An Investigation of the Reliability, Validity, and Translation of Holland's Self Directed Search for Utilization by a Malaysian Population

Amla H. M. Salleh

Western Michigan University

Follow this and additional works at: https://scholarworks.wmich.edu/dissertations

Part of the Counseling Commons

Recommended Citation


This Dissertation-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Dissertations by an authorized administrator of ScholarWorks at WMU. For more information, please contact wmu-scholarworks@wmich.edu.
AN INVESTIGATION OF THE RELIABILITY, VALIDITY, AND TRANSLATION OF HOLLAND'S SELF DIRECTED SEARCH FOR UTILIZATION BY A MALAYSIAN POPULATION

by

Amla H. M. Salleh

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Education
Department of Counseling and Personnel

Western Michigan University
Kalamazoo, Michigan
December 1984

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
The main purpose of this study was to examine the validity of the Malay translated version of Self Directed Search (SDS) and the use of Holland's hexagonal model with a Malaysian college student population.

Form E of the SDS was used. The four subscales, Likes, Competencies, Occupations, and Self Rating, were modified and translated into Malay Language following back-translation procedure. The translated version was pretested using "counterbalance" design. The responses from a population of 169 Malaysian undergraduate students from Western Michigan University were analyzed. Principal factor analysis with varimax rotation was used to produce simple structure analogous to types (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional). The formula suggested by Wakefield and Doughtie (1973) was employed to test the model in terms of space-distance between pairs of types. The reliability estimate of the instrument was obtained by coefficient alpha (.81).

In general, the results seemed to be consistent with the findings of other studies with regard to the following conclusions: (a) The analysis of data produced factors analogous to types, although with lesser numbers and fewer unitary factors. (b) Men and women
seemed to have different factor structure. (c) Holland's hexagonal model was supported. (d) Some scales failed to split some components of the SDS.

Although it can be concluded that the study generally supported the theory ($p < .01$), however, discrepancies such as the uniqueness of I-E-C factor for the women's sample and the number of factors with combinations of types raised two questions. Were the discrepancies due to the cultural differences of the sample or were they due to the incompleteness of the scales? Therefore, more investigation is necessary to validate further the positive results, and the refinement of the instrument with item revisions is recommended to examine the scales.
INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.
Salleh, Amla H. M.

AN INVESTIGATION OF THE RELIABILITY, VALIDITY, AND TRANSLATION OF HOLLAND'S SELF DIRECTED SEARCH FOR UTILIZATION BY A MALAYSIAN POPULATION

Western Michigan University

Ed.D. 1984

University Microfilms International 300 N. Zeeb Road, Ann Arbor, MI 48106
ACKNOWLEDGMENTS

I wish to express my deep gratitude and appreciation to those who have contributed to the success of this study.

My special thanks go to Dr. John Geisler, the chairman of my doctoral committee, for his time and his patience, to Dr. Robert L. Betz and Dr. Chris Koronakos, the members of the committee, for their support. I am indebted to Solihin Ibrahim and to Farid Ridzuan for their help in collecting the data. To Mohar Ibrahim, Zohra Ibrahim, Siti Hafizah Sheikh Long, and Halilatun A. Rahman, their effort in helping me in adapting and translating the instrument was greatly appreciated. To Dr. Rohaty Majzub and Encik Farouk A. Majid and his wife, Cik Cak, my thanks for their invaluable aid. I would also like to thank all Malaysian undergraduates (during Spring '84) at WMU for their cooperation. To the Consulting Psychologists Press in California, my appreciation for allowing me to use the instrument, and to Lee Pakko for her kindness and patience in typing the manuscript.

Dr. Shuaib Che Din and his wife, Cik Naimah, and Dr. Suradi Salim and his wife, Cik Normah, have my deepest gratitude for their friendships and support that made my struggle during the course of this study become bearable.

To my husband, Mahadzir M. Khir, and my sons, Muhamad Anas and Muhamad Syakir, I dedicated this effort for their love and support that sustain my strength and my determination.
To Universiti Kebangsaan Malaysia, my thanks for the financial support.

Amla H. M. Salleh
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. STATEMENT OF THE PROBLEM</td>
<td>1</td>
</tr>
<tr>
<td>Theoretical Background</td>
<td>2</td>
</tr>
<tr>
<td>The Purpose of the Study</td>
<td>7</td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td>8</td>
</tr>
<tr>
<td>Other Considerations</td>
<td>8</td>
</tr>
<tr>
<td>The Organization of the Study</td>
<td>12</td>
</tr>
<tr>
<td>II. REVIEW OF RELATED LITERATURE</td>
<td>13</td>
</tr>
<tr>
<td>Early Studies of Holland's Typology</td>
<td>13</td>
</tr>
<tr>
<td>Studies Related to Hexagonal Model</td>
<td>15</td>
</tr>
<tr>
<td>Other Studies Related to Person-Environment Congruency</td>
<td>22</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>28</td>
</tr>
<tr>
<td>III. RESEARCH INSTRUMENT, SAMPLING AND DATA COLLECTION, AND DATA ANALYSIS</td>
<td>29</td>
</tr>
<tr>
<td>Research Instrument</td>
<td>29</td>
</tr>
<tr>
<td>The Self Directed Search</td>
<td>29</td>
</tr>
<tr>
<td>Reliability</td>
<td>30</td>
</tr>
<tr>
<td>The Malay Edition of SDS</td>
<td>30</td>
</tr>
<tr>
<td>Sampling and Data Collection</td>
<td>33</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>34</td>
</tr>
</tbody>
</table>
Table of Contents—Continued

Chapter

IV. THE RESULTS OF THE STUDY ............................................................ 37
   Factor Analytic Study ................................................................. 37
      Factor Loadings for Men ......................................................... 44
      Factor Loadings for Women ..................................................... 45
   The Distances Between Types of Personality .......................... 47
   Reliability Information ............................................................... 53

V. SUMMARY, DISCUSSION, CONCLUSIONS, AND
   RECOMMENDATIONS ......................................................................... 54
   Summary ................................................................................................. 54
   Discussion ............................................................................................. 57
   Recommendations ................................................................................ 62
   Conclusions ........................................................................................... 63

APPENDICES .............................................................................................................. 65
   A. Original Edition of SDS ................................................................. 66
   B. Modified Version of SDS ............................................................... 74
   C. Malay Version of SDS ................................................................. 81
   D. Cover Letter ................................................................................... 89
   E. The Intercorrelation of the Four SDS Subscales
      on 24 Variables ........................................................................ 91

BIBLIOGRAPHY .......................................................................................................... 93
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Modification of SDS Items</td>
<td>31</td>
</tr>
<tr>
<td>2.</td>
<td>Varimax Rotated Factor Matrices for 86 Women and 80 Men</td>
<td>39</td>
</tr>
<tr>
<td>3.</td>
<td>Varimax Rotated Factor Matrices for 86 Women and 80 Men Shown Separately</td>
<td>40</td>
</tr>
<tr>
<td>4.</td>
<td>SDS Scale Intercorrelations</td>
<td>48</td>
</tr>
<tr>
<td>5.</td>
<td>Distances Between Pairs of Types in Common Factor Space</td>
<td>50</td>
</tr>
<tr>
<td>6.</td>
<td>Comparison of Distance Between Pairs of Personality Types for Women and Men</td>
<td>52</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

1. Hexagonal Model of Psychological Relationships Between People of Different Types ........................................ 5
CHAPTER I

STATEMENT OF THE PROBLEM

The Self Directed Search (SDS), a counseling instrument (Holland, 1971) that can provide a vocational counseling experience for those who do not have access to professional counselors, seems to be a promising possibility for a guidance program with limited resources. For the Malaysian Guidance Program that has similar limitations (Iyre, 1980), it is considered worthwhile to investigate the SDS as a possible means of reaching more students who are in the process of planning their educational and vocational programs.

The Malaysian guidance movement which began 15 years ago places a special emphasis on career guidance. Schools and higher educational institutions; the Guidance Bureau of the Ministry of Culture, Youth, and Sports; and the Manpower Planning Department of the Ministry of Labour are, with other governmental agencies, providing guidance programs to the young people in the country (Iyre, 1980, Salim, 1976).

In schools, career guidance teachers perform duties to disseminate information regarding jobs and educational opportunities for students. Those who have left schools and are seeking jobs or other vocational training may get help from the Guidance Bureau of the Ministry of Culture, Youth, and Sports, and the Manpower Planning Department of the Ministry of Labour. These two departments provide training and placement services, in addition to a job-information
service, while counseling centers at universities include personal counseling in their services.

In general, the job of matching students with the educational and vocational opportunities are based solely upon the student's academic record alone. In some cases the decisions are made with school personnel, parents', relatives', and friends' influences. In the first guidance circular published by The Ministry of Education in 1965 (cited in Malaysia, The Ministry of Education, 1966), it was indicated that interest inventories would eventually be used in Malaysian guidance services, particularly in the school setting. However, the use of such inventories is still very limited. This is because local inventories are not available and qualified guidance personnel are too few in number. As Awang (1976) suggested, one way to meet the need is by adapting and translating existing tests from other countries.

The SDS is the culmination of more than 2 decades of the theoretical and empirical research of Dr. John L. Holland. The development of the instrument arises from his concern with the application of his theory of vocational choice.

Theoretical Background

Holland has developed a career typology theory of vocational behavior that describes lifework as the implementation of a broad personal behavioral style (Osipow, 1983). Holland (1973) believed that career choices represent an extension of personality. He summarized the theory as follows:
1. In our [American] culture, most people can be categorized as one of six types: realistic, investigative, artistic, social, enterprising, or conventional. The description of each type is both a summary of what we know about people in a given occupational group and a special way comprehending this information. It is a theoretical or ideal type. A type is a model against which we can measure the real person. Each type is the product of a characteristic interaction between a variety of cultural and personal forces.

2. There are six kinds of environments: realistic, investigative, artistic, social, enterprising, and conventional. Each environment is dominated by a given type of personality, and each environment is typified by physical settings posing special problems and stress.

3. People search for environments that will let them exercise their skills and abilities, express their attitudes and values, and take on agreeable problems and roles. Realistic types seek realistic environments, social types seek social environments and so forth. To a lesser extent, environments also search for people through friendships and recruiting practices.

4. A person's behavior is determined by interaction between his personality and the characteristics of his environment. If we know a person's personality pattern and the pattern of his environment, we can, in principle use our knowledge of personality types and environmental models to forecast some of the outcomes of such pairing. Such outcomes include choice of vacation, job changes, vocational achievement, personal competence, and educational and social behavior. (pp. 2-5)

Holland supplemented the four key assumptions by four other secondary assumptions. These assumptions can be applied to both a person and his or her environment. The four secondary assumptions are as follows:

1. Consistency. Within a person or environment, some pairs of types are more closely related than others. For example, realistic-investigative have more in common than conventional-artistic. And degrees of consistency or relatedness are assumed to affect vocational preference—realistic-investigative should be more predictable than realistic-social.
2. Differentiation. Some persons or environments are more clearly defined than others. For instance, a person may be closely resemble a single type and show little resemblance to other types. In contrast, a person who resembles many types or environments that is characterized by about equal numbers of the six types would be labelled undifferentiated or poorly defined.

3. Congruence. Different types require different environments. For instance, realistic types flourish in realistic environments because such environments provide opportunities and rewards a realistic type needs. Incongruence occurs when a type lives in an environment that provides opportunities and rewards foreign to the person's preferences and abilities--for instance, a realistic type in social environment.

4. Calculus. The relationships within and between types or environments can be ordered according to a hexagonal model in which the distances between the types or environments are inversely proportional to the theoretical relationships between them. This spatial arrangement provides explicit definitions of both consistency (three levels) and congruency (three levels) and congruence of person and environment (three or more). In this way the internal relationships of theory are defined and organized by a single geometrical model [see Figure 1]. (p. 15)

Osipow (1983) provided a brief description of Holland's six personality types.

The Realistic (Motoric) orientation is characterized by aggressive behavior; interest in activities requiring motor coordination, skill, and physical strength: masculinity. People oriented toward this role prefer "acting out" problems; they avoid tasks involving interpersonal and verbal skills and seek concrete rather than abstract problem situations. . . .

The Investigative (Intellectual) person's main characteristics are thinking rather than acting, organizing and understanding rather than dominating or persuading and asociability rather than sociability. These people prefer to avoid close interpersonal contact, though the quality of their avoidance seems different from that of their Realistic colleagues.

Figure 1

Hexagonal Model of Psychological Relationships
Between People of Different Types
The Artistic (Esthetic) orientation manifests strong self-expression and relations with other people indirectly through artistic expression. They dislike structure and prefer tasks emphasizing physical skills or interpersonal interactions. They are interceptive and asocial much like the investigative, but differ in that they are more feminine than masculine, show relatively little control, and express emotion more readily than most people. (pp. 83-84).

The Social (Supportive) people seem to satisfy their needs for attention in a teaching or therapeutic situation. In sharp contrast to the Investigative and Realistic people, Social people seek close interpersonal situations and are skilled in their interpersonal relations, while they avoid situations where they might be required to engage in intellectual problem solving or use extensive physical skills.

The Enterprising (Persuasive) people are verbally skilled, but rather than use their verbal skills to support others as the social types do, they use them for manipulating and dominating people. They are concerned about power and status, as they are conventional people, but differ in that they aspire to the power and status while the conventional honor others for it.

The Conventional (Conforming) style is typified by a great concern for rules and regulations, great self-control, subordination of personal needs, and strong identification with power and status. This kind of person prefers structure and order and thus seeks interpersonal and work situations where structure is readily available.

In general, Holland's (1973) theory is comprehensive enough to integrate knowledge and at the same time sufficiently close to observable behavior to stimulate further research (Osipow, 1983). The theory appears to suffer from two major problems: lack of explanation of why and how people develop into various types, and failure to account for the change in people (Awang, 1976; Tuck & Keeling, 1980). However, the theory has generally received support from research that has tested, directly or indirectly, most of its major formulations. Holland, Gotfredson, and Nafziger (1975) and Holland (cited in
Osipow, 1983) claimed that typology of persons and environment may be more useful than other strategies such as life stage in developing ways to cope with career problems.

The Purpose of the Study

Earlier studies have supported two claims: (1) The Vocational Preference Inventory (VPI), the predecessor of the SDS, and the SDS, itself, are effective in classifying people into six vocational behavior types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional; and (2) the VPI and the SDS are able to describe the relationship among the six types. Zytowsky (1978) claimed that the types seem to hold no matter what population is analyzed. It is the purpose of this study (a) to obtain more evidence about the factorial validity of the SDS, and (b) to examine further the use of Holland's (1973) hexagonal model with a Malaysian college student population. Specifically, answers were sought for the following research questions:

1. Will the factor structure which is analogous to the six personality types of the SDS instrument for Malaysian undergraduates be comparable to the factor structure of other studies with other populations?

2. Will the hexagonal model proposed be appropriate for this sample?

3. Can the SDS be translated into the Malay language so that it can be understood by the potential client?
In addition, reliability of the SDS will be determined by coefficient alpha.

Limitations of the Study

No claim of representativeness will be made, as the sample will only consist of a Malaysian undergraduate population from two selected universities in the United States; and therefore, the sample is restricted and seriously qualified.

A second limitation would be the exposure of the subjects in the study to the American culture. When the data were collected, these students had been in the United States for a period of between several months to 3 years. This experience may in some way influence their responses to the SDS.

When these limitations are taken into consideration, the results of this study should still contribute some valuable information both on the usefulness of the SDS in classifying people from another culture and its possible utilization as a counseling instrument with a Malaysian population.

Other Considerations

Sechrest, Fay, and Zaidi (1972) have presented one major problem, which is relevant to the present study, namely, the "transporting an instrument from one linguistic area to another" (p. 52). They pointed out that the problem of equivalence is critical considering the cultural differences between the culture in which the instrument is developed and the culture to which the instrument is to be used.
Chapman and Carter (1979) argued that,

If proper procedures are not employed, study which involves cross cultural use of measurement instruments suffers from the possibility that the results obtained are due to errors in translation rather than differences in the people or the variables being measured. (p. 78)

The equivalence problem includes vocabulary equivalence, grammar-syntactical equivalence, experiential equivalence, and conceptual equivalence (Sechrest et al., 1972). The first two problems are related to linguistics. Vocabulary equivalence refers to the problem of developing equivalent terms. Brislin (1970) found that some languages are easy to translate to and some are not; for example, the Pulauan language has very few terms for colors. Sechrest et al. (1972) also found that in some cases even a good dictionary is unworkable because it does not have the right meaning for those persons for whom the test is written. However, Werner and Campbell (1970) suggested using several words to express the term which is expressible in one word in the source language but not in the target language. One possible solution suggested by Sechrest et al. (1972) is to secure a translator who is familiar with the language used by the potential respondents.

The second problem is the grammar-syntactical problem. However, this particular problem is more critical in longer passages. The measurement which was used for the present study has met the criteria suggested by Werner and Campbell (1970), i.e., the instrument should avoid complex sentences, passive voice, and pronouns.

The experiential equivalence and the conceptual equivalence are related to cultural differences. There are instances where
experiences in one culture are not available in another. Chapman and Carter (1979) provided an example of an item on a test which could not be literally translated and retain the same meaning. The item: "If you find a four-leaf clover do you believe it might bring you luck?" could not be translated to Farsi because the significance of a four-leaf clover is uniquely a Western notion. However, this problem could be minimized by determining what the item is supposed to reflect; i.e., in this manner a translator can identify a trait or response disposition in the source culture and find an equivalent trait within the experience of respondents in the second culture.

This conceptual problem is somewhat apart from the previous kind of equivalence problem "for it may very well be that one has in two cultures a word, when translated, mutually yields high agreement and yet it may not be that the concept implied by the words are, in fact, identical or particularly close in nature" (Sechrest et al., 1972, p. 30). The word love in the item "I love a parade," for example, might be quite easy to translate into the Malay language. Nonetheless, the concept of love as used in English is far different in its implication from the concept which might define the words used in Malay. Therefore, in translating and adapting an instrument, a translator needs to be familiar with the source language (Brislin, 1970).

Brislin (1970) also found that some translators do better translation jobs than others. Sechrest et al. (1972) indicated that this problem arises from the translator's idiosyncrasies. One way to minimize such problems is by consulting several translators. Brislin
found that back-translation helps to detect error in meaning.

Perhaps the most common and highly recommended procedure for verifying the translation of a questionnaire or test is the procedure of "back-translation." In this procedure, the instrument is rendered into the target language by one translator. The resulting version is then translated back into the source language. Items with apparent discrepancies between the two translations then are modified and a second back-translation is conducted. Brislin, Lonner, and Thorndike (1973) recommended that the instrument be back-translated at least three times, each time by a different translator. In a situation where both versions are open to revision, the back-translation procedure is best incorporated with a procedure called "decentering" (Brislin et al., 1973), in which both versions are subject to modification. In a situation where the instrument being translated has already had a history of being used with the original language, and the researcher, as part of his or her study, wants the items to remain intact when they are rendered into the second language, the decentering procedure will not be appropriate (Chapman & Carter, 1979). The researcher in this situation is then faced with the issue of functional versus formal equivalence. A formal and exact translation of items may distort meaning. Consequently, if equivalence of meaning is to be preserved, flexibility in translation must be tolerated. Chapman and Carter (1979) and Brislin (1970) further recommended that after back-translation the researcher needs to do pre-testing. Chapman and Carter (1979) proposed using a counterbalanced design on persons fluent in both languages. The counterbalanced
design procedure is one in which one-half of a sample is given the original test and the other half is administered the translated version. The procedure is then reversed so that within a short time span a sample of people take both versions. Scores then may be correlated.

The Organization of the Study

The second chapter presents the review of related literature in the following manner: studies related to Holland's typology and his hexagonal arrangement, and studies related to person-environment congruences. Chapter III presents a description of the subjects used in the study, the procedures followed in conducting the study, a discussion of the Self Directed Search instrument and the questionnaire, and the statistical methods employed to analyze the data. Results and discussion of the results will be found in Chapter IV. The final chapter includes a summary of the study, its findings, and conclusions.
CHAPTER II

REVIEW OF RELATED LITERATURE

Holland's theory proposes six types of personality and six types of correspondent environmental models: Realistic (R), Artistic (A), Investigative (I), Social (S), Enterprising (E), and Conventional (C). The six types have a particular arrangement between them. The theory also stipulated that outcomes of person-environment interaction are somewhat predictable. Studies with American samples testing the propositions have generally been supportive of the theory.

Early Studies of Holland's Typology

Holland and his colleagues (1963, 1964, 1965, 1969) conducted several massive studies. They used college students for their samples to define students' types and their relationships to other variables such as college majors, self-rating, extracurricular activities, reaction to stress, and several other variables. In one study, Holland (1962a) assessed two large samples of bright high school graduates (National Merit Finalists) over 1- and 2-year intervals (N = 1,177 and 994). Holland found that certain personality types chose certain major fields of study; i.e., certain personality types (VPI scores) clustered around particular academic majors. Although most of the analyses were statistically significant and were moderately efficient, the study indicated that the formulations at the time were not sufficiently comprehensive to cope with the myriad...
results (Holland, 1959).

In another longitudinal study, Holland (1963) again used a sample of National Merit Finalists (N = 592). This longitudinal study differed from the first one in two ways: The time interval was longer and six scales of the Strong Vocational Interest Blank (SVIB) were selected to assess the types. Using the Strong scales and the choice of major field with several other dependent variables, Holland produced findings that approximated those obtained in the first study. A similar pattern of success and failure was observed.

Two other studies were conducted (1963-64, 1964a) by Holland using VPI scores. With the same type of samples (N = 638 and 1,437), Holland tested similar hypotheses about types. The results of both studies were as predicted. These results replicated many previous findings about the characteristics of types and extended the range of personal characteristics found to be related to the types.

Later, Holland (1965, cited in Holland, 1973) studied a large sample of men and women (N = 1,576 and 1,571) from 28 colleges with a wide range of academic talent and social status. This particular study seems to be more valuable. Although the sample was not a representative one, it did allow a large-scale test of the theory with a relatively normal group. The results of this study extended the previous studies, with some differences. The results for women were more positive than those for men. In all earlier studies, the reverse had been true. The results were more explicit and substantial. A count of the theoretically expected high mean scores for types and subtypes were as follows: For men, 76% of the predictions
were correct for comparison across types, 75% were correct across two-letter subtypes, and 64.1% were correct across three-letter subtypes. For women, those percentages were 84%, 75.4%, and 72.7%, respectively. Abe and Holland (1965) also assessed 12,432 college freshmen at 31 colleges and universities. Results were supportive of the theory; and when using majors as independent variables in place of vocational choice, results closely resembled those obtained by the use of vocational choice.

Studies Related to Hexagonal Model

Edwards and Whitney (1972) were the first to use Self-Directed (SDS) scores in testing Holland's hexagonal model. With a sample of 358 men and 360 women, Edwards and Whitney used factor and configural analysis to analyze responses in an attempt to verify the relationships among the six types, to clarify the characteristics of each type, and to extend Holland's hexagonal model to new domains of assessment. To get more accurate factor-analytic study, data obtained from the scales within each of four domains (activities, competencies, occupations, and self-ratings) were used separately and then together, and male and female groups were used as separate norm groups. The authors explained that the 30 variables produced by the four domains when used together yielded factor loadings which were more consistent across domains than when domains were analyzed separately. This aggregate procedure yielded a more accurate picture of the structure of the instrument, while the separate analyses were useful for examining the validity of the theory. Results indicated
that Realistic (R) and Investigative (I) had high loading on Factor 1 for both males and females. Factor 2 had similar patterns of loadings for the Social (S) and Enterprising (E) scales. Factor 3 was dominated solely by Conventional (C). Factor 4 had a substantial loading for Artistic (A) across all four domains.

Configural analysis was employed to locate the variables for men and women. The analyses were performed separately. Results indicated that the hexagonal model identified in earlier studies (Holland, Whitney, Cole, & Richards, 1969) was replicated across all domains with the arrangement of RIASEC for men and the arrangement of IRASEC for women. Although the findings showed that the configuration was more distinct for men than for women, this study generally supported the model and also supported the organization of the SDS and Holland's occupational classification.

Wakefield and Doughtie (1973) studied 300 undergraduate students to test whether the first six VPI scales would be able to yield measures that were interrelated in the same manner as the theoretical types. Using the factor analysis method, the distances between each pair of the six personality types in the six-dimensional space defined by the common factors were computed and compared with Holland's (1971) hexagonal model. The placement of the six personality types in six-dimensional space by factor analysis corresponded closely to Holland's model.

Crabtree (1971) assessed a sample of high school students (759 boys and 672 girls) with the VPI and applied configural analyses to the matrixes of correlations for the VPI scales. He obtained
configurations for boys and girls that were identical to Holland's in their proper order (RIASEC) (Holland et al., 1969). In addition, Crabtree (1971) correlated the expected size of correlations for every pair of the scale combinations on the hexagon. The author found that highly correlated environments, similar to one another, are closer together than those with low correlations. For example, Realistic score correlations are higher with Investigative scores on one side and Conventional on the other side, but fairly remote from and lower than Social, which is completely across the hexagon; and Artistic is next to Investigative and Social but very distant from Conventional across the hexagon (see Figure 1).

Using American samples, the studies cited above indicate that the model is basically sound. However, Holland also theorized that the six personality types are actually a complex cluster of personnel attributes resulting from a person's biological and social heredity, as well as personal history. Tuck and Keeling (1980) argued that if the typology is the product of inherited characteristics and social learning, then its nature must by definition be dependent on particular environments; and it could well be that types and the relationships among them will vary from one cultural group to another.

Yom, Doughtie, Chang, Alston, and Wakefield (1975) carried out a study to investigate whether the variables measured by the VPI were the same for both Black and White students. The VPI scores from a group of Black students and the VPI scores from a group of White students were factor analyzed separately. With the method of determining the degree of correspondence in two populations proposed by
Keiser (cited in Yom et al., 1975), the Black structure was rotated to correspond to the White structure. They found that the correspondence between the variables measured by the VPI for Black and White students was very similar. They also concluded that the VPI measures the same variables for Black and White college students.

With a Canadian sample, Rachman, Armenic, and Araya (1981) conducted a rather conservative study, testing the construct validity of the SDS. The authors randomly selected 1,206 Canadian professional accountants for the study. The responses to four SDS subscales (excluding the Day-Dream section) were analyzed by Common Factor Analysis. Results generally indicated that SDS has a clear structure, and the loading of each scale defined only one personality type (with the exception that both Social and Enterprising had a relatively high loading on one factor). When separate analyses of each subtest (Activities, Competencies, Interests, and Self-Estimates) were carried out, the results were mixed. The Activities and Competencies subtests failed to discriminate Social type and Enterprising type. While the Interest subtests score could split Enterprising and Social, the Self-Estimate subtest failed to clearly define Conventional type. Rachman et al. (1981) explained that the inconsistent results were due to the fact that results from Activities, Competencies, and Ability subtests are dependent on the occupation (environment) in which individuals are located, whereas results of Interests subtest are independent of environment because there are expressions of a more general rather than a specific attitude. On measuring the psychological relationships between types, and between
factors, it was found that both results indicated general agreement with Holland's hexagonal model (RIASEC).

A version of the SDS was also used to investigate the vocational structure of students and working women in Israel. Fieldman and Meir (1976) studied 322 female students in academic and various vocational programs and 167 working women in 70 different occupations. Together with a version of SDS, a Satisfaction measure was also used to measure the level of satisfaction with the vocational choice for the working group. Using a Smallest Space Analysis (SSA) in analyzing the responses, it was found that the Israel female structure was IRAESC for the student sample and IRASEC for the working women sample. To test the possibility of the existence of a different structure for females, Fieldman and Meir further analyzed the intercorrelations of the SDS as reported by Holland in 1972 (cited in Fieldman & Meir, 1976) and by Edwards and Whitney (1972) applying the same method. In both analyses, the arrangement was RIASEC for males, while for females the arrangement resembled IRASEC. The authors concluded that the repetition in the study for both samples of an IRASEC arrangement strongly suggests that for females occupational fields are not exactly arranged in the same psychological order as for males.

Although these studies indicate that the theory seems to hold for different kinds of population, Meir, Barak, and Sholberg (1973) believed that the similarity in the order of the occupational field between the American samples and the Israel sample might be due to the fact that Israel belongs to the Western world in its culture and
economic system. This fact might also be true for the Canadian and for the Black samples in the earlier studies. To answer this challenge, Meir and colleagues (1973) conducted a study on a sample which was claimed as from a non-Western setting. One hundred and seventy Arab students (ages 17-18), 231 Jewish applicants to a university in Israel (ages 21-25), and 250 twelfth grade Jewish boys and girls were selected for the study. Two hypotheses were tested: The occupational fields will also form a circular order in a non-Western sample, and the order of the fields will resemble the order found by Cole and Hanson (1971) and by Meir et al. (1973). Using a Hebrew Interest Questionnaire based on Roe’s (cited in Meir et al., 1973) classification of occupations and a Course Inventory, the responses were analyzed by Guttman Lingoes Smallest-Space Analysis procedure. Meir et al.’s (1973) study produced nearly the same circular form of the occupational fields for both the Jewish and the Arab samples, resembling the results achieved by Cole and Hanson (1971). When the analysis was organized into Holland’s model, the arrangement of the types for the Arab sample was in the order of RIASCE on the Hebrew questionnaire and in the order of RIASEC on the Course Inventory. For the Jewish sample it produced the arrangement of RIASEC for the boys and IRASEC for the girls, while the analysis of the university applicants produced the arrangement of RASCEI on the Hebrew test and RIASCE on the Course Inventory. The authors offered several possible explanations with regard to the differences in the arrangement of the types. It might be due to the differences in the cultural environment, or differences between the definitions of Roe and Holland, or
because of the questionnaire used and the way in which the data were analyzed, or may be the combination of these differences. However, Meir and associates concluded that the differences in the results were minimal and the results were a confirmation of Holland's theory.

In attempting to establish the factorial validity of the SDS for a different population, Tuck and Keeling (1980) analyzed responses of 247 male and female high school students (ages 17-18) in New Zealand. Principal Factor Analysis was used to identify the six factors analogous to Holland's six personality types. The results indicated that for females the Social and Enterprising scales could not split into two factors, and the Investigative and Realistic defined single factor in the analysis of females' responses. Computed distances between pairs of the six personality types in five dimensional factorial space were compared with the order of the distances expected from Holland's model. The position of the types in space corresponded more closely with the model for the males than for the females. Forty-four of the 54 comparisons for the males were consistent with the order of RIASEC, while 38 of the 54 comparisons for the females' sample were consistent with the postulated order. When the order of IRASEC was tested, Tuck and Keeling found that 40 comparisons for the females were consistent with the order. The authors concluded that the resulting correspondence between some summary codes on SDS and the existing occupational classification based on Holland's typology may be less than perfect, particularly for females.
Replicating Wakefield and Doughtie's (1973) method, Awang (1976) conducted a cross-cultural investigation on the VPI factor structure and on Holland's hexagonal model. The sample of the study consisted of 472 tenth grade Canadian boys and 613 Form IV (equivalent to Grade 10) Malaysian boys from 24 schools. The study sought to answer the question whether VPI factor structure for the Malaysian boys would correspond to the Canadian boys', and whether the arrangement of the types produced by the study would be comparable to Holland's model. Principal Component analysis was used to analyze the responses to the VPI. The results generally indicated that the VPI factor structure for both groups was very similar in kind and degree. All the factors which were analogous to the types have substantially high loadings with a few minor discrepancies. In testing the hexagonal model, Awang computed and compared distances between adjacent, alternative, and opposite pairs of the six types. He found that out of the 54 possible comparisons, 36 of the comparisons were in the expected direction for the Canadian boys and 30 comparisons were in the expected direction for the Malaysian boys. On the basis of the probability of .05, the author concluded that these results support the viability of Holland's hexagonal model.

Other Studies Related to Person-Environment Congruency

At the core of Holland's theory is the belief that successful people closely resemble the stereotypes for their particular vocation. Holland and Astin (1962) tested the theory using National Merit Finalists as the subjects. Utilizing the VPI, Holland and
Astin produced correlations which indicated that achievers in each of four areas (science, arts, leadership, and sociability) resembled the stereotypes of the scientist, artist, leader, and social achiever. Holland (1963) again reported that students of superior aptitude perceive occupations in stereotyped ways which tend to be consistent with some of the personality and originality variables associated with vocation and choice of major field.

Kelso (1969) assessed 188 college males with the Vocational Preference Inventory (VPI) and the California Personality Inventory (CPI). He tested the ability of the VPI to discriminate across fields of study and also correlated VPI and CPI scores. The results indicated that students usually select courses consistent with their types and that types tend to have many of the personality traits attributed to them.

In another study, Williams (1972) selected a random sample of 145 male graduate students from 18 academic departments and sorted them into types. Students were administered the VPI, the 16PF, the Allport-Vernon-Lindzey (AVL) Study of Values, and the Miller Occupational Values Indicators (MO). Responses were analyzed by analysis of variance, multiple analysis of variance, multiple discriminant analysis, and canonical correlation to compare among types. Results indicated that a student's field of study (type) and his VPI, AVL, MO, and the 16PF scores were usually consistent with the characteristic attributed to the types.

Another relevant study was conducted by Osipow and Ashby (1968) to determine how well college freshmen's VPI personality types
corresponded with their choices of majors. The student's choice of a major was coded with the first digit of code profiles suggested by Holland (1966). When they were grouped according to types, the first digits of the students' personality codes and their choice of major code were significantly related, with the exception of the Realistic type. For this group, Realistic majors were chosen predominantly by Intellectual not by Realistic types of students. In offering an explanation for this unpredicted finding, the authors pointed out that college environments are overly represented by Intellectual types and they are numerous in each of the groups of majors classified by type. It is interesting to note that the most common second digit in the profiles of Intellectual students choosing Realistic majors represented the Realistic type. The same second digit was almost common among Intellectual types choosing Intellectual majors. Holland cited the Intellectual and Realistic types as being consistent and the Realistic environment as being "attractive" to Intellectual types.

Holland (1973) also hypothesized that people who had made congruent choices, either occupational or educational (college majors), would be more adjustable to the environment, more stable in the environment, and more satisfied with the environment. Walsh and Russel (1969) found students with a congruent choice of college major (student's high point VPI code and choice of field belong to the same category in Holland's classification) reported fewer personal adjustment problems than students who had made incongruent choices. This finding is consistent with the hypothesis that congruences encourage
personal stability. Walsh and Lewis (1972) then conducted another study with a stronger design using VPI scores. Students' (37 males and 37 females) choice of field was categorized as congruent, incongruent, or undecided. These groups then were administered the Omnibus Personality Inventory. Results indicated that congruent males as opposed to incongruent or undecided males maintained personal stability and satisfaction. Female results were not reported.

Another study testing the hypothesis that congruence encourages positive educational outcomes was carried out by Bruch and Krieshok (1981). A group of 158 students from theoretically oriented engineering classes of 1975, 1976, and 1977 were classified as R-type or I-type on their VPI profiles. The engineering program was classified as I-type. Thus, I-type students would be highly congruent and R-type students would be moderately high congruent. The two groups were compared on their persistence and their GPA. Using $x^2$ and $t$ tests, Bruch and Krieshok found that results on both outcomes measures favored the higher student-curriculum congruence hypothesis.

Morrow (1970) and Nafziger, Holland, and Gotfredson (1975) examined the question of whether high congruence is related to satisfaction with one's major field of study. In general, both studies reported positive relationships between level of congruence and some selected indicators of student satisfaction.

Morrow (1970) conducted a study testing the hypothesis that students who have made congruent choices of educational environments, i.e., departments of their majors, would express more satisfaction with their choice of major than students who have not. Eighty-six
male and 61 female mathematics majors and 54 male and 122 female sociology majors comprised his sample. These two majors were selected because they had been classified by Holland (1966) as two dissimilar environments. Mathematics is classified as Intellectual/Investigative and sociology is classified as Social. Subjects were classified by personality classifications on the basis of their responses to the VPI. Satisfaction with choice of college majors was assessed using a questionnaire measuring occupational choice satisfaction. Results were analyzed by analysis of variance and a Duncan new multiple-range test for significant test (.05 level). Mean satisfaction scores of each group of personality type and college major were compared. Morrow reported mixed results. Satisfaction with majors was significant related to personality type for mathematics students but not for sociology students. Investigative and Realistic type sociology students did not express less satisfaction than Social types. Morrow suggested the possibility that students of these two personality types may express relatively uniform satisfaction in a number of environments. An alternative explanation lies in the possibility that students' stereotypes concerning sociology are not as consistent or uniform as are their stereotypes concerning mathematics, with the results that sociology has more general appeal to students of different personality types than the theory predicts.

Nafziger et al. (1975) tested hypotheses about person-environment congruency, consistency, and differentiation. The subjects were 1,878 students from one college and one university who had been given the SDS before their freshman year; they were administered
a Satisfaction questionnaire 1 or 3 years later. Three degrees of person-environment congruency were obtained. The level of congruency, ranging from lowest to highest were as follows: Level 1 environmental code--neither hexagonally adjacent nor identical to the first letter of the person's summary code (least congruent); Level 2 environmental one-letter code is hexagonally adjacent to the first of the person's summary code; and Level 3 environmental one-letter code is identical to the first letter of the person's summary code (most congruent). Using an analysis of variance, the responses were analyzed with the satisfaction measure as the dependent variable. The results support Holland's congruency hypothesis but not the differentiation and the consistency hypotheses.

This review of literature indicates that Holland's theory and the two instruments (VPI and SDS) have some validity in classifying people into the types outlined in the hexagonal model. In most factorial studies, at least four factors which were analogous to types did appear in the analysis. The arrangement of RIASEC seems consistent particularly for male groups, while the arrangement of types for female groups across the samples are consistently in the order of IRASEC. College students consistently indicated that the choice of their majors was congruent to their personality type, and congruent students seem to be more satisfied than incongruent students.
Significance of the Study

For college students, the transition from secondary school to college and eventually to the world of work involves numerous and complex career decisions (Hansen, 1974). Empirical evidence demonstrated that an interest inventory can assist people in such situations. The results of an interest inventory provide a description of the individual's interest and this facilitates self-exploration. Descriptive information may be used to help people to understand themselves, to organize information about themselves and the world of work, and later to examine changes in their interest over time. Cronbach (1970) further claimed that the interest of college students is measured to provide descriptions that have real-world implications with respect to educational and vocational planning.

To meet such needs, it is relevant to investigate whether Holland's (1971) SDS could be helpful to identify the vocational interests of Malaysian students. The SDS is a practical and inexpensive vocational interest inventory for American people. However, the question whether SDS measures the same variables for Malaysian as it does for American students would be a prime concern of the investigation. Tuck and Keeling (1980) suggested that if an instrument is to be used for a new population, the factor structure of the instrument for the new population needs to be established. Although Awang's (1976) study indicated that Holland's theory was applicable to a sample of Malaysian school boys, more evidence is needed to support the usefulness of the instrument.
CHAPTER III

RESEARCH INSTRUMENT, SAMPLING AND DATA COLLECTION, AND DATA ANALYSIS

Research Instrument

The revised and translated edition of SDS (Form E) (Holland, 1974) was used together with a single question to elicit information on the sex of the subjects.

The Self Directed Search

The SDS consists of four subscales, namely, Likes, Competencies, Occupations, and Self-Rating. They are organized in terms of Holland's six personality types: Realistic, Investigative, Artistic, Enterprising, Conventional, and Social. The scales and items are arranged in the following manner:

Likes: six scales, 10 items each. The subject indicates his or her preferences for activities listed.

Competencies: six scales, 10 items each. The subject rates his or her ability on the skills listed.

Occupations: six scales, 12 items each. The subject indicates his or her preferences for occupation listed.

Self-Rating: a set of six ratings, each rating corresponding to a type. The subject rates himself or herself on a scale from 1 to 6 on mechanical, scientific, artistic, teaching, sales, and clerical...
ability. Appendix A contains a copy of the original version of the SDS (Form E).

Reliability

Holland (1971) has presented data indicating that the individual scales are internally consistent (Kuder-Richardson Formula 20 coefficients range from .63 to .87 and cluster in the .70s). The different assessments on the same dimensions, e.g., interest and competency in realistic areas, are positively correlated. The various dimensions are independent and the summary scales are reliable. O'Conell and Sedlacek (1972) reported a test-retest reliability coefficient of .92 for the summary code over a 7-month interval. Thus the data demonstrate the existence of the predicted relationship among and within the scales of SDS and a substantial degree of stability over time.

The Malay Edition of SDS

The four subscales (Likes, Competencies, Occupations, and Self-Rating) of SDS were translated into the Malay Language following this procedure: The instrument was first revised and modified. The process of translation, which was based on the modified version, was carried out in two stages. The instrument was translated into the Malay Language, and it was blind back-translated twice by bilingual-professional persons in the field of counseling, communication, education, and sociology who were at the time attending graduate school at Western Michigan University.
Interviews with potential respondents and a preliminary tryout indicated that some of the statements and titles in the original instrument needed to be modified. Table 1 lists the titles, statements, and the changes that were made.

Table 1
Modification of SDS Items

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Original item</th>
<th>Modified item</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Shop course</td>
<td>Industrial art course</td>
</tr>
<tr>
<td>32</td>
<td>Religious service</td>
<td>Religious functions</td>
</tr>
<tr>
<td>121</td>
<td>Airplane mechanic</td>
<td>Aircraft mechanic</td>
</tr>
<tr>
<td>123</td>
<td>Master plumber</td>
<td>Plumber</td>
</tr>
<tr>
<td>128</td>
<td>Filling station attendant</td>
<td>Petrol pump attendant</td>
</tr>
<tr>
<td>164</td>
<td>Director of welfare agency</td>
<td>Head of Welfare Department</td>
</tr>
<tr>
<td>165</td>
<td>Assistant city school</td>
<td>Assistant Regional Educational Officer</td>
</tr>
<tr>
<td>166</td>
<td>Superintendent</td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>Personal counselor</td>
<td>Student counselor</td>
</tr>
<tr>
<td>168</td>
<td>Vocational counselor</td>
<td>Vocational guidance counselor</td>
</tr>
<tr>
<td>171</td>
<td>Manufacturer's Rep.</td>
<td>Manufacturer's agent</td>
</tr>
<tr>
<td>178</td>
<td>Real estate salesmen</td>
<td>Property salesmen</td>
</tr>
<tr>
<td>182</td>
<td>Tax expert</td>
<td>Tax accountant</td>
</tr>
</tbody>
</table>

With the exception of religious services item, other alterations consisted of changing job titles and school course. The modified version of SDS is found in Appendix B.
Three sources were consulted in order to minimize the cultural equivalent problems: the Dictionary of Occupational Classification (Malaysia, Ministry of Labour and Manpower, 1980), the Malay version of Vocational Preference Inventory (VPI) (Awang, 1976), and personnel from the Malaysian educational system who were at the time attending Western Michigan University.

Although the grammar-syntactical problems were anticipated during the translation process, they appeared to be very minimal. The nature of the instrument seemed to reduce the problems because the instructions and statements (items) are grammatically simple, direct, brief with a single pronoun "you" in few places, and the response called for only "yes" or "no" or "like" or "dislike." The discrepancies that appeared in the three translations were merely derived from differences in educational orientation among the translators.

The final Malay translated version of the SDS (Appendix C) was pretested. The pilot study was carried out on a small group of Malaysian students who just started their graduate programs at Western Michigan University. Both editions of the scales were administered. The students were contacted prior to the study and 20 of them agreed to participate. They were asked to respond to both editions of the scales on two occasions, 5 days apart. Half of the participants were assigned randomly to respond to the modified version first and to respond to the translated edition later, and the rest of the group were asked to do the reverse. The two sets of responses were correlated. The correlation coefficients for each
of the scales ranged from .85 to .97 and the entire test correlation was .90. High correlation between both editions indicated that further change was not necessary. With the efforts taken to achieve cultural equivalence and with the minimal grammatical problems the Malay edition of the SDS is believed to have retained the basic character of the original instrument, although it cannot be assumed that any altered item is the exact cultural equivalent.

Sampling and Data Collection

The subjects chosen for the study were Malaysian undergraduates who are attending selected universities in the United States. The undergraduate populations from Western Michigan University and the University of Southern Illinois were selected for the study. The total number of subjects was 698, both males and females, that came from various fields of study. The age range was between 18 and 35.

The list of the Malaysian students from the selected campuses was sought from the Malaysian Student Department in Chicago. Since the available list was not complete, the Malaysian Student Organization on each campus was contacted for more recent and complete lists.

The Malay edition of SDS together with a cover letter (Appendix D) was distributed to each student in the sample during spring session of 1984. Two data collectors were appointed on each campus to ensure the response rate would be high. One hundred and ninety-eight questionnaires were distributed to subjects at Western Michigan University and 500 were mailed to subjects at Southern Illinois University. The response rate from Western Michigan University was 80%.
However, the response rate from Southern Illinois University was very poor despite several follow-ups. The researcher was then informed that the low response rate was due mainly to the timing factor. At the time when the questionnaire was mailed it was only a week away from the final examination week, followed by graduation after which those who had completed their study left for home (Malaysia). A one-month holiday after the semester ended was another contributing factor, during which most of the students traveled and/or moved. Thus the follow-up effort apparently did not help the situation. Since the responses from subjects at Southern Illinois were very few (6%), only data from Western Michigan University were analyzed.

Data Analysis

Two sets of scores were calculated. In the first set, the raw scores (the number of items checked "yes" or the number circled in the self-rating) were computed for each of six types on each of four sections (Likes, Competencies, Occupations, and the Self-Estimates). This procedure produced 24 raw scores for each student. For the second set, the raw scores on each of the 24 variables were transformed into standard scores, using the male and the female independent norm groups. A total score on each personality type was obtained summing the standard scores on each of the six types across the four sections. The sum of the standard scores was used to ensure that each section of the SDS made an equal contribution to the total scores on each type, which is somewhat analogous to what occurs when instructions for obtaining a summary code using ranks are followed.
(Tuck & Keeling, 1980).

The intercorrelations among the six types on each of the four scales (24 x 24 matrix of Pearson product-moment correlation) (Appendix E) were factor analyzed using principal factor analysis provided by the Statistical Package for the Social Sciences (SPSS) Program Factor, Method PA2 (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). The factors produced by this procedure were compared to Holland's model, as the intention was to confirm the existence of six axes analogous to the six types. Varimax rotation was applied to produce a factor structure which is the appropriate model against which to test the coherence of the subsection within the SDS.

The second set of scores was used to validate the appropriateness of the hexagonal model. The above procedure was repeated. After varimax rotations, the loadings were used to calculate the distances between the six scales of Realistic, Investigative, Social, Conventional, Enterprising, and Artistic using the formula:

\[ d(xy) = \sqrt{\sum_{i=1}^{N} \left( a_{xi} - a_{yi} \right)^2} \]

where \( d(xy) \) is the distance from point \( x \) to point \( y \) and \( a \) is the loading of variable \( x \) on the factor \( i \). Fifty-four comparisons of adjacent, alternate, and opposite pairs of the six personality types were made.

From Holland's hexagonal model the distances between Realistic-Artistic (R-A), Artistic-Enterprising (A-E), Enterprising-Realistic
(E-R), Investigative-Social (I-S), Social-Conventional (S-C), and Conventional-Investigative (C-I) of alternative pairs are greater than the distances between Realistic-Investigative (R-I), Investigative-Social (I-S), Artistic-Social (A-S), Social-Enterprising (S-E), Enterprising-Conventional (E-C), and Conventional-Realistic (C-R) of the adjacent pairs, but less than the distances between Investigative-Enterprising (E-I), Realistic-Social (R-S), and Conventional-Artistic (C-A) of opposite pairs. All comparisons involve the alternate pairs.

With the assumption that the six points are arranged randomly in multidimensional space, the probability of the distance between one pair of the points being greater than the distance between a second pair of points equals the probability of the second distance being greater than the first. This assumption is made for every pair of distances involving the six points. If \( r \) is the number of distance relationships and if \( p(r) \) is the probability of a relationship occurring in the hypothesized direction, and if \( N \) is the number of observations (54), the rejection of the hypothesis of random arrangement of points (.01 level) in the appropriate direction (\( r > np \)) will be taken as evidence that data from the SDS conform to Holland's model (Wakefield & Doughtie, 1973).

Finally, coefficient alpha was computed to determine the reliability of the SDS with a Malaysian population at \( p > .01 \).
CHAPTER IV

THE RESULTS OF THE STUDY

The results of the study are described under three major headings in the following manner: (1) factor analysis for the entire sample, factor analysis for men, and factor analysis for women; (2) the results of testing Holland's hexagonal model with a Malaysian population; and (3) the report of the reliability study.

Factor Analytic Study

The entire test analyses were performed on 24 scales: (a) 18 scales were derived from the composite scores from each subtest—Likes (L), Competencies (C), and Occupational Interests (I)—and (b) six scales from Self-Rating subtests. The 24 x 24 correlation matrix (the correlation coefficients between all pairs of scales) was factor analyzed using the principal component analysis with varimax rotation.

In factor analytic studies the retention of common factors to be rotated is based on (a) an eigenvalue which is greater than one, and (b) the percentage of total variance accounted by the factors to be rotated. In general, retained factors should account for a large portion of the total variance—75% or more is recommended (Edwards & Whitney, 1972, p. 130).

The principal factor analysis identified five factors having eigenvalues greater than one (1) in all analyses: in the analyses
for the total sample, and in the separated analyses performed for men and women.

Table 2 lists the factor loadings for the entire sample which account for 80% of the total variance. Table 3 presents the factor loadings for men and women separately and account for 80% of the total variance in the men's sample and 76% of the total variance in the women's sample. Loadings greater than .50 are used to interpret the data. Loadings between .50 to .65 are considered low, .65 to .75 are moderate, and loadings of .75 and above are considered high.

For practical purposes three primary factors were identified in the analyses of the total sample and in the analyses of the women's sample. Two factors of the five extracted factors in the case of the men's analyses were identified in this study (Tables 2 and 3). The remaining factors appear to be insignificant, since there are very few acceptable loadings on these factors. Furthermore, those few loadings are from the last few scales which have remarkably low intercorrelation among the scales and with other scales as well (see Appendix E.). These findings reflect the fact that the scale has a very low reliability.

An inspection of Table 2 indicates that Variables 3, 4, 9, and 10 have remarkably high loadings (.94 in all cases) on Factor 1. Variables 5, 11, 15, and 17 have loadings ranging from moderate to low. Variables 3, 9, and 15 represent measures of ability and interest in artistic work. Variables 4 and 10 reflect the ability and the willingness to function in social situations. The items under these measures reflect activities which serve or to help people. It
Table 2
Varimax Rotated Factor Matrices
for 86 Women and 80 Men

<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1 Likes-Realistic</td>
<td>-05</td>
</tr>
<tr>
<td>2 Likes-Investigative</td>
<td>-20</td>
</tr>
<tr>
<td>3 Likes-Artistic</td>
<td>94</td>
</tr>
<tr>
<td>4 Likes-Social</td>
<td>94</td>
</tr>
<tr>
<td>5 Likes-Enterprising</td>
<td>50</td>
</tr>
<tr>
<td>6 Likes-Conventional</td>
<td>44</td>
</tr>
<tr>
<td>7 Competencies-Realistic</td>
<td>07</td>
</tr>
<tr>
<td>8 Competencies-Investigative</td>
<td>48</td>
</tr>
<tr>
<td>9 Competencies-Artistic</td>
<td>94</td>
</tr>
<tr>
<td>10 Competencies-Social</td>
<td>94</td>
</tr>
<tr>
<td>11 Competencies-Enterprising</td>
<td>45</td>
</tr>
<tr>
<td>12 Competencies-Conventional</td>
<td>-11</td>
</tr>
<tr>
<td>13 Interests-Realistic</td>
<td>05</td>
</tr>
<tr>
<td>14 Interests-Investigative</td>
<td>33</td>
</tr>
<tr>
<td>15 Interests-Artistic</td>
<td>61</td>
</tr>
<tr>
<td>16 Interests-Social</td>
<td>41</td>
</tr>
<tr>
<td>17 Interests-Enterprising</td>
<td>50</td>
</tr>
<tr>
<td>18 Interests-Conventional</td>
<td>40</td>
</tr>
<tr>
<td>19 Self Rating-Realistic</td>
<td>06</td>
</tr>
<tr>
<td>20 Self Rating-Investigative</td>
<td>-02</td>
</tr>
</tbody>
</table>
Table 2—Continued

<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>21 Self Rating-Artistic</td>
<td>01</td>
</tr>
<tr>
<td>22 Self Rating-Social</td>
<td>-03</td>
</tr>
<tr>
<td>23 Self Rating-Enterprising</td>
<td>-02</td>
</tr>
<tr>
<td>24 Self Rating-Conventional</td>
<td>-01</td>
</tr>
</tbody>
</table>

Note. The decimal point is omitted (e.g., -.05). $h^2 = \text{Communality}$.

Table 3

Varimax Rotated Factor Matrices for 86 Women and 80 Men Shown Separately

<table>
<thead>
<tr>
<th>Variables</th>
<th>Women's factor matrices</th>
<th>Men's factor matrices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1 L-R</td>
<td>60</td>
<td>-02</td>
</tr>
<tr>
<td>2 L-I</td>
<td>97</td>
<td>02</td>
</tr>
<tr>
<td>3 L-A</td>
<td>-02</td>
<td>08</td>
</tr>
<tr>
<td>4 L-S</td>
<td>01</td>
<td>15</td>
</tr>
<tr>
<td>5 L-E</td>
<td>97</td>
<td>16</td>
</tr>
<tr>
<td>6 L-C</td>
<td>96</td>
<td>00</td>
</tr>
<tr>
<td>7 C-R</td>
<td>90</td>
<td>04</td>
</tr>
<tr>
<td>8 C-I</td>
<td>96</td>
<td>04</td>
</tr>
</tbody>
</table>

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Table 3--Continued

<table>
<thead>
<tr>
<th>Variables</th>
<th>Women's factor matrices</th>
<th>Men's factor matrices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9 C-A</td>
<td>02</td>
<td>90</td>
</tr>
<tr>
<td>10 C-S</td>
<td>-22</td>
<td>30</td>
</tr>
<tr>
<td>11 C-E</td>
<td>97</td>
<td>03</td>
</tr>
<tr>
<td>12 C-C</td>
<td>96</td>
<td>03</td>
</tr>
<tr>
<td>13 I-R</td>
<td>05</td>
<td>03</td>
</tr>
<tr>
<td>14 I-I</td>
<td>96</td>
<td>05</td>
</tr>
<tr>
<td>15 I-A</td>
<td>00</td>
<td>60</td>
</tr>
<tr>
<td>16 I-S</td>
<td>90</td>
<td>06</td>
</tr>
<tr>
<td>17 E-E</td>
<td>97</td>
<td>02</td>
</tr>
<tr>
<td>18 E-C</td>
<td>96</td>
<td>06</td>
</tr>
<tr>
<td>19 S-R</td>
<td>00</td>
<td>01</td>
</tr>
<tr>
<td>20 S-I</td>
<td>00</td>
<td>11</td>
</tr>
<tr>
<td>21 S-A</td>
<td>04</td>
<td>50</td>
</tr>
<tr>
<td>22 S-S</td>
<td>06</td>
<td>25</td>
</tr>
<tr>
<td>23 S-E</td>
<td>40</td>
<td>04</td>
</tr>
<tr>
<td>24 S-C</td>
<td>00</td>
<td>28</td>
</tr>
</tbody>
</table>

Note. L = Likes, C = Competencies, I = Occupational Interests, S = Self Rating, R = Realistic, A = Artistic, S = Social, E = Entrep­ring, and C = Conventional. The decimal point is omitted. h² = Communality.
appears that the artistic features and the social features have a considerable number of aspects in common, which could account for their loadings on the factor contributing the largest part of the total variance. The social type may choose different kinds of activities than the artistic type. However, since both of them do things which involve other people (the former do things to serve others while the latter do things to entertain others), both of them must have a common characteristic.

High loadings on Variables 5, 11, and 17 indicate preference for activities to lead and to convince others. Working with people might become the common element for these variables to be highly correlated with artistic and social variables. Any interaction with people may be perceived by the sample as having the same value regardless of the purpose. These humanistic variables have a very low correlation with Variables 1, 2, 7, 8, 13, 19, and 20 that represent measures of interests, ability, and competencies in working with things rather than with people. In short, this factor may be identified as a people-oriented factor or Artistic-Social factor.

Factor 2 has the highest loadings on Scales 2, 5, and 8, has moderate loadings on Scales 17 and 18, and has low loadings on Scales 6 and 11. Scales 2 and 8, together with Scale 14 which has a substantial loading, reflect activities that require an inquisitive mind in isolated situations, i.e., a preference not to work with other people. Scales 5, 11, and 17, which load moderately, represent an enterprising characteristic. Theoretically, these two variables are the most unlikely to combine on one factor. However, the rationale
for this may be due to the ambition and commitment aspects of enterprising characteristics that become the common factor with research oriented type of work. Substantial loadings on Scales 6 and 18 are somewhat consistent with the nature of investigative work that require the skill of using educationally technological equipment. Zero and near zero loadings on most of social and artistic variables indicate that this research-ambition factor is not necessarily related to people.

Scales 1, 7, and 13 have loadings ranging from moderate to high (.60, .76, and .85, respectively) on Factor 3. Scales 6 and 12 have fairly high loadings (.60 and .80, respectively). Loadings on this factor clearly identify a "things" oriented factor as opposed to a "people" oriented factor (Factor 1). Scales 1, 7, and 13 represent willingness, ability, and interests in working on mechanical and technical things, while Scales 6 and 12 indicate willingness and ability in working and using technical facilities. Both seem to require precision, systematic, rigid situations in most cases, and above all working with things rather than people. Other scales appear to be uncorrelated with the scales described earlier. With the exception of Variables 11 and 14, other loadings are insignificant with most of them near zero.

The factor structure of this analysis could be summarized as follows: (a) The five factor solution yielded three meaningful factors: a people-oriented factor (Factor 1), a things-oriented factor (Factor 3), and a combination of people- and things-oriented factor (Factor 2). In Holland's terms, Factor 1 could be identified
as Artistic-Social-Enterprising (A-S-E) factor, Factor 2 is an Investigative-Enterprising (I-E) factor, and Factor 3 is a Realistic-Conventional (R-C) factor. There is a noticeable inconsistency of the factor structure in this analysis compared to Holland's hypothetical structure and compared to the results of other studies (Moir et al., 1973; Rachman et al., 1981; Tuck & Keeling, 1980; Wakefield & Doughtie, 1973). Holland (1973) hypothesized that investigative types would be opposite to the enterprising type and located directly across the hexagon. In no other studies were these two variables combined to form a factor as it has in this study.

**Factor Loadings For Men**

When men and women are grouped separately, the factor structure appears to be different. Table 3 for the men's factor loadings indicates that three different combinations of scales dominate Factor 1. Artistic scales have loadings of .95 on Scale 3, .94 on Scale 9, and .60 on Scale 15. The Social scale has loadings of .98 on Scale 4, .97 on Scale 10, and .70 on Scale 16. The Enterprising scale has loadings of .96 on Scale 5, .69 on Scale 11, and .96 on Scale 17. These scales (which have high loadings) reflect people-oriented characteristics. Working in the areas of social, artistic, and enterprising involves one common factor, i.e., people. The men in the sample seem to value the activities to help others, to entertain others, and to lead or convince others in the same way. Both investigative (Scales 1, 8, 14, and 20) and realistic work (Scales 1, 7, 13, and 19) appear to be valued differently by the sample. Thus, the
two clusters of scales, the E-S-A and C-R are uncorrelated except in the case of Investigative (Scale 8). Scale 6 and Scale 18 have moderate loadings on this factor. These scales reflect work in the area of using technical expertise.

Factor 2 has substantially high loadings on Scales 6, 7, 12, and 13. The loadings range from .70 to .85. These four scales reflect a things-oriented factor. Scales 6 and 12 represent working with mechanical and technical things and do not require contact with other people as in the activities reflected by other scales. Scales 7 and 13 reflect working with technological equipment, such as using an adding machine, a typewriter, etc. The common factor for these two sets of scales is the fact that the person needs to have skills in using machines, a need to follow certain rules and laws, and a need to perform in isolated situations. With the exception of Scales 14 and 15 other scales have zero loadings.

The two factors in this analysis are related to Factor 1 and Factor 2 in the general analysis of combined men and women.

**Factor Loadings for Women**

Examining the loadings of the factor matrix for women, Factor 1 has high loadings in Scales 2, 5, 6, 7, 8, 11, 12, 14, 16, 17, and 18. All the loadings are remarkably high, i.e., all of them are above .90. With the exception of Scale 1, other scales have zero loadings on this factor. Scales 8 and 14 reflect working with an inquisitive mind, conducting research, and investigating. Scales 5, 11, and 17 represent working with commitment and ambition. This
enterprising scale seems to measure a common element with the investigative scale mentioned earlier. Scales 6, 12, and 18 appear to have a remarkably high correlation with the two sets of scales above. These scales relate to working in a systematic manner, requiring discipline and skills of a technical nature. Scales 1 and 7 have fairly high loadings. These seem quite consistent with the other scales that have very high loadings. Working and repairing technical and mechanical things should have a number of aspects in common with work using technical facilities in that they both involve machines, are not people oriented, and both need special skills and training. This factor seemed to be a combination of all the non-people variables in the test.

Factor 2 is clearly identified as an Artistic factor with three scales, 9, 15, and 21 (with lesser confidence), that have loadings ranging from .50 to .90. The scales reflect working with people and providing entertainment which requires a special ability and creativity. Other scales appear to be uncorrelated.

Two scales that have high loading on Factor 3 are Scales 4 and 10 (.60 and .90). These two scales indicate social types of work. They reflect working with people providing human services. These scales seem to be totally uncorrelated with other scales. All other scales have zero loadings.

Comparing the factor structure between men and women, one can see that the sex variable seems to affect the factor structure. Men and women in this sample seem to have different structures. The male sample produces two factors: an A-S-E factor and a R-C factor. One
factor is a people-oriented factor and the other is a things-oriented factor. In the case of the women's sample, three factors emerge: an Investigative-Conventional-Enterprising (I-C-E) factor, an Artistic (A) factor, and a Social (S) factor. An analysis of the women's data yields two factors with a single characteristic, while the men's analysis fails to split the types. The fact that men and women produce different structures is consistent at least with two other studies (Meir et al., 1973; Tuck & Keeling, 1980), although the structure of each sample is different. One of the men's factor structures (R-C) seems to resemble the entire sample structure. In the women's analysis there is a combination of types, the investigative-enterprising (in the I-E-C factor) which is similar to the combination of Factor 2 in the total sample's analysis. The I-E combination appears to contradict the hypothesis which claims that an investigative type is opposite to an enterprising type. For a sample which is from a different culture as in the case of this study, there is a possibility that the cultural influences contribute to the factor structure.

The Distances Between Types of Personality

Table 4 presents the intercorrelation coefficients among the six personality types for men and women as measured by summated standard scores on the SDS.

For the men's sample, Scale A has fairly high correlation with Scales S and E (.80 and .85, respectively). Scale E and Scale S are also highly correlated (.90). These three scales have moderate
Table 4

SDS Scale Intercorrelations

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>I</th>
<th>A</th>
<th>S</th>
<th>E</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>77</td>
<td>12</td>
<td>30</td>
<td>66</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>70</td>
<td>--</td>
<td>45</td>
<td>36</td>
<td>84</td>
<td>78</td>
</tr>
<tr>
<td>A</td>
<td>29</td>
<td>70</td>
<td>--</td>
<td>42</td>
<td>03</td>
<td>-12</td>
</tr>
<tr>
<td>S</td>
<td>14</td>
<td>67</td>
<td>80</td>
<td>--</td>
<td>38</td>
<td>26</td>
</tr>
<tr>
<td>E</td>
<td>30</td>
<td>70</td>
<td>85</td>
<td>90</td>
<td>--</td>
<td>91</td>
</tr>
<tr>
<td>C</td>
<td>60</td>
<td>70</td>
<td>60</td>
<td>64</td>
<td>73</td>
<td>--</td>
</tr>
</tbody>
</table>

Note. Correlations below the diagonal are for men (n = 80). Those above the diagonal are for women (n = 86). R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. The decimal point is omitted.

correlations (.60, .64, and .73, respectively) with Scale C and Scale I (.70, .67, and .73, respectively), and very low correlations with Scale R (.29, .14, and .30, respectively). Scales R and C are moderately correlated (.60). For the women's sample Scale A and Scale S seem to have very low correlations with other scales. The correlation coefficients of Scale A with Scales R, I, S, E, and C are as follows: .12, .45, .42, .03, and -.12; and Scale S is correlated to other scales in this manner: .30 with R, .36 with I, .42 with A, .38 with E, and .26 with C. Scales C, E, and I seem to have high correlations among them. Scale C has .91 correlation coefficient with Scale E and .78 with I. The correlation between Scale E and Scale I is .84. The results seem to reflect the factor structure for both samples which have been discussed earlier. Those scales that are
highly correlated combined to form a factor: Factor A-S-E for the men and Factor I-E for the women. Scales that have low correlations with other scales form a single factor: Factor A and Factor S for the women's sample. Principal factor analysis of these correlations produced five factors with positive eigenvalues in both samples.

Table 5 presents the computed distances between pairs of personality types in five dimensional space following varimax rotation. All comparisons involve alternate distances. Holland (1973) and his associates proposed that the six personality types could be arranged in a hexagon shape, in that some personalities are closely located while some are not (see Figure 1 in Chapter I). The distances between pairs of personalities represent resemblances to each other. For example, an R type is hypothesized as closely resembling an I type and they are located adjacent to each other on the hexagon. An R type is hypothesized as having less common characteristics with an A type and has no common characteristics with an S type. Therefore, A is located in an alternate position to R, and S is located directly across from R. The distances between the alternate pairs (R-A, A-E, E-R, I-S, S-C, and C-I) are postulated as larger than the adjacent pairs (R-I, I-A, A-S, S-E, E-C, and C-R) and smaller than the opposite pairs (I-E, R-S, and C-A). There are six pairs each for the adjacent and alternate locations, and there are three pairs of opposite locations. The total possible comparisons are 54.

Table 5 indicates that the computed distances have the order of the hypothesized order and a 0 indicates that the order of the distances are opposite to the hypotheses.
Table 5
Distances Between Pairs of Types in Common Factor Space

<table>
<thead>
<tr>
<th>Pairs</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-I</td>
<td>62</td>
<td>30</td>
</tr>
<tr>
<td>I-A</td>
<td>63</td>
<td>16</td>
</tr>
<tr>
<td>A-S</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>S-E</td>
<td>42</td>
<td>90</td>
</tr>
<tr>
<td>E-C</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>C-R</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>R-A</td>
<td>102</td>
<td>100</td>
</tr>
<tr>
<td>A-E</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>E-R</td>
<td>108</td>
<td>60</td>
</tr>
<tr>
<td>I-S</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>S-C</td>
<td>70</td>
<td>97</td>
</tr>
<tr>
<td>C-I</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>I-E</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>R-S</td>
<td>120</td>
<td>82</td>
</tr>
<tr>
<td>C-A</td>
<td>70</td>
<td>130</td>
</tr>
</tbody>
</table>

Note. The decimal point is omitted.
Tables 5 and 6 for the women's sample show that 40 of the comparisons are consistent with the postulated order of R-I-A-S-E-C (possible 54 comparisons). The $Z$ score for an $r^1$ of .40 is 3.946 ($p < .0004$). Thirty-two out of possible 36 directions for the adjacent pairs have smaller distances than the alternate pairs, and 8 out of 18 possible directions for the opposite pairs have larger distances than the alternate pairs. The inconsistent direction is the distance in the space between I-E (postulated opposite type). The distance is smaller than the distance between all the six alternate types, and also smaller than distances between three of the six adjacent types. The distance of R-S (postulated opposite type) also appears to be smaller than the distance between four of the six postulated alternate types. And there are two directions for the alternate pairs that have smaller distances than the distances of all the adjacent pairs.

In the men's sample 36 of the 54 comparisons are in the order of hypothesized direction. The $Z$ score for an $r$ of .36 is 3.561 ($p < .0005$). Twenty-two out of 36 possible directions for adjacent pairs have smaller distances than the alternate pairs, and 10 out of 18 possible directions for opposite pairs have larger distances than the alternate pairs. There are more inconsistent directions in the case of men's sample than in the women's sample. The computed distance between C-I (the postulated alternate type) is smaller than all the computed distance between five out of six hypothesized adjacent

---

$^1r = \text{the number of relationships between pairs of personality.}$
Table 6
Comparison of Distance Between Pairs of Personality Types for Women and Men

<table>
<thead>
<tr>
<th>Pair of alternate types</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R-A A-E E-R I-S S-C C-I</td>
<td>R-A A-E E-R I-S S-C C-I</td>
</tr>
<tr>
<td>Adjacent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-I</td>
<td>1 0 1 1 1 0</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>I-A</td>
<td>1 0 1 1 1 0</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>A-S</td>
<td>1 0 1 1 1 0</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>S-E</td>
<td>1 0 1 1 1 1</td>
<td>1 1 0 1 1 0</td>
</tr>
<tr>
<td>E-C</td>
<td>1 0 1 1 1 1</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>C-R</td>
<td>1 0 1 1 1 0</td>
<td>1 1 0 1 1 0</td>
</tr>
<tr>
<td>Opposite types</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-E</td>
<td>0 1 0 0 0 1</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>R-S</td>
<td>1 1 1 1 1 1</td>
<td>0 0 1 0 0 1</td>
</tr>
<tr>
<td>C-A</td>
<td>0 1 0 0 0 1</td>
<td>1 1 1 1 1 1</td>
</tr>
</tbody>
</table>

Note. R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. The distances for the women's sample are on the right of the table and the distances for the men's sample are on the left of the table.
types. The computed distance of C-A (postulated opposite type) is smaller than distances between five out of six hypothesized alternate types, and the distance of I-E, which is also hypothesized opposite type, is smaller than the hypothesized distance between three of six alternate types.

In the men's sample the number of inconsistent directions are greater than in the women's sample. However, the magnitude of the inconsistency for the women's sample is very noticeable. The distance of I-E (opposite type) is much smaller than was hypothesized. This result seems to be consistent with the result of women's samples in other studies (Meir et al., 1973; Tuck & Keeling, 1980). The difference between the results obtained in previous studies (in the case of women samples) and the results from this study may be due to the cultural differences of the sample which will be explained in Chapter V.

Reliability Information

Cronbach's coefficient alpha was calculated to obtain the reliability for each of the subtests. The reliability coefficient of the entire test was also obtained. The reliability estimate for the entire test is .81, and the reliability estimate of the subtests are as follows: Subtest 1 was .60, Subtest 2 was .71, Subtest 3 was .61, and Subtest 4 was .68. The entire test in terms of reliability is moderately high (.81) and the subtests' reliability coefficients are moderate.
CHAPTER V
SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Summary

There is a significant need for a reliable and valid procedure for assisting students in making educational and career choices. In Malaysia, career decisions are made primarily on the basis of a student's academic record alone. In some cases the decisions are made with school personnel, parents', relatives', and friends' influence. Empirical data indicate that an interest inventory can assist people who are in the process of making decisions about career choices, training opportunities, and educational planning.

Based on its simplicity, validity, and practicality, the Self Directed Search (SDS), a vocational interest instrument developed by Holland (1973), seems to have promising potential for assisting students with career choices. For these reasons the SDS was chosen for investigation in this study. The instrument attempts to describe people's (age 13 through adult) interests in terms of personality types as proposed by Holland (1973). His theory assumes that people can be categorized into six types: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). The theory further assumes that the psychological relationship of the six personality types can be arranged in a hexagonal model with the arrangement of R-I-A-S-E-C at the major intersections of the model.
Some pairs of types are more closely related than others. For example, Realistic-Investigative types have more in common than Conventional-Artistic types, and so on. These two assumptions are the primary concern of this study.

Studies with American, Canadian, Israeli, and New Zealand samples indicate that the instrument is valid and the theory is supported. With factor analysis as the procedure these studies consistently produced at least four factors analogous to the types across the samples. The present investigation was designed to determine whether data from a Malaysian sample would produce results comparable to the results of other studies. The specific questions were: Would the factor structure from Malaysian students' data be the same as they were in other studies? Would the relationship between types as proposed by Holland's (1973) theory be supported?

Form E of SDS was used for the current investigation. The instrument is comprised of four subscales, namely: Likes, Competencies, Occupations, and Self-Ratings. All the scales are organized in terms of Holland's (1973) six personality types: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). Subjects indicated their preference for the items listed in the first three scales and rated their ability on a scale from 1 to 6 for the Self-Ratings scales.

For the purposes of this study, the instrument was modified and translated into the Malay language with a "back translation" procedure (Brislin, 1970). Twelve items (Table 1) were modified, and the instrument was translated back and forth three times by several
bilinguals working independently and then conjointly to eliminate translation differences. The technique was employed to maximize the equivalence of meaning between the two versions. A pilot study with "counterbalance" design indicated that the translated version of SDS was highly correlated with the original edition ($r = .90$). The Malay edition of SDS was mailed to the sample during the spring of 1984.

The responses of 169 Malaysian undergraduates from Western Michigan University were analyzed using a common factor analysis with varimax rotation to determine the factor structure for the sample. A sex differentiation analysis was also performed. In testing the hexagonal model, the formula suggested by Wakefield and Doughtie (1973) was utilized. Space-distance data were calculated between each pair on the hexagon. A total of 54 possible comparisons was made between adjacent pairs, alternate pairs, and opposite pairs. The reliability of the instrument was determined by coefficient alpha.

The following points summarize the findings.

1. Three factors were identified from an analysis of the entire sample: Factor 1, Artistic-Social-Enterprising; Factor 2, Investigative-Enterprising; and Factor 3, Realistic-Conventional.

2. When a separate analysis was performed according to sex, men and women appeared to generate different factor structures. The two factors for the men were (1) an Enterprising-Social-Artistic factor and (2) a Conventional-Realistic factor. Data from the women's sample produced three factors, namely: (1) Enterprising-Investigative-Conventional, (2) Artistic, and (3) Social.
3. The results of measuring the distances in space between the six personality types were as follows: For the male sample, 36 out of 54 possible comparisons were in the hypothesized direction. For the women's sample, 40 of the comparisons were consistent with the postulated order of R-I-A-S-E-C (54 comparisons).

4. The reliability coefficients for the subscales ranged from .60 to .68. The reliability for the entire test was .81.

Discussion

The results of the present study exhibit some deviations from the studies of Rachman et al. (1981), Tuck and Keeling (1980), and Edwards and Whitney (1972). Data from this study produced fewer factors (by factor analysis) than other comparable studies. With the exception of the two unitary factors from the women's sample, other factors did not define a single characteristic. Some scales combined together and formed a composite factor, while others either lacked variances or their variances were in different directions. This strayed variance will be discussed first.

The items in the Conventional (C) scales seem to be psychologically homogeneous, but with men their variances go two different directions. The directions indicate that the scales have a relatively strong relation with both the Artistic-Social (A-S) and Realistic (R) factors. In the analysis of the total sample they seem to affiliate with the Investigative (I) factor and the Realistic (R) factor. The affiliation with the R factor and the I factor seems reasonable. Items on Scales R and C are related to machine manipulations, while
items on Scale I indicate the conceptual aspect of technical knowl-
edge. On the other hand, the affiliation of the variances of the subtest measuring C type with an A-S factor, as in the case of the men's sample show a surprising relationship, particularly to the social scales that represent interest in people's welfare.

Realistic scales appear to be homogeneous to the men, but do not appear so to the women. Scales from first domain (Likes) and second domain (Competencies) developed significant variances in a composite factor (Enterprising-Investigative-Conventional) for women. An affiliation of this kind seems unusual and, perhaps, could be explained by the presence of the Conventional scales in the factor which could have a type of relationship mentioned earlier. The scales from the last two subtests (Occupational Interests and Self-Estimate) seem to be lacking in variances.

The Enterprising scale is another source of strayed variance for the men and also for the entire sample. The scores on these scales contributed significant variances to three of the factors in the entire sample's analysis and also to both factors in the men's analysis. The affiliation with the Realistic factor is difficult to explain. Usually such unexpected affiliation can be accounted for by one or more items in the tests that stray from the prominent common element. The possible explanation for the relation with the I factor in the entire sample study may be due to the variances from the women sample that is included in the analysis. The women's data generated one composite factor (Enterprising-Investigative-Conventional). The relationship between the scales that reflect an interest in helping
others (Social) and the scales that represent interest in controlling others (Enterprising) is not surprising. Tuck and Keeling (1980) with their New Zealand sample, Rachman et al. (1981) with their Canadian sample, and Edwards and Whitney (1972) with their American sample consistently found that S and E combined to determine one factor. Based on these findings the question of whether the SDS differentiates between these types was raised.

Two composite factors are identified in both the men's and women's analyses. The Artistic-Social factor identified in the men's study is similar to the first factor of the entire sample. The women's sample has a different composite factor. In the case of the men's sample, Artistic scales and Social scales evidenced a very strong relationship. Both measures contributed equally significant variances across all three domains (Likes, Competencies, and Occupational Interests). This may indicate the men in the sample view items in the Social scales as having artistic value.

The combination of Enterprising, Investigative, and Conventional into one of the women's factors seems to be most unusual. However, their relationship was very strong. All three scales load equally and exceptionally high on the factor. The tentative explanation could be that cultural influences may have been expressed in the personality. The majority of the subjects in the sample are students with high academic performance, particularly in mathematics and science subjects. These subjects with their investigative mind have been exposed to two different kinds of social values. At home, unlike their opposite sex siblings, they were raised in the strict
rules of adab (well-behaved) which includes respect for others, politeness, and obedience which may contribute to their interest in conventional activities. On the other hand, the recent concept of promoting the Malays in business industries offers tremendous opportunity and encouragement to develop interests in fields related to business. Schools and media have become agents in promoting competitive and enterprising values. This may explain why the tests measuring these types contribute very significant variances to this factor. Within the family these intellectual girls were raised to be conventional and in school they are taught to be aggressive.

Two other single type factors were identified (with a lesser degree of confidence) in the entire sample. One of them is the R factor which is similar to the second factor for the men. These two factors, however, are weakened by the affiliation of other scales that have been described earlier. Tuck and Keeling (1980) also found in their female sample two factors that could not be clearly identified.

Two other factors were clearly and uniquely identified in the women's sample: Artistic and Social. All the scales measuring artistic types from the three tests contributed significant variances to this factor, and scales measuring the social types also contributed significant variances to the Social factor. In this respect one may conclude that the data from the women's sample appears to answer partially the question whether the factor structure of this sample would be comparable to the factor structure of other studies. In this sense these two factors from the women's sample are comparable.
Since the women's data produced two clear factors, there are greater numbers of relationships between types (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional) which are consistent with the hypothesized directions than in the case of the men's sample. This result seems to contradict the results of other studies. It was found in all of the studies mentioned that men's samples have always produced more consistent arrangements than women's samples.

It may be concluded that there are similarities and there are discrepancies between the findings of this study and the results of other studies. This conclusion is open to two lines of interpretations.

Interpreted from a cross-cultural perspective, the results may have been influenced by different cultural values. The unusual affiliation of the E-I-C factor, for example, may theoretically be interpreted as a complex personality (Holland, 1973). However, considering the cultural variables the combination may as well just be a unique type.

From another view, sometimes apparent linkages between two or more scales, as cautioned by Guilford (1954), could be merely a function of faulty test construction. To a certain degree this may have happened. Other studies mentioned earlier have demonstrated that their analyses fail to split some components of the SDS. Enterprising and Social components for both male and female analyses define one factor and the Realistic and Investigative components for females alone define another factor. Although the type of components
are different from the present study, these findings support the hypotheses that some scales of SDS are factorially complex and require further refinement.

The conclusion that some of the scales that measure personality types are incomplete is further supported by examining the findings of studies measuring the same types using the Vocational Preference Inventory (VPI), the predecessor of the SDS. It was found that the problems mentioned in this study have never appeared in other studies using the VPI. Among others, Awang (1976) found that personality types were identified among a sample of male Malaysian school students with the VPI as the criterion. This information may imply that the theory underlying the tests, both the SDS and VPI, is basically sound.

Recommendations

While the deviations could become the grounds to challenge the completeness of some scales, the similarities warrant further research to further validate the present findings. Particularly important is the need for cross validation efforts with new and larger samples from diverse Malaysian populations. A larger sample would have enhanced the findings because categorization according to types and sex reduce the usable size of the sample. Bearing in mind that the present sample consisted of Malaysian undergraduates, larger and more diverse samples would help to determine whether the present findings could be generalized to other Malaysian populations.
As indicated by the data, some of the scales are not complete. Therefore, item revision seems appropriate to enhance discriminant validity.

The inconsistency of the directions as to where the variances of the tests go suggest that each domain (Likes, Competencies, Occupational Interest, and Self-Estimate) should be examined or investigated separately. By doing so, further validation of the theory underlying the tests could be conducted.

Conclusions

Several conclusions can be drawn from the present study.

1. Generally, the findings support the theory in a broad sense that people can be categorized into types. However, it may not necessarily be as many as six types.

2. The psychological relationships findings also confirm the hexagonal model proposed by Holland et al. (1969). The model seems to provide better descriptions for women's occupational fields than the men's.

3. The reliability indices indicate that the instrument is moderately reliable.

4. The lack of empirical separations of several scales suggest that some of the scales are incomplete.

5. The correlation matrices of all the scales indicate that the Self-Estimate scales are unreliable.

With the limitations of this exploratory preliminary study, the results may not be conclusive. However, these findings generate some
valuable information with respect to the usage of SDS with a culturally unique and different population. With additional research as recommended, perhaps the findings would be more meaningful and useful.
APPENDICES
PLEASE NOTE:

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

These consist of pages:

- Appendix A
  Pages 67-73
- Appendix B
  Pages 75-80
- Appendix C
  Pages 82-88

University Microfilms International
300 N. ZEEB RD., ANN ARBOR, MI 48106 (313) 761-4700

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Appendix A

Original Edition of SDS
Appendix B

Modified Version of SDS

74
Appendix C

Malay Version of SDS
Assalamualaikum
Saudara/i yang dihormati,
Semoga sejahtera selalu.

Saya seorang penuntut di Western Michigan University yang sedang menjalankan penyelidikan disertasi saya. Dengan itu saya memohon bantuan sdra/i meluangkan sedikit masa menjawab soalselidik yang saya lampirkan di sini.

Terusterang saya nyatakan bahawa kejayaan pengajian saya bergantung besar kepada response sdra/i. Kesudian sdra/i menjawab dan mengembalikan soalselidik ini amatlah saya hargai dan saya dahulukan ribuan terima kasih.

Soalselidik ini adalah inventori minat Dr. Holland yang telah diubahauhi dan diterjemah. Dari kajian 2 terdahulu didapati ianya dapat membantu penuntut2 baik di sekolah maupun di univeristi mengetahui minat dan kebolehan yang dapat dijadikan panduan memilih bidang pengajian, latihan, dan pekerjaan yang secocok dengan seseorang itu. Kajian saya bertujuan untuk melihat kemungkinan inventori ini digunakan untuk membantu kita penuntut2 Malaysia. Hasil kajian ini akan lebih bermakna sekiranya jumlah responses yang saya terima banyak. Dengan itu saya sangat-sangat mengharapkan kerjasama sdra/i agar sudi menjawab soalselidik ini.

Sekira nya sdra/i ingin mendapatkan maklumat tentang minat dan kebolehan serta bidang pengajian dan pekerjaan yang secocok dengan sdra/i sila buat catatan dan tuliskan nama sdra/i. Sebagai tanda penghargaan saya atas pertolongan sdra/i saya sedia membuat analisa secara individu dan menghantarnya kepada sdra/i.

Segala responses adalah rahsia. Olih itu bagi sdra/i yang tidak berminat mendapatkan maklumat sendiri, sdra/i tidak perlu menurunkan nama dan alamat.

Besarlah harapan saya jika soalselidik ini dapat sdra/i jawab secepat mungkin dan dikembalikan selewat-lewatnya dalam masa seminggu dari surat ini diterima. Sekian, salam hormat dan selamat berjaya dalam pengajian.

Wassalam,
yang berharap

[Signature]
Amla Hj. Salleh.
Appendix E

The Intercorrelation of the Four SDS Subscales on 24 Variables
<table>
<thead>
<tr>
<th>Likes</th>
<th>Competencies</th>
<th>Occupations</th>
<th>Self-rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>I</td>
<td>A</td>
<td>S</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>52</td>
<td>01</td>
</tr>
<tr>
<td>6</td>
<td>65</td>
<td>50</td>
<td>51</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>65</td>
<td>03</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>70</td>
<td>63</td>
</tr>
<tr>
<td>9</td>
<td>04</td>
<td>01</td>
<td>96</td>
</tr>
<tr>
<td>10</td>
<td>00</td>
<td>02</td>
<td>92</td>
</tr>
<tr>
<td>11</td>
<td>65</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>12</td>
<td>40</td>
<td>65</td>
<td>03</td>
</tr>
<tr>
<td>13</td>
<td>40</td>
<td>03</td>
<td>02</td>
</tr>
<tr>
<td>14</td>
<td>51</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
<td>00</td>
<td>57</td>
</tr>
<tr>
<td>16</td>
<td>33</td>
<td>52</td>
<td>53</td>
</tr>
<tr>
<td>17</td>
<td>43</td>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>18</td>
<td>34</td>
<td>50</td>
<td>51</td>
</tr>
<tr>
<td>19</td>
<td>06</td>
<td>04</td>
<td>06</td>
</tr>
<tr>
<td>20</td>
<td>07</td>
<td>12</td>
<td>00</td>
</tr>
<tr>
<td>21</td>
<td>03</td>
<td>00</td>
<td>07</td>
</tr>
<tr>
<td>22</td>
<td>05</td>
<td>02</td>
<td>-06</td>
</tr>
<tr>
<td>23</td>
<td>21</td>
<td>12</td>
<td>-01</td>
</tr>
<tr>
<td>24</td>
<td>03</td>
<td>-04</td>
<td>-05</td>
</tr>
</tbody>
</table>

Note. R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, and C = Conventional.
Underlined intercorrelations indicate high correlations (.60 and above).
Decimal point is omitted.
BIBLIOGRAPHY


Evaluation report of the job experience program organized jointly by the Selangor Vocational Guidance Association and the Selangor Education Department. (1975). Kuala Lumpur: SVGA.


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


O'Conell, T. J., & Sedlacek, W. E. (1972). The reliability of Holland's Self-Directed Search for educational and vocational planning. JSAS Catalog Selected Documents in Psychology, 2, 123. (MS No. 239)


Salim, S. (1976). An analysis of the guidance and counseling program of Portage Northern High School and a proposal for developing a guidance and counseling program in a secondary school in Malaysia. Paper submitted for Specialist Degree, Western Michigan University, Kalamazoo, MI.


