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Career time perspective and career decision-making in users of DISCOVER: A latent variable analysis

Schlossman, Colin K., Ph.D.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

CAREER TIME PERSPECTIVE AND CAREER DECISION-MAKING IN USERS OF DISCOVER: A LATENT VARIABLE ANALYSIS

by

Colin K. Schlossman

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Executive Officer

Professor Carol Kehr Tittle

Professor David Rindskopf

Supervisory Committee

The City University of New York

Abstract

CAREER TIME PERSPECTIVE AND CAREER DECISION-MAKING
IN USERS OF DISCOVER: A LATENT VARIABLE ANALYSIS

by

Colin Schlossman

Adviser: Professor Shirley Feldmann

This study examined the latent structure of the relations between use of a computer-assisted career guidance system (DISCOVER) and three variables in the vocational domain: attitudinal vocational maturity, career time perspective and career decision-making. 432 undergraduates were assigned to either a treatment (DISCOVER) group or served as controls in a pre-posttest experimental design. Two factors emerged from the factor analyses (LISREL): an attitude and a time perspective factor. That time perspective emerged as an independent factor is a new and unexpected finding. Regression analyses revealed the only significant effects were all three variables at Time 1 on themselves at Time 2. DISCOVER had no significant effect. Findings are discussed in terms of career indecision and are related to previous studies. Suggestions for future research are provided.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Coupled with the increasing phenomenon of adult career change, the recent widespread reliance on computer-assisted career guidance systems (CACG) continues to generate the need for greater understanding of the processes and effects involved in their use. From the mid-sixties, this topic has been a popular area of research, first in the evaluation of the effects of main-frame technology and later the mini and microcomputer programs (Cairo, 1975). The use of microcomputer-assisted career guidance in colleges increased sharply in the last decade because they were readily available, and they became a source of vast amounts of vocational information, both attractive to students and easy to use (Sampson, Shahnasarian, & Reardon, 1987).

Computer-assisted career guidance systems also present a vast fertile environment for the study of vocational variables and for the testing of guidance theory. Although there have been a number of studies in these areas involving both CACG and guidance theory in general, many of the findings remain equivocal and conclusions should be interpreted cautiously. Particularly, research to date using CACG has not been able to adequately explain the influence of CACG on two major conceptions in the process of vocational development: career decision-making behavior and vocational maturity. The question of concern is, "What is the nature and extent of the influence of CACG on these two variables?" Innovative research in the sense of methods and variables is needed.

One possible explanation that has not been investigated in the context of CACG, but seems initially positive, is that the user's career time perspective becomes more future oriented (Savickas, Silling, and Schwartz, 1984). The proposed research will explore the role that career time perspective plays in the effects of computer-assisted career guidance on career decision-making and vocational maturity. This research will employ structural equation modeling techniques as refined by Joreskog and Sorbom (1981). A brief statement regarding the state of vocational guidance in general and CACG in particular at the university level may be instructive at this point.

The past decade in the vocational guidance field in colleges can be summed up by the description of four major forces which caused the exponential growth of computerized vocational systems in universities (Harris-Bowlsbey, 1984): 1. The vast expansion in the amount of career information. 2. A keen interest in the fastest growing college population-the adult student (retirees and working adults). 3. A large increase in attention to the process of career decision-making, due to its direct practical applications for students (Harren, 1979). 4. The skyrocketing costs of delivering student services (counseling, special programs for handicapped and learning disabled, bilingual, etc.) (University Task Force on Student Retention and Academic Performance, 1983).

Research has lagged behind the wave of technological innovations, in the sense that, the technology currently used in guidance is creating more questions than answers (Pyle, 1984; Walz, 1984). Thus, a major concern among guidance professionals, is the extent to which they are maximizing the utility of their CACG systems (Sampson, 1985). As will be shown in the review of the literature, much of the research is inconclusive and some contradictory. Briefly, this is due to the vastness of this theoretical area and the lack of a cohesive terminology (Savickas, 1984).

PURPOSES OF THE STUDY

The purposes of this study are:

1. To further examine the relationship of career time perspective (CTP) to the two major relevant process dimensions (Crites, 1976, 1983) in career development: attitudinal vocational maturity (AVM) and career decision-making (CDM).

2. To make an initial examination into the simultaneous effects of the DISCOVER CACG system on the three above mentioned variables in a latent variable analysis.

QUESTIONS TO BE ANSWERED

Questions that this proposal will attempt to answer are:

1. What is the underlying latent structure in the relationships of career time perspective, attitudinal vocational maturity, and career decision-making?

2. Is this structure different for males and females?

3. How does this structure change after use of the DISCOVER computer assisted career guidance (CACG) program?

RATIONAL FOR THE STUDY

As indicated earlier, little is known regarding changes in vocational attitudes and career decision-making in users of computerized guidance systems and less is known concerning career time perspective changes. As it is generally agreed that CACG is a powerful tool with important functions both for individuals and institutions (Sampson, Shahnasarian, and Reardon, 1987), the results of this study may indicate more efficient approaches to vocational counseling in general and the instruction of career decision-making strategies in particular, and lead to greater efficiency in the application of computers to the vocational guidance process. Higher education has traditionally taken on an active vocational and counseling role and this study will assist in greater theoretical clarity and increased application efficiency in this area.

CHAPTER 2

LITERATURE REVIEW

To present an adequate yet parsimonious review of the vocational literature for the proposed research is a most necessary yet difficult undertaking. Career guidance research and theory building are vast topics spanning close to a century of diverse development and organization with ties to the diciplines of economics and sociology, and to the subdiciplines of environmental, clinical, developmental, and educational psychology. The computer itself is a new and hardly understood phenomenon in education in general, and its effects upon vocational variables are largely unknown (Harris-Bowlsbey, 1984a). The effort in this review is: to describe the origins of the concepts of immediate concern (attitudinal vocational maturity, career decision-making, and career time perspective); to present the scientific etiology of these concepts; to explain the state of computerized career guidance; and thus to develop a clear understanding and appreciation of the framework for the proposed research.

Several bodies of literature are examined. Initially a brief general review of selected career guidance theories is presented. Included will be some of the research completed using older mainframe systems and other mini and microcomputer systems. Secondly, research involving the use of the DISCOVER computer-assisted career guidance (CACG) program is reviewed. A description of the DISCOVER system itself may be found in Appendix A. Thirdly, a more focused review of the variables in question are discussed in reference to CACG. Fourthly, the theoretical model and the hypotheses for the present study are presented. Finally, the literature which supports the use of the proposed modelling procedures is contained in a separate chapter.

CAREER GUIDANCE THEORIES

Models of career guidance can be inferred from both of the major classes of vocational theories, those of vocational choice such as Roe's Theory of Needs (1957), and Holland's Theory of Occupational Choice (1966), and the career development theories, typified by Tiedeman and O'Hara (1963) and Super (1963). Historically, there has been movement from the former, the Trait and Factor Approach which studied what vocational choices are made, to studying when and how these choices are made, embodied in the Developmental Approach (Tolbert, 1974, 1980).

The first to match an individual's traits with the requirements of an occupation was Parsons (1909); this major theoretical paradigm became known as the trait and factor approach. His idea was that individuals possess characteristics which can be objectively measured and matched to specific jobs by using logical reasoning. The notion of measuring an individual's characteristics led to measurement of aptitude (Hull, 1928), interest (Super, 1931) and self-analysis (Kitson, 1931) concerns. Expanding upon these notions, psychoanalytic vocational psychologists (Bordin, 1963; Roe, 1957, 1964; Segal, 1961) focused on the influence of unconscious needs and desires which were hypothesized to stimulate occupational preferences. Holland (1966, 1973), by classifying occupations according to personality characteristics, broadened the trait and factor approach considerably. Many of these theorists typically focused on the study of one psychological trait. For example, Bordin focused on expressing or controlling one's impulses; Roe focused on the social dimension or the individual's social needs, Segal focused on conforming or nonconforming tendencies, and Holland focused on the interpersonal environment. The major theories in the trait and factor tradition will be presented briefly: the theories of Roe and Holland.

Vocational choice theorists ask the question: Given the particular set of characteristics an individual expresses at a particular point in time, in which occupations is he or she likely both to be interested in and to succeed? Roe (1957) proposed that two overriding factors, the level of psychic energy an individual has to devote to education and work and the relative warmth of the early childhood environment, predispose people to choose specific vocations. She classified occupations in a two-dimensional matrix by level of education and field of interest. The warmer the nurturing environment the more an individual becomes predisposed to choose occupations offering face-to-face contact with people while science and technology type occupations are more attractive for those from relatively cold, nonsupportive childhood environments. By taking a case history or, more recently, by administering the Individualized Career Exploration Instrument (Miller-Tiedman, 1976), counselors are able to assess both field of interest and motivational level.

Roe's theory predicts that if the attitudes of parents were warm and accepting, their children would develop an orientation to people, welcome a social environment, and seek similar types of work environments. It could also be argued that individuals deprived of a warm environment as children would seek socially warm work environments as adults. Thus there may well be an interactive effect on vocational choice rather than a cause and effect relationship as Roe predicted.

Studies by Roe and Siegelman (1964) lend modest support to the notion that early home experiences are related to later orientation to people, but other studies focusing on the same hypotheses have not been supportive (Grigg, 1959; Hagen, 1960; Switzer, Grigg, Miller, and Young, 1962). This drawback coupled with the exclusion of many other career choice variables are two of the main weaknesses of her theory.

In the other major vocational choice theory, Holland (1966, 1973) postulated that individuals possess varying amounts of six discrete personality types and that an individual's type is molded by a unique combination of heredity and environment. The activities in early childhood that are offered by parents and significant others, if positively reinforced, may become interests. These interests affect the activities of the individual and lead to expression of related abilities and in time to the formulation of a set of values. Holland's six personality types are attracted to and seek out one of six related work environments. For example, the Realistic type (prefers manual labor, working outdoors, and less structured supervision) seeks out Realistic work environments such as construction and forestry jobs. The names of the other types are relatively self-describing: Investigative, Social, Conventional (office work), Enterprising, and Artistic. Job satisfaction is largely dependent on the similarity of the occupational environment type to the individual's type, with greater similarity indicative of greater satisfaction.

By administration of the Vocational Preference Inventory (Holland, 1975), or the Self-Directed Search (Holland, 1977), a vocational counselor may ascertain a person's type expressed in a three-letter code. By matching lists of occupations coded by this same three-letter system, a more detailed investigation of suggested occupations (those occupations which according to the theory will both match the individual's abilities and satisfy the individual's interests) is possible. The DISCOVER CACG system delivers a version of the Self-Directed Search under the topic called "Interest Inventory" in the second module of the program and encourages the user to investigate the suggested occupations in the third module.

The more recent versions of the Self-Directed Search have addressed sex bias and the theory has been found both to apply to minority group members, and, in general, appears to have a sound rationale (Edwards and Whitney, 1977). Citing aspects of Holland's theory that serve as the basis for the major career clusters and vocational-interest inventory in the American College Testing Program's Career Planning Profile, Tolbert (1980) states, "Without question, the instrument, as well as the theory on which it is based, has considerable utility for career guidance and counseling" (p. 72).

The second theoretical paradigm, Career Development, has been defined as "the process of fashioning a vocational identity through differentiation and integration of the personality as one confronts the problem of work in living" (Tiedeman & O'Hara, 1963, p. 5) and by Haney & Howland (1978):

> Career development is defined as a process whereby individuals develop realistic goals for professional and personal life-style futures, thereby building strategies for movement towards these goals, through the investigation of appropriate and available options open to the individual based on personal needs and direction-orientation and the dynamics of surrounding social and economic environments. (p. 78)

Career development theorists are not as present-time bound as trait and factor theorists, and are more interested in the processes of career choices than in the actual choice. They ask the question: To make satisfying career decisions, what processes should individuals go through? David Tiedeman focused on the importance of the career decision-making process and its relation to the formulation of an ego identity for work. Tiedman and O'Hara (1963) conceptualized seven phases of development encapsulated in just two stages, Anticipation and Implementation. Beginning in the Anticipation Stage, a decider becomes aware of a need and looks to the environment to identify possible alternatives (Exploration Phase), narrows the field of these alternatives while simultaneously assessing the advantages and disadvantages of each (Crystallization Phase), finally reaches a tentative choice (Choice Phase), and reviews the choice and its anticipated consequences (Clarification Phase). Entering the Implementation Stage the decider must relate to variables that are external to the individual. In the Induction Phase, the decider may take a job or enter college in an attempt to conform to the environment and starts to behave in greater conformity to role expectations. During the Reformation Phase, the decider attempts to modify the environment by projecting himself or herself into the environment. Finally, there's a compromising and blending of the environment's press and the decider's will within the Integration Phase, a state of dynamic equilibrium, not a static condition.

More recently, Tiedeman (1979) focused on his "I-power" conceptualization: the development and strengthening of the capacity of an individual to maximize his/her potential by modifying or changing the environment, by actively investing in the environment and by self-actualization. He suggested that the study of futurism be introduced into schools and colleges as a strategy for individuals to control their futures (Tiedeman, 1978).

Donald Super, another career development theorist, approached the subject of career development from a number of broad perspectives; one of the first emphasized an individual's development of a self-concept. Super (Super, Starishevsky, Matlin & Jordaan, 1963) felt that choosing an occupation is the implementation of a self-concept, a relatively fluid entity that could change through maturation, experience, and counseling. Vocationally related self-concept systems form the vocational self-concept. Over the life span as the vocational self-concept changes, so may the vocational choice.

Another perspective mentioned in the earlier study (Super et al, 1963), and then increasingly emphasized by more recent additions to his career development theory (Super, 1980a), was concerned with life stages, developmental tasks, and vocational maturity. He proposed that five age-related stages exist: Growth, Exploration, Establishment, Maintenance, and Decline. Within each of these stages, there exist specific vocational development tasks and coping behaviors which, if poorly managed, create problems or deficits in later life stages. From these conceptions flowed his construct of "vocational maturity", defined as an individual's relative ability in relation to similar others to cope with appropriate developmental tasks theoretically assigned to that stage. The Career Development Inventory (Thompson, Lindeman, Super, Jordaan & Myers, 1981) was in part developed from these conceptions to estimate vocational maturity, measures the following factors: awareness of a need to plan ahead, knowledge and use of resources, decision-making skill, career information, world-of-work information, and occupational knowledge. Having knowledge of these factors helps counselors gauge client career choice readiness and helps in the prescription of interventions if needed.

A third relevant area of Super's work, called the Career Rainbow, dealt with career as a unique combination of eight specific life roles (Super, 1974, 1980a): worker, student, leisurite, parent, spouse, homemaker, citizen, and son/daughter. The worker role is seen as only one role in a series of complicated interactions with the others and thus as only one outlet for the expression of interests, abilities, and values. The resulting model contains five major elements essential for a complete theory of career development: a lifelong developmental process, decision-making strategies, the impact of social and personal factors, roles in the lifestyle, and career patterns. Among the inventories available and in part based on this theory is the Career Development Inventory (CDI) adult form (Super, 1977), which unlike the earlier versions that were to be used for adolescent populations, is targeted for college age and older individuals. This inventory will be utilized to measure career maturity attitudes in the proposed research.

The theories so far reviewed are by no means an exhaustive list of vocationally related theories, but are more central to the concerns of the proposed study. The following theories are less germane, but nevertheless, need to be mentioned. Psychoanalytic theorists (Nachmann, 1960; Galinsky, 1962; Bordin, Nachmann and Segal, 1963) have attempted to investigate and explain the role of various personality variables to the career choice process in terms of psychoanalytic theory. Sociological theories have emphasized the role of social institutions such as the family, home, and occupational structure (Hollingshead, 1949; Blau, Gustad, Jessor, and Wilcock, 1956). In a more recent effort to synthesize these many and varied types of influences on the career choice process into a more unified and workable whole, Social-Learning theorists (Mitchell, Jones, and Krumboltz, 1975; Krumboltz, 1979; Thoresen and Ewart, 1978) have built more encompassing models. In short, social-learning theory conceptualizes four categories of factors that influence career decision-making: 1. Genetic endowment and special abilities, 2. Environmental conditions and events, 3. Learning experiences, and 4. Task-approach skills. Career decision-making theories will be reviewed in the section, Career Decision-Making.

In summary, the purpose of the preceding section was to present an overview of the more relevant vocational theories. As theoretical notions in this area became more sophisticated, they tended to encompass greater numbers of explanatory factors. Roe's Needs Theory demonstrates the naivete of early theoretical attempts. Another early theory, in the Trait and Factor tradition, was Holland's Theory of Occupational Choice. Although by itself an inadequate method for career selection, with time and extensive revision, it has generated an excellent method of relating an individual's interests to occupations that will complement those interests. Holland's theory has also spawned many theoretical questions and thus has acted as a driving force for research.

The career development theories, as exemplified by those of Donald Super, are by far the most comprehensive. Super's theory has undergone much revision and expansion over a 40 year period. This theory and those of social-learning seem to be converging, in that as they increasingly incorporate more global concepts (e.g. life roles), they tend to overlap. For education and guidance, the implications of these theories may be summed up by the following needs: 1. to synthesize career development concepts with school programs at all levels; 2. to work with home and community concerns for maximum effectiveness; 3. to provide opportunities for the individual to practice decision-making skills; 4. to give special attention to choice points in the educational process and throughout an individual's life.

FOUNDATIONS OF COMPUTER-ASSISTED CAREER GUIDANCE (CACG)

This section describes in general the types of computerized systems, for example, informational versus guidance, and describes their major distinguishing features: scope, content, structure, style, cost, effects, and rationale. For a description of DISCOVER see Appendix A.

The role of the computer as an active agent in the career guidance process, is directly related to the theoretical base of the career guidance program. There are quite different demands that these two categories of theories, vocational choice theories and career development theories, make of a computerized guidance system. As vocational choice theories tend to prescribe interventions that are step-by-step, mainly one-time processes, they have a greater potential for computerization than the career development theories which, by their emphasis on change-over-time, indicate a need for greater depth of analysis and adaptability to the changing individual. In regards to the former theories, the computer, having excellent file search capabilities can easily identify occupations in its file that have a specific Holland Code from the Self-Directed Search (Holland, 1977), or Roe Level and Field, corresponding to prior on-line assessment of the individual.

Utilizing the capacities for interactive dialogue and individualized treatment, the computer can provide personalized interpretations for individual users. Regarding the career development theories, CACG interventions may be informational, such as assisting the user to ascertain and evaluate their various life roles and thus be better able to plan ahead, or instructive, such as teaching a career decision-making strategy (DISCOVER modules one and four respectively).

Computerized guidance developed in three waves or generations. Computers were first used in career guidance as batch processors, that is, for off-line scoring of many questionaires simultaneously at a central location. Although they are the most inexpensive way to provide career guidance information, few exist today because of the extended time between administration, scoring, and delivery. Later, on-line systems were developed that employed teletype or cathode ray tube (CRT) technology. Typically, a student would sit at a terminal and communicate directly with a centrally located computer. There were at least three advantages over the older batch processing systems. Students could interact with the computer in the sense that their responses in a highly structured interview format would elicit specific computer text output. Also, a separate file for each user could be easily updated. In the third generation of CACG, search strategies became increasingly more sophisticated so that file searches could be accomplished by differing sets of characteristics directed by the user. Some of these systems have become quite sophisticated and are presently in operation. The Education and Career Exploration System (ECES), Oregon Career Information System (OCIS), Computerized Vocational Information System (CVIS), and Guidance Information System (GIS) are examples that serve hundreds of locations simultaneously.

In general, because CACG systems involve language, they vary in their use of diction, fluency, syntax, clarity, etc. as well as the way they imbed graphics and give a sense of dialogue. More importantly, CACG systems range from relatively pure information systems to those where the emphasis is on guidance. The former can be defined as those that place primary emphasis on the searching of files, usually by variables that are inherent in the work tasks and external to the user. They vary widely in the flexibility of search strategies, as well as the number and range of files offered and the amount of information provided about schools and occupations. They tend to be systems based on centrally located mainframe technology and have usually been in existence for some time. They have the advantages of ease of updating occupational information and can easily be programmed to address more local employment concerns.

On the other hand, guidance systems can be defined as those with emphasis on the teaching of a decision-making process and the assessment of self-variables. Like the information systems, guidance systems also contain files of occupations and other vocational data. There are three characteristics that all guidance systems share. First, on-line assessment instruments increase self awareness in the user while organizing relevant self-variables so that they may be translated to occupational choices. Secondly, a career-decision making process is taught either explicitly or implicitly, and thirdly, searches of occupations by using person-variables are provided usually with the printing of lists containing ranked suitable job titles. Some newer systems have an additional section which deals with ways of implementing decisions. These activities include, appraisal of the client, strategies for decision-making, information about options, and planning, respectively. Taken together these four areas may be said to comprise the "curriculum" of career development (Katz, 1973).

Computer-assisted guidance can also be analyzed by its distinguishing features, e.g. scope, content, structure, style, cost, effects, and rationale or the model of career decision-making on which the system is based. Scope refers to the above mentioned "curriculum," the number of these areas addressed, and the depth of coverage applied. The relative emphasis of information and guidance provided and the populations and settings targeted for use are other "scope" concerns.

Content refers in part to the number of person-variables appraised and the methods of assessment employed, the types of career information included, the decision-making instruction, and career planning provided. The more recent the development of the system, the greater the number of these content areas included and usually the more detail and refinement expressed. There is no overall agreement as to the operational definitions of the psychological domains assessed. Indeed some systems confuse and mix them (e.g. interests and values), although they have been defined in logical terms (Katz, 1963), and have been substantiated through factor analyses of test and inventory scores (Norris & Katz, 1970). Some systems confound the assessment process additionally by using a client's response to a solitary item as a subtitute for a complete test or inventory. Because of the confounding of discrete psychological domains and for other reasons to be elaborated on shortly, comparisons between systems are difficult to make.

Information is another section in the content area and again varies widely in the amount and types provided from system to system. For example, some systems report only the most commonly-occurring salary by occupation (such as the Guidance and Information System), others report beginning, median, top, and variations in salaries (e.g. the Educational Testing Service's System of Interactive Guidance and Information). Information about decision-making after an individual has been assessed and career possibilities have been suggested by the computer are included in only the more recent systems, as is help in planning courses of action once some decisions have been completed.

The interrelationships and linkages between components and the routing of students through them is the structure of a system. Structure is how the connections are made between what the computer "knows" about the user and what it "knows" about occupations (Katz & Shatkin, 1980). Direct-access programs function like an index in a book to access discrete units of information. Structured search uses the capabilities of the computer to collect groups of related data after the user specifies a set of characteristics. There are usually suggested methods for follow-up called "crosswalks" (prompts suggesting the next logical step), the most commonly used being direct access.

Searches of occupations are accomplished by various rules: searching by overall resemblance, search by inclusion or exclusion of some characteristic or characteristics, search by a "less than or equal to", "greater than" or "do not have" rule. These rules reflect the theories of guidance inherent in the system. Bases for searches may be by person variables, such as capabilities or handicaps, or by rewards, tasks, or by conditions for work variables, such as indoor or outdoor work. No present system includes a person's sex as a search characteristic.

Commonly found on more recent CACG systems, is a variation of the overall resemblance rule which could more accurately be called a partial resemblance rule. Employing a free-choice search formula, users may designate certain characteristics to be ignored and others to have veto power, that is, to keep an occupation from being listed. Possible drawbacks of the free choice search format are to allow important characteristics to be ignored and to give trivial concerns undeserved power. In compensating for this shortcoming many systems when queried for further exploration of an occupation include all characteristics when outputting information. Users may be confronted with attributes of occupations that they would have overlooked but realize are disqualifying (e.g. occupations that require physical performance beyond the capabilities of the user).

The System of Interactive Guidance and Information (SIGI) employs a regression analysis to predict user success in a specific occupation by selecting and weighing the best composite of user attributes, such as abilities, values and/or interests. This is accomplished by comparing these to a database of characteristics of a large number of people who have attempted to enter the occupation and have succeeded or failed.

Another approach compares user abilities and an occupation's work task demands like physical strengths, aptitudes, and sensory demands. That users need not know much about the world of work, is an advantage of this approach. Other systems match preferences of users with characteristics of occupations to satisfy them. Variety versus continuity, standard hours versus shift work, and indoor versus outdoor work are some commonly used. Still others match operationally defined user values such as income, autonomy, helping others, variety, etc., to the satisfactions and rewards particular occupations may offer.

In developing a system, weights must be given to these various concerns. For example, educational plans or highest intended level of education is a question included in virtually all systems although the importance given it reflects in part the philosophy of the system. Some systems regard these plans as an ability, something stemming from financial or intellectual limitations, while other systems see them as free choices of the individual and therefore treat them as preferences. Although virtually every job requires some level of education, most CACG systems consider education necessary but not sufficient for outputting occupational lists, as a worker may be capable of performing a job but just not be happy doing so. Preferences usually don't hold the same importance. It is generally agreed that CACG users can assess their physical and cognitive abilities more accurately than they can their preferences.

In the computerized system, style refers to the ways information is presented, the degree of interactivity, the language and graphics employed, and the methods of communication. The hardware used will have a large effect on a system's style which in turn greatly affects user level of persistence, amount of activity, and perceived satisfaction. Microcomputers with attached printers and integral hard disk systems that forego the chore of changing diskettes are fast becoming the systems of choice.

The microcomputer-based systems (also called interactive systems) have an almost instantaneous response time so that a user may revise a list of system-suggested options by changing only one response. The immediacy and flexibility of these systems, together with their menu-driven style, make the newer CACG systems a pleasant and satisfying experience to use. Most avoid responses that necessitate the referring to off-line materials. With virtually all the necessary instructions, prompts, and cues part of the CRT display, attention is maximized. Menus are presented which guide the user to pursue logical paths through the system.

One of the first systems of this type (although originally developed for mainframe technology) was the Information System for Vocational Decisions (ISVD) which was based on the paradigm of career decision-making, developed and refined over many years by David Tiedman and his associates (Tiedman & O'Hara, 1963; Tiedman, 1979). Emphasized were such concepts as fostering inquiry and a sense of importance on the part of the user. Attempts at using natural language and open-ended questions such as "What do you want to do today?" (in a bid to disguise the system's latent multiple-choice array) failed because many times user responses were incomprehensible by the computer. In turn, the user perceived the system as uncomprehending. Although the original intention was to make for more human-like conversation, the effort used too much of a system's resources and tended to distract and frustrate users.

Costs of CACG systems vary immensely and are difficult to compare because prices are quoted for a license to use the system for some specific time, for some amount of connect time, CPU time, or by each operational video display terminal (VDT) per month, semester, year and so on. The additional outlays for hardware, updating of programs, manuals, and handbooks are other factors that contribute to the difficulty of making cost estimates.

RESEARCH USING CACG SYSTEMS

Much of the research using CACG systems has concentrated on the short-term effects (Cairo, 1975; Harris-Bowlsbey, 1984; Katz, 1984). These projects usually include studies of acquisitions of knowledge, expressions of attitudes and opinions, changes in users' behaviors, and investigating changes in overall guidance programs and particular counselor reactions. Comparison of systems is difficult due to differences in the CACG systems themselves, differences in research designs and methods of studying them, and due to the fact that almost all systems have undergone various updating and modifications.

A number of CACG systems were explicitly based on theories formulated and research conducted over many years by their developers. ECES I emerged from many years of work by Donald Super and his associates on the Career Pattern Study and on propositions about vocational development emphasizing continuity, self-concept, exploratory behavior, planfulness, reality-testing, and compromise (Super 1953, 1954, 1957; Super & Overstreet, 1960; Super et al., 1963). The System for Interactive Guidance and Information (SIGI) embodied Martin Katz's emphases on values and information-processing in a model of career decision-making (Katz, 1954, 1963, 1966, 1974). David Tiedman's ISVD is another of these systems (described above).

Various studies have investigated the Computerized Vocational Information System (CVIS). Two early studies of users' opinions (CVIS, 1969; Artunian, 1973) found that most users felt they learned about themselves and occupations. In a comparison of the effects of CVIS and guidance counselors on students' course selections, Price (1971) found no significant differences. In another of the early studies, Harris (1972) employed a pre-post control group design in an evaluation of the Computerized Vocational Information System (CVIS) using a population of high school sophmores. Utilizing the Career Development Inventory, there was no found difference in the degree of congruence between their expressed educational-vocational aspirations and objective data about grades and measured ability, nor any significant increase in the number of occupations CVIS users viewed as options; users were found to have significantly increased the accuracy and range of their occupational information, awareness of the need to plan, and their knowledge of resources for vocational exploration.

Melhus, Hershenson, and Vermillion (1973) compared a counselor-based to a computer assisted approach to guidance using CVIS. After identifying the top and bottom 54 students of a class of over 800 sophmores on a "readiness for counseling" dimension based on a composite measure of academic and personal coping skills, half of each group used CVIS while the other half received individual counseling. The outcome measure was the extent of change of occupational plans. Results showed that individual counseling had a greater effect on low readiness students and that CVIS did not effect the two groups differentially. In another comparison of CVIS and a counselor based approach, Price and Johnson (1973) found no differences between the two treatments for helping high school students explore and select courses. Specifically, no differences were found between students' level of understanding of information relevant to course selection, the appropriateness of their resulting academic programs as judged by five counselors, their self-reported reactions to either approach, and the extent to which they subsequently requested course changes.

Another study of CVIS investigated its effect on the career development of three randomized groups each of 24 disadvantaged high school students (Maola and Kane, 1976). Again, using a pre-post design, CVIS users achieved significantly greater gains on all three subscales (knowledge of occupational characteristics, occupational preparation requirements, and career planning) of the Assessment of Career Development, than either a second group participating in individual career counseling and also receiving printed materials providing information comparable to CVIS or a control group. The counseling (second) group also showed significantly greater gains on all three dimensions than the control group, but not as great as the CVIS group.

In a pre-posttest design using 792 male and female tenth graders in an experimental group and 1.453 controls matched on relevant variables, Myers, Lindeman, Thompson, and Patrick (1975) evaluated the effects of the Education and Career Exploration System (ECES) on career maturity. Although the experimental group showed significantly larger gains on degree of planfulness and knowledge and use of resources for career exploration, no differences were found in the acquisition of information about education, occupations, and career decision-making. A modest though significant postive relation was found for time spent on the system and gains in vocational maturity. This was one of the few studies to explore the variable of time spent using the computer; this variable needs further exploration. In two related studies using ECES, Pilato and Myers studied the effects of a computer-generated accuracy of self-knowledge feedback report on estimates of intelligience and interests (Pilato and Myers, 1973) and the effects of the same procedure on the appropriatness of subjects' vocational preferences (Pilato and

Myers, 1975). In the former study, posttest scores revealed that subjects receiving feedback increased their accuracy about intelligence but not for interests, although these effects had disappeared on a posttest given six weeks later. In the latter study, subjects who had received feedback increased the congruence of their career goals with the levels suggested by their test scores and grades. A posttest six weeks later showed that increses in appropriateness did persist.

In a study of an updated version of ECES III Drake (1979) employed the Career Development Inventory (CDI) to compare two groups each consisting of 160 high school sophmores. Users of ECES were found to have larger gains than nonusers on all dimensions of vocational maturity.

McKinlay and Adams (1971) in a study of the popularity of Oregon's OIAS among high school students, found the system's occupational files and QUEST fun to use and easy to understand but that the other information files were much less used. In a study of a CIS-based system, MOIS of Massachusetts, Welch (1978) undertook a survey of user schools. Among users 96% felt the instructions were clear, 88% found the system useful, but only 66% found the system easy to use without help.

In one of many studies by the developers of the System for Interactive Guidance and Information (SIGI), Chapman, Katz, Norris, and Pears (1977) used interviews, questionaires, records of students' interactions with the system, and counselors' reactions to elicit differences in changes between two groups of 200 users and nonusers. Users better understood their values and career goals, had more knowledge about the sources of staisfaction wanted from a job, were more certain about which academic program was related to their occupational goals, possessed more detailed and accurate information about the occupation they might enter, and had more confidence in their decision-making.

Hypothesizing that SIGI users would manifest greater change toward a higher decision-making stage and greater internality, Cochran, Hoffman, Strand, and Warren (1977) used 72 undergraduate college students in a pre-posttest design. Results showed users had significant positive changes on measures of decision-making stage related to college major, but not on measures of decision-making stage related to occupation. Although no significant changes were found on measures of locus of control, brief exposure to a computer-based system was concluded to have positive effects related to choice of a college major.

Pyle and Stripling (1976), using Crites' Career Maturity Inventory (CMI), studied the impact of SIGI within the context of a career-planning course on the career choice attitudes of 66 full-time community college students. SIGI users were found to have significantly higher posttest scores than students in a control group.

In a review of CACG, Cairo (1983) concluded that little is presently known about its effects and agrees with Katz (1980), that the nature of these systems offers some unique possibliities for examining the career decision-making process. Cairo also concludes these systems: promote a greater awareness of the need for planning, increase user knowledge about career exploration resources and educational and occupational alternatives, widen the number of considered occupations, and their appropriateness.

In other reviews of CACG research, Clyde (1979) and Parish, Rosenberg, and Wilkinson (1979) concluded that use of these systems enhance both the acquisition of career information and the process of career decision-making. More recently, Dungy (1984) found that prior vocationally relevant experiences enhance the effectiveness of users' subsequent CACG use. Cairo (1983), Sampson (1984), and Spokane and Oliver (1983) in presenting specific recommendations for improving CACG evaluations, suggest using validated instruments to identify changes in user knowledge of self, options, and the decision-making process, as well as, documenting user behaviors.

In conclusion, the foregoing studies report mixed results. Generally, they show some significant changes in CACG users such as increased knowledge of occupations and career planning, but because of differences in instruments, CACG systems used, and subject population characteristics, no encompassing conclusions may be made. It is entirely possible that differences in results could be entirely due to differences between systems. In addition, during the time span of the mentioned studies, these systems were being modified and updated on a regular basis, so attempts at comparing results using the same system at different points in time may be futile. These studies are representative of research in the area in that due to large experimental differences general conclusions lack reliability. Needed is an experimental method that holds as many of the experimental procedures, etc., constant. Results of CACG systems studied under these rigorous conditions, as mentioned, could be compared with confidence. The suggestion to use only validated instruments seems warranted. Research using the DISCOVER CACG program will now be reviewed.

DISCOVER

A description of the DISCOVER program and its modules may be found in Appendix A.

Recently, a computerized vocational counseling program called DISCOVER was added to existing resources at a local community college. DISCOVER is a microcomputer based guidance program that places emphasis on the assessment of interests, the self-rating of abilities, and the inventorying of values. The user may identify occupational alternatives by using each of these, separately or together. The modules contained in one of the first versions aimed primarily for use by 11th and 12th graders are: Introduction, Clarifying Values, Values and Occupations, Effective Decision-Making, Decision-Making in Careers, Organization of the Occupational World, Browsing Occupations, Reviewing Interests and Strengths, Making a List of Occupations to Explore, Getting Information About Occupations to Explore, Narrowing a List of Occupations, and Exploring Specific Career Paths. These modules were developed by application of systems analysis to the process of career development and are an example of a systematic career development model (Rayman & Harris-Bowlsbey, 1977). More recently DISCOVER FOR ADULTS has been developed for use by adults defined as persons of college age and above. For this discussion DISCOVER FOR ADULTS will hereinafter be called DISCOVER. A detailed description of each module is contained in Appendix A.

In a recent survey of DISCOVER use, Sampson, Shahnasarian, and Reardon (1987) calculated a total of 253 active sites from a respondent rate of 65% to their mailed questionaires. The breakdown of institutions using DISCOVER was: high schools, 40%; vocational-technical, 2%; community college, 19%; 4-year college, 13%; university, 21%; and other, 5%. Systems were available an average of 5.1 days per week for 8.9 hours per day. Individual counseling was the most popular adjunctive assistance to users (95)%, followed by classroom (40)%, and group counseling (37)%. This agrees with the recommendations of Sampson (1983) and Sampson and Pyle (1983) that counselor intervention before and after guidance-type system use is most important.

DISCOVER is mentioned in a good number of published papers in reference to administrative roles and in reference to CACG in general (ACT, 1983, 1984; Harris-Bowlsbey, 1986; Isaacson, 1985; Pyle, 1984). After an initial number of field trials, experimental type studies using DISCOVER are few although many locations do in-house evaluations.

In one of the first investigations using DISCOVER, Harris-Bowlsbey, Rayman, and Bryson (1976) used 44 high school students in a small scale field study. Two career development instruments were used as dependent measures in a pre-posttest control group design. Citing design flaws and weaknesses in implementation, no significant differences were found between the groups.

Rayman, Bryson, and Bowlsbey (1978) conducted another field trial in order to find out the reactions of students and parents, the effects of DISCOVER on students, and to make recommendations for improvements to the system. Matching 48 controls and 48 experimental group members by grade level, sex, and reading level, the results showed a general favorable reaction by users and an increase in specification of both educational and vocational goals. No significant difference was found on any career development variables. Limitations discussed by the authors include small sample size (by the end of the field trial there were only 30 in each group), poor controls, and inconsistent technical operation.

Glaize, & Myrick (1984) compared DISCOVER to small group counseling. 120 11th grade students were given only posttests on career maturity, career decidedness, career goal directed behavior, and a student attitude inventory. No significant differences were found. In another study, decision-making style was investigated using DISCOVER. No interaction of decision-making style and DISCOVER use was detected in 188 subjects all auto workers between the ages of 23-24 (Marin, 1984).

In one of the few studies to find a change in career maturity after use of DISCOVER, Kapes, Borman, and Kimberly (1985) found significant changes in career development attitudes in 50 undergraduates.

In a prior investigation using DISCOVER (Schlossman, 1985), users had various impressions of the utility of the system. User attitudes varied from considering the experience positive and useful to feelings that they received nothing of value for their time expended. In a pre-posttest design, no significant difference was found between experimentals and controls in career maturity and locus of control. One possible explanation is that the instruments used were too gross to detect any changes in the measured variables.

In summation, findings are equivocal in the use of DISCOVER as found with the results of CACG in general. Again, due to differences in sample population characteristics such as age, etc., results are difficult to compare. Also, as mentioned, DISCOVER has undergone many technical changes, the greatest being the introduction of DISCOVER FOR ADULTS, which was introduced to the market in the early 1980's. Comparison of results of studies utilizing the earlier version to that of the the newer version would seem unwarranted. Conservatively, DISCOVER increases both self and occupational knowledge in the user and may increase decision-making skills and career maturity attitudes under some conditions that at this time remain unknown.

Much of research using DISCOVER has used adolescent populations (high school students). This population may be developmentally different than adult populations (undergraduates which start at an average age of 20 and have different vocational concerns) (Super, 1963, 1980a; Tiedman and O'Hara, 1963).

To insure a more efficient use of DISCOVER, more information is needed regarding the interaction of program and user variables, especially adult users. Because users may progress at their own rate when using DISCOVER, reading rate should not influence the effect of DISCOVER but only the time to complete each section (Chapman et. al., 1973). Students who have success with DISCOVER (users who report that they learned something of value) feel they are better able to move toward a vocation. Those that do not have success generally feel that the computer-selected occupations aren't appealing and usually have trouble understanding the decision-making process and how it applies to moving from interests and values to occupational choices. The reasons for these differences need to be researched.

The theoretical underpinnings of the variables of interest (career decision-making, attitudinal vocational maturity, and career time perspective) will be explored at this point, starting with career decision-making and culminating in the theoretical model for the present study.

CAREER DECISION-MAKING

Before 1950 the trait and factor approach of matching individual traits to world of work characteristics was the prevailing theoretical and application model. Career decision-making was characterized as a time-bound largely static event which occurred usually around the time of high school graduation. Little attention was given to either the antecedents or the consequences of the act of choosing. Vocational issues were first considered in a developmental model by Carter's (1940) conceptualization of the formation of career attitudes in adolescence and Super's (1942) use of life stages in the analysis of career exploration and establishment.

Difficulties in career decision-making (CDM) have been described as one of the major categories of adult career problems (Campbell & Cellini, 1981). These problems have at least four major sources (Gati, 1986, p. 408): "lack of information regarding the attributes of the career decision maker or the educational and vocational alternatives, or both; lack or resources (time, money, etc.) to collect all of the required information; cognitive limitations of the career decision-maker (cdm) in storing and processing the information; and, lack of a framework for identifying and processing relevant information (i.e., combining information on the career decision maker and on possible careers)."

It is generally agreed that a decision-making conceptual framework assumes the presence of a decision maker, a decision situation, internal and external information, and that two or more alternative actions and therefore several outcomes are possible (Harren, 1979). Each outcome has a probability and a value level. Decision makers arrange the information, etc., into strategies and make some level of commitment. Strategies can also be seen as rules or criteria that guide the assembling of the above concepts into an array and as such are a property of the organism.

Models of career decision-making can be divided into two groups. Descriptive models represent the ways people generally make vocational decisions and includes models by Tiedeman and O'Hara (1963), Hilton (1962), Vroom (1964), Hsu (1970), and Fletcher (1966). Prescriptive models represent attempts to help people make better decisions. Katz (1963, 1966), Gelatt (1962), and Kaldor and Zytowski (1969) have formulated models of this latter type. At least two of the models mentioned here have been incorporated into CACG, the Tiedman & O'Hara model has been applied to the Information System for Vocational Decisions (ISVD) (Tiedeman et al., 1967, 1968), and the Katz model forms the basis of the System of Interactive Guidance and Information (SIGI) (Katz, 1969a). DISCOVER employs the planful decision-making strategy (see Appendix A). For a more detailed analysis of these earlier theories see Jepsen & Dilley (1974).

Two other models are worth mentioning. The elimination-by-aspects theory of choice (Tversky, 1972), has been adapted for career decisions in the Sequential Elimination Model (SEM). Each occupational alternative is viewed as a set of aspects or characteristics, e.g., various levels of expected salary or binary attributes such as requiring an advanced degree or not. Alternatives are eliminated that do not contain the particular aspects in question until only a few or possibly only a single alternative remains.

Another model, the Expected Utility Model (EU), (Pitz & Harren, 1980) is based on a set of axioms or general principles that reflect what is considered desirable by the decision maker. In this approach, the product of each alternative's utility multiplied by the probability of success is that alternative's expected utility. Used in the career context, it is assumed that a rational decision maker will choose those alternatives with the highest utilities relative to that individual's values, interests, abilities, etc. This approach works best when there are relatively few well-known alternatives to choose from, but not as well for career decisions which usually involve tens or hundreds of potential (but generally unknown) alternatives. Additionally, this model works best when alternatives are clearly defined, a situation which is not often found in vocational domains due to the great variability within many occupations. Although this model is best when the choice of one alternative excludes all others (e.g., where to construct a new airport), it is still valuable in CDM when an individual can try a number of low cost alternatives simultaneously (e.g., applying to a number of universities).

Both of the above mentioned approaches stimulate career decision makers to think about occupational concerns, attempt to improve their CDM skills, and both prepare them for future career decisions. They differ however in the way they identify preferred occupational alternatives: The comparison in the EU model is carried out within each occupational alternative across all aspects, while in the SEM approach the sequence of aspects reflects their relative importance and all of the remaining alternatives are compared with the acceptable range of each aspect.

In general, decision-making involves reaching an optimal choice among alternatives, involves the investment of resources (e.g. mental, economic, etc.), and leads to outcomes with particular utilities and probabilities. Career decision-making ability refers to the extent to which the individual is able to apply principles of decision-making to specific career problems. Psychological decision theory was seen by early theorists as offering a greater understanding of vocational development (Brayfield, 1963, 1964; Super, 1961; Tyler, 1961). Theorists have more recently concluded that this promise remains largely unfulfilled (Crites, 1969; Osipow, 1968). One problem in comparing various theories in this area is that authors have not used either the framework or the language of their predecessors.

There exists an abundance of literature dating from 1929 (Crites, 1969) regarding college-age and adult populations who for a variety of reasons have not made long-range educational or vocational decisions. Due to various estimation methods and the heterogeneousness of this population, the extent of undecidedness (a general term used to convey the idea that a decision has not been made) was estimated originally to range from 18% to 61% of total college enrollments (Anderson, 1932; Tucci, 1963; Webb, 1949). More recently estimates of those uncommitted were found to range from 22% to 50% (Astin, 1977; Lunneborg, 1975). In addition, estimates range from 50% to 60% of college students who enter college and change majors (Astin, 1977). Environmental factors such as parental and societal pressure are seen as leading to unrealistic or uninteresting choices and ultimately to a sense of career directionlessness, one or more changes of college major, and in general depressed motivational attitudes and behaviors. Identity forclosure (the premature decision-making before complete exploration of personal values and needs, Erikson, 1959) is one of many personality factors having related effects.

The phenomenon of career indecision, defined as an inability to decide on a course of action to narrow down and finally pursue a definitive career path, has been well studied. Goodstein (1965), in a study of anxiety and career indecision, identified two groups of uncommitted student populations: the undecided who were found to have transient anxiety states and the indecisive who chronically experience debilitating anxiety which permeates all life decisions.

Undecided individuals are so because they have failed to develop appropriate decision-making skills and can be described as being developmentally undecided, that is, lacking the skills to decide. Traditional career counseling would suggest systematic exploration of personal and professional interests followed by the use of career resources such as the library and printed materials that list and describe various career opportunities.

Additionally, the Goodstein theory posits that anxiety is the root cause of the second type of indecision, chronic indecision or indecisiveness. It is reasoned that because of the interfering effects of anxiety and not as the result of a lack of opportunity, the individual fails to develop the appropriate decision-making skills. Further, because the individual perceives many situations as threatening and anxiety provoking, a poor sense of identity is developed. Trait anxiety is also theorized to effect locus of control and also to directly affect career indecision (Super, 1957). The hypothesis that choosing an occupation involves checking the compatibility of one's self-concept to that occupation would lead an individual with a poor self-concept to be externally controlled. Evidence has been advanced by Galinsky and Fast (1966), that suggests one of the clearest ways identity concerns are expressed is through the process of making a vocational choice.

Hartman, Fuqua, & Blum (1985) studied the effect of anxiety on career indecision, locus of control, and identity. Their proposed model is consistent with the trend toward distinguishing between being undecided, which represents a fairly normal developmental sequence and being indecisive, which represents a more chronic condition (Crites, 1964; Holland & Holland, 1977; Salomone, 1982). Goodstein's (1965) conceptualization of the role of trait anxiety was supported in that its effect on career indecision is almost entirely mediated through its effect on identity and locus of control. An externalized locus of control, identity confusion, and trait anxiety should therefore be associated with the more chronic form of career indecision.

In a related study using the Identity Scale (Holland, et al., 1975), Kelso (1976) compared decided and undecided high school students (1,015 boys and 1,247 girls) and found that this scale discriminated between occupational choosers and nonchoosers. Other scale comparisons noted that nonchoosers lack self-reliance, work involvement, and communication skills. In addition, they are less involved with family, peers, and schools. Holland and Holland (1977) assessed 1,005 high school juniors and 692 college juniors using measures of personality (including the Identity Scale), decision-making ability, interests, and vocational attitude. Results showed, in part, that college students who characterize themselves as "decided" or "undecided" ("decided" individuals were classified such on the basis of answering "true" to the statement "I have made a tentative occupational choice or I am currently employed full time", p. 405) only differ on the Identity and Interpersonal Competency scales. Approximately 50% of subjects stated that they didn't have to make a decision at the present time with those remaining falling equally into either the category of mild or moderate-to-severe immaturity, interpersonal incompetency, anxiety, and alienation.

More recently, studies comparing interventions have become popular. Salomone (1982) found that those experiencing career indecision also exhibit other types of personal indecisiveness. Cooper, Fuqua, and Hartman (1984) noted a relationship between an external focus in interpersonal relationships, a lowered self-esteem, greater passivity, and personal indecisiveness. Cooper (1986) looked at the effects of group and individual counseling on career indecision and personal indecision. Testing the hyposthesis that career indecision and personal indecisiveness often are present in young persons experiencing vocational decision-making difficulties (Van Matre and Cooper, 1984), Cooper found no significant difference between the two types of counseling using 24 college students, but did find the two types of indecisiveness occuring together.

In summary, the concept of career decision-making has recently been a topic of increased interest for researchers. Largely taken for granted in the past, the process is now seen as central to effective career development for the individual (Super, 1983). With time, research found large differences in amounts and types of career decision-making activity across individuals. This concept has been linked to various personality traits as mentioned. The undecided/indecisive paradigm is the most widely accepted thinking in this area at the present time.

The DISCOVER CACG system offers users a chance to confront the four major adult career problem categories as outlined by Gati (and mentioned above): lack of information, lack of resources, cognitive limitations of the career decision-maker, and lastly, lack of a framework for storing and processing vocational information. The first problem category is addressed in the second module of DISCOVER where users may evaluate themselves in any of four areas and gather career information in the third module. To address the second problem area mentioned by Gati, DISCOVER is usually offered as a free service to students and much information can be retrieved in a relatively short time. As DISCOVER also teaches a CDM process and stores and processes all data (to address the other mentioned problem areas), it is both a most useful tool for students and institutions and a tailor-made apparatus for the proposed research.

VOCATIONAL MATURITY

Vocational or career maturity can be defined as a readiness to cope with vocational developmental tasks (Savickas, 1984). This concept was originally separated into two aspects, developmental tasks- defined as societal expectations that characterize each stage of vocational life, and task coping- behaviors instrumental to satisfactory and satisfying responses to these tasks (Super and Overstreet, 1960).

More recently, Crites (1978, 1981) defined vocational maturity as consisting of attitudinal and cognitive aspects. From a schema suggested by Vernon (1950) for the structure of intelligence, Crites operationalizes the observed variables at the lowest level, the group and dimensional factors constituted from the interrelationships among the observed variables at the intermediate level, and the common variance among the group factors, the degree of vocational development, at the highest level. That vocational maturity can be factored into component parts has been suggested by Super & Overstreet (1960), Gribbons and Lohnes (1968), and Crites (1974).

The model differentiates between career choice content and career choice process. The former refers to the consistency and realism of career choice factors. They can be operationalized by a question like: "Which occupation do you intend to enter when you have completed your schooling or training?" (Crites, 1978, p. 4). The latter, that of career choice process, the area of present interest, refers to the variables involved in arriving at a declaration of career choice content. Included are the career choice competencies: self-appraisal, occupational information, goal selection, planning and problem solving, and the career choice attitudes: decisiveness, involvement, independence, orientation, and compromise.

Crites (1976, 1983) has refined his original conceptualizations to include attitudinal vocational muturity, cognitive vocational maturity, and career decision-making. Relations between the three have been found to be as follows: measures of attitudinal vocational maturity (AVM) correlate to measures of career decision-making (CDM) in the .40-.59 range and correlate to measures of cognitive vocational maturity (CVM) in the .30-.49 range (see Figure 2). Measures of cognitive vocational maturity (CVM) do not relate to measures of career decision-making (Barak, Carney, and Archibald, 1975; Holland, Gottfredson, and Nafziger, 1975; Holland & Holland, 1977; Jepsen & Prediger, 1981; Walsh & Hanle, 1975).

In summary, the notion of career maturity has undergone revision and refinement in the last two decades or so. A myriad of studies have investigated career maturity using various definitions of the concept, various instruments to measure it, and under various experimental conditions. That it is related to CDM is generally accepted. Little is known about its relation to career time perspective which is one of the purposes for the proposed research: to investigate these relations in reference to CACG.

CAREER TIME PERSPECTIVE

Just three studies have investigated career time perspective. All three are reviewed in this section. The proposed research flows directly from the last of these reviewed studies (Savickas et al., 1984) and is, in part, both a replication and an extension.

Although time perspective is a long familiar concept in psychology, career time perspective (CTP) is less understood. CTP has not been studied in reference to CACG, and only three studies have addressed the part of career time perspective in vocational maturity (VM) and career decision-making (CDM). In the first two studies CTP emerged from statistical analyses as the underlying structure or organizing influence operating on behavioral indices of VM and CDM. In the first, the Career Pattern Study (Super & Overstreet, 1960) measured 138 ninth-grade boys on 27 indices of VM. Factor analysis extracted planfulness as a major factor along with three different time segments as lesser factors (short view, intermediate, and long view ahead). These factors as a group formed "planfulness or time perspective" and were hypothesized to constitute VM in ninth-grade boys.

In a subsequent related study, Super (1974) further refined his developmental model of VM in which he saw "planfulness or time perspective" as a basic dimension or second-order factor subsuming the first-order factors of distant future, intermediate future, and present. In a later revision of his model, Super (1983) saw planfulness as including three components: autonomy, time perspective, and self-esteem.

In the second study involving CTP, Jepsen (1974a) measured 116 eleventh-grade students on 32 indices of vocational decision making. An emphasis was placed on obtaining a sample of adolescents who identified with "working class" backgrounds and aspirations, and emphasis was also placed on obtaining a detailed description of their conscious VDM processes. Four index clusters were extracted by cluster analysis according to time segments: planning activity cluster (present), senior courses cluster (immediate future), posthigh school plans cluster (intermediate future), and long-range plans cluster (10 years in the future). Thus CTP, as reported by both Super and Jepsen, is an important component in VM and CDM. This analysis continues below.

The third study (Savickas, Silling, and Schwartz, 1984) explored the relationship of career time perspective to the three major process dimensions of career development as hypothesized by Crites (1976, 1983) (see Figure 1). (The present study proposes to use this same paradigm and introduce CACG as a treatment). Savickas et al. (1984), investigated the hypothesis that career time perspective is a component in attitudinal vocational maturity and career decision-making and not in cognitive vocational maturity. The authors base this hypothesis on the view that career time perspective is a part of career decision-making (Jepsen, 1974a) and of attitudinal vocational maturity, particularly planfulness (Super, 1983), which has been defined as the extent to which an individual has engaged in career planning efforts (Phillips & Strohmer, 1983). Career time perspective was predicted not to be a part of cognitive vocational maturity, because CTP has been found to affect career choice content but not to affect the career choice process (Barak et al. 1975).

In Figure 1, the circles represent the career dimensions (latent variables) and the boxes represent the observed variables selected to represent the latent variables. Arrows indicate significant relationships. The observed variables were taken from Super's (1983) model of vocational maturity and Holland's research on career decision-making (Holland & Holland, 1977). As each variable was multiply operationalized (Cook & Campbell, 1979), two measures for each were obtained. From a factor analysis of 31 TP measures, Madison (1984) extracted one major factor which was described as a sense of continuity between the present and future. The best measures of continuity were the Long-Term Personal Direction Scale (LTPD) (Wessman, 1973) and the Achievability of Future Goals Scale (AFG) (Heimberg, 1961) both used to measure CTP by Savickas et al. They measure an inclination to structure the future with events and the tendency to optimistically anticipate the future, respectively.

Attitudinal Vocational Maturity (AVM) was measured by the Career Development Inventory-College and University Form (CDI) (Thompson, Lindeman, Super, Jordaan, & Myers, 1981), using both the career planning scale (CP) and the career exploration scale (CE). The CDI measures five aspects of vocational maturity in five separate scales as postulated by Super (1974): planning orientation, use of resources, career decision making, knowledge of the world of work, and knowledge of preferred occupation. Using the CDI, Kapes, Borman, & Kimberly (1985) measured significant changes (p >.05) in career development attitudes in 50 undergraduates using either DISCOVER or SIGI. Phillips & Strohmer (1983) employing the CDI found that planning orientation is related to progress in the task of choosing an occupation and not to choosing a college major or adjusting to college.

Two observed variables in career decision-making (CDM) were measured, degree of indecision by the Vocational Decision-Making Difficulty Scale (VDMD) (Holland, Gottfredson, and Nafziger, 1973) and satisfaction with career choice by a single question answered on a six-point Likert-type format used by Holland & Holland, (1977) (see Appendix D). Subsequent research (Slaney, Palko-Nonemaker, and Alexander, 1981; Slaney, 1980; Holland & Holland, 1977; Holland et al., 1975) has supported the validity of this item and the VDMD. Because studies have reported the need for career planning assistance with individuals who consider themselves decided (Goodson, 1981; Larsen & Heppner, 1985; Walters & Saddlemire, 1979), all subjects in the present proposed research regardless of their degree of career decidedness on the pretest were included in the study.

Results of Savickas et. al. study confirmed by factor analysis the hypothesis that TP is related to AVM and CDM but not to cognitive vocational maturity, that is, confirmed the conceptual and empirical descriptions of the dimensions and structure underlying the career process variables. As sex was not found to moderate the relations in this study, data across sex was combined. In general, women experience greater challenges for career decision-making because of the dual pull of home and work roles (Farmer, 1987) and therefore differential effects by gender must be considered. Findings that structured continuity of CTP related to AVM and CDM, while optimistic continuity of CTP related only to AVM, led to the hypotheses for Savickas et al., (1984) that lack of future structure is a developmental antecedent of vocational indecision and that pessimism is a part of immature attitudes toward planning. Their suggestions for further research: to investigate the relations of CTP to career maturity and indecision conclude the study.

This section on career time perspective has reviewed the three studies in the area of vocational guidance that make explicit mention of the variable. The knowledge in this area may be summarized by the following:

1. Time perspective is a long familiar concept in psychology, yet little is known about career time perspective.

2. Three studies have investigated career time perspective, and, in sum, have found it related to aspects of both attitudinal vocational maturity and progress in career decision-making.

3. More specifically, the implication that vocational indecision (a chronic condition) is the end result of a lack of future structure, vocational immaturity, and a lack of sufficient career decision-making skills, is a new and important finding which needs further investigation.

4. That pessimism is related to immature attitudes toward planning is also a new and important finding which, with Number 3 above, has large implications for further research.

5. No study has investigated the role of career time perspective as a possible contributing explanation for the varied results in the research using CACG.

6. No investigation has attempted to look at the latent structure, in other words, the unobserved causative relations among these variables.

7. No study has used a longitudinal design to study numbers 5 and 6 above.

This study attempts to further the knowledge in these areas.

THEORETICAL MODEL FOR THE PRESENT STUDY

The theoretical model for the study is presented in Figure 5 and Figure 6. These figures display the structural and measurement models, respectively, which are the same for group 1, the control group, and group 2, the treatment (DISCOVER) group. Career time perspective (at Time 1) was, in general, hypothesized to affect both attitudinal vocational maturity and career decision-making, (at Time 2) and that attitudinal vocational maturity (at Time 1) was hypothesized to affect career decision-making (at Time 2). These hypotheses stem directly from a review of the literature, specifically the research of Savickas, Silling, and Schwartz (1984), who found by factor analysis, that career time perspective is related to attitudinal vocational maturity and career decision-making. Savickas et al. did not attempt to explore the latent causative structure of these variables.

THE PRESENT STUDY

The present study was an attempt to investigate the latent structure of these variables in a longitudinal analysis and to make the first attempt at investigating changes in this structure by the use of the DISCOVER computer-assisted career guidance program.

A number of analyses were proposed in the present study although not all could be completed. The foundation for these analyses was to be a matrix of moments about zero of the observed variables which was to be developed from the pretest and posttest data for each group. LISREL VI (Joreskog & Sorbom, 1981) with structured means allows for the testing of three sets of hypotheses: no initial differences, parallel slopes (which compares effects across groups of Time 1 variables on Time 2 variables), and no treatment effects.

HYPOTHESES

The following hypotheses and their attendant analyses were proposed:

H1- Means of pretest scores for the experimental and control groups will not be significantly different.

H2- Attitudinal Vocational Maturity and Career Decision-Making at Time 1 will have significant effects on themselves at Time 2.

H3- Attitudinal Vocational Maturity at Time 1 will have a significant effect on Career Decision-Making at Time 2.

H4- Users of the DISCOVER CACG program will show a significant increase over nonusers in Career Time Perspective, Career Decision-Making, and Attitudinal Vocational Maturity.

CHAPTER 3

GENERAL PROCEDURES FOR MODEL SPECIFICATION

This section describes the proposed LISREL statistical procedures and subsequent analyses that were employed to examine the collected data. The following chapter explains the methodology of the present study.

Structural Equation Modelling (SEM) employs both path and factor analytic methods. The former is used to examine causal relations among observed variables while the latter explains the covariation among observed variables in terms of unobserved factors. Examples employed to illustrate these methods will be similar to the models to be tested in this study.

Structural Equation Modelling employs a path diagram to display graphically the hypothesized patterns of causal relations among the variables of interest (see Figure 2). As an example, consider a model with four standardized observed measures (Z_1 through Z_4) where two time perspective variables, structured time continuity (Z_1) and optimistic time continuity (Z_2) are exogenous. They are hypothesized to affect attitude to planning and career indecision. Causal paths are indicated by straight arrows to the affected variable, and correlations between exogenous variables are denoted by a double-headed curved arrow. Path coefficients (p_{ij}) represent the relative strength of the causal relationships.

The following equations represent the endogenous variables expressed in terms of the exogenous variables and error:

$$Z_3 = p_{31}Z_1 + p_{32}Z_1 + e_4$$

$$Z_4 = p_{41}Z_1 + p_{42}Z_2 + e_4$$

Because of the introduction of latent variables, SEM uses a similar but more complicated diagrammatic system (see Figure 3, representative of a factor analysis model and Figure 4, representative of a structural equation and measurement model). Observed variables are enclosed in rectangles and unobserved or latent variables in circles. Single-headed arrows represent the direct causal effect of one variable on another while the correlation between two variables is indicated by curved double-headed arrows.

Note in Figure 4, wholly independent "exogenous" variables are denoted by ξ s (xi) while intervening or dependent (endogenous) variables are denoted by η s (eta). Causal paths between exogenous and endogenous variables are denoted by γ s (gamma). The portion of the corresponding endogenous variable not accounted for by the other latent variables is indicated by ζ (zeta).

Effects of endogenous variables on each other are denoted by β s (beta). Exogenous variables may be correlated; these relations are represented by ϕ s (phi). In the measurement model (or factor model) the exogenous and endogenous variables are considered separately. The observed endogenous variables are represented by Y s and the observed exogenous variables by X s. λ s (lambda) represent the influence of a latent factor on an observed variable.

In Figure 4, the observed variables (X s and Y s) are linearly related to their respective factors. These relations imply the following formula (see Joreskog and Sorbom, 1981):

$$\Sigma = \Lambda_x \Phi \Lambda_x' + \Theta_\delta$$

If the factor loadings are relatively large (the observed exogenous variables are good measures of the related latent factors), the errors of measurement (δ s) are relatively small and the latent factors are significantly related to each other, further investigation of the structure of the factors may be instructive.

As in path analysis, initially developed by Wright (1921, 1934), the model attempts to account for variation and covariation in endogenous variables by specifying their causal dependence on other exogenous and endogenous variables in the model. The advantage of SEM over path analysis includes the assessment of measurement error (instead of assuming no error of measurement) and the testing of model specification (instead of assuming all related variables are included in the model).

SEM has a two part mathematical model: a measurement model and a structural model (Joreskog & Sorbom, 1984) (see Figure 4). The measurement model describes how the latent or unobserved variables (e.g. attitudinal vocational maturity and career decision-making) are measured in terms of the observed variables and measures and, in addition, the reliability of these observed variables. The structural model specifies the hypothesized causal relations among the latent variables. Thus a researcher, by using a causal model of underlying constructs, can account for the covariances among observed variables.

The measurement equation, in general, for this same model is:

$$x = \Lambda_x \xi + \delta$$

And, in particular, these equations are:

$$x_1 = \lambda_{11}\xi + \delta_1$$

$$x_2 = \lambda_{21}\xi + \delta_2$$

$$x_3 = \lambda_{32}\xi + \delta_3$$

$$x_4 = \lambda_{42}\xi + \delta_4$$

The notation to be used in this paper is as follows:

ξ_j = common factor

λ_{ij} = factor loading (the influence of factor j on variable i)

δ_i = residual (the part of variable i not accounted for by the common factors

ϕ_{ij} = correlation between ξ_i and ξ_j

PARAMETER ESTIMATION

The most widely available statistical package used to estimate linear structural relations among variables is the LISREL VI computer program (Joreskog & Sorbom, 1984). LISREL uses a number of different estimation methods for determining population parameter values from sample variance and covariance matrices. One such method is maximum likelihood estimation (ML). This method determines parameter values such that the observed covariances (with standardized variables, the observed correlations) are most likely. The ML method assumes the variables have a multivariate normal distribution.

Procedures have been developed for comparing two or more groups using LISREL with stuctured means. In addition to the group covariances, group means can also be specified. In this way, initial and outcome differences and differential treatment effects can be determined for latent constructs. The assumption that errors of measurement are uncorrelated and that the expected value of each residual equals zero is the same as in the general structural equation model, but the rule that the expected value of latent variables (η s) must equal zero is relaxed.

Other differences are that the moment matrix of moments about zero is analyzed (instead of the covariance matrix), and that two latent variables, ξ_1 and η_7 (actually constants, both equal to 1.0), are added as intercepts in the structural and measurement models, respectively. As shown in Figure 5 (a structural model with two latent variables, career decision-making and attitudinal vocational maturity measured at two different times), these intercepts create the gamma (γ) paths allowing for comparisons across groups. The corresponding measurement model is shown in Figure 6, depicting at least two observed measures (y s) for each latent variable. Lastly, a dummy observed variable, X, is included which is set equal to 1.0.

The equations for the structural model are:

$$\eta_1 = \gamma_{11}^{(g)}\ \xi_1 + \zeta_1$$
$$\eta_2 = \gamma_{21}^{(g)}\ \xi_1 + \zeta_2$$
$$\eta_3 = \gamma_{31}^{(g)}\ \xi_1 + \beta_{31}^{(g)}\eta_1 + \zeta_3$$
$$\eta_4 = \gamma_{41}^{(g)}\ \xi_1 + \beta_{42}^{(g)}\eta_2 + \zeta_4$$
$$\eta_5 = \gamma_{51}^{(g)}\ \xi_1$$

where the superscript in parentheses refers to group g, where g goes from 1 to the number of groups in the study.

As ξ = 1.0, these simplify to:

$$\eta_1 = \gamma_{11}^{(g)} + \zeta_1$$

$$\eta_2 = \gamma_{21}^{(g)} + \zeta_2$$

$$\eta_3 = \gamma_{31}^{(g)} + \beta_{31}^{(g)}\eta_1 + \zeta_3$$

$$\eta_4 = \gamma_{41}^{(g)} + \qquad + \beta_{42}^{(g)}\eta_2 + \zeta_4$$

$$\eta_5 = 1.0$$

The equations for η_3 and η_4 may be simplified by substituting the parameter values of η_1 and η_2 from the first three equations. These equations may be rewritten as:

$$\eta_3 = \gamma_{31}^{(g)} + \beta_{31}^{(g)}(\gamma_{11}^{(g)} + \zeta_1) + \zeta_3$$

$$\eta_4 = \gamma_{41}^{(g)} + \beta_{41}^{(g)}(\gamma_{11}^{(g)} + \zeta_1) + \beta_{42}^{(g)}(\gamma_{21}^{(g)} + \zeta_2) + \zeta_4$$

The matrix form for the equations η_1 through η_4 is:

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\end{bmatrix} = \begin{bmatrix}0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0\\ \beta_{31} & 0 & 0 & 0\\ \beta_{41} & \beta_{42} & 0 & 0\end{bmatrix}\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\end{bmatrix} + \begin{bmatrix}\gamma_{11}\\ \gamma_{21}\\ \gamma_{31}\\ \gamma_{41}\end{bmatrix}\begin{bmatrix}\xi_1\end{bmatrix} + \begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\end{bmatrix}$$

Note that all non-zero elements of β are situated triangularly below the diagonal indicating a recursive model (see Hargens, 1988).

The equations for the measurement model are:

$$y_1 = \lambda_{11}^{(g)}\eta_1 + \lambda_{15}^{(g)}\eta_5 + \varepsilon_1$$

$$y_2 = \lambda_{21}^{(g)}\eta_1 + \lambda_{25}^{(g)}\eta_5 + \varepsilon_2$$

$$y_3 = \lambda_{32}^{(g)}\eta_2 + \lambda_{35}^{(g)}\eta_5 + \varepsilon_3$$

$$y_4 = \lambda_{42}^{(g)}\eta_2 + \lambda_{45}^{(g)}\eta_5 + \varepsilon_4$$

$$y_5 = \lambda_{53}^{(g)}\eta_3 + \lambda_{55}^{(g)}\eta_5 + \varepsilon_5$$

$$y_6 = \lambda_{63}^{(g)}\eta_3 + \lambda_{65}^{(g)}\eta_5 + \varepsilon_6$$

$$y_7 = \lambda_{74}^{(g)}\eta_4 + \lambda_{75}^{(g)}\eta_5 + \varepsilon_7$$

$$y_8 = \lambda_{84}^{(g)}\eta_4 + \lambda_{85}^{(g)}\eta_5 + \varepsilon_8$$

The matrix form for the measurement equations is written as:

$$
\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7 \\ y_8 \end{bmatrix}
=
\begin{bmatrix}
\lambda_{11} + & & & & \lambda_{15} \\
\lambda_{21} + & & & & \lambda_{25} \\
& \lambda_{32} + & & & \lambda_{35} \\
& \lambda_{42} + & & & \lambda_{45} \\
& & \lambda_{53} + & & \lambda_{55} \\
& & \lambda_{63} + & & \lambda_{65} \\
& & & \lambda_{74} + & \lambda_{75} \\
& & & \lambda_{84} + & \lambda_{85}
\end{bmatrix}
\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{bmatrix}
+
\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \end{bmatrix}
$$

To identify the model we set one λ associated with each η equal to 1.0:

$$\lambda_{11} = \lambda_{32} = \lambda_{53} = \lambda_{74} = 1.0$$

Additional procedures to identify the group means in terms of latent variables are necessary. Factor loadings must be constrained equal across groups ($\Lambda_y^{(1)} = \Lambda_y^{(2)}$) to insure identification. For the comparison group (group 1), all γ s are set equal to zero.

The expected values of the structural equations would then be:

$$
\begin{aligned}
&E(\eta_1^{(1)}) = 0 \qquad && E(\eta_1^{(2)}) = \gamma_{11}^{(2)} \\
&E(\eta_2^{(1)}) = 0 \qquad && E(\eta_2^{(2)}) = \gamma_{21}^{(2)} \\
&E(\eta_3^{(1)}) = 0 \qquad && E(\eta_3^{(2)}) = \gamma_{31}^{(2)} + \beta_{31}^{(2)}\gamma_{11}^{(2)} \\
&E(\eta_4^{(1)}) = 0 \qquad && E(\eta_4^{(2)}) = \gamma_{41}^{(2)} + \beta_{41}^{(2)}\gamma_{11}^{(2)} + \beta_{42}\gamma_{21}
\end{aligned}
$$

The measurement model is also simplified whereby the factor loadings for η_s represent the means of the respective observed variables for group 1:

$$E(y_1^{(i)}) = \lambda_{1s}^{(i)} + \lambda_{11}^{(i)}\gamma_{11}^{(i)}$$
$$E(y_2^{(i)}) = \lambda_{2s}^{(i)} + \lambda_{21}^{(i)}\gamma_{11}^{(i)}$$
$$E(y_3^{(i)}) = \lambda_{3s}^{(i)} + \lambda_{32}^{(i)}\gamma_{21}^{(i)}$$
$$E(y_4^{(i)}) = \lambda_{4s}^{(i)} + \lambda_{42}^{(i)}\gamma_{21}^{(i)}$$
$$E(y_5^{(i)}) = \lambda_{5s}^{(i)} + \lambda_{53}^{(i)}\gamma_{31}^{(i)}$$
$$E(y_6^{(i)}) = \lambda_{6s}^{(i)} + \lambda_{63}^{(i)}\gamma_{31}^{(i)}$$
$$E(y_7^{(i)}) = \lambda_{7s}^{(i)} + \lambda_{74}^{(i)}\gamma_{41}^{(i)}$$
$$E(y_8^{(i)}) = \lambda_{8s}^{(i)} + \lambda_{84}^{(i)}\gamma_{41}^{(i)}$$

(Note that for group 1, all $\gamma_{ij}^{(1)} = 0$ so only the first term on the right hand side of each equation is nonzero in group 1.)

By subtracting expected values of corresponding pairs of latent background and outcome variables, it is possible to estimate group differences in the structural model. Three hypotheses of interest are: no initial differences, parallel slopes and no treatment effects. By subtracting the expected values of the latent variables associated with the pretests (η_1 and η_2) of the comparison group from their corresponding values in the treatment group, the hypothesis of no initial differences is tested:

$$H_1: \quad \gamma_{11}^{(2)} - \gamma_{11}^{(1)} = 0; \quad \gamma_{21}^{(2)} - \gamma_{21}^{(1)} = 0;$$

or that,

$$H_1': \quad \gamma_{11}^{(2)} \text{ and } \gamma_{21}^{(2)} = 0.$$

Comparing the chi-square of this model (H_1') with the model which is not constrained in this manner will test for significance of initial differences.

Testing for parallel slopes is accomplished by testing the equality of corresponding Betas across groups:

$$H_2 : \beta_{31}^{(1)} = \beta_{31}^{(2)};\ \beta_{41}^{(1)} = \beta_{41}^{(2)}, \text{ etc.}$$

If H_2 is rejected, an interaction exists between the treatment and one or more of the η s and therefore the conditional expectation must be investigated, e.g. $E(\eta_3 | \eta_1) = \gamma_{31}^{(g)} + \beta_{31}^{(g)}\eta_1$. In this case, conclusions regarding the treatment effect must specify the level of η_1. If the slopes are parallel, the unconditional expectation may be considered, $E(\eta_3) = \gamma_{31}^{(g)} + \beta_{31}^{(g)}E(\eta_1^{(g)})$ when examining the treatment effects.

To test the no treatment effect hypothesis, the expected values of the latent variables associated with the posttests (η_3 and η_4) of the comparison group are subtracted from their corresponding values in the treatment group:

$$H_3: \gamma_{31}^{(2)} - \gamma_{31}^{(1)} = 0;\ \gamma_{41}^{(2)} - \gamma_{41}^{(1)} = 0;$$

An equivalent hypothesis is:

$$H_3': \gamma_{31}^{(1)} = \gamma_{31}^{(2)};\ \gamma_{41}^{(1)} = \gamma_{41}^{(2)}$$

ASSESSING GOODNESS OF FIT

The program computes a squared multiple correlation coefficient for each measurement equation in the model as well as for the model as a whole: a goodness of fit test and an adjusted goodness of fit test, an overall chi-square test, and an estimation of the root mean square residual. The provided chi-square test is an indicator of the fit of the model to the data. This statistic measures whether the difference between the observed correlation or covariance matrix and a matrix predicted by the model differs by a critical amount from zero. If a critical value is exceeded at a predetermined probability level, the model is judged to not adequately represent the process that generates the pattern of relationships among the variables in the population. Because this statistic is in part a function of sample size, with larger samples there is a higher probability of rejecting a model if it is wrong.

Joreskog and Sorbom (1984) discuss two other measures of overall fit which are less dependent on sample size, the goodness-of-fit index and the root mean square residual error statistic. The goodness of fit index, a measure of the relative amount of variances and covariances jointly accounted for by the model, is independent of sample size and relatively robust against departures from normality (Anderson, 1987). The root mean square residual, which is a measure of the average of the residual variances and covariances when the observed and predicted covariance matrices are compared, is useful when a correlation matrix of the observed variables is analyzed.

CHAPTER 4

METHODOLOGY

SAMPLE

The sample for the study consisted of both male and female undergraduate university students who had not used DISCOVER. The university is set in a large urban area and attracts students from many ethnic backgrounds. DISCOVER has been developed especially for college and adult populations (Rayman & Harris-Bowlsbey, 1977). This population was selected because of general agreement in the field that students of this age group lack decision-making skills, are generally undecided about a career path, and are still attempting to orient themselves in the work world (Phillips & Strohmer, 1983; Super, 1983.

Two major factors were considered when determining the minimum sample size. The first was that maximum likelihood estimation (LISREL) was to be employed which requires at least 100 subjects per group (Tanaka, 1987). Secondly, preliminary factor analyses of pilot data with similar populations indicated differing factor patterns for males and females. As the study incorporated four groups (sex[2] X treatment[2]), a minimum sample size of 400 was necessary. Allowing for mortality of subjects, a total of 461 subjects were approached with 432 agreeing to participate and completing the student consent form (see Appendix C), all questionaires and requirements of the study. The final sample consisted of 219 females and 213 males see (Table 1).

Table 1

Age and Student Status Categories by Group

Group	Age 1	Age 2	Age 3	Age 4	Status 1	Status 2	Status 3	Status 4
Male								
Experimental(N=106)	63	30	7	6	87	20	8	1
Control(N=107)	64	31	6	6	80	19	7	1
Female								
Experimental(N=108)	73	22	9	4	84	15	8	1
Control(N=111)	74	24	9	4	84	17	9	1

Note: Age in years- 1=20 or less; 2=21 to 24; 3=25 to 29; 4=30 or over. Status in years according to credits earned- 1=Freshman; 2=Sophomore; 3=Junior; 4=Senior

Approximately 88% of the subjects were between the ages of 17 and 24, 76% were full-time students, and 75% were first year students. With few exceptions, none had ever used a computerized vocational guidance system before. No data is available regarding parental or family status and ethnicity.

INSTRUMENTATION

This section describes the six instruments used to assess the six observed variables. See Appendix D for a description of the items. The instruments were selected on the basis of extending the investigation of career time perspective from a study by Savickas, Silling & Schwartz (1984). All instruments were administered at Time 1, the pretest phase, and again at Time 2, the posttest phase. Each dimension or latent variable was multiply operationalized by the measurement of at least two observed variables (Cook & Campbell, 1979). The instruments will be described in pairs, as each pair measures the same latent variable. First the career time perspective measures will be described followed by the career decision-making and attitudinal vocational maturity measures, respectively.

Career Time Perspective Measures (CTP)

Although numerous time perspective measures have been reported, most lack adequate operational definition or are linguistically inconsistent. Madison (1984) resolved this dilemma in extracting continuity as the only major factor along with three inconsequential factors from 31 measures of time perspective. Continuity can be defined as the notion that future events are connected to the present and that the future will be pleasant and fruitful. He found that continuity was best measured by the Long Term Personal Direction Scale (LTPD) (Wessman, 1973) and the Achievability of Future Goals Scale (AFG) (Heimberg, 1961). The LTPD and the AFG differ in that they measure different response tendencies toward the future; the LTPD measures the inclination to structure or map the future with events and the AFG measures the tendency to optimistically anticipate the future, respectively. An example of the former would be specific plans for future graduate school attendance or employment to be used as experience for more distant future plans. These measures have been used in a prior similar study with undergraduate college students (Savickas et al., 1984) and have shown to be effective and easy to administer, with an alpha reliability of .87 for the LTPD and .69 for the AFG. As continuity has been shown to be the only major factor in time perspective, these measures are referred to as structured continuity (SC) and optimistic continuity (OC) for the LTPD and the AFG, respectively. The LTPD is a 20-item scale and the AFG contains eight items; both are answered in a 7-point Likert-type format (see Appendix B).

Career Decision-Making Measures (CDM)

Two observed variables in career decision-making were assessed. The degree of indecision was assessed by the Vocational Decision-Making Difficulty Scale (VDMD) devised by Holland, Gottfredson, and Nafziger (1973) (see Appendix B). Items in this scale measure self-estimates of ability to make vocational decisions, knowledge of personal preferences, and knowledge of world of work demands. The satisfaction with career choice was assessed by the Career Decision Satisfaction Item (Holland & Holland, 1977) asking the satisfaction level of career choice (see Appendix B).

The VDMD, a true/false 13-item scale, deals with the lack of confidence about decision-making skill and lack of self- and ocupational information, with higher scores indicating a greater degree of indecision. KR-20 reliability coefficients for the VDMD of .86, .84, .78, and .63 have been reported with four samples of high school and college students (male and female) by Holland & Holland (1977). The validity of the satisfaction item has been supported by empirical evidence such as significant correlations with other satisfaction scales as well as with verbal responses to queries regarding current job descriptions (Slaney, Palko-Nonemaker, & Alexander, 1981; Slaney, 1980; Holland & Holland, 1977; Holland et al., 1975).

Attitudinal Vocational Maturity Measures

Attitudinal Vocational Maturity (AVM) was measured by the Career Development Inventory-College and University Form (CDI). The CDI is a product of the long-term research projects directed by Donald Super and assesses the career development status of college-level groups, or, in other words, the knowledge and attitudes about career choice. Although this inventory also contains Decision-Making and World of Work subscales, only the Career Planning and the Career Exploration subscales were utilized for this study. The Career Planning Subscale (CP) and the Career Exploration Subscale (CE) measured the observed variables planfulness and exploratory attitudes respectively. Alpha reliability of .91 for the CP and .80 for the CE have been reported by the authors (Super, Thompson, Lindeman, Jordaan, & Myers, 1982). The Career Development Inventory has been administered to numerous similar populations to that employed in the present study and has demonstrated its consistent validity and reliability in measuring the variables of interest (Holland and Holland, 1977; Kapes, Borman, and Kimberly, 1985; Savickas et al., 1984; Slaney, 1980).

Background Questionaire

Subjects were required to answer a short background questionaire which assessed age, status (year in college), gender and three questions regarding use and feelings about computerized guidance (see Apendix E).

DESIGN

This study employed males and females in both control and experimental groups (four groups in all). Six indicators of two latent factors were measured at two separate times across all groups. Experimental groups used modules three, four and five of the DISCOVER computerized guidance program (see Appendix A for a description of DISCOVER). Control group members received no treatment. Data was analyzed by the ALPHA FACTOR ANALYSIS and REGRESSION subprograms and the DISCRIMINANT program of the Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) and the LISREL VI program (Joreskog & Sorbom, 1984). See Chapter 3 for a detailed discussion of LISREL model specifications and below for details of the data analysis procedures.

PROCEDURE

Classes at a local university were visited and the students were asked to volunteer to help in this study investigating the effectiveness of DISCOVER in helping with career issues. The requirements regarding signing the consent form, using DISCOVER and completing the instruments were explained. Of 461 originally agreeing to join the study, 432 students completed all elements of the study. Those who had used DISCOVER in the past were eliminated from the study (only two students had previous use). Students joining in the study were randomly assigned to groups and asked to read and sign a "Student Consent Form," a copy of which may be found in Appendix C. This form covers all APA requirements for psychological experimentation using human subjects.

Subjects were pretested using all six instruments: LTPD, AFG, VDMD, Career Decision Satisfaction Item, and the CDI CP and CE scales. They also answered some additional background questions regarding their age, sex, semester(s) completed in college, whether they are full-time or part-time, which computerized vocational guidance system in the past, if any, they have used, and lastly, how they felt (or would feel) using such a system.

Recent preliminary trials using these instruments on college populations have shown the need to explain item number 13 (the unexplained peculiar intermittent mass behavior of lemmings) in the LTPD scale. No other difficulties were noted. Average time for completing all scales and background questions is approximately 23 minutes.

Although all subjects were informed that using DISCOVER was a requirement of the study, only experimental group members were given appointments to do so. To insure against experimenter-subject attentional effects (e.g. Hawthorne Effect), controls (the deferred treatment group) were told they would be scheduled to use DISCOVER later in the term because of limitations regarding system user capacity.

Students using DISCOVER at their appointed time completed all three required modules, numbers three, four and five. They completed the interest and values inventories in the third module of DISCOVER, LEARNING ABOUT YOURSELF. Using these results in the fourth module, FINDING OCCUPATIONS, each student received a printout of machine-suggested occupations. In the fifth and last module, LEARNING ABOUT OCCUPATIONS, students explored at least three suggested occupations of their choosing and received a three page printout for each occupation describing the tasks, materials, work environment, salary, occupational outlook and references to contact for more information. Pilot testing has shown that the average time to complete these three modules is about 45 minutes.

Approximately four to six weeks after using DISCOVER, all experimental subjects were individually administered the same six instruments which completed the posttest phase. At this time, the specific nature of the experiment and hypotheses were disclosed as well as all subjects pretest scores and their implications. Control group members were invited to make appointments to use DISCOVER. A list of subjects who indicated a desire to receive final results of the statistical analyses was made.

METHOD OF DATA ANALYSIS - ORIGINAL ANALYSIS PLAN

The study proposed here is an initial attempt to investigate the latent structure of attitudinal Vocational maturity, career decision-making and career time perspective in a longitudinal analysis and to make the first attempt at investigating changes in this structure by the use of the DISCOVER computer-assisted career guidance system. Presented here is a brief outline of the analyses that were originally planned although not all were completed.

The proposed analyses consisted of one exploratory factor analysis stage and six LISREL stages, three using confirmatory factor analyses to determine the number and nature of the underlying factors and three using structural equation models to explore the causative structure. LISREL model building is a reiterative process of model refinement incorporating both theoretical and empirical demands. The original analysis plan is described here. Data for each of the four groups at Time 1 were factor analyzed in the exploratory phase. Hypotheses generated from the exploratory analyses were further examined by a series of confirmatory factor analyses and structural equation modelling subsequent to fixing all exploratory factor laodings of .30 or less to zero.

In stage one, confirmatory factor analyses were conducted separately on each of the four groups at Time 1 and 2 to further examine the relations between the latent factors and their observed indicators (see Figure 3). Correlation or covariance matrices and factor pattern paths were inputted and the strengths of these factor patterns, that is, the relationships between the factors and their indicators, were outputted. By analyzing the output modifications were performed with the objective of finding the best model to fit the data.

Simultaneous (all groups analyzed at the same time) confirmatory factor analyses with no constraints (such as equal factor or error patterns and/or equal covariance structures among factors) across groups were conducted in the second stage to explore the equality of covariance structures across groups. Forms of less strong equalities may also be tested. The third stage incorporated constraints such as equal numbers of factors across groups and similar factor and error variance structures across groups. These third stage analyses were conducted as an exercise to help determine the model building processes of the next three stages.

The final three proposed stages considered the longitudinal nature of the data. These analyses were concerned with the structural or causative pattern among the variables across time of measurement and were to determine the effect of the treatment (versus no treatment) on the latent factors across time (see Figure 4). Independent structural equation models, based on the confirmatory factor analyses for each of the groups separately, were tested in stage four.

In stage five, the likelihood of the simultaneous fit of these structural equation models without constraints was to be explored akin to stage two above. If similarity of latent structures across groups was found, initial differences and treatment effects across groups were to be explored in the stage six.

This final stage of the proposed analysis introduces two innovations. Firstly, group means in addition to the covariance matrices are added to the input (LISREL with structured means). Secondly, dummy variables are created as noted by ξ_1 and η_5 (see Figure 5 and 6) which create paths (called γ s and λ s) that can be compared, revealing for example, initial differences (γ_{11} and γ_{21}) and treatment differences (γ_{31} and γ_{41}) across groups. See below for a description of how stage six analyses were to be applied to the original hypotheses.

HYPOTHESES

The theoretical model for the originally proposed study, stage six, is presented in Figure 5 (structural model with structured means) and in Figure 6 (measurement model). This model is the same for group 1, the control group, and group 2, the treatment (DISCOVER) group with (g) representing the group affiliation for that parameter or effect (g=1 for the experimental (DISCOVER) group and g=2 for the control group). LISREL VI with structured means allows for the testing of three sets of hypotheses: no initial differences, parallel slopes (which compares effects across groups of Time 1 variables on Time 2 variables), and no treatment effects. The following hypotheses and the method employed for testing them were to be as follows (see Chapter 3 for a more detailed analysis):

H_1- Means of pretest scores across treatment groups were to be tested for no initial differences by testing the equality of parameters (gamma) $\gamma_{11}^{(g)}$ and $\gamma_{21}^{(g)}$ across groups. Or: $\gamma_{11}^{(1)}=\gamma_{11}^{(2)}$ and $\gamma_{21}^{(1)}=\gamma_{21}^{(2)}$. Here a comparison is being made between two sets of paths that signify strengths of relations between a dummy variable (equaling 1), and the equivalent factor (being measured) in each group. In effect, these factors are the sole determiners of the value of their corresponding γ s (gammas). Therefore, what is being measured is the equivalence of the corresponding factors in each group. As the factors for these particular comparisons are η_1, attitudinal vocational maturity and η_2, career time perspective, both measured at Time 1, this procedure becomes a test of no initial differences across groups.

H_2- The effects of the two latent variables, Attitudinal Vocational Maturity and Career Decision-Making on themselves from pretest (Time 1) to posttest (Time 2) were to be tested by examining the equality of the corresponding β s: $\beta_{31}^{(g)}$ and $\beta_{42}^{(g)}$ across groups (equivalent to the testing of parallel slopes). Or: $\beta_{31}^{(1)}=\beta_{31}^{(2)}$ and $\beta_{42}^{(1)}=\beta_{42}^{(2)}$. Examining the differences between these parameters (across groups) is one way of quantifying the effect of the treatment (DISCOVER) (see H_4 below). In this hypothesis, β s represent the effect of a Time 1 factor on a Time 2 factor.

H_3- The testing of the effect of Attitudinal Vocational Maturity at Time 1 on Career Decision-Making at Time 2 was to be accomplished by examining the equality of $\beta_{41}^{(g)}$ across groups. Or: $\beta_{41}^{(1)}=\beta_{41}^{(2)}$ (see Figure 7). This hypothesis represents the notion that attitudinal vocational maturity is a more global construct than career decision-making and possible effects across time should be further investigated. A value significantly different from zero would indicate that some effect across time does exist. Signigicant differences across groups would tend to indicate an interaction effect by DISCOVER, that is, DISCOVER has some effect on the relation between these two factors over time.

H_4- The testing of treatment effects was to involve the testing of the equality of $\gamma_{31}^{(g)}$ and $\gamma_{41}^{(g)}$ across groups. Or: $\gamma_{31}^{(1)}=\gamma_{31}^{(2)}$ and $\gamma_{41}^{(1)}=\gamma_{41}^{(2)}$. In a similar fashion to H_1, significant differences between these factors would lead to the conclusion that the treatment had some effect on the experimental group members. The implications of these differences were to be interpreted in relation to the other present findings and the literature.

Due to the fact that career time perspective emerged as a latent factor and career decision-making did not, the above analyses were performed with career time perspective and attitudinal vocational maturity as factors. This exchange did not affect the methodology of the study as stated.

METHOD OF DATA ANALYSIS - REVISED PLAN

A major shortcoming of the LISREL analysis developed in that significant structural models could not be found, as described in stage five above. Therefore, stage six could not be performed and the hypotheses of the study could not be tested. To resolve these problems, additional analyses were performed in a revised data analysis plan. The revised plan consisted of two major parts, a series of discriminant analyses and a series of regression analyses.

Prior to testing the hypotheses, each pair of measures of a single factor (e.g., the time perspective measures, structural continuity (LTPD) and optimistic continuity (AFG)), was standardized (subtracting the mean from each raw score and dividing by the standard deviation). For each pair, these standardized scores were then added together and divided by 2, creating one new variable (e.g., hereinafter referred to as T1, Time Perspective at Time 1) representing an average of both indicators. This process was continued creating six new variables in all, three replacing the six original Time 1 variables and three in place of the six original Time 2 variables (A1 to represent attitudinal vocational maturity at Time 1, D2 to represent decision-making at Time 2, etc.). These created variables each represent a composite indicator for the three hypothesized factors of interest at both time measurements. In this way, the different scales of the measures were compensated for, and the analyses were simplified without any loss of information.

DISCRIMINANT ANALYSES

Six discriminant analyses were performed using the program Discriminant Analysis of the Statistical Program for the Social Science (SPSS) (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) to test for no initial differences at Time 1 (pretests) across groups (Hypothesis 1), and to test for significant differences across groups at Time 2 (Hypothesis 4). At each time measurement, three tests were performed: testing for differences across treatment groups by pooling data across sex, by first entering sex and then testing for differences across treatment groups, and lastly by testing for differences across sex by pooling data across treatment groups.

REGRESSION ANALYSES

Hypotheses 2 and 3 (the expectation of effects of Time 1 variables on Time 2 variables) were tested by using the SPSS subprogram Regression. Similar to analysis of variance, tests for main effects and interaction effects were performed. The regression equation is broken down here for simplification of description. To test main effects of sex (controlling for treatment (X) and pretests, A1,T1,D1), pretests (controlling for sex (Sex) and treatment (X)), and treatment (controlling for sex and pretests), on each of the three posttests, the following regression equation was employed:

$$Y'=A+\beta_1 A1+\beta_2 T1+\beta_3 D1+\beta_4 Sex+\beta_5 X$$

Subsequent analyses employed interaction effects and combined sex with pretest interaction terms,

$$+\beta_6(A1Sex)+\beta_7(T1Sex)+\beta_8(D1Sex)$$

treatment with pretest interaction terms,

$$+\beta_9(A1X)+\beta_{10}(T1X)+\beta_{11}(D1X)$$

and sex and treatment with pretest interaction terms,

$$+\beta_{12}(A1XSex)+\beta_{13}(T1XSex)+\beta_{14}(D1XSex)$$

The results of the discriminant and regression analyses were tested for significance by use of the F statistic in the usual way. The results of all analyses are described in the next section.

CHAPTER 5

RESULTS

Data used for the analyses were collected over a one year period from an initial pool of 441 subjects of whom 432 completed all parts of all six instruments and were included in the analyses. All items of these observed measures are displayed in Appendix D and background questions are displayed in Appendix E. The means, standard deviations (see Table 2) and correlations by group are presented in Appendices F.1-F.3. In general, means increased from Time 1 to Time 2 across all groups except for the variable Indecision which decreased slightly in three of the four treatment groups (except the male experimental group which remained unchanged). Large correlations were found between structured continuity and optimistic continuity at the same time measurement and for all variables across time measurements.

TABLE 2

<u>Means and Standard Deviations by Group</u>

Variable	FeMale		Male	
	Mean	S.D.	Mean	S.D.
		Experimental Group		
Structured Continuity1	92.01	11.67	92.76	11.45
Optimistic Continuity1	43.44	6.90	43.76	6.58
Indecision1	7.19	2.96	7.18	2.78
Satisfaction1	4.32	1.52	4.30	1.46
Attitude to Plan1	72.00	23.59	71.84	22.65
Attitude to Explore1	178.98	28.63	180.78	27.62
Structured Continuity2	94.90	13.00	94.92	12.37
Optimistic Continuity2	45.57	7.24	45.35	6.96
Indecision2	7.16	2.68	7.18	2.59
Satisfaction2	4.94	1.14	4.74	1.05
Attitude to Plan2	76.36	23.37	74.79	23.46
Attitude to Explore2	182.89	27.12	183.71	28.25
	Control Group			
Structured Continuity1	91.12	12.36	93.92	11.71
Optimistic Continuity1	43.07	7.67	44.38	6.91
Indecision1	7.33	3.04	7.51	2.80
Satisfaction1	4.25	1.49	4.18	1.47
Attitude to Plan1	71.08	23.71	71.12	23.19
Attitude to Explore2	178.98	28.45	181.70	28.79
Structured Continuity2	92.32	12.92	94.57	12.48
Optimistic Continuity2	44.21	7.74	45.21	6.88
Indecision2	7.05	2.90	7.24	2.57
Satisfaction2	4.70	1.35	4.57	1.22
Attitude to Plan2	73.65	23.33	73.69	22.83
Attitude to Explore2	179.59	25.95	180.72	26.88

Note: 1=Time 1; 2=Time 2

Initially, preliminary exploratory factor analyses were conducted to examine the relationships among the manifest variables in terms of latent variables. Although all four groups exhibited two latent factors as expected, the pattern and strength of relationships varied somewhat by group and also by administration of the instruments (Time 1 and Time 2). The analyses, to be described in the following sections, used chi-square as the criterion of goodness-of-fit.

CROSS-SECTIONAL MODELS: POOLED MODELS

Models were developed for all groups at Time 1 and at Time 2 by analyzing the covariance matrix generated from correlation matrices and standard deviations computed in the exploratory phase. Due to problems in LISREL in determining initial estimates, the variables were rescaled to eliminate the negative qualifiers associated with intercorrelations of the measure Indecision, which represents a deficiency of the positive construct Career Decisiveness. The best fitting cross-sectional confirmatory factor analysis models are presented in Appendices G.1 and G.2. Both models consist of the six observed variables hypothesized to be measures of two correlated latent factors, attitudinal vocational maturity and career decision-making. The measures concerned with time, structured and optimistic continuity, as well as the attitudinal measures, attitude to planning and attitude to exploration were originally hypothesized to represent the attitude factor while career satisfaction and indecision were expected to represent the career decision-making factor. These findings were not replicated here. At Time 1 (see Appendix G.1), the Lambda X matrix shows rather high loadings for the two time perspective measures and the attitude to explore measure on the first factor. The second factor shows loadings for all variables but the time perspective measure. At Time 2 (see Appendix G.2), similar loadings are found, in that the career time perspective measures load on a factor distinct from the attitudinal variables. These findings indicate that, contrary to prior research, career time perspective may be a distinct factor in the larger structure of the career development area and will be further elaborated on in the discussion section.

The Time 1 model (X^2=8.50, df=6, p=0.204) and the Time 2 model (X^2=14.09, df=7, p=0.050) both fit the data well. These chi-squares (X^2) show that the factor structures in Appendices G.1 and G.2 are more than chance representations of the relationships in the data.

CROSS-SECTIONAL MODELS: WITHIN-GROUPS MODELS

The next stage in the analysis examined the treatment groups separately. The groups consisted of subjects by time (2), sex (2) and treatment (2). The fits of those models are presented in Table 1 and 2. All models fit the data of each group well, indicating that the factor structures found are reliable estimates of existing factor structures in the data.

TABLE 3

Cross-Sectional Confirmatory Factor Analysis Models: Goodness-of-Fit

Group	X^2	df	p	N
Time 1				
Female Experimental	2.90	8	0.940	108
Female Control	3.34	8	0.911	111
Male Experimental	4.20	7	0.756	106
Male Control	5.32	8	0.723	107
Time 2				
Female Experimental	6.53	8	0.588	108
Female Control	13.93	9	0.125	111
Male Experimental	5.45	8	0.709	106
Male Control	6.41	8	0.601	107

The equality of factor structures across groups was then examined in a series of simultaneous analyses (four groups analyzed at the same time) consisting of the following hypotheses: equality of covariance structures H_{Σ}, equal number of factors $H_{n=2}$, invariance of factor loadings H_{Λ}, invariance of both factor loadings and residuals $H_{\Lambda\Theta}$, and invariance of factor loadings, residuals and correlations among factors $H_{\Lambda\Theta\Phi}$. The purpose of these analyses is to determine if the latent structure of the various groups are similar enough so that simultaneous structural analyses will be meaningful. See Chapter 4, Methodology, for further explanation. The results of these analyses are presented in Table 3. The most reasonable hypothesis is $H_{\Lambda\Theta\Phi}$, that is they have invariant factor loadings, residuals and correlations.

TABLE 4
Cross-Sectional Confirmatory Factor Analysis Models: Equality of Factor Structures

Hypothesis	χ^2	df	p	Decision
H_{Σ}	10.41	63	1.000	accepted
$H_{n=2}$	5.82	16	0.990	accepted
H_{Λ}	14.25	40	1.000	accepted
$H_{\Lambda\Theta}$	18.11	58	1.000	accepted
$H_{\Lambda\Theta\Phi}$	19.73	67	1.000	accepted

STRUCTURAL EQUATION MODELS

The longitudinal nature of the data was to be considered next by combining cross-sectional models at Time 1 and Time 2 across groups and examining causal relationships among the latent variables. First within group relationships and then between group relationships were to be considered. Figure 4 represents a graphical depiction of the general structural equation model which was to serve as an initial guide. This model was to guide the design for the subsequent investigations of causal relationships in the four separate group models.

Various models were attempted, but convergence was not achieved. In other words, a satisfactory structural equation model could not be found. To account for the high correlations of Time 1 measures with those same measures at Time 2, their errors, Theta Epsilons or Θ_{ε}, were allowed to correlate by freeing those parameters. The model with all sbubdiagonal beta paths between the factors freed was closest to significance (X^2=62.34, df=42, p=0.022) (see Figure 7). The reasons for this finding are not clear and no inference should be made in this regard, as this model was not significant.

The findings of most importance were from the LISREL confirmatory factor analyses. Although a two factor structure was found as predicted, Career Time Perspective was exhibited as a unique factor and Career Decision-Making was found to be a part of Attitudinal Vocational Maturity. Findings to date have found that Career Decision-Making and Attitudinal Vocational Maturity were distinct factors and that Career Time Perspective loaded on the attitude factor. Because the hypotheses could not be tested with the results from the LISREL analyses, discriminant analyses to test equivalence of groups and regression analyses to test for effects across time were undertaken.

DISCRIMINANT ANALYSES

Indicators of similar latent factors (as described in the Methodology chapter) were combined to create six new standardized variables, three at Time 1, A1, T1 and D1, representing the attitude, time perspective and decision-making indicators respectively, and similarly three at Time 2 (A2, T2 and D2). The means and standard deviations are depicted in Table 5.

TABLE 5

Means and Standard Deviations of Standardized Variables

Variable	Mean	S.D.	N
	Control Group		
A1	0.03	0.80	218
T1	0.08	0.88	218
D1	0.02	0.65	218
A2	0.00	0.78	218
T2	0.05	0.88	218
D2	0.02	0.71	218
	Experimental Group		
A1	0.04	0.83	214
T1	0.08	0.82	214
D1	0.03	0.63	214
A2	0.11	0.82	214
T2	0.15	0.87	214
D2	0.09	0.64	214

Note: All 12 original variables are combined into pairs. 1=Time 1, 2=Time 2. A1=attitude to explore + attitude to plan; T1=structured continuity + optimistic continuity; D1=satisfaction + indecision.

To test Hypothesis 1, that is, the means of pretest scores (Time 1) for the experimental and control groups will not be significantly different, three discriminant analyses were performed: first, testing for differences across treatment groups by pooling data across sex, second, by entering sex and then testing for differences across treatment groups, and lastly by testing for differences across sex by pooling data across treatment groups. Results found were $X^2=0.70$, d.f.=3, p=0.99; $X^2=1.14$, d.f.=4, p=0.89; and $X^2=2.07$, d.f.=3,p=0.56, respectively, and all were highly nonsignificant, meaning that there was no significant initial differences between the groups on the pretests. Hypothesis 1 was confirmed.

To test Hypothesis 4, that is, users of the DISCOVER CACG program will show a significant increase over nonusers in Career Time Perspective, Career Decision-Making, and Attitudinal Vocational Maturity (posttest scores), three discriminant analyses were performed as in testing Hypothesis 1 above. All results were nonsignificant indicating that DISCOVER users had no significant difference on the three mentioned variables when compared to nonusers. For example, testing for differences at Time 2 across treatment groups by pooling data across sex resulted in a X^2=3.58, d.f.=3, p=0.31; entering sex first found X^2=4.52, d.f.= 4, p=0.34; and lastly, testing for differences across sex by pooling data across treatment groups yielded X^2=2.26, d.f.= 3, p=0.52. Hypothesis 4 was not confirmed.

In summary, Hypothesis 1 was upheld indicating there were no significant differences between the groups at Time 1. Hypothesis 2 was not upheld in that the treatment did not have a significant effect on the variables of interest. There were no significant differences between the groups at Time 2.

To answer the questions raised by Hypotheses 3 and 4, effects of variables across time measurements, the results of the regression analyses are now discussed.

REGRESSION ANALYSES

Initially, regression main effects were analyzed. These analyses contained five independent variables, three pretest values, sex and a dummy variable created for group membership. The three posttest measures (Time 2) were the dependent variables. In summary, only similar pretest (Time 1) measures had a significant relationship with that same measure at Time 2. Neither treatment nor sex had a significant effect on posttest values. When controlling for pretest values, no interaction effects were significant.

Tests for sex main effects (data pooled across treatment) were not significant. The attitude measure at Time 2 (A2) regressed on sex yielded an R^2=0.00, F=1.16, and p=0.28. The time perspective measure (T2) regressed on sex showed an R^2=0.00, F=0.18, and p=0.67. The decision-making measure (D2) regressed on sex found an R^2=0.00, F=0.45 and p=0.50. All of these results were highly nonsignificant indicating sex had no real effect on the dependent variables.

The effect of each Time 1 measure (pretest) on that same measure at Time 2 was highly significant in a stepwise regression, whereas, the other pretest measures were automatically excluded by the probability to include (pin<.05) (default value). The indication here is that there are no significant relations between variables at Time 1 and Time 2 other than that same variable measured at Time 2. The following values were found: for the attitude measure (A2 regressed on A1), R^2=0.94, F=3025.10, and p<0.001; for the time perspective measure (T2 regressed on T1), R^2=0.80, F=1771.81, and p<0.001; and for the decision-making measure (D2 regressed on D1), R^2=0.71, F=1029.82, and p<0.001. These comparisons are all highly significant.

A dummy variable (X) was created for the treatment condition. A value of 1 indicated the treatment group (DISCOVER) and a value of 2 indicated control group membership. Analyses to determine treatment main effects yielded the following nonsignificant values: A2 regressed on X found an R^2= 0.00, F=1.95 and p=0.16; T2 regressed on X yielded an R^2=0.00, F=1.32, and p=0.25; and D2 regressed on X resulted in R^2=0.00, F=1.25, and p=0.26. All these analyses are highly insignificant meaning the treatment (DISCOVER) had no effect on the dependent variables.

The following interaction effects were also tested: treatment and sex (XSex), pretest and sex (A1Sex, T1Sex, D1Sex), treatment and pretest (XA1,XT1,XD1), and prestest, treatment, and sex (A1XSex,T1XSex,D1XSex). None of these interaction terms had any significant effect on the dependent variable when entered after the corresponding independent variable, e.g., A1Sex had no significant effect on A2 after A1 was entered into the equation. There was no significant effect on the posttests for any of the interaction terms.

In summary, Hypothesis 2, the attitude and decision-making variables at Time 1 will have significant effects on themselves measured at Time 2 was upheld. In addition, this same relation held for the time perspective variable. Hypothesis 2 was confirmed.

Hypothesis 3, the attitude measure at Time 1 will have a significant effect on the decision-making measure at Time 2 was not upheld. Hypothesis 3 was not confirmed.

CHAPTER 6

DISCUSSION

The main objective of this study was to examine the effects of the DISCOVER computerized guidance program on users' attitudinal vocational maturity, career decision-making and career time perspective over time. A subsidiary objective was to further explore the latent structure of these three constructs. A database was developed including both users and nonusers (control group) with data collected both before and after the treatment (DISCOVER). The factor structure of this data was examined cross-sectionally and longitudinally. In addition, both within-group and pooled data were analyzed.

The three modules used by those in the experimental group were selected on the basis that they represent the most active career guidance components of DISCOVER. Users, under supervision, completed a Holland (1977) type interest inventory (module 3) and received a machine-generated list of suitable occupations (usually 10 to 20 out of a possible 600 or so) based on the interest inventory results (module 4). They then picked three or four of these occupations (module 5) to receive printed information on each, which included sources for more information (usually institutions to write or call such as trade organizations, governmental agencies, etc.). The world-of-work map (Prediger, 1976), which displays related occupations grouped according to the Holland code, was discussed briefly before using DISCOVER and served a career information and orienting function. The other (unused) modules serve either a routing function (deciding which modules would be most beneficial (useful) to the particular user, as purely information sources, or as adjuncts in performing career related tasks (e.g., writing a resume) and were therefore deemed not particularly relevant.

Data was not collected on the user's attained Holland code, nor were the lists of machine generated occupations quantified for this study. In addition, no data was collected on time spent using DISCOVER or whether users followed up the machine-generated suggestions regarding additional information.

DISCOVER was expected to increase users knowledge of, and show how their career interests relate to, the organization of occupations in general and some occupations in particular, and inform the user regarding specific education and/or experience needed to enter these occupations. These interventions were expected to lower measured indecision and increase the time perspective measures, Structured Continuity and Optimistic Continuity. The reasoning here is that the career exploration and information gathering exercises in DISCOVER show the steps involved in attaining certain careers (structured career events or structured continuity), and impart to users a greater sense of career related confidence (optimistic continuity) by displaying various career areas suitable to them and worth investigating further while eliminating others.

As mentioned, DISCOVER was expected to decrease measured indecision in users directly by offering career alternatives and paths to follow to attain these careers, and indirectly by increasing time perspective. Until recently, problems in the Career Decision-Making area were seen in a rather dichotomous fashion (Fuqua & Newman, 1989; Jones, 1989); an individual was either indecisive or undecided.

Indecision was seen as a serious condition, an inability to make meaningful career decisions. Being undecided was seen as a nonserious temporary state, or one where there was no need for a decision to be made. Heretofore, evidence has been found that lack of future structure (structured continuity) could be an antecedent of career indecision, a somewhat chronic and debilitating condition, and that pessimism regarding future career issues (optimistic continuity) may be related to immature attitudes toward planning, resulting in being undecided (Savickas, et al, 1984).

The hypotheses of this study could not be tested as originally planned using LISREL, as a satisfactory (significant) structural or longitudinal model could not be found. A series of discriminant and regression analyses were added in this regard.

The major significant finding of the LISREL analyses was that career time perspective seemed to emerge as an independent factor along with an attitudinal factor in the cross-sectional confirmatory factor analyses (see Table 6 and Appendix F). Hypotheses 1 and 2 were confirmed and hypotheses 3 and 4 were not. The discussion will focus on the results leading to these conclusions and their implications.

Table 6

<u>LISREL Estimates of Factor Loadings</u> (<u>Lambda X</u>) - <u>Pooled Data</u>

Variable	Time 1 Factor 1	Time 1 Factor 2	Time 2 Factor 1	Time 2 Factor 2
Strucont	11.048	0.000	0.000	10.787
Opticont	5.303	0.000	0.000	5.561
Indec	0.000	0.931	0.965	0.000
Satis	0.328	0.425	0.352	0.261
Attplan	0.000	10.165	13.761	0.000
Attexplo	7.445	7.327	12.653	0.000

Note: Estimates by Maximum Likelihood

The present study measured time perpective with the same two instruments as in Savickas et. al., but results are inconclusive in this regard. Both time perspective measures loaded heavily on one factor along with attitude to career exploration at Time 1. At both time measurements, a career decision-making variable, satisfaction (with career decisions), had smaller loadings on the time perspective factor. Considering the small variance of Satisfaction, and its relatively large covariance with the Time Perspective measures, these findings may indicate an overlap in the theoretical conceptualization of these variables. The complete lack of a factor loading of the attitude to career exploration variable on the time perspective factor at Time 2 seems to indicate that DISCOVER may, in some unknown way, separate exploration attitudes from one's ideas about the continuity of their future career. These findings do not shed any light as to time perspective's role in the undecided/indecision debate.

The lack of convergence of the LISREL program (a finding in itself) disallowed the development of a satisfactory structural (longitudinal) model and therefore the effect of the DISCOVER program could not be evaluated with this approach. Reasons for a lack of convergence range from testing the wrong model (leaving out significant variables in the relations of interest), to large measurement error.

By substituting discriminant analysis in this regard, no significant differences were found among the groups at pretest (Hyp. 1) indicating a truly randomized design and equivalent groups. Performing these same tests on the posttest results again indicated no differences among groups (Hyp 4). This finding indicates that the treatment (DISCOVER) did not have a significant effect on the variables of interest, although, in general, slight nonsignificant mean gains were made by the experimental (treatment) groups. Other indications could be that the measures were not sensitive enough to detect the effect of DISCOVER, the time spent on DISCOVER by the treatment group (about 45-50 minutes on average) was too limited, or that the time span after DISCOVER use until the postest at Time 2 was too short to allow for the full effect of DISCOVER to be observed. Data regarding specific time spent by subjects using DISCOVER was not collected.

Effects of variables across time and group (Hyp. 2 and 3) were evaluated by a series of regression analyses. Only the main effects of each pretest on itself, as measured at Time 2 (posttest), was significant. Again, no sex or treatment effect was found.

VOCATIONAL IMPLICATIONS

The major finding of this study is that Career Time Perspective may be a more complex and active concept than originally conceived. Here it emerged as a relatively independent factor. More studies are needed to explore the role time perspective plays in career decision-making, in computerized career guidance, and in the career development area in general. If more effective career counseling (a traditional role of educators) is to be achieved, greater knowledge of the basic variables of importance is needed. The assumption by Savickas et. al. (1984) that Career Time Perspective consists exclusively of the notion of continuity, on the basis that this is so for Time Perspective in general, needs further investigation. The question of acquisition or development of Career Time Perspective also needs further attention, in the sense that, the possiblilities of learning a more pragmatic sense of time should be investigated. Future studies using LISREL or related programs should be aware that many of the instruments used in the career area measure diffuse constructs lacking the conceptual clarity regularly used in other areas of research which may negatively effect model building. Researchers in this area should not consider LISREL and LISREL type analyses the solution to all data analysis problems.

EDUCATIONAL IMPLICATIONS

Results of the analyses indicate that DISCOVER had little effect on the variables of interest. The most important determiner of these variables in the post-condition was their respective pretest strengths. One explanation as noted by Mencke & Cochran (1974) is that short range counseling interventions have little impact on attitudinal variables related to career choice. These variables are molded in the individual at least in part by a developmental process (Super, 1974) which assumes that a brief intervention will have minimal short term observable effects. Consonant with this view, Hoffman & Cochran (1975) noted that college students are in a position of adjusting to new sources for identity and self-concept formation. They are in the process of adjusting college major to present and future occupational conceptions (Crites, 1981). The point here is that an intervention such as DISCOVER may have interference from other powerful social forces in this age group, e.g., new peer group norms and greater economic needs created by college attendance.

Another possible explanation for the nonsignificant findings is that DISCOVER may interact with a more specific set of construct dimensions possibly not well measured by the instruments employed, or that these instruments may not be measuring optimally given the context of the study. Generalizing to other populations regarding the results of this study may not be appropriate. Most subjects, as reported in the background questions answered on the posttest (see Appendix H), found the experience to be more interesting and useful than reported on the pretest, and expressed a desire to learn more about computers in general and to continue career exploration with the DISCOVER program. DISCOVER can serve as an adjunct to counseling and save counselors considerable time when compared to traditional one-on-one counseling if administered properly. A final note in this regard is that over 3-4 months after the posttest, few students returned on their own to use DISCOVER.

A more comprehensive exit questionaire would have been useful. Data could have been collected on family background variables, prior experience in the work force, career related activities after DISCOVER use, experience with other counseling interventions, and other career-related variables.

Future studies might include time-on-DISCOVER, student Holland-type, and the amount of follow-up on DISCOVER-suggested activities as variables in a developmental design. Also the interaction of computer intervention with more traditional individual and group career counseling could be explored. Lastly, the relation of Time Pespective to additional career dimension variables needs to be explored.

APPENDIX A

A DESCRIPTION OF DISCOVER AND ITS MODULES

DISCOVER is a computerized vocational guidance system with desktop self-containment capability. It is both a source of detailed career information and a career planning process (Wilhelm, 1978). It has nine parts or "modules" as follows: Beginning The Career Journey, Learning About The World of Work, Learning About Yourself, Finding Occupations, Learning About Occupations, Making Educational Choices, Planning Next Steps, Planning Your Career, and Making Transitions.

In the first module, Beginning The Career Journey, an introduction to the system is offered and various modules are suggested based on the results of an on-line career maturity inventory.

The second module, Learning About The World Of Work, helps users understand the occupational structure as outlined in the American College Testing (ACT) World-of-Work Map (Prediger, 1976). This map has four dimensions: data, people, things, and ideas and is a refinement of the Dictionary of Occupational Titles (DOT) classification system. The advantages of using the graphic aid of a map has been outlined by Cole et al. (1971). With distance as a measure, it is possible to study (a) congruence of an individual and occupation; (b) similarity of two occupations; (c) stability of occupational choices over time; (d) stability of measured interests; and (e) differentiation of interests. For a detailed discussion of theoretical backgrounds in this area see Prediger, 1981.

Learning About Yourself, the third module, administers and scores an interest inventory and self assessments of values, abilities and experiences. This module also accepts results of paper and pencil versions of these questionaires. The interest inventory is an on-line version of Holland's Self-Directed Search (SDS) (Holland, 1977) where an individual makes a series of choices between sets of various activities. Usually taking no longer than 15 minutes, the user may then move to another module.

In the fourth module, Finding Occupations, the user elects one or more of the inventories used in Module 3 to build a list of machine-suggested occupations.

The fifth module, Learning About Occupations, provides detailed national information about hundreds of occupations. The user may select titles from the list and receive a detailed screen display or printed description of the occupation's work setting, work tasks, etc. Various other options are available. The user may go back to the previous module and complete one of the surveys they may have elected to skip, such as appraising their values, and then look at how the list of suggested occupations has changed. Another option is to input an occupational code from a hard-copy list available at the terminal so that the user may look directly at occupations they have had some previous interest in. Additionally, users may find occupations by inputting selected occupational characteristics (such as salary level, place of work, and level of training) or by relating favorite school subjects. This module can be used for five minutes or hours depending on user preference.

In the sixth module, Making Educational Choices, various training pathways may be explored. This module's activities are usually continued in Module 7, Planning Next Steps, where users can obtain: information about how to get college credit for prior learning experience, information about external degree programs, and descriptions of colleges and graduate schools.

The eighth module, Planning Your Career, helps the user identify and understand their life and career roles and is used with Module 9, Making Transitions, which provides support for dealing with the impact of changes in life and career roles.

APPENDIX B

DIRECTIONS FOR A BRIEF USE OF DISCOVER (LESS THAN ONE HOUR).
PLEASE READ BEFORE USING THE COMPUTER!!

USE THESE DIRECTIONS TO RECEIVE A PRINTED LIST OF MACHINE SUGGESTED OCCUPATIONS AND A BRIEF PRINTED DESCRIPTION OF 3 OCCUPATIONS OF YOUR CHOICE BASED ON YOUR INTERESTS AND VALUES. YOU WILL BE ASSISTED AT ALL TIMES DURING YOUR USE OF DISCOVER MODULES 3, 4 and 5 ONLY. You may want to come back to use the others at some future time.

1. Go to JH 201 to make an appointment to use DISCOVER. It is not uncommon for appointments to be assigned up to one week from the date you first apply, although you may be able to use the machine immediately.

2. Be on time when your appointment is scheduled. If you are late you may not be able to finish in the hour assigned to you. Announce to the secretary the purpose of your visit.

3. Once seated at the machine, you may turn on the system (if not already on) by pushing the red button on the power strip which is located to the left of the computer (please see posted directions). DO NOT turn off the computer for any reason. If you do, you will seriously damage the program.

4. Wait for about one minute for the computer screen to show: C:\>. Press the ONLINE button on the printer which will stop the printer. Type the word DISCOVER and press the ENTER key, which is located on the right of the quote key (near your right pinky home key, if you type). Press the grey F1 key (on the left) hereinafter called NEXT. Read the two help screens you will see. Press NEXT after each one.

5. Then you are asked to make a choice regarding how you will use DISCOVER. Press "B" for the GUIDANCE PLUS INFORMATION SECTION. Press another "B" to indicate you have never used DISCOVER before.

6. Press "B" again. This section asks you to type in some identifying information so that if you decide to use the system further at a later date, you will be able to access the information from the parts already used without having to do them over. Please see the posted sign for your counselor's number.

7. Press "A" when asked which module to start with. This will save time. At the menu screen (with numbers 1 to 0) press "3" to LEARN ABOUT YOURSELF.

8. Press NEXT and then "A" twice to take the VALUES INVENTORY. Then press NEXT and the number which best answers each question to rate your values. Follow directions on the screen to rank your values.

9. After finishing, press "A" to do another part of module 3. Press "A" again and then "B" to take the INTEREST INVENTORY. All questions must be answered or you will have to do it again. For each item press either "L" for 'like', "I" for 'indifferent' or "D" for 'dislike'. Follow on-screen directions. When finished press NEXT and "C" to go to

another module. Press "A" to have a summary printed.

10. Press "4" to use FINDING OCCUPATIONS. Press NEXT twice and then "A" for using test scores from Module 3 to find occupations. Press the letter next to the degree level you will obtain. Press NEXT. IMPORTANT- Press BOTH "A" and "B" to include both inventories in the search. Press NEXT. Answer "A" (YES) as needed to keep all jobs in the search active.

11. When the screen YOUR SELECTED VALUES appears, press "C" to see the list of occupations. Press NEXT twice. When the list appears press PRINT. Press NEXT and PRINT again if more occupations show.

12. Press NEXT twice and then "D" and "B". Press "5" to use LEARNING ABOUT OCCUPATIONS. Press NEXT twice. Your occupational list will appear. Press NEXT to see the complete list of occupations and then press "B". Press the letter of the 3 or 4 occupations you are most interested in. Press NEXT and "B" to print your occupational information. Press "B", "C" and "D".

13. Press "E", "B" and then "C" to go back to the Main Menu to exit. The program will ask you a few questions. You may want to save your work to be added to at another date.

YOU ARE FINISHED. THANK YOU. PLEASE LEAVE THE COMPUTER ON.
THE PRINTOUTS ARE YOURS TO KEEP

APPENDIX C

STUDENT CONSENT FORM

A study of the effects of the DISCOVER Computer Program, a vocational guidance and career information system located in the Transfer and Placement Office will be undertaken shortly. Student volunteers will be able to use English commands to learn about suitable career options and schools that offer training in these areas, as well as to learn something about their own interests. Students will work with the computer individually. Each will be asked to complete several questionaires in the course of the study.

Participation is voluntary and withdrawal from the study is possible at any time. Confidentiality of materials and records will be maintained, of course. There are no foreseen risks to use of DISCOVER. Hundreds of students have already used this computer program and many have found it a rich and rewarding experience. At the conclusion of the study a discussion will be held to answer students' questions and explain all results. Names will not be used in data analysis and the study has no relation to grades.

I wish to participate in this study. I realize that I may withdraw at any time.

Name ____

Student I.D. Number ____

Telephone Number ____

Address ____

Signature ____

APPENDIX E

Background Questionaire

Please circle the letter that most accurately answers each question.

1. Have you ever used a computerized vocational guidance program? If so, please write in the name.

A- No B- Yes ______________________________

Answer #'s 2. and 3. whether you have used one or not:

2. How useful do you think they are?

A- A waste of time B- Sometimes useful C- Usually useful
D- Very Useful

3. How interesting do you think they are?

A- Not interesting B- Somewhat interesting C- Very interesting

4. My enrollment status is:

A- Freshman B- Sophomore C- Junior D- Senior

5. My gender is:

A- Female B- Male

6. My age is:

A- 20 years or less B- 21 to 24 C- 25 to 29 D- 30 or over

APPENDIX F.1

Means and Standard Deviations by Group

Variable	FeMale Mean	FeMale S.D.	Male Mean	Male S.D.
		Experimental Group		
Structured Continuity1	92.01	11.67	92.76	11.45
Optimistic Continuity1	43.44	6.90	43.76	6.58
Indecision1	7.19	2.96	7.18	2.78
Satisfaction1	4.32	1.52	4.30	1.46
Attitude to Plan1	72.00	23.59	71.84	22.65
Attitude to Explore1	178.98	28.63	180.78	27.62
Structured Continuity2	94.90	13.00	94.92	12.37
Optimistic Continuity2	45.57	7.24	45.35	6.96
Indecision2	7.16	2.68	7.18	2.59
Satisfaction2	4.94	1.14	4.74	1.05
Attitude to Plan2	76.36	23.37	74.79	23.46
Attitude to Explore2	182.89	27.12	183.71	28.25
	Control Group			
Structured Continuity1	91.12	12.36	93.92	11.71
Optimistic Continuity1	43.07	7.67	44.38	6.91
Indecision1	7.33	3.04	7.51	2.80
Satisfaction1	4.25	1.49	4.18	1.47
Attitude to Plan1	71.08	23.71	71.12	23.19
Attitude to Explore2	178.98	28.45	181.70	28.79
Structured Continuity2	92.32	12.92	94.57	12.48
Optimistic Continuity2	44.21	7.74	45.21	6.88
Indecision2	7.05	2.90	7.24	2.57
Satisfaction2	4.70	1.35	4.57	1.22
Attitude to Plan2	73.65	23.33	73.69	22.83
Attitude to Explore2	179.59	25.95	180.72	26.88

Note: 1=Time 1; 2=Time 2

APPENDIX F.2

<u>Correlations</u> (<u>Female</u> <u>Experimental</u> <u>Group</u>)

SC1	1.000											
OC1	0.628	1.000										
I1	0.311	0.186	1.000									
S1	0.286	0.236	0.221	1.000								
AP1	0.239	0.160	0.350	0.239	1.000							
AE1	0.260	0.187	0.195	0.187	0.243	1.000						
SC2	0.904	0.516	0.300	0.235	0.148	0.229	1.000					
OC2	0.639	0.884	0.252	0.209	0.142	0.166	0.660	1.000				
I2	0.224	0.120	0.896	0.214	0.324	0.189	0.159	0.102	1.000			
S2	0.318	0.194	0.121	0.812	0.232	0.188	0.345	0.285	0.067	1.000		
AP2	0.247	0.135	0.363	0.206	0.969	0.222	0.212	0.166	0.292	0.252	1.000	
AE2	0.264	0.181	0.258	0.182	0.245	0.962	0.282	0.222	0.199	0.237	0.262	1.000

<u>Correlations</u> (<u>Female</u> <u>Control</u> <u>Group</u>)

SC1	1.000											
OC1	0.673	1.000										
I1	0.303	0.169	1.000									
S1	0.267	0.218	0.197	1.000								
AP1	0.249	0.180	0.332	0.270	1.000							
AE1	0.263	0.203	0.167	0.161	0.242	1.000						
SC2	0.944	0.588	0.260	0.255	0.175	0.195	1.000					
OC2	0.689	0.936	0.166	0.222	0.176	0.137	0.687	1.000				
I2	0.267	0.139	0.937	0.171	0.300	0.173	0.229	0.126	1.000			
S2	0.277	0.224	0.036	0.830	0.238	0.105	0.289	0.274	0.039	1.000		
AP2	0.251	0.161	0.319	0.261	0.978	0.210	0.202	0.182	0.277	0.241	1.000	
AE2	0.259	0.209	0.194	0.187	0.216	0.967	0.216	0.170	0.193	0.152	0.204	1.000

<u>Legend</u>
Time 1=1, Time 2=2
Structured Continuity1 (SC1), Optimistic Continuity1 (OC1), Indecision1 (I1), Satisfaction1 (S1), Attitude to Plan1 (AP1), Attitude to Explore1 (AE1), Structured Continuity2 (SC2), Optimistic Continuity2 (OC2), Indecision2 (I2), Satisfaction2 (S2), Attitude to Plan2 (AP2), Attitude to Explore2 (AE2)

APPENDIX F.3

Correlations (Male Experimental Group)

SC1	1.000											
OC1	0.606	1.000										
I1	0.265	0.101	1.000									
S1	0.279	0.220	0.112	1.000								
AP1	0.156	0.122	0.353	0.276	1.000							
AE1	0.316	0.301	0.176	0.130	0.276	1.000						
SC2	0.894	0.532	0.195	0.204	0.110	0.197	1.000					
OC2	0.557	0.875	0.122	0.221	0.155	0.204	0.619	1.000				
I2	0.243	0.066	0.890	0.136	0.289	0.168	0.144	0.041	1.000			
S2	0.232	0.190	0.127	0.854	0.279	0.194	0.208	0.250	0.136	1.000		
AP2	0.145	0.082	0.370	0.279	0.963	0.259	0.148	0.164	0.274	0.301	1.000	
AE2	0.266	0.269	0.233	0.116	0.250	0.909	0.227	0.255	0.178	0.234	0.281	1.000

Correlations (Male Control Group)

SC1	1.000											
OC1	0.610	1.000										
I1	0.145	0.001	1.000									
S1	0.249	0.242	0.082	1.000								
AP1	0.246	0.181	0.266	0.285	1.000							
AE1	0.231	0.197	0.140	0.189	0.285	1.000						
SC2	0.909	0.498	0.079	0.202	0.180	0.129	1.000					
OC2	0.619	0.879	0.040	0.240	0.184	0.102	0.641	1.000				
I2	0.105	0.029	0.912	0.084	0.217	0.108	0.015	0.034	1.000			
S2	0.249	0.164	0.013	0.861	0.237	0.150	0.270	0.260	0.013	1.000		
AP2	0.229	0.132	0.256	0.264	0.973	0.231	0.205	0.182	0.187	0.242	1.000	
AE2	0.190	0.164	0.186	0.176	0.246	0.915	0.147	0.153	0.119	0.215	0.231	1.000

Legend Time 1=1, Time 2=2;
Structured Continuity1 (SC1), Optimistic Continuity1 (OC1), Indecision1 (I1), Satisfaction1 (S1), Attitude to Plan1 (AP1), Attitude to Explore1 (AE1), Structured Continuity2 (SC2), Optimistic Continuity2 (OC2), Indecision2 (I2), Satisfaction2 (S2), Attitude to Plan2 (AP2), Attitude to Explore2 (AE2)

APPENDIX G.1

Confirmatory Factor Analysis Cross-Sectional Models of Best Fit -- Pooled Data

Covariance Matrix Analyzed

	SC	OC	I	S	AP	AE
			Time 1			
SC	153.463					
OC	58.608	55.160				
I	5.291	0.026	12.666			
S	5.349	2.466	0.631	2.217		
AP	72.546	33.633	17.129	9.673	562.117	
AE	109.892	55.889	4.887	8.056	184.925	754.271
			Time 2			
SC	161.315					
OC	59.981	51.984				
I	4.731	1.217	7.182			
S	4.361	2.388	0.144	1.493		
AP	57.147	29.264	16.037	7.227	537.915	
AE	76.150	39.528	12.449	6.535	154.088	729.378

Structured Continuity (SC), Optimistic Continuity (OC), Indecision (I), Satisfaction (S), Attitude to Plan (AP), Attitude to Explore (AE)

Lisrel Estimates (Maximum Likelihood)

Lambda X

	Time 1		Time 2	
	KSI 1	KSI 2	KSI 1	KSI2
SC	11.048	0.000	0.000	10.787
OC	5.303	0.000	0.000	5.561
I	0.000	0.931	0.965	0.000
S	0.328	0.425	0.352	0.261
AP	0.000	18.165	13.761	0.000
AE	7.445	7.327	12.653	0.000

Note: Structured Continuity (SC), Optimistic Continuity (OC), Indecision (I), Satisfaction (S), Attitude to Plan (AP), Attitude to Explore (AE)

APPENDIX G.2

Confirmatory Factor Analysis Cross-Sectional Models of Best Fit -- Pooled Data

Lisrel Estimates (Maximum Likelihood) (Continued)

Phi

	Time 1		Time 2	
	KSI 1	KSI 2	KSI 1	KSI 2
KSI 1	1.000		1.000	
KSI 2	0.361	1.000	0.433	1.000

Theta Delta

SC	OC	I	S	AP	AE	X^2	df	p
Time 1								
31.406	27.034	11.800	1.828	232.155	605.772	8.50	6	0.204
Time 2								
44.961	21.064	6.250	1.222	348.538	569.280	14.09	8	0.050

Note: Structured Continuity (SC), Optimistic Continuity (OC), Indecision (I), Satisfaction (S), Attitude to Plan (AP), Attitude to Explore (AE)

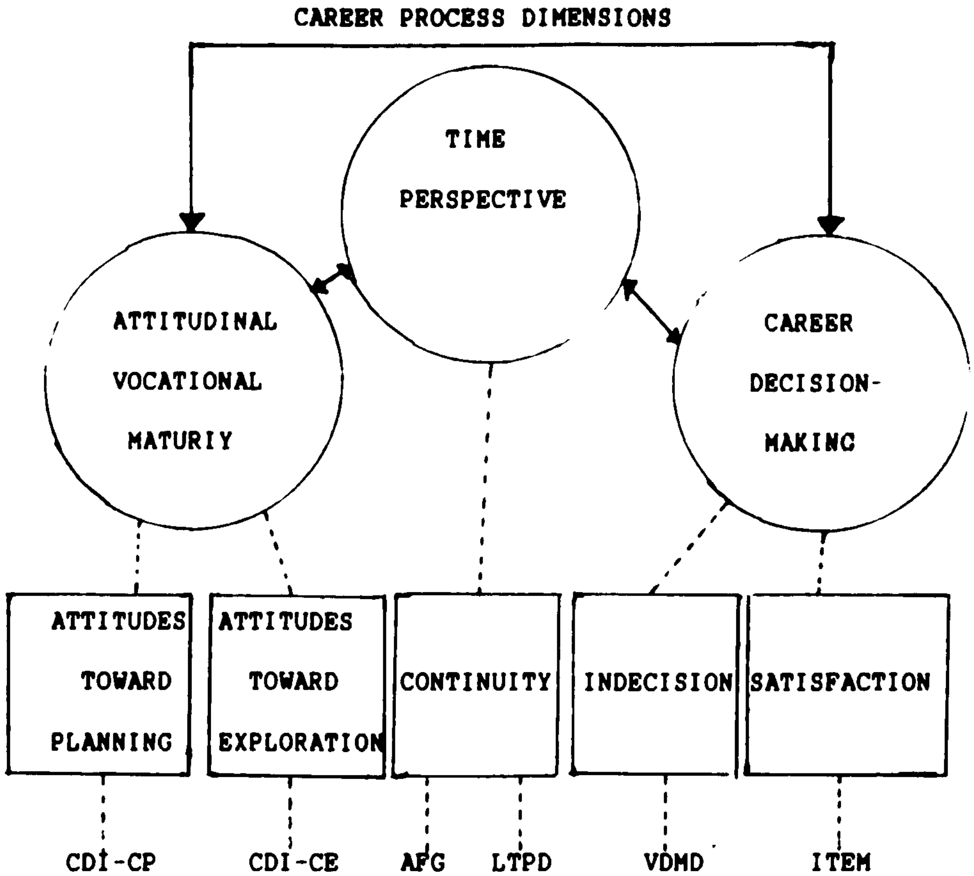


FIGURE 1 HYPOTHESIZED RELATIONSHIP BETWEEN TIME PERSPECTIVE AND CAREER PROCESS DIMENSIONS (SAVIKAS, SILLING, & SCHWARTZ, 1984)

Note: Abbreviations stand for the Career Development Inventory Career Planning scale (CDI-CP), and Career Exploration scale (CDI-CE), and for the Achievability of Future Goals scale (AFG), the Long Term Personal Direction scale, the Vocational Decision-Making Difficulty scale (VDMD), and the Career Choice Satisfaction Item (ITEM).

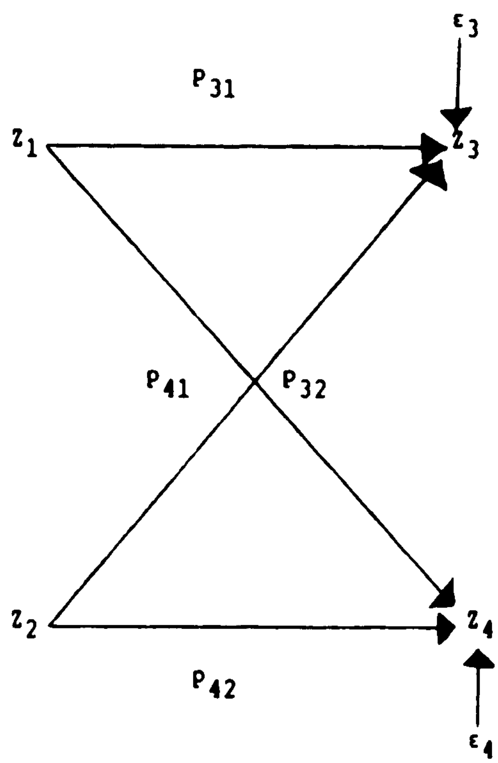


FIGURE 2: EXAMPLE OF A PATH MODEL WITH FOUR STANDARDIZED MEASURES

Z_1 Structured Time Continuity
Z_2 Otimistic Time Continuity
Z_3 Attitude to Planning
Z_4 Career Indecision

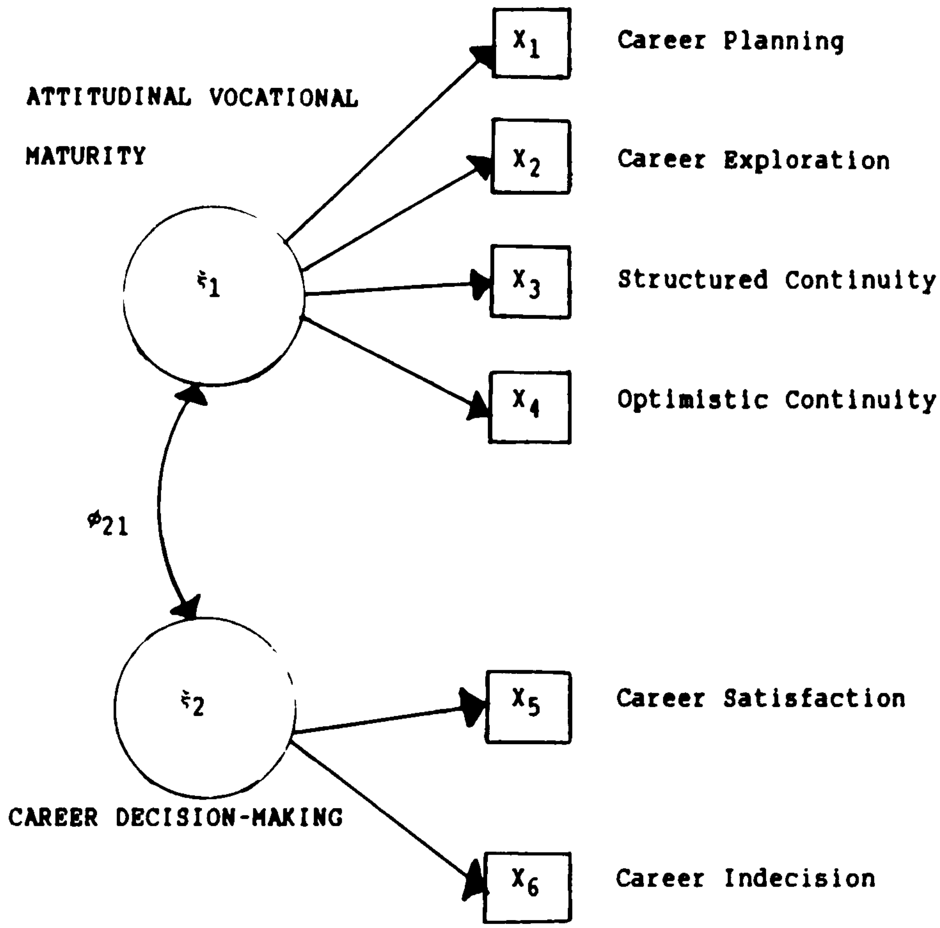


FIGURE 3 A FACTOR ANALYTIC MODEL OF ATTITUDINAL VOCATIONAL MATURITY AND CAREER DECISION-MAKING

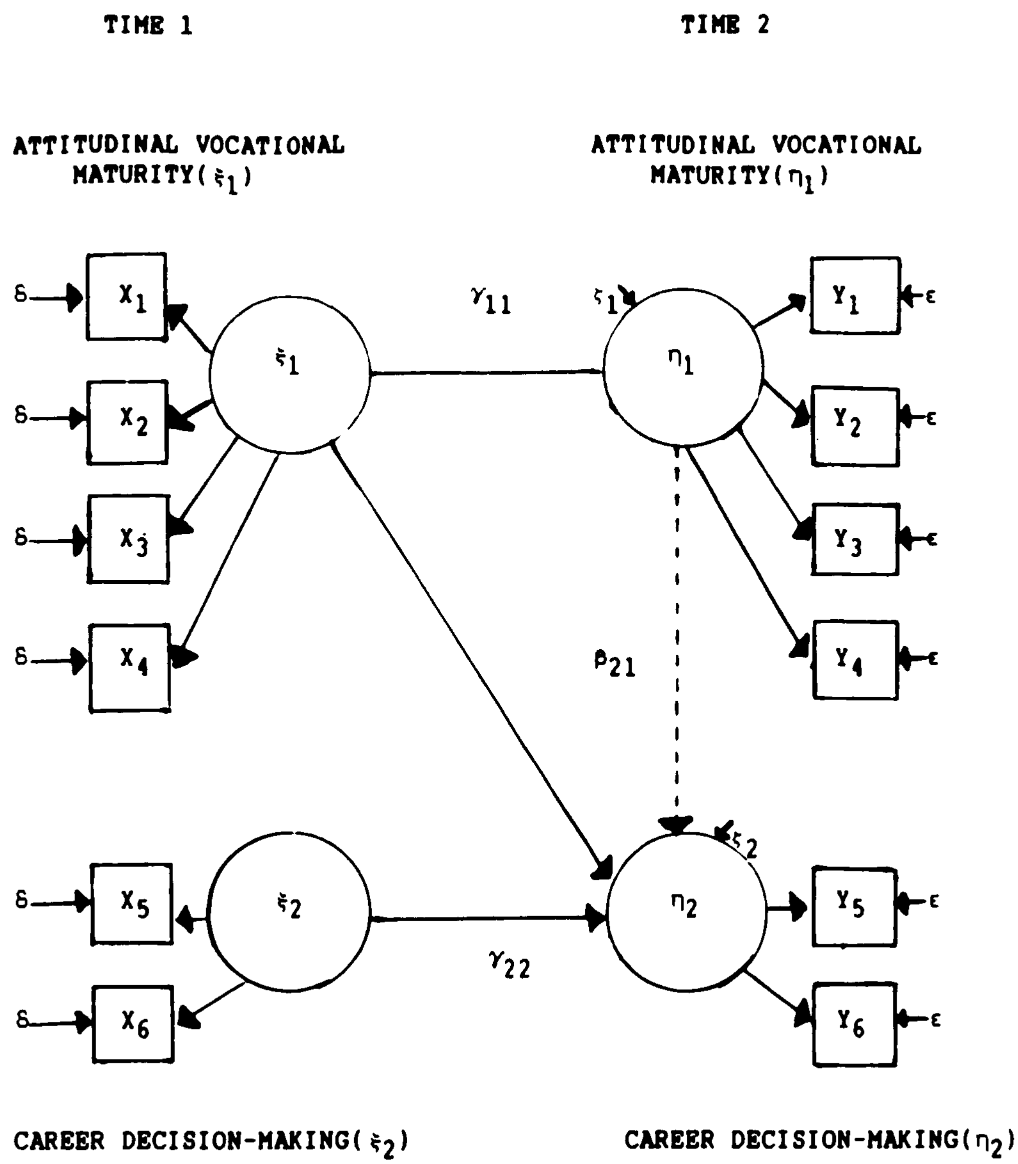


FIGURE 4: A STRUCTURAL AND MEASUREMENT MODEL OF ATTITUDINAL VOCATIONAL MATURITY and CAREER DECISION-MAKING AT TIME 1 & 2

X_1,Y_1 Career Planning
X_2,Y_2 Career Exploration
X_3,Y_3 Structured Continuity
X_4,Y_4 Otimistic Continuity
X_5,Y_5 Career Satisfaction
X_6,Y_6 Career Indecision

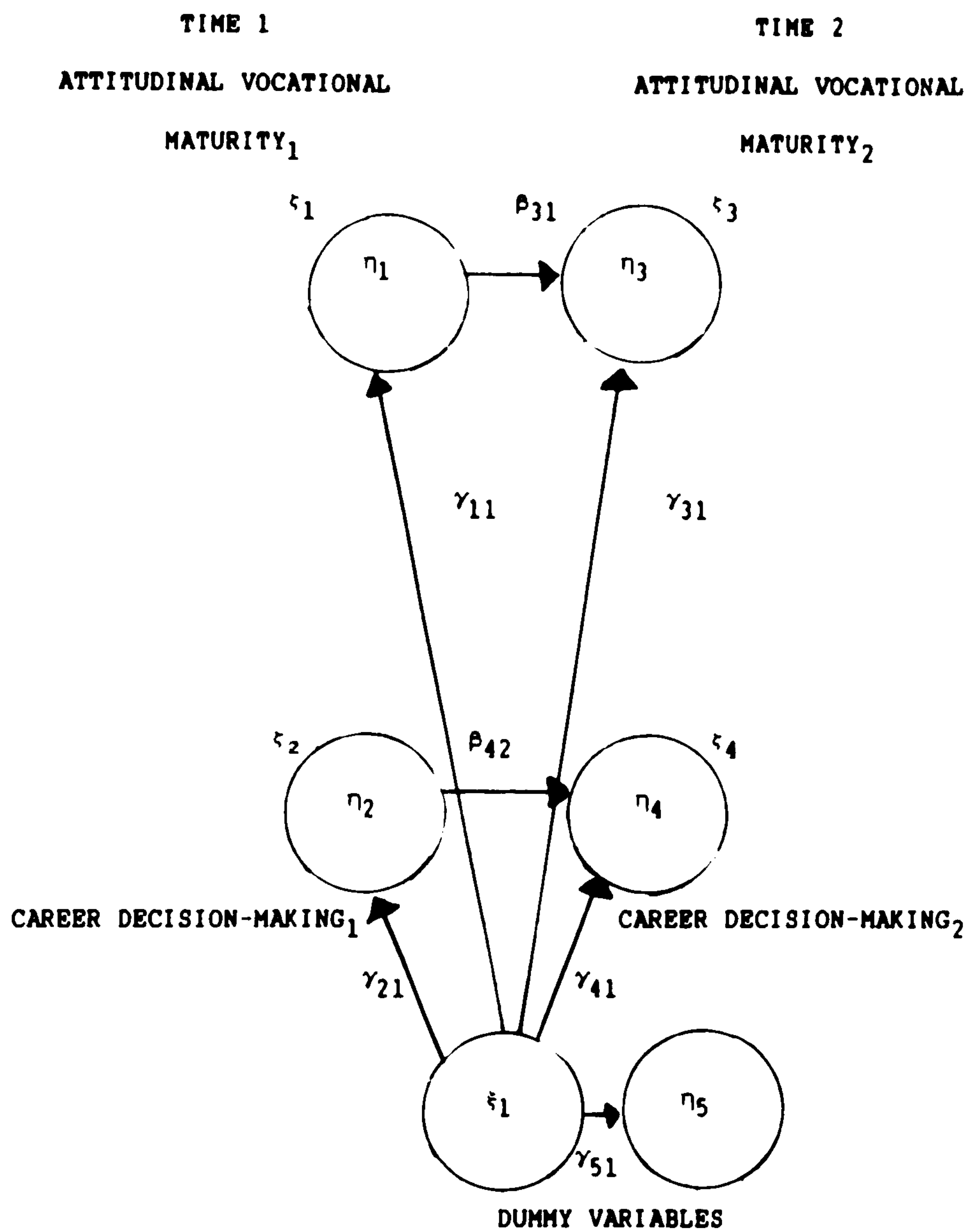
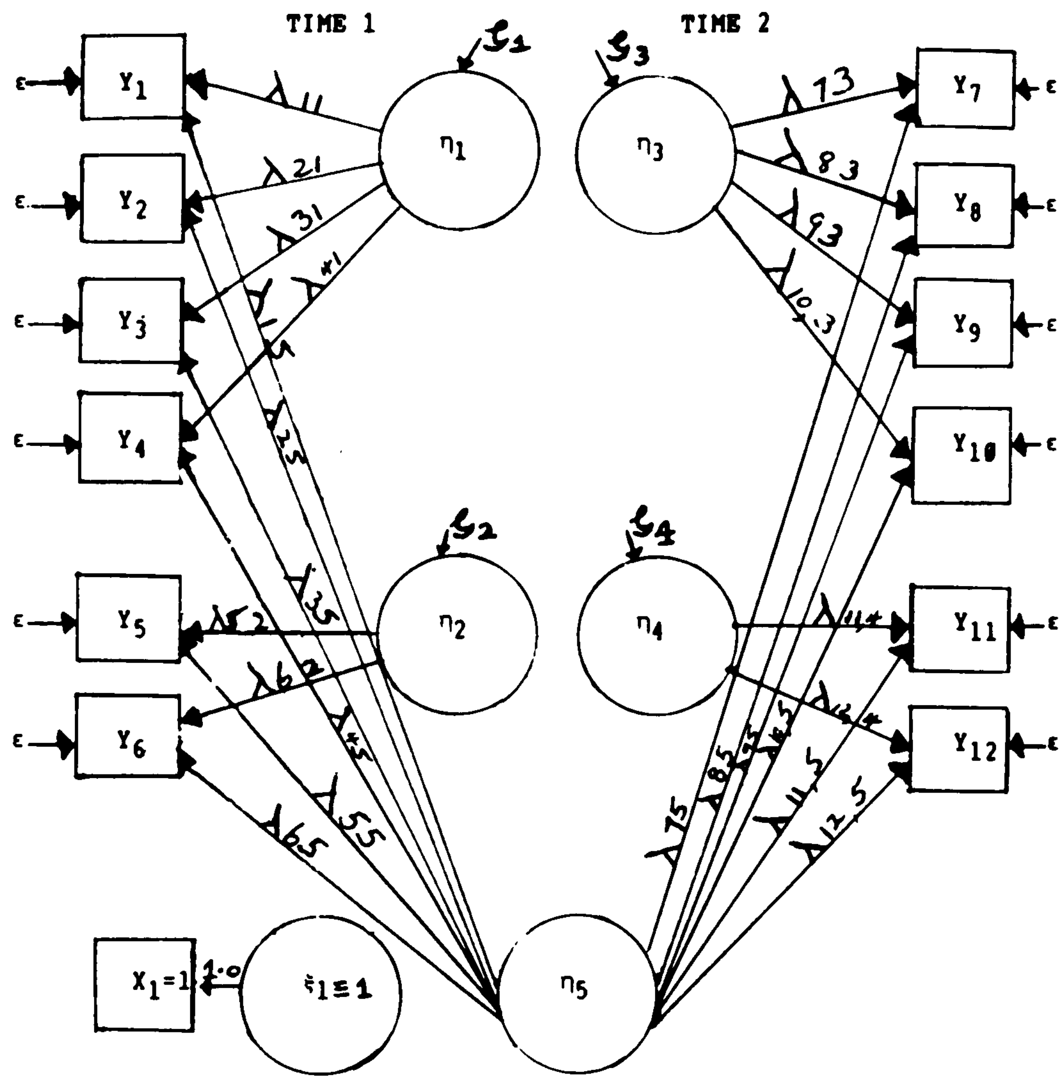


FIGURE 5: A STRUCTURAL MODEL WITH STRUCTURED MEANS OF ATTITUDINAL VOCATIONAL MATURITY AND CAREER DECISION-MAKING AT TIME 1 AND 2



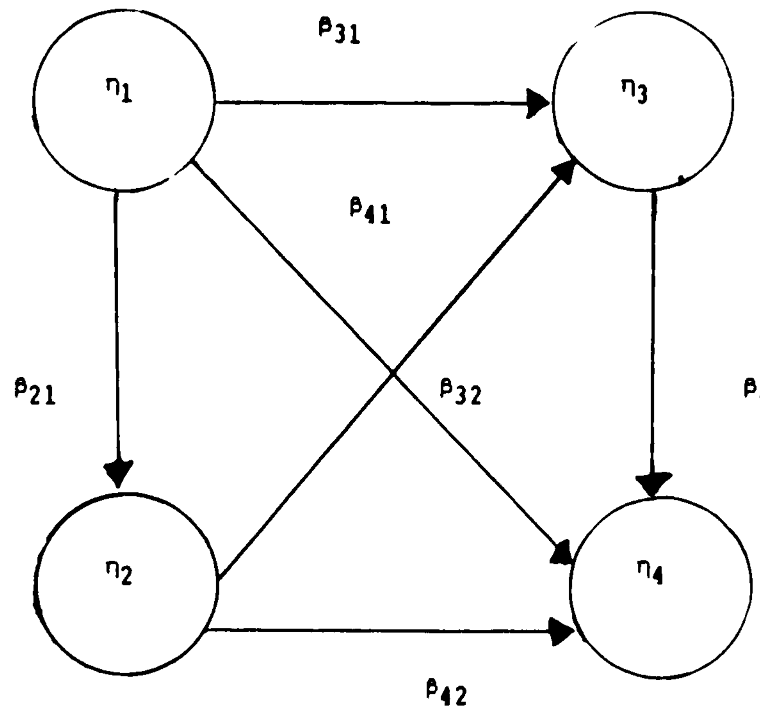
η_1, η_3 ATTITUDINAL VOCATIONAL MATURITY η_2, η_4 CAREER DECISION-MAKING

FIGURE 6: A MEASUREMENT MODEL WITH STRUCTURED MEANS OF ATTITUDINAL VOCATIONAL MATURITY AND CAREER DECISION-MAKING

Y_1, Y_7 Career Planning
Y_2, Y_8 Career Exploration
Y_3, Y_9 Structured Continuity
X_4, Y_4 Otimistic Continuity
X_5, Y_5 Career Satisfaction
X_6, Y_6 Career Indecision

TIME 1 TIME 2

ATTITUDINAL VOCATIONAL MATURITY(η_1) ATTITUDINAL VOCATIONAL MATURITY(η_3)



CAREER DECISION-MAKING(η_2) CAREER DECISION-MAKING(η_4)

FIGURE 7: A STRUCTURAL MODEL OF ATTITUDINAL VOCATIONAL MATURITY AND CAREER DECISION-MAKING WITH ALL SUBDIAGONAL BETAS FREE

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