-half hour of your time.

What's The Study Trying to Do? basically, the study is trying to assess public opinion toward a few current news topics, and we want to see how your communication activity and information processing habits influence your opinion.

How Will These Data Help The Undergraduate Curriculum? some of the results may be used to recommend that certain skills be acquired during your collegiate career. As you are probably well aware, it is a difficult task to determine what the best "mix" of classes is for each individual. Hopefully, the results will provide some insights into this problem.

ALL RESULTS WILL BE CONFIDENTIAL. NO ONE WILL KNOW HOW YOU RESPONDED.

APPENDIX G

Procedures that were Followed to
Greet Participants and Introduce Them to the Study

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Procedures that were Followed to
Greet Participants and Introduce Them to the Study

Instructions for When the Participant Arrives

Introduce yourself and ask them to sit down.

Wait a few minutes for all persons to arrive. Don't wait too long (maybe 5 minutes).

Explain that the study is examining information processing, and what we would like them to do is fill out a questionnaire. Tell them that: The first part of the questionnaire asks a little bit about their background; the second part asks them to state their opinion about a few topics, and the third part asks them to perform a simple grouping task.

HOWEVER, before they can begin, you must present them consent Form A, and have them sign it, date it, and put the time of day on it. Explain to them that the consent form is required by the University, and that it is simply a statement of their agreement to participate. Tell them once they finish the questionnaire, you will debrief them and tell them more about the nature of the study.

After they sign the consent form put the time of day (to the nearest minute) on the questionnaire and let them begin.

Tell them that if they have any questions, or experience any confusion over how to answer any question, or are just not sure about what to do--to ask you. Tell them you'll be right outside, and that when they are done to just come outside and give you the questionnaire.

Once they finish the questionnaire and they come to hand it in, note the time of day (to the nearest minute) and write it on the questionnaire.

Thank them for participating, and ask them to sit down so that you can explain the nature of the study.

Tell them:

1. The study is concerned with how individual's process information.

2. The major question being tested is the extent to which a person's environmental conditions will determine how he/she will process information.

3. The first part of the questionnaire asked them to tell us about what things were like when they were growing up, and how things are now.

   In particular, we were interested in what kind of information environment they were exposed to, because differences in environment should cause differences in processing. To test this:

4. Our theory predicts that there should be differences in the kinds of numbers people use in the second part of the questionnaire, depending upon what the environmental conditions were. Of course, we may be wrong, but this is what we are interested in finding out.

5. Finally, tell them the Communication Department is interested in the results because the findings may suggest how to "track" students. If our "guesses" are supported, it is possible that instead of putting people in "remedial" or "accelerated" tracks, we might want to put them in courses that teach them new symbol sets and/or different ways to package information or view the world. For example: in math courses, logic courses, foreign languages, etc.

Ask them if they have any questions.

If not, tell them that we would like to access their student records to extract

ACT & SAT Test Scores
MSU Entrance Exam Scores
High School GPA, and
College GPA

Tell them that they do not have to grant us access to their student record information, but that it would really be beneficial to our study if they did so. Assure them that: (1) their information will be treated carefully, (2) confidentially, and (3) there will be no way for anyone else to find out what their student record has in it, or how they performed on this questionnaire.

If they say "OK," present them with consent Form B. Have them sign it and date it.

Thank them again and ask them to cooperate by not explaining to anyone else the nature of the study or what they did. Tell them the study is going to run for two weeks, and we don't want to bias any future participants. Tell them we are asking a lot of communication majors to participate, and we don't want to screw-up what work we have already done by having people know what's going on, and try to respond either:

(a) in ways to help the study, or

(b) in ways to hurt the study.

So, mums the word OKAY? OKAY!!

T H A N K S!

APPENDIX H

Consent Forms A and B

APPENDIX H

Consent Forms A and B

Michigan State University

Department of Communication

Form A

1. I have freely consented to take part in a scientific study being conducted by: N. J. Stoyanoff

   under the supervision of: Dr. David C. Ralph

   Academic Title: Director of Undergraduate Studies

2. The study has been explained to me and I understand the explanation that has been given and what my participation will involve.

3. I understand that I am free to discontinue my participation in the study at any time without penalty.

4. I understand that the results of the study will be treated in strict confidence and that I will remain anonymous. Within these restrictions, results of the study will be made available to me at my request.

5. I understand that my participation in the study does not guarantee any beneficial results to me.

6. I understand that, at my request, I can receive additional explanation of the study after my participation is completed.

Signed: ______________________________

Date: ______________________________

Michigan State University

Department of Communication

Form B

I ________________________________ have been informed on the nature of the research being conducted, and agree to let the Department of Communication provide access to my student records to the persons involved in this research effort. I recognize that these investigators will employ certain procedures to combine my student record data with the questionnaire data, and understand the procedures that will be utilized to protect the confidentiality of my personal data. I understand that I may withdraw my participation in this study at any time. ___N. J. Stoyanoff___ is in charge of this specific activity.

Signed ______________________________

Date ______________________________

APPENDIX I

Model Indicators, Labels, and Corresponding Questionnaire Items

APPENDIX I

Model Indicators, Labels, and Corresponding Questionnaire Items

Theoretic Construct	Indicator	Label	Questionnaire Items
Social Structural Factors (ξ)			
	x_1	FINCOME	WHEN YOU WERE GROWING UP, WHAT WAS THE AVERAGE YEARLY INCOME YOUR FAMILY LIVED ON? $________/YR (estimate in 1980 dollars)
	x_2	FOCC	FATHER'S OCCUPATION? (WHAT HE DOES/DID, NOT WHERE HE WORKS) (see Appendix J)
	x_3	MOCC	MOTHER'S OCCUPATION? (WHAT SHE DOES/DID, NOT WHERE SHE WORKS) (see Appendix J)
	x_4	FED	WHAT IS THE HIGHEST GRADE OR YEAR IN SCHOOL THAT YOUR FATHER COMPLETED? (see Appendix J)
	x_5	MED	WHAT IS THE HIGHEST GRADE OR YEAR IN SCHOOL THAT YOUR MOTHER COMPLETED? (see Appendix J)
	x_6	SRNOW	A SOCIALLY RESPONSIVE LIFE-STYLE IS ONE IN WHICH AN INDIVIDUAL'S BEHAVIORS ARE ACKNOWLEDGED AND RESPONDED TO BY OTHERS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW SOCIALLY RESPONSIVE IS YOUR LIFESTYLE NOW? ________

Theoretic Construct	Indicator	Label	Questionnaire Items
Social Structural Factors (ξ) (cont'd)	x_7	DIVNOW	A DIVERSE LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL DOES THINGS WHICH ARE VARIED, DIFFERENT, AND UNUSUAL. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON"S EXPERIENCE . . . HOW DIVERSE IS YOUR LIFESTYLE NOW? ______________________________
	x_8	INDNOW	AN INDEPENDENT LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL IS SELF-DIRECTED, AUTONOMOUS, AND FREE TO DO WHATEVER HE/SHE LIKES. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW INDEPENDENT ARE YOU NOW? ______________________________
	x_9	NUTNOW	A NURTURED LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL'S EMOTIONS, FEELINGS, AND WELL-BEING ARE CARED FOR BY OTHERS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW NURTURED ARE YOU NOW? ______________________________
	x_{10}	COHNOW	A COHESIVE LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL ESTABLISHES CLOSE RELATIONSHIPS AMONG FRIENDS AND FAMILY. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . .

Theoretic Construct	Indicator	Label	Questionnaire Items
Social Structural Factors (ξ) (cont'd)			HOW COHESIVE IS YOUR LIFESTYLE NOW?
	x_{11}	INTELNOW	AN INTELLECTUAL LIFESTYLE IS ONE IN WHICH AN INDIVIDUAL IS SURROUNDED BY INTELLIGENT, KNOWLEDGEABLE, AND COMPETENT PEOPLE. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW INTELLECTUAL IS YOUR LIFESTYLE NOW?
Information Environment (η_1)	y_1	AKNTNOW	AN ACTIVE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW ACTIVE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW?
	y_2	AKMENOW	HOW ACTIVE ARE YOUR MEDIA EXPERIENCES NOW?

Theoretic Construct	Indicator	Label	Questionnaire Items
Information Environment (η_1) (cont'd)			
	y_3	STNTNOW	A STIMULATING INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION WHICH TEACHES HIM/HER NEW THINGS AND STIMULATES HIS/HER CURIOSITY AND IMAGINATION. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW STIMULATING ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ______
	y_4	STMENOW	HOW STIMULATING ARE YOUR MEDIA EXPERIENCES NOW? ______
	y_5	SRNTNOW	A SOCIALLY RESPONSIVE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION WHICH ACKNOWLEDGES OR RESPONDS TO HIS/HER BEHAVIORS. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW SOCIALLY RESPONSIVE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ______

Theoretic Construct	Indicator	Label	Questionnaire Items
Information Environment (η_1) (cont'd)	y_6	DVNTNOW	A DIVERSE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION ABOUT A VARIETY OF TOPICS, AND WHICH INFORMS HIM/HER ABOUT DIFFERENT THINGS ABOUT THE TOPIC. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW DIVERSE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________
	y_7	DVMENOW	HOW DIVERSE ARE YOUR MEDIA EXPERIENCES NOW? ____________
	y_8	NUNTNOW	A NURTURING INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL PROCESSES A LOT OF INFORMATION WHICH IS DIRECTED AT HIS/HER FEELINGS, EMOTIONS, AND WELL-BEING. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW NURTURING ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________

Theoretic Construct	Indicator	Label	Questionnaire Items
Information Environment (η_1) (cont'd)	y_9	CHNTNOW	A COHESIVE INFORMATION ENVIRONMENT IS ONE IN WHICH AN INDIVIDUAL INTERACTS WITH A SET OF PEOPLE WHO ARE HIGHLY INTEGRATED AND WHO EXCHANGE A LOT OF INFORMATION WITH EACH OTHER. IF ZERO MEANS NOT AT ALL, AND 100 DESCRIBES THE AVERAGE PERSON'S EXPERIENCE . . . HOW COHESIVE ARE YOUR INTERPERSONAL COMMUNICATION NETWORKS NOW? ____________________
	y_{10}	NHRSTKT	ON THE AVERAGE, ABOUT HOW MANY HOURS PER WEEK DO YOU SPEND TALKING WITH THESE YOUR FRIENDS? ____________________
	y_{11}[a]	PRINTIME	INDICATE HOW MANY HOURS PER WEEK YOU SPEND READING EACH OF THE FOLLOWING: THE STATE NEWS ______ HRS/WK THE LANSING JOURNAL ______ HRS/WK THE DETROIT FREE PRESS ______ HRS/WK THE DETROIT NEWS ______ HRS/WK THE NEW YORK TIMES ______ HRS/WK THE WALL STREET JOURNAL ______ HRS/WK PERIODICALS (MAGAZINES) ______ HRS/WK

[a]PRINTIME was an indicator which was computed using the following equation:

$$\text{PRINTIME} = (-.0005)\ (\text{SN}) + (.0018)\ (\text{LJ}) + (.0333)\ (\text{FP}) + (-.1029)\ (\text{DN}) + (.0039)\ (\text{NYT}) + (-.0695)\ (\text{WSJ}) + (-.1569)\ (\text{MAG})$$

Theoretic Construct	Indicator	Label	Questionnaire Items
Information Environment (η_1) (cont'd)	y_{12} [b]	NEWSTIME	INDICATE HOW MANY HOURS PER WEEK YOU SPEND WATCHING . . . . TV NETWORK NEWS ______ HRS/WK TV LOCAL NEWS ______ HRS/WK TV MORNING NEWS PROGRAMS ______ HRS/WK TV LATE NIGHT NEWS ______ HRS/WK

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where: SN = number of hours per week spent reading the State News
LJ = " " " " " " " " Lansing Journal
FP = " " " " " " " " Detroit Free Press
DN = " " " " " " " " Detroit News
NYT = " " " " " " " " New York Times
WSJ = " " " " " " " " Wall Street Journal
MAG = " " " " " " " " Periodicals (Magazines)

These coefficients were the factor score coefficients obtained from a confirmatory factor analysis which examined the extent to which these six questionnaire items loaded on a single factor. See Tables I-1 and I-2 for the full results of this analysis.

[b] NEWSTIME was an indicatory which was computed using the following equation:

$$\text{NEWSTIME} = (1.323)\ (\text{TVNW}) + (-.642)\ (\text{LONW}) + (-.509)\ (\text{AMNW}) + (-.229)\ (\text{PMNW})$$

where: TVNW = number of hours per week spent watching TV network news
LONW = " " " " " " " TV local news
AMNW = " " " " " " " TV morning news
PMNW = " " " " " " " TV late night news

These coefficients were the factor score regression coefficients obtained from a confirmatory factor analysis which examined the extent to which these four questionnaire items loaded on a single factor. See Tables I-3 and I-4 for the full results of this analysis.

Theoretic Construct	Indicator	Label	Questionnaire Item
Indicators y_{13} to y_{20} were all derived from the MMDS data. Indicators y_{13} to y_{17} are simply descriptive statistics which describe the paired-comparison scores generated by each individual, while indicators y_{18} to y_{20} describe the summary statistics obtained from the factoring of the variance-covariance matrix generated by the paired-comparison scores.			
Processing Style (η_3)			
	y_{13}	NOS	Total number of <u>unique</u> scores used
	y_{14}	FOF	Total number of scores = 0, 50, or an integer multiple of 50
	y_{15}	C.V.	Coefficient of variation among scores used
	y_{16}	NEXMIN	Total number of scores $\leq$ 10
	y_{17}	NEXMAX	Total number of scores $\geq$ 1000
Cognitive Structure (η_3)			
(differentiation)	y_{18}	NDR	Number of real dimensions
(discrimination)	y_{19}	TRACE	Trace of the eigenvector matrix
(integration)	y_{20}	WARP	$\frac{\text{Sum of the positive eigenroots}}{\text{sum of all (positive and negative) eigenroots}}$
y_{21} was derived from the Scott "Listing and Comparing Task."			
(differentiation)	y_{21}	H	Computed using the formula: $\log_2 n - \frac{1}{n} [\Sigma n_i \log_2 n_i]$ where: n = the number of stimuli presented (19); n_i = the number of elements in each grouping pattern.

Table I-1

Summary Statistics for the Indicators of Printime (N=99)[a]

Indicator	N	Mean	Standard Deviation	Skew	Minimum Score	Maximum Score
SN	99	2.326	1.346	.580	0.000	6.000
LJ	97	.459	1.129	2.994	0.000	5.500
FP	98	2.855	2.883	1.197	0.000	14.000
DN	96	.469	1.176	3.650	0.000	7.000
NYT	96	.568	1.696	4.382	0.000	12.000
WSJ	96	.424	.996	3.418	0.000	5.000
MAG	98	3.462	3.765	2.974	0.000	25.000

[a]Unequal n sizes are the result of case elimination due to missing data. For a glossary of the indicators, see Appendix I. When skew > $|2|$, the data were transformed to ln (variable + constant.

Table I-1 (cont'd)

Indicator	Constant	Mean of Transformed Scores	Standard Deviation of Transformed Scores	Skew of Transformed Skews
SN	-	-	-	-
LJ	.25	-.9397	.8984	1.765
FP	.25	.5719	1.2071	-.452
DN	.25	-.9097	.8913	1.666
NYT	.01	-3.6396	2.1205	1.822
WSJ	.25	-.8965	.8491	1.521
MAG	.25	.9488	.8727	-.290

Table I-2

A Confirmatory Factor Analysis On the Indicators of Printime (N=99)[a]

Indicator	unstand-ardized	(standard error)	stand-ardized	Unstandardized Error of Measurement: error	Unstandardized Error of Measurement: (std. error of error)	factor score coefficient
SN	-5.21	(410.78)	-.01	1.81	(.26)	-.0005
LJ	1.00[c]	(0.00)	.00	.81	(.12)	.0018
FP	267.48	(b)	.46	1.25	(.22)	.0333
DN	124.89	(9464.92)	.21	.75	(.11)	-.1029
NYT	566.30	(b)	.97	3.56	(.71)	.0039
WSJ	179.97	(b)	.31	.63	(.11)	-.0695
MAG	254.36	(b)	.43	.57	(.13)	-.1569

df = 14
χ^2 = 14.88
probability level = .3862

[a]See Table I-1 for the sample size of each indicator. This analysis is based on transformed scores for all indicators; see Table I-1. For a glossary of the indicators, see Appendix I.

[b]The standard error exceeded the print limitation (99,999) on the LISREL® computer program and cannot be reported.

[c]This value is fixed to serve as a reference indicator.

Table I-3

Summary Statistics for the Indicators of Newstime (N=99)[a]

Indicator	N	Mean	Standard Deviation	Skew	Minimum Score	Maximum Score
TVNW	99	2.091	2.239	2.651	0.000	14.000
LONW	98	1.552	1.714	1.487	0.000	8.500
AMNW	98	.556	1.563	4.823	0.000	12.000
PMNW	99	1.035	1.268	1.198	0.000	5.000

[a] Unequal N sizes are the result of case elimination due to missing data. For a glossary of the indicators, see Appendix I. When skew $>|2.0|$, the data were transformed to ln (variable + constant).

Table I-3 (cont'd)

Indicator	Constant	Mean of Transformed Scores	Standard Deviation of Transformed Scores	Skew of Transformed Skews
TVNW	.25	.4052	1.0476	-.515
LONW	.25	.0690	1.1109	-.175
AMNW	.25	-.9194	.9539	1.826
PMNW	.25	-.2919	1.0878	.186

Table I-4

A Confirmatory Factor Analysis On the Indicators of Newstime (N=99)[a]

				Unstandardized Error of Measurement		
Indicator	unstandardized	(standard error)	standardized	error	(std. error of error)	factor score coefficient
TVNW	.89	(.15)	.78	.49	(.11)	1.323
LONW	1.00[b]	(0.00)	.88	.46	(.12)	-.642
AMNW	.59	(.12)	.51	.65	(.10)	-.509
PMNW	.79	(.14)	.69	.70	(.12)	-.229

df = 2
χ^2 = 1.10
probability level = .5774

[a]See Table I-3 for the sample size of each indicator. This analysis is based on transformed scores for all indicators. For a glossary of the indicators, see Appendix I.

[b]This value is fixed to serve as a reference indicator.

APPENDIX J

Codebook for x_2 - x_5

APPENDIX J

Codebook for x_2 - x_5

For x_2 and x_3 the occupational prestige score is derived from Duncan (1961). The Siegel NORC scale was used. For x_4 and x_5 the participants' responses were coded using the following scheme:

EDUCATION

Missing	= xx
None	= 00
Kindergarten	= 01
1st Grade	= 02
2nd Grade	= 03
3rd Grade	= 04
4th Grade	= 05
5th Grade	= 06
6th Grade	= 07
7th Grade	= 08
8th Grade	= 09
9th Grade	= 10
10th Grade	= 11
11th Grade	= 12
H.S. Grad. 12th Grade	= 13
1 Yr. Coll.	= 14
2 Yr. Coll.	= 15
3 Yr. Coll.	= 16
4 Yr. Coll.	= 17
2 Yr. Degree	= 18
4 Yr. Degree	= 19
MA, MBA, MFA, MS	= 20
PHD	= 21
MD	= 22
DDS	= 23
JD	= 24
1st Yr. Adv. Degree	= 25
2nd Yr. Adv. Degree	= 26
3rd Yr. Adv. Degree	= 27
4th Yr. Adv. Degree	= 28

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